Installation and Implementation of a LAMP Documentation Server

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***Abstract*— The focus of the ECSU TeraGRID team for the summer of 2007 is to setup a documentation platform for a Condor-based GRID to be established at Elizabeth City State University. This documentation platform will be a Linux based web sever that will utilize Web 2.0 standards to create a virtual documentation web portal. Grid computing itself is the creation of a "virtual supercomputer" by using a network of geographically dispersed computers. In order to create such a network infrastructure, documentation is critical to communicate with the users, and the maintainers of the systems.**

The web server will utilize an Ubuntu Linux kernel with an Apache web server, a MySQL Database, a PHP scripting package, and a Media Wiki web interface. This particular setup is called a LAMP server. LAMP is the acronym for Linux, Apache, MySQL, and PHP, which are all open source applications. The combination of these LAMP applications allows Media Wiki to function.

Once installed, the documentation server will be utilized to first display the information on how to create the document server. The documentation server will then later be used to document how to setup a Condor-based GRID system. *(Abstract)*

I. LAMP

LAMP server is a type of software bundle found in a specific server. LAMP stands for Linux, Apache, MySQL, and PHP. The P can also stand for Perl or Python but generally it is assumed to be PHP. It is a solution stack of software programs, commonly open-source programs, used together to run dynamic websites or servers. Linux is the operating system (sort of like a windows system). Apache is the web server used. MySQL is the database management system. PHP, Perl, or Python is used as the programming language for the system. Though the originators of these open source programs did not design them all to work specifically with each other, the combination, has become popular because of its low acquisition cost and because of the ubiquity of its components (which come bundled with most current Linux distributions). When used in combination they represent a solution stack of technologies that support application servers.

II. LINUX

A. Description

Linux is a Unix-like computer operating system. It is one of the most popular of free software and open source development available. Its primary source code can be modified, used, and redistributed by anyone without any restraints.

Largely known for its use in servers, it is used as an operating system for a variety of computer hardware, such as desktop computers, supercomputers, and embedded devices such as mobile phones and routers.

Most Linux distributions support many programming languages. Primary system software such as libraries and basic utilities are usually written in C. Enterprise software is often written in C, C++, Java, Perl, Ruby, or Python. The most common collection of utilities for building both Linux applications and operating system programs is found in the GNU toolchain, which includes the GNU Compiler Collection (GCC) and the GNU build system. Most Linux distributions also support Perl, Ruby, Python.

Linux seeks for interoperability with other operating systems such as Microsoft Windows and Mac OS X, and by extension the software that runs on Linux aims for interoperability with other Linux and non-Linux software. As an operating system underdog competing with mainstream operating systems, Linux cannot rely on a monopoly advantage. Therefore, in order for Linux to be a convenient operating system for users, it must interact well with non-Linux computers. Interoperability also provides users the choice of software and data formats without restricting them as a result of that choice.

Linux includes, by default, a command line interface (CLI) as part of its Unix-like functionality. Distributions specialized for servers may use the CLI as their only interface, since without a graphical user interface (GUI) the systems resource consumption is reduces. As well, Linux machines can run without a monitor attached. These "headless systems" can be controlled either through X11 remotely, or the CLI must be used through a protocol such as SSH or telnet.

Under Linux, desktop software such as word processors, spreadsheets, email clients, and web browsers are available. The following are some of Linux's major desktop applications:

Office: OpenOffice.org. It may be useful to compare office suites.
Internet: aMule, Azureus, Evolution, Firefox, Thunderbird, Opera, Pidgin.
Multimedia: Amarok, MPlayer, Totem, VLC, Xine, XMMS.
Graphics: Blender, GIMP, Inkscape, Scribus.

B. Ubuntu

Under the umbrella of Linux falls Ubuntu. Ubuntu is an African word meaning "Humanity to others", or "I am what I am because of who we all are". The Ubuntu distribution is known for "bringing the spirit of Ubuntu to the software world."

