Design and Implementation

Introduction

We hope to share this system with other groups; we must implement a solution that can be adopted at other institutions.

- System MUST use technologies that can be adopted by satellite sites for client software.
- System SHOULD use technologies that can be adopted by satellite sites for server software.Write access by more clients must be available

4.1 Implementation Environment

Client software MUST run on Pentium and higher Linux based systems.
The client must have browsers. The system used through Internet access (more details in next chapter)

4.2 Requirements Specifications

One of the first design issues in the creation of a digital library is to prepare a list of high-level requirements. This list includes what information the library will contain, how that information will be generated, what audience the information is intended for, and how the data will be accessed. For our project, we wanted to create a repository for computer science laboratories. Instructors throughout the world should be able to visit a web site and submit information about the labs they use in their classrooms. From this description we see that: the information for the library should be gathered through on-line submissions; the intended audience is computer science educators around the world; and the data should be accessible through the web. All of these issues must be considered in the

development of a digital library. A clear plan must be developed before one starts the detailed design and development of the library.

4.2.1 Hardware Linux

Another important issue that needs to be assessed before site development begins is the storage location of the digital library. The web server must have access to the Internet, ample hard drive space, and the ability to handle the expected access load. Preferably, the computer will have a T1 or better connection to the Internet. This will allow faster access for users. If a PC is used, it should be at least a 100 MHz Pentium. Similar speeds are recommended for UNIX machines. Ample disk drive space for library materials is also recommended. We recommend at least 1GB of free disk space. This will give your library plenty of room to expand.

Once architecture has been chosen, a web server must be chosen. A UNIX machine was chosen, one of the numerous free web servers that can be downloaded from the web, such as Apache Web Server (which we are currently using), can be used.

The choice of which hardware and supporting software should be used is an important decision. Many people consider Linux machines to be more reliable than PCs. Also, the software for UNIX machines has been in use for many years whereas PC software is relatively new. We chose to use a Linux machine because of the reliability and speed of this arrangement. And it will be **open** source

4.2.2 Storage - DLS Database

How to store the files that will comprise the digital library? There are a number of options available. Two possible methods are using a database and creating a special directory and file structure. There are many databases to choose from. Examples include Oracle, MSQL, and Microsoft Access. Mysql is a good choice for a database on a UNIX machine. It is very reliable and fairly flexible. There are some problems that arise from using a database, however. The main problem involves the database's lack of flexibility. After creating a database, if a new field needs to be added, a new database needs to be created. On a number of systems, the transfer of data from the old database to the new one can be difficult and time consuming.

For each laboratory, we created an abstract file. This file included information about the lab, such as the author's name, the title of the lab, the subject of the lab, and other relevant information. For each lab,

. Our DLS Librarian is a database. It stores all your data in a central file it provide more security and access. It logs users' activity to files (when, which file, what action a user has accessed/taken). It password-protect the most important files. It categorizes files into departments and folders so users can easily know where to store their files. It eliminates unexpected mistakes like accidentally deleting a files or even a folder. It allows **backup** of all your corporate files when the database is backup. Restoring is easy and a built-in feature.

