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Design and Development of Prototype Network for Engineering and Technology Department

1. Introduction

The faculty of the science and technology on the college of Northampton, that's specifically situated within the avenue campus, network building has been constructed and inaugurated to Provide widespread sources and facilities for their college students. As a result, college students' learning and enjoyment can be extended and evolved in their fields. The complete network infrastructure and offerings are managed by using its services that are positioned at the park campus. The computing department of the faculty of science and generation has positioned exceptional efforts to have their personal servers and facilities that make it one-of-a-kind from other departments and Colleges.

In the cutting-edge device, many servers are used with a purpose to guide college students' works and Personnel as well. As an example, report server, web server, and authentication server. Moreover, Staff ought to effortlessly control their own sections at the community and engineering department Website (www.Computing.Northampton.ac.Uk) and add their module materials that comprise. Their weekly works and tests. This project will try to design a prototype network for the Engineering and Technology department and check out to bring into action any possible developments and enhancements that could be applied to the present system. For instance, define any weaknesses that might be found and work on them. As a result, the new prototype is more efficient and reliable in terms of performance, management, and user permissions.

1.1 Project Background

In this group project, it's essential to grasp the present systems which they are using at the computing department within the school of science and technology. They need their own servers to support students and staff; the online server runs the WAMP server to retain students' work and digital computers to archive the documents.Recognizing that even very large individual databases and registries might not have a sufficient number of cases to detect the problems in the network an aim of this project is to check the feasibility and usability of the network on the distributed database network to support the generation and synthesis of latest scientific information. A research network model also would improve study efficiency through re-use and standardization of study infrastructure .generating valid scientific evidence about the impact and benefits of network model will be accomplished by implementing either a distributed network or through the creation of

an oversized centralized data repository to develop a distributed data network that permits data owners to keep up confidentiality and physical control over their data.

1.2 Aims and Objectives

The main aim of the project is to design, test, and implement a new prototype network model for the Engineering and Technology department based on a three-layer Cisco hierarchical model overcoming all the low-sides of the current model.

Objectives of this project are pointed below:

1. To make the overall user experience convenient by adding most of the features from the model existing in Computing ground.

2. To provide a wide range fast wireless network so that it can be accessed from any corner within the campus area.

3. To stop the misuse of files and information. Also provide different servers for different purposes.

4. To deliver an easily operable and accessible online as well as offline network services.

1.3 Development Methodology

The following are the overall methodologies that we are going to follow:

- Evaluation of the current network system in the Computing Department: The computing department has been running a good network system. It is important to estimate the upsides and downsides of the network scheme of this department so that the new model can provide a better usability without interfering with the simple user experiences.
- Interview of a Network Technician: Carrying out an interview with an IT Technician will help us in getting answers that would arise after overall evaluation. This would also help us on adding some extensions to the model and implementing a perfect one.
- Add different servers: Three different servers for the file, web and authentication activities need to be added. File servers would check and certify all the files uploaded to the network. Staff can also be authenticated with their information. They would have staff web pages on the web server with their profiles and module materials saved on the file server. All the students enrolled in the module are validated in the authentication server. They are only allowed to view files from a file server that they have access to.
- Access and privilege to users: Network Administrator can remotely access all the servers and can manage the network environment. They can also edit, add, and remove users and files. Module leaders could append, edit, delete, and upload module materials in their respective module. Students would be allowed to access and organize their content on their X-drive.

- Implement the prototype network: Implements consists of building the network and making sure that it is ready for the real test. Configuring servers and creating user accounts with various sets of privileges will be helping in this process.
- Test the prototype Network: All the features that were set as a basic part of the model
- will be tested, including other extras. This includes testing for bugs and errors. Security of servers and the network environment will be tested to protect them from external attacks. It would be made sure if the performance is working as intended or not.

2. Requirements Engineering

After setting our mind on all the aims that need to be fulfilled, we are now starting the process to achieve them all. In the Requirements Engineering section, we will collect a lot of information by carrying out an interview, searching problem domains, and comparison of software system.

2.1 Elicitation Activities

We have formed an outer idea of how to build this model. For the knowledge of further features to include in the model, we have Network Technician ready to give an interview. We are also working on problem domain search. This is going to aid us in improvising the existing system.