Ubuntu is a free of charge, community developed operating system that is designed for laptops, desktops and servers. Ubuntu contains the applications needed for such as word processing, email applications, web server software, and programming tools. Every six month a new desktop server is released as well free security updates for eighteen months.

Ubuntu is available for PC, 64-Bit and Mac architectures. CDs require at least 256 MB of RAM. Installation requires at least 4 GB of disk space.

With the installation disk, we were able to download the complete working environment which took a total of twenty-five minutes. Once we installed our system it was is immediately ready to use.

The Server Edition of Ubuntu is built on the solid foundation of Debian which is known for its strong server installations and reliable performance.

In 15 minutes, the time it took to install Ubuntu Server Edition, we were also able to install the LAMP (Linux, Apache, MySQL and PHP) server. This feature, exclusive to Ubuntu Server Edition, is available at the time of installation.

The LAMP option meant that we did not have to install and integrate each of the four separate LAMP components, a process which could have taken hours. Instead, we got increased security, reduced time-to-install, and reduced risk of misconfiguration, all of which resulted in a lower cost of ownership.

With Ubuntu Desktop Edition we are able to surf the web, read email, create documents and spreadsheets, and edit images.

When we started the system for the first time we got to see a desktop that was clean and tidy, no desktop icons, and a default theme that is easy on the eye.

Once Ubuntu was installed, all the basics were in place so that the system was immediately usable. Ubuntu's OpenOffice contains a user interface and feature set that is similar to other office suites, and includes the all the key desktop applications needed, including: (1) Word processor - for anything from writing a quick letter to producing an entire book; (2) Spreadsheet - a tool to calculate, analyze, and present your data in numerical reports or charts; and (3) Presentation - an easy, and powerful tool for creating effective multimedia presentations.

C. Procedure

Ubuntu 7.04—also known as Feisty Fawn—is known for its reliable software management tools and catalog of ready-to-install free software applications.

Ubuntu LAMP server installed the following versions: Ubuntu Feisty Fawn 7.04, Apache 2.2.3, MySQL 5.0.38, and PHP 5.2.1.

The first step necessary is to download the server version of Ubuntu onto a CD and proceed to boot the CD. Once it has started booting you will see the first screen and select the second option to "Install to the Hard disk Option" and press enter. > Next choose the language and press enter> Choose your location and press enter > If you wanted to try to have the keyboard layout detected by pressing a series of keys you need to select the "yes" option and if you didn't want that and wanted to choose from a list click no, [we selected NO]> Select Origin of keyboard and press enter> Select keyboard layout and press enter.

The following download screens will appear: Detecting hardware to find CD-ROM Drivers in progress> Scanning CD-ROM in Progress> Loading additional components progress bar> Configures the network with DHCP if there is a DHCP server in the network>

Next enter the Hostname of the system: [we set it to: ubuntulamp].

The following download screens will appear: Detecting Disks and Hardware in progress> Starting up the partitioner in progress> Next you must partition the hard disk. [We selected "use entire disk option"] and press enter> Warning message about data lost on hard disk.

The following download screens will appear: Creating partitions in hard disk> Write the changes to disk option: select yes and press enter> Creating ext3 file system in progress> Configuring the clock option [since we wanted to leave UTC we selected yes] and press enter> Next you enter the Full name of the user [administrator] you want to create for the server select continue and press enter> Enter username for account continue and press enter> Enter the password for administrator user select continue and press enter> Confirm the password for administrator user select continue and press enter.

The following download screens will appear: Installing the base system in progress> Configuring package mirror; this is related to the country option.

Now it Installs software and select the server options if DNS or LAMP is desired [we chose LAMP for our LAMP server installation].

The following download screens will appear: Software Installation in Progress> Installing GRUB Boot loader in progress> Installation complete message will appear and the CD will eject> Select continue and press enter it will reboot the server> After rebooting, the screen will prompt for username> This completes the Ubuntu LAMP Server Installation and the server is ready for installing applications which supports Apache, MySQL and PHP.