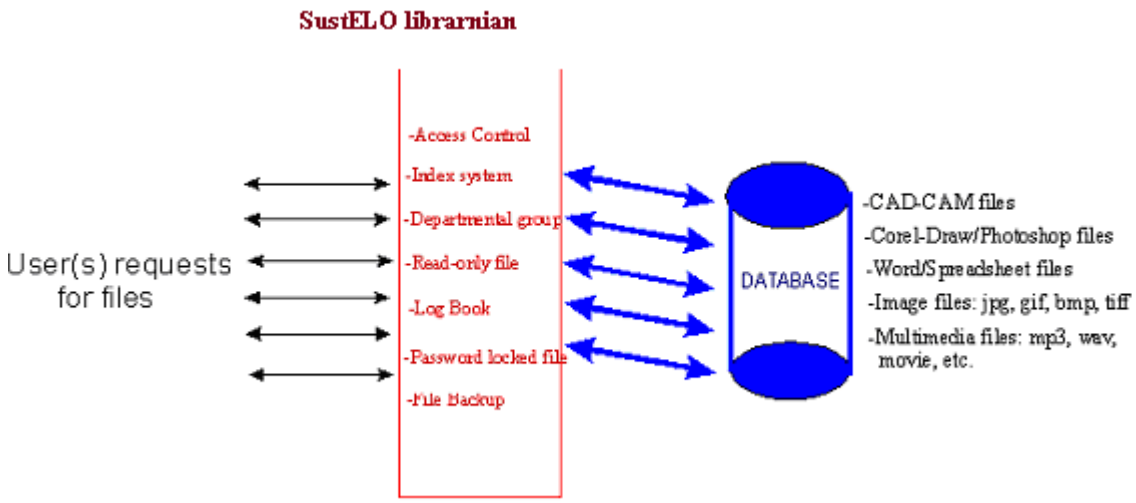

Figure 4-1 DLS Librarians

4.2.3 Accessibility

The next major concern involves accessibility for users. This involves deciding on the target audience. It must be determined if the website should be accessible by everyone regardless of system specifications, or only by people with more advanced hardware and software. With the advances in computers, there is now a greater disparity between the connection speeds of users. The spectrum of computers ranges from those using 9600 baud modems to computers connected directly to a T3 line. This is a problem because it can affect the number of graphics that can reasonably be included on a website. For computers with very slow connections, graphics can become an unwanted nuisance and may cause users to turn away from a site.

To handle this problem, we chose to create separate low-resolution and high-resolution sections for our website. The low-resolution section contains HTML 2.0 webpages with no graphics. There is also JavaScript, or frames located on these pages. This page loads fast enough to be usable

over all connections, and can even be viewed on text only browsers, such as Lynx. We also created a more advanced high-resolution site that contains frames, graphics, and JavaScript. This is more visually appealing (and arguably more functional); however, the content is the same as the low-resolution section.

4.2.4 Security - File Privileges

A lot of time and effort is needed to successfully secure your website; we **will just mention** a few key security issues when using Linux. First, the biggest problem we encountered was dealing with file permissions. Our site had to be able to create files on-the-fly in order to store the information that was gathered from a webpage. A standard web server runs under the default user ID of ``nobody." Any file created with a CGI script will have ``nobody" as the owner of the file. This turns out to be a security risk because the file permissions have to be set to world readable, world writeable, and world executable. There are a couple solutions to this problem. One solution is to use the ``chown" command in your CGI scripts. Unfortunately administrator privileges are needed to use this command, and most system administrators will not grant this access. A more viable solution is to install and run a web server and edit the configuration files. This way, the user ID under which the web server runs can be set. We decided to set our server to run as the user ID of the account under which we are developing our site. This is shown below by a Another option is to secure certain areas of the website. Both the Apache and NCSA web servers for UNIX feature server-side security access setup. In a configuration file called ``htaccess", users who are allowed to access

certain areas of your website can be defined. When a user browsing the web tries to access a webpage in a secure area, a user login and password box appears. Only a correct login and password will allow the user to access that section of the website

4.2.5 Password Protection

Department Manager can password-protect any kind of files within his/her department. This protects the most important files like contract, bank statement, design files, patented design, etc.

User Right Control - A user may be assigned limited rights:

Read only - able to read a file but not change;

Change - able to read and modify a file but not delete;

All rights - able to read, modify and delete a file.

Activity Log Book - All user activities will be recorded in the Activity Log Book.

It records: -The date & time a user login/logout of the system;

-File modification - by which user, date&time;

-File accessed -by which user, date&time;

-File deletion - by which user, date&time.

4.2.6 Higher security control

It stores thousands of files and images in a database system. Users are classified into departments. They can only login to their belonging departments and view/read/store/modify the files within that department. Management of users and file security is very easy. Each department will assign a Department Manager who is in charge of managing his/her department's users and files.

It keeps all your important files in the SQL database system. You can use index to categorize files. Control who can access them and their access right. Protect files with password. Backup files periodically. Logging user's activities. And synchronize files between different locations.
It acts between users and the central file library. So no more unauthorized action on your company's important assets.

4.2.7 e-Document system

All University documents can be scanned and stored in the central database, for easy retrieval and viewing. Documents are categorized into many categories and departments. Staffs in department cannot view the documents belonging to another department without authorization given. SQL database is capable of storing tens or even hundreds of Gigabyte of data securely and reliably. Documents of branch office is easily uploaded into the headquarter database with data replication technology.