2.1.1 Interview Plans

We have prepared various questions to be asked to the Network Technician. Following are the questions that we will be asking the Technician:

Questions

Interviewee	Questions

Network technician, Mr. Narinder Singh	1. You have been working as a network technician for a long time in this university. Are there any kind of low sides that the system has? 2. We have looked through the network system of the computing department. Are there any sectors you want us to make change or enhance? Regarding connectivity or accessibility? 3. Do you also want a network connection to communicate between the computing department and engineering department? 4. The Internet would also be made available. How wide should the internet coverage be? Only within the department area only or around the whole compound. 5. In what number should we install and connect other devices like printers? 6. What kind of data and file backup system do doy have at present? 7. Should we make the contact information of teachers visible to students? 8. Besides admins, can students edit their personal details. 9. Would the addition of a chat system be appropriate in case when any student would want to reach out to you? 10.?

2.1.2 Interview Findings

The outcomes of interview that was held are given below:

2.1.3 Other problem domain research

2.1.3.1 Comparable Software System Review

To have more detailed idea of how to build the system, we examined some of the preexisting services. Those services were somehow similar in their usability but overall experience differed between them. Some of them are:

1. Moodle:

Moodle provides educators, administrators and learners with a single strong, secure and integrated learning platform for personalized learning environment. It is being used by many educational instutions all around the globe.

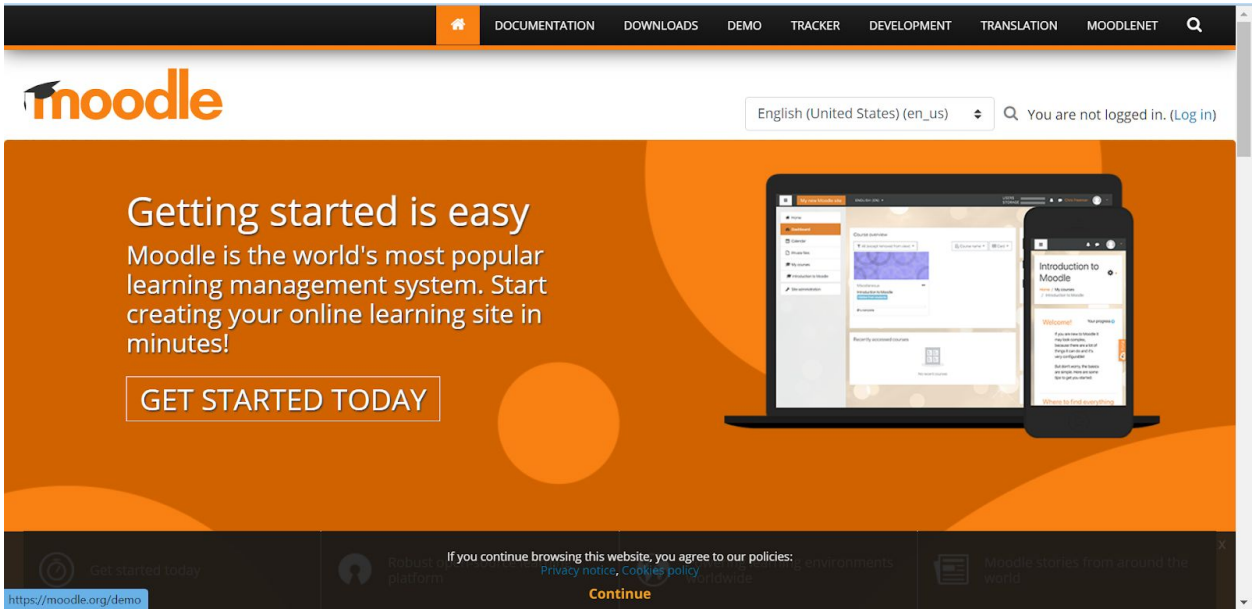

Fig: Moodle(Homepage)

Some positive and negative aspects of moodle are listed below;

Positive Aspects	Negative Aspects

§ Moodle has easy page navigations and it is compatible for all devices. § It also has various customizable features which makes it somehow useful for a better personal experience. § Easy to create, add, delete, and view study materials for students. § It is able to keep track of academic events, such as task deadlines and meetings.	§ It has basic user interface and is not so user friendly. § It is less efficient as technical knowledge is required to manage it.

2. NILE:

NILE is the online learning platform introduced by University of Nothampton, UK in collaboration with Blackboard.com. So, all the features are same as blackboard.