Once the following steps are complete, use the code "sudo apt-get update" to update the operating system. Then by re-inserting the operating cd into the cd drive use the code "sudo apt-get install ubuntu- desktop" to install the ubuntu GNOME desktop.

III. APACHE

A. Description

Robert McCool created the first Apache web server. He was involved with the National Center for Supercomputing Applications web server, also known as NCSA HTTPd. Robert McCool left the HTTPd in the mid 1994. Development of the server technology stalled as a result of his absence. Several other people assisted McCool with his development of the server. The co-creators of Apache are Brian Behlendorf, Roy T. Fielding, Rob Hartill, David Robinson, Cliff Skolnick, Randy Terbush, Robert S. Thau, Andrew Wilson, Eric Hagberg, Frank Peters, and Nicolas Pioch.

Version 2 of the Apache server was a substantial re-write of much of the Apache 1.x code, with a strong focus on further modularization and the development of a portability layer, the Apache Portable Runtime. The Apache 2.x core has several major enhancements over Apache 1.x. These include UNIX threading, better support for non-Unix platforms, a new Apache API, and IPv6 support. The first alpha release of Apache 2 was in March 2000, with the first general availability release on April 6, 2002. Version 2.2 introduced a new authorization API that allows for more flexibility. It also features improved cache modules and proxy modules.

Apache is primarily used to serve both static content and dynamic Web pages on the World Wide Web. Many web applications are designed expecting the environment and features that Apache provides. It is the web server component of the popular LAMP web server application stack along with Linux, MySQL, and the PHP/Pearl/Python programming language.

Apache is redistributed as part of various proprietary software packages including the Oracle RDBMS or the IBM Web Sphere application server. Mac OS X integrates Apache as its built-in web server and as support for its WebObjects application server. Borland in the Kylix and Delphi development tools also supports it in some way. Apache is included with Novell Net Ware 6.5, where it is the default web server.

Apache is used for many other tasks where content needs to be made available in a secure and reliable way. One example is sharing files from a personal computer over the Internet. A user who has Apache installed on their desktop cam put arbitrary files in the Apache's document root, which can then be shared.

Programmers developing web applications often use a locally installed version of Apache in order to preview and test code as it is being developed. The Apache HTTP Server is a web server notable for playing a key role in the initial growth of the World Wide Web. Apache was the first viable alternative to the Netscape Communications Corporation web server and has since evolved to rival other Unix-based web servers in terms of functionality and performance. Since April 1996 Apache has been the most popular HTTP server on the World Wide Web. Apache is developed and maintained by and maintained by an open community of developers under the auspices of the Apache Software Foundation. The application is available for a wide variety of operating systems including Microsoft Windows, Novell Net Ware and Unix-like operating systems such as Linux and Mac OS X. Released under the Apache License; Apache is free and open source software.

B. Procedure

The step to installing apache to the grid was to locate a suitable version of the file. To locate the file type in your web browser www.apache.org and it should take you to the apache web site where you can download the version that best suites your computer. After downloading apache the next step is to unzip and extract the file. Double clicking on the file, which looks like a box, does this. The file itself is located on your desktop. Once opened, just click extract and Ubuntu will extract your files and place them in a folder.

Now that the files have been extracted it is time to open the terminal window. If you do not have administrative privileges you will have to use sudo code to trick the computer into thinking that you have administrative privileges. The first thing you must do when the terminal window opens is type *ls* onto your keyword. Ls (list) tells the computer that you want to see a list of all of the files that are present in its database. Once the computer has generated a list of all the files you must find the name of the computer among those files. The computer we used name was Desktop. Desktop is the default name of all computers that use Ubuntu. The next step is to type *cd* (change directory) and Desktop. This tells the computer to move its focus to Desktop. Once inside Desktop type *ls* to list all of the applications inside of Desktop. Depending on the type of apache you downloaded the name should be written in blue. Once you have located the files you must change directory again to that file. For us the file name was httpd-2.2.4. Type *ls* again then type *./configure –enable-so.* The computer should start configuring the files so it can install them. Once it finishes it may have run into a problem with the c compiler.