4.2.8 e-Document Function

DLS Librarian can be used to store thousands of digital (scanned) documents. Business can scan all types of paper documents and store them into DLS Librarian for ease of management and retrieval.e-Document Quick Viewing Quick viewing function is built-in to allow viewing of all digital (scanned) documents. Just right click on the mouse will pop up the Quick Viewing Screen.

4.2.9 File Backup

The whole Data can be backup periodically as a single database file. It allow safe recovery of data from industrial strength backup hardware such as DAT drive or

other storage system. As large as Terabye (1000GB) of data can by backup.Internet Access to Your Corporate File

Because our MDL Librarian is a database-type file system. You can access all your corporate files like accessing a database from the Internet. Anywhere. Anytime. On any computer. Yet we protected the system by our Security File Gateway.

4.2.10 Data Replication

Share of files across two or more database located in different locations is possible by use of database replication service.

4.3 Languages

4.3.1 PHP

4.3.1.1 What is PHP?

- PHP stands for PHP: Hypertext Preprocessor
- PHP is a server-side scripting language, like ASP
- PHP scripts are executed on the server
- PHP supports many databases (MySQL, Informix, Oracle, Sybase, Solid, PostgreSQL, Generic ODBC, etc.)
- PHP is an open source software (OSS)
- PHP is free to download and use

4.3.1.2 What is a PHP File?

- PHP files may contain text, HTML tags and scripts
- PHP files are returned to the browser as plain HTML
- PHP files have a file extension of ".php", ".php3", or ".phtml"

4.3.1.3 Why PHP?

- PHP runs on different platforms (Windows, Linux, Unix, etc.)
- PHP is compatible with almost all servers used today (Apache, IIS, etc.)
- PHP is FREE to download from the official PHP resource: http://www.php.net/
- PHP also supports a massive number of databases, including Informix, Oracle, Sybase, Solid, and PostgreSQL - as well as the ubiquitous ODBC.
- PHP supports a host of other features right at the technological edge of Internet development. These include authentication, XML, dynamic

image creation, WDDX, shared memory support, and dynamic PDF document creation to name but a few..

- PHP is easy to learn and runs efficiently on the server side

4.3.2 MySQL

4.3.2.1 What is MySQL?

- MySQL is a small database server
- MySQL is ideal for small and medium applications
- MySQL supports standard SQL
- MySQL compiles on a number of platforms
- MySQL is free to download and use

4.3.2.2 PHP + MySQL

- PHP combined with MySQL are cross-platform (means that you can develop in Windows and serve on a Unix platform)

4.3.2.3 Where to Start?

- Install an Apache server on a Windows or Linux machine
- Install PHP on a Windows or Linux machine
- Install MySQL on a Windows or Linux machine

4.3.3 JavaScript

JavaScript was created by Netscape to be used in its browser to support more advanced websites than HTML allows. One feature of JavaScript is the ability to determine what browser the user is running and load a webpage that would better suit this browser. JavaScript can also make websites more dynamic. We used JavaScript to add visual effects to our

website, such as the highlighting of textual information when the mouse cursor is placed over it.

The following code segment shows how the browser version can be checked using JavaScript:

4.4 What is Open source?

Open source software such as Linux is freely downloadable software that allows anyone to inspect and improve the source code.

4.3.4 Why Open source software development ?

1. reliability, performance and security aspects
2. cost benefits of Open source

next section discussed how Open source stacks against proprietary software

4.3.4.1 Reliability

Repeated tests have shown that open source platforms are more reliable than proprietary ones.

4.3.4.1.1 *Open source vs. Commercial software reliability test*

According to a Fuzz study,www.cs.wisc.edu several proprietary and open source applications were crash tested by feeding random characters. Open source applications had higher reliability by this method. In this study, around 23% commercial applications crashed as compared to 9% open source applications.

- **Linux is more reliable than Windows NT**

Over 10 months,. Windows NT crashed an average of once every 6 weeks. Linux servers never went down.

- **MySQL Database Server had lesser defects than proprietary databases.**

along with other proprietary database. They found that MySQL code had 21 defects in 236,000 lines of MySQL source code, translating to around 0.09 defects/KSLOC. Other databases had defects of over 0.57 defects/KSLOC more than 6 times that of MySQL.

4.3.4.1.2 *Performance*

Linux with windows on similar hardware platforms were stress and speed tested.