At this point in time you must click on system, administrator, synaptic package manager and click on the search option. You will have to type in the administrator password. If you do not know where to find administrator it is located on the tool bar at the top of the screen under system.

At this screen move to the search window and type in gcc. Check everything that deals with gcc and clink install. Go back to the terminal window and type in *./configure—with-x-toolkit=xaw*. From there type in *config.log* following that *sudo make install, sudo ./configure, and sudo ./make*. Once the terminal window has come to a stop everything should have installed itself.

IV. MYSQL

A. Description

MySQL is a key part of LAMP, and a fast growing open source enterprise software stack. More and more companies are using LAMP as an alternative to expensive proprietary software stacks because of its lower cost and freedom from lock-in. It was first released internally on May 23,1995, but it wasn't until January 8, 1998 that the version for Windows 95 and NT was released. More releases of the beta version have been made and distributed to various locations. The latest version is version 5.1. Libraries for accessing MySQL databases are available in all major programming languages with language-specific API's. In addition, an ODBC interface called MyODBC allows additional programming languages that support the ODBC interface to communicate with a MySQL database, such as ASP or Cold fusion. The MySQL server and official libraries are mostly implemented in ANSI C.

The primary goals that have been set for MySQL include: to be the best and most used database in the world, to be available and affordable for all, easy to use, to be continuously improved while remaining fast and safe, to be pleasurable to use, and free from bugs.

MySQL is a multithreaded, multi-user SQL database management system. It has more than 10 million installations. MySQL is owned and sponsored by a single for-profit firm, the Swedish company MySQL AB, which holds copyright to most of the code base. The company develops and maintains the system, selling support and service contracts, as well as proprietary-licensed copies of MySQL, and employing people all over the world who collaborate via the Internet. MySQL AB was founded by David Axmark, Allan Larsson, and Michael Widenius. The CEO is Marten Mickos.

MySQL is popular for web applications and acts as the database component of the LAMP, MAMP, and WAMP platforms and for open-source bug tracking tools like Bugzilla. Its popularity as a web application is closely tied to the popularity of PHP, which is often combined with MySQL. PHP and MySQL are essential components for running the popular Word Press blogging platform.

MySQL works on many different platforms. The platforms include Mac OS X, Solaris, SunOS, Windows XP, Windows Vista, etc. MySQL is written in C and C++. It has an embedded database that allows enterprises to bring their applications and solutions to the market faster. MySQL provides standards-based drivers for JDBC, ODBC, and .Net enabling developers to build database applications in their language of choice. In addition, a native C library allows developers to embed MySQL directly into their applications. The MySQL Migration Toolkit is a powerful framework that enables a user to quickly migrate their proprietary databases to MySQL. Using a Wizard-driven interface, the MySQL Migration Toolkit implements a proven methodology and walks the user through the necessary steps to successfully complete a database migration project.

B. Procedure

1.) Go to http://www.mysql.org/
2.) Click on Downloads on the far-left side
3.) Go down until you see MySQL Community Server and click on download
4.) Out of the list choose **Ubuntu 6.06 LTS (Dapper Drake)**
5.) Then beside **Client (x86)** click *pick a mirror*
6.) Follow the screen downloads by clicking Next

V. PHP

A. Description

PHP is a programming language that was originally designed for producing dynamic web pages. PHP is used mainly in server-side scripting, but can be used from a command line interface or in standalone graphical applications. The main implementation is produced by the PHP group and released under the PHP License. The Free Software Foundation considers PHP to be free software.

The Danish programmer Rasmus Lerdorf wrote PHP as a set of CGI binaries in the C programming language in 1994. It was made to replace a small set of Pearl scripts he had been using to maintain his personal homepage. His original reason for designing PHP was to use it to display his resume and to collect certain data about the number of people that viewed his web page. PHP (Personal Home Page Tools) was released on June 8, 1995 after Lerdorf combined it with his own form interpreter to create PHP/FI.

In 1997 Zeev Suraski and Andi Gutmans rewrote the parser and formed the base of PHP3 changing the language's name to the suit it a Hypertext Preprocessor. The development team officially released PHP/FI 2 in November of 1997 after months of beta testing. Public testing of PHP 3 began and the official launch came in June of 1998. Suraski and Gutmans then started a new rewrite of PHP's core producing the Zend Engine in the year of 1999. They also founded Zend Technologies, which actively manage the development of PHP.

In May of 2000 another version of PHP was released. The Zend Engine powered PHP 4. On July 13, 2004 PHP 5 was released and the Zend Engine 2 powered it. It had new features like a support for object-oriented programming, performance enhancements, better support for MySQL, and support for SQLite.

PHP also provides a command line interface for developing shell and desktop applications or any other system administration task. PHP is increasingly used on the command line for tasks that have traditionally been the domain of Pearl, Python, or shell scripting. It primarily acts as a filter. The program takes input from a file or stream containing text and special PHP instructions and outputs another stream of data for display.

PHP includes a large assortment of free and open source libraries with the core build. PHP is an Internet aware system with modules built in for accessing file transfer protocol servers, database servers, and other libraries like those of MySQL and SQLite. PHP allows developers to write extensions in the C language to add functionality to the PHP language. These can then be compiled into PHP or loaded dynamically at runtime. The PHP language is kept as human-readable source code.

B. Procedure

Before installing PHP to the Linux operating system, there are certain system packages that have to be installed. After successfully acquiring the packages needed, the Apache web server software was installed in order to run and operate PHP safely. The latest version of PHP (PHP 5.2.3) was then downloaded and obtained from http://www.PHP.net . The software package of the PHP 5.2.3 was unzipped and extracted to another folder once found on the computer. PHP had to be installed through the command line terminal of the Linux operating system.

In the command terminal a series of commands had to be entered to install PHP. The first command the must be enter *is $ sudo apt-get install php5.* This will run a series of tests to make sure the computer has all the packages it needs. The next command is *$ sudo apt-get install libapache2-mod-php5*. This is an apache library that also needs to be installed for the proper running of the software. The following command should be *$ sudo /etc/init.d/apache2* restarted in order to restart apache. After the installation, the PHP needs to be tested by using the command *$ <?php phpinfo();?>*. Once tested, the recommended PHP modules XSLT, GD and PEAR should be installed by use of the command *$sudo apt-get install*

php5-xsl php5-gd php-pear. Once the modules are installed issue a restart to Apache for all changes to take effect.

VI. MEDIA WIKI

A. Description

MediaWiki derives from the word "wiki", which is a web application designed to allow multiple authors to create, remove, and edit web page content using a web browser. The multiple author capacity makes them effective tools for mass collaborative authoring. One of the best-known is the online encyclopedia called Wikipedia. Also, the term refers to the collaborative software used to create such a website, known as Wiki Software, which is usually implemented as a script that runs on a web server with the Wiki content stored in a relational database management system such as MySQL. The first Wiki Software was created back in 1995.

MediaWiki is free server-based software, Wiki Software package which is licensed under the GNU General Public License and developed by contributors around the world. The name "MediaWiki" was thought of by Wikipedia contributor Daniel Mayer as a joke towards Wikipedia. It is designed to be run on a large enterprise server farms for a website that gets millions of hits per day. It is extremely powerful and scalable software. Some companies use it as a content management system.

The main benefits from MediaWiki are: free open source software, the ability to edit web pages online and check the results immediately (no need to upload or use FTP), and it is an excellent collaboration tool allowing different users to work on the one/same project.