- Linux was faster than a Windows 2000
- Apache/Linux was faster than IIS/Windows NT combo

Caldera Linux with Apache serves Web pages 50% faster than IIS with Windows NT.

- For Dynamic Websites, Apache/Linux is faster than IIS/Windows

for Dynamic sites such as shopping carts ,Apache with Linux combination is faster than IIS with Windows NT

4.4.1.1.3 Security

Open source platforms are far more secure than proprietary systems simply because security holes, if any are detected faster and corrected before it affects users.

- IIS attacked more than Apache

  IIS was attacked 1400 times more frequently than Apache in 2001. In 2002, compared to 12,000 of apache.

- Gartner Group suggest that businesses migrate to Apache from IIS due to poor security track record

  IIS security record is so poor that Gartner Group that businesses hit by Code Red and Nimda shift to alternatives.

- More defaced sites run on Windows servers compared to Linux
  59% of defaced systems ran Windows, 21% Linux, 8% Solaris, 6% BSD, and 6% all others in the period of August 1999 through December 2000. Windows systems have had nearly 3 times as many defacements as GNU/Linux systems.

- Linux systems are relatively immune from attacks

Reports Security Breaches Rare in Linux Environment. 78% of the respondents to the GNU/Linux developers survey have never experienced an unwanted intrusion and 94% have operated virus-free.

The points listed above are by no means complete. The benefits are out there for all to see. Large corporations are also shifting to Linux, in various degrees, through their intra-nets or websites and finally to their desktops. saving millions of dollars. Online Brokerage, due to performance reasons. in their gas stations for increased reliability. That makes it important that software products of the future should run on Linux and other Open source platforms, not just for cost benefits but because it simply makes good common sense.

4.5 Problems in Implementation

- **Copyright and licensing**

DLS has contributed to the debate about copyright and licensing, particularly in the area of electronic short loan. It has conducted negotiations and dialogues with publishers direct, and has also contributed to the development of Higher Education Resources ON-demand
(HERON) as a test site. HERON is acting as a clearing-house for UK HE in terms of copyright clearance of book chapters and journal articles and digitization.

- **Authentication and profiling**

DLS has contributed to debates in higher education on authentication and profiling. The Project has shown the potential for tapping into pre-existing institutional datasets to deliver authentication and has shown that using an existing physical item such as the University ID card, from which the information is read, can ease the introduction of a new authentication service.

- **Digitization**

Through its research into digitization processes and work on **costing** the process of digitising a variety of materials, the Project has influenced the work of other institutions

- **IT infrastructure**

BUILDER has used specific IT infrastructure and has shown how ‘off the shelf’ components can be used to provide enabling technologies for others to develop. The work with Project partners has demonstrated how such technologies can be transferred to other

- **Electronic document delivery**

BUILDER has taken the idea of electronic document delivery, prevalent within earlier eLib projects, and has implemented them within an institutional setting so that this idea has been embedded within the culture of the institution. Electronic delivery of exam papers and Schools are now readily accepting that teaching and learning materials can, and should be delivered, over the Web.

- **The Influence of eLib**

Other eLib projects informed BUILDER in its first year particularly in relation to ESL,cross-searching and digitisation, but since then this influence has been less pronounced with more approaches being made to BUILDER for consultancy advice from HE institutions and other eLib projects. For instance, the Project received a consultancy visit from the HyLiFe hybrid library project. Wider developments had an influence with the development of the Resource Discovery Network (RDN) superseding BUILDER's plans to use WHOIS++ in order to provide cross-searching facilities.

4.6 Design & Implementation for E-University network

4.6.1 Introduction

This Section is to provide a technical Network Design based on the given E-University network requirements, all the necessary technical information necessary for the Network Design of the learning organization network; this document is intended for all the technical staff involved in materializing and Design this Network .

Based on the requirements defined by E-University network needs, the E-University network has been designed to meet all the predefined set of requirements. The main objective of this Network Design is to design, provide all the necessary technical support for the Network Design of this project through our local experience and the international standards and trends in today's networking industry.

4.6.2 Architecture

The main objective of this Network Design is to develop an infrastructure to carry the expected application of the intended E-University network. This infrastructure should be capable of carrying current and future data.. Frame Really will be used as the main transport media for the entire network. Intelligent layer 3 devices will be used to provide the required Media Access Layer and Network Layer functionality. The standard WAN technology is the chosen MAC layer for the implementation of this project.