B. Requirements

MediaWiki is built on top of an AMP environment. It typically runs in a LAMP environment using GNU/Linux operating system but it is also possible to run MediaWiki correctly under Microsoft Windows and Apple Max OS X. The software operates using one of the above operating systems, the Apache httpd (version 1.3, 2.0 or above) web server for delivering web pages, the relational database management system MySQL daemon (version 4.x or above) as a database storage type for storing the content, the scripting language PHP (version 4.3 or above) for the application logic that glues together these components, and some type of web browser. Everything needed is available as open source software.

The hardware recommended is i386 architecture (Intel, AMD, etc.) but others are possible (PowerPC w/Mac OS X), memory should be about 96 MC of RAM for best performance, a few megabytes of disk space, and a Network Interface Card.

C. Procedure

1. Go to MediaWiki's homepage (http://www.mediawiki.org/wiki/MediaWiki).
2. Click on Download (http://www.mediawiki.org/wiki/Download).
3. Click on mediawiki-1.10.0.tar.gz. (http://download.wikimedia.org/mediawiki/1.10/mediawiki-1.10.0.tar.gz). This is the current version.
4. Save it to disk (Desktop).
5. Now you must uncompress the file. Go to Applications -> Accessories -> Terminal
6. On Ubuntu/Linux OS to untar (uncompress) the file, type in the command: tar xvzf mediawiki-*.tar.gz (the * stands for all folders within the file)

Now, you must make a directory file for MediaWiki, change permissions, and copy the folders extracted from the downloaded file into the new directory.

1. In the Terminal, type in: cd /var/www
2. sudo mkdir wiki (mkdir is make directory, and wiki is what I named the file that MediaWiki was going to go into; this command resulted in creating the file "wiki")
3. sudo chown -R apache:apache /var/www/wiki/* (changes permissions for the config directory; owner to apache)
4. sudo cp -r /home/administrator/Desktop/mediawiki-1.10./* /var/www/wiki (copies folders into wiki file; it is very important to use the * because if you don't then it will likely not copy all the files/folders to the wiki)
5. Minimize the Terminal window and go to: http://locahost/wiki
6. It should show the MediaWiki icon and the version being used. It said I needed to set up the wiki first (and provided a link to the setup process).

To check to make sure the database is running properly you must sign in with the root password.

1. Terminal and typed in the command, *sudo mysql –u root –p*
2. Type in password: ure_mysql
3. When it gave me the prompt of *mysql* -> I typed in *status* and hit Enter
4. It showed that the database was working.

Setting up MediaWiki.

1. Go to Terminal. Enter command: cd /var/www/wiki
2. sudo chmod a+w config (changes configurations so setup process can be done)
3. Go back to http://locahost/wiki and click set up.
4. It ran a process of checking the environment and showed this after it was done:

- Don't forget security updates! Keep an eye on the low-traffic release announcements mailing list.

Checking environment...

Please include all of the lines below when reporting installation problems.

- PHP 5.2.1 installed
- Found database drivers for: MySQL
- PHP server API is apache2handler; ok, using pretty URLs (index.php/Page_Title)
- Have XML / Latin1-UTF-8 conversion support.
- Session save path appears to be valid.
- PHP's memory_limit is 128M.

- Couldn't find Turck MMCache, eAccelerator, or APC. Object caching functions cannot be used.
- Found GNU diff3: /usr/bin/diff3.
- Found GD graphics library built-in, image thumbnailing will be enabled if you enable uploads.
- Installation directory: /var/www/wiki
- Script URI path: /wiki
- Environment checked. You can install MediaWiki.

Next, setup the site configurations (on the same page, below the environment information).