The design is based on a layered concept where the network is divided into 3 main regions with respect to media being used, connectivity devices and their respective configuration. The layered approach is made-up of the following regions:

Core **:** Main data center equipments and local point of connectivity .

Distribution : Secondary focus of sub-distribution for regional sites Access

: provides sites/University network access to the network.

4.6.3 The Task

This Network t is designed for the transport of highly secure, high-quality, high-speed voice, data and video benefits of this project are as follows:

- Optimum design for current and future applications.
- Quality of service and bandwidth management for optimum link utilization.
- Round the clock availability.
- Ease of management and fault prevention and isolation.
- Secure Internet work infrastructure.
- Redundancy at the physical and logical as well as the data link layers of the network implementation.

Figure 4-2 Network Design

4.6.4 Physical Link Architecture.

To achieve the desired level of security and bandwidth, Sudatel carrier has been selected as the media of transport.

The table below summarizes the technical specifications of the physical media that will be used for the project implementation.

No	Layer Description	Technology Used	Technical Specs	Comments
1	Core Layer	Frame relay	PVC	
2	Distribution Layer – II	Fast Ethernet		
3	Access layer (i.e. user access)	Fast Ethernet		

Table 4-1 Physical Architecture.

4.6.5 Data Link Architecture.

Cisco router fast and fast Ethernet is the technology that will be used at the core, distribution and access layers of this network.

According to the current trend in the networking era, Ethernet has gained an increased momentum in the deployment of large Wide Area Network. Even though the SHDSL technology will be to link the internet services direct from SUDATEL , number of limitations and disadvantages has been eliminated with the advent of intelligent layer 3 switching devices. Some of the features that could be delivered by means of this technology are:

- Built-in link redundancy offers active and backup data paths
- Integrated server load balancing at wire speed greatly increases availability
- Policy-Based Q o S at wire speed to allocate bandwidth, and prioritize traffic

- Access Control Lists can be linked to a class of service, while performing Layer 1-4 packet-level security and controlling traffic flows -- all at wire-speed.
- Use the SHDSL Technology for up to 1MBP/S bandwidth to Handle the internet services

4.6.6 The Design and Implementation of the E-University network WAN

Frame relay connectivity will be used to implement the WAN for the E-University network sites .No proper data network design was put in mind while making the management system and security design network for the E-University network , thus no provision was made for any kind of in-site or sites .

4.7 Requirements

Based on the above design, the requirements are:

No	Active Equipment Requirements	PART NO.	QTY	Comments
1	Cisco Router 1751		1	Cisco Product
2	Catalyst 3548 XL Enterprise Edition		3	Cisco Product
3	Catalyst 3512 XL Enterprise Edition		1	Cisco Product
4	Fire wall PIX 525		1	Cisco Product
5	GigaStack Stacking GBIC and 50cm cable		3	Cisco Product
6	50 centimeter cable for GigaStack GBIC		4	Cisco Product
7	Web Server		1	
8	Proxy Server		1	
9	Primary domain		1	
10	Mail server		1	
11	Backup server		1	
12	Cisco work server		1	
13	DMZ Server		1	

Table 4-2 Requirements.

4.8 Technical specifications for a server

These technical specifications are preliminary and may change during the implementation, due to new functional and/or performance requirements. The final version will be included in the technical documentation.

Operating system	Linux
System software	Apache web server, Php, TCL,, MySQL, various Php supporting modules
Computer	Standard PC, 1 - 2 CPUs min. 2.8 MHz
Main memory	512 MB
Disk	80 GB
Network connection	10 - 100 MBit/s connection to the European backbone

Table 4-3:Technical specifications for a server

The Apache web server should be configured to do logging.

- **Router Recommended:**

Cisco router are recommended for its powerful capabilities ,

Core router :

.Branches router :
Cisco 1760
2 WAN serial interface , 100/100 Ethernet interface , 2 VIC & X.21 serial cable

- **Software should support :**

Frame Relay ,OSPF , TCP/IP, ISDN & IPSEC .

- **DTUs Recommended** :

Data Termination Unit, 1Mbps 3Km, Serial interface port RS4492801 . DTU at the head office support speeds up to 2 Mbs for central office and 1Mbs at all branches .