5. Name: ECSUGridWiki
6. Contact e-mail: jeaimehp@gmail.com
7. Language: English
8. Copyright/License: No license metadata
9. Admin username: ECSUGridWiki
10. Password: uregrid
11. No caching.
12. For all of the e-mail, I enabled all of the options.
13. Database configuration:
    a. Type: MySQL
    b. Server: localhost
    c. Name: wikidb
    d. User: wikiuser
    e. Password: uregrid
    f. Port: 5432
14. Superuser account
    a. Username: root
    b. Password: ure_mysql
15. MySQL Specific Options
    a. Database Table Prefix: ecsuwiki

To edit the configuration file for MediaWiki the following commands are required to access it:

1. cd /var/www/wiki
2. sudo gedit LocalSetting.php

VII. How To Use Media Wiki

To access the MediaWiki go to: http://10.24.5.58/wiki . It takes you to the homepage (http://10.24.5.58/wiki/index.php/Main_Page).

Pages are created by MediaWiki's wikitext format. Wikitext (also known as wiki markup) allows users to easily modify pages, temporarily publish random sentences (to see how they look), and even temporarily delete a page in a wiki. It helps users edit these pages without any knowledge/skill of programming (XHTML and CSS is used).

To create a page:

1. Go to log in/create account.
2. Log in as the Administrator (ECSUGridWiki).
3. Go to the address bar and behind Main_Page, type in a colon (":" , without the parenthesis and no spaces). For example: Main_Page:URE

To edit a page:

1. After you have created the page, click on edit this page.
2. Simple editing tips

- To create a link to a webpage already on the wiki, you need to type the name of the webpage on wiki first with two brackets before it, and put the | in-between it and the name of the page, ending with two brackets and no spaces. For example: [[Main_Page|Main page]]
- To create a web link outside of the wiki, you need to type/copy & paste the URL with a bracket before it, and then enter a space between the URL and the name of the page. For example: [http://www.yahoo.com Yahoo]

To access a page simple type in the name of the page you are looking for in the search bar. For example: MediaWikiCheckingEnvironment and it will bring up the page.

When a user submits an edit to a page, MediaWiki writes it to the database, but without deleting the previous versions of the page. This allows the user and/or administrator to easily go back and refer to the older content, incase spamming or vandalism has occurred. This content is found on the Recent Pages link on the left corner.

MediaWiki manages image and multimedia files, which are stored in the filesystem. For the larger wikis with a lot of users, MediaWiki supports caching and can easily be coupled with Squid proxy server software.

Some of its key features include links, namespaces, subpages, categories, templates, and media content. Links are created by surrounding words with double square brackets, and any spaces between them are left intact. Namespaces are prefixes before a page title (ex: User: or Talk:) which allows a page to exist under multiple names, but serve a different purpose depending upon their prefix. For example: [[The Man]] could be describing the movie with Samuel L. Jackson and Eugene Levy but [[User:The Man]] could be a profile describing a user who goes by this nickname. Each page has an associated Talk: page which can be used to discuss its contents. Subpages are a simple feature that provides automatic back-links from a page of the pattern [[Page title/Subpage title]] to the component before the slash (ex: Page title). Categories are user-created, similar to tags used in many web applications by the ones in MediaWiki are hierarchical and descriptive. The templates are text blocks that can be loaded inside another page whenever that page is requested. A template "tag" is simple a special link in double curly brackets (ex: {{corrupted}}) which calls the template (ex: Template:Corrupted) to load where the tag is. Templates support parameters, meaning parts of the text can be substituted for each specific use case. Media content (which is what MediaWiki suggests) includes a wide variety of uploaded media files, and image galleries and thumbnails can be created with swift easiness if everything is set up properly.

VIII. Future Work

Recommendations for future work include setting up a four-node, Condor-based GRID using the documentation server created to document future procedures. Work has already begun on this 4-node GRID. As of July 12, 2007, the TeraGRID team currently has a three-node mix platform grid. In terms of condor, nodes are referred to as "workers"

and servers referred to as “masters.” This platform grid consists of two Red Hat Linux nodes and one OSX node with a Red Hat master. All systems are using Condor 6.8.5 as a job distribution package.

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