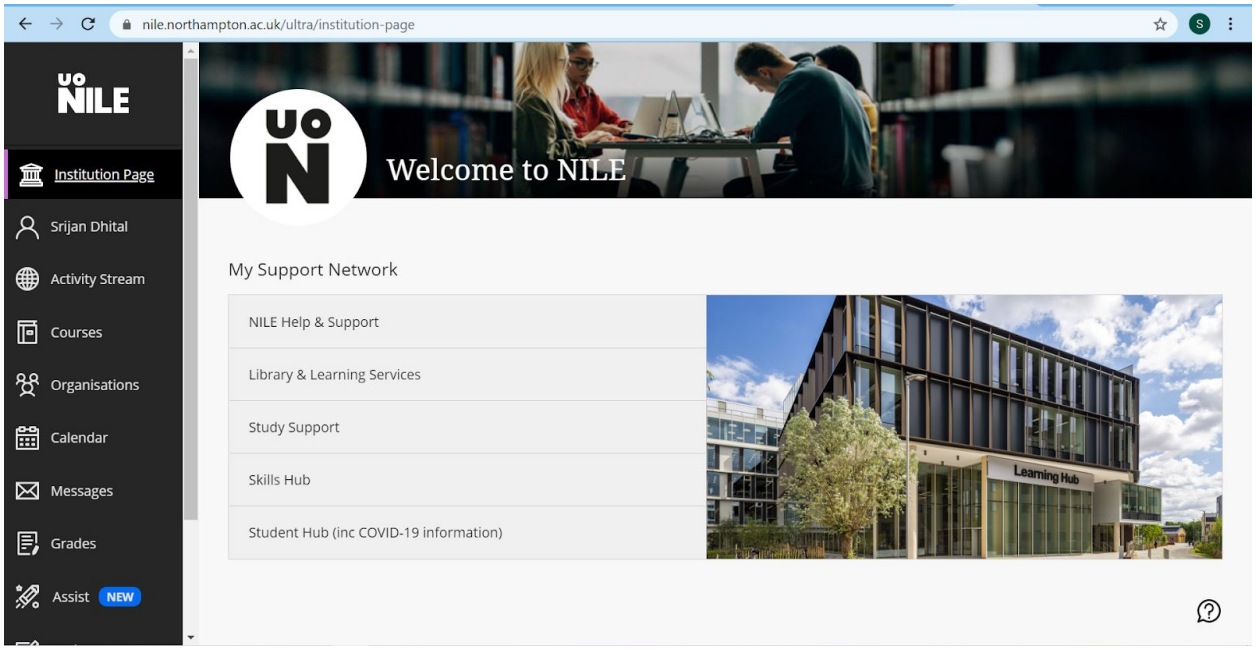

Fig: NILE(Institution Page)

The positive and negative aspects of this platform are:

Positive Aspects	Negative Aspects
§ The user interface is clean and understandable. § Students can edit their details. § Sidebar navigation has ability to open any pages. § Students can send messages to their fellow students.	§ Navigation is too crowded. § Students cannot communicate with their module tutors.

§ It has help desks everywhere and new assist function is also available.	

2.1.3.2 Development Relevant Legislation

1. Data Protection Act:

The Data Protection Act (2018), UK states that everyone responsible for using personal data has to follow 'data protection principles' where the information should be transparent, accurate, up-to-date, and secure. Person who is about to give away his personal information should be aware of every field and instance where that information could be used. There is stronger legal protection for more sensitive contents related to race, ethnic background, political opinions, religious beliefs, trade union membership, genetics, health and sex life.

2. Digital Economy Act:

The digital economy act encourages people to digitize every aspect from their sector. This act will empower consumers and provide better connectivity so that everyone has access to broadband wherever they live to fit for the digital future. This will also enable better public services using digital technologies and protect children from online pornography.

3. Computer Misuse Act:

In the digitally developing world, there are data saved in every digital sector. Those data could be stolen unethically by unauthorized personnel. The computer misuse act strictly prohibits any kind of harm, harassment, bully or rob through digital medium. Online scam, robbery, and data stealing are acts that could lead to a big punishment.

Any other relevant problem domain investigation data:

· Difficulty in keeping and maintaining records of each and every student because of the traditional based system.

· Quality of education could not be maintained due to an uneasy network system.

· Module activity tracks could not be kept on time for both tutors as well as students.

· Lack of communication medium between students and teachers.

2.2.2 Resources and Requirements

The requirement of instrument and device to achieve the our project which makes it successful, we need the following requirements and resources:

Device	Purpose	Price
Router (2811)	For the ISP router which used to connect our network (siteA) to siteB for the VPN connection	$6499
Router 2800 (x2)	For the DHCP addressing and VPN testing purpose	£680.00
Nokia router model(G-140)	For the access point to provide the wireless access to the users with radius authentication by windows server.	$20.00
Switch (2950)	Connect all wires of the network device and for the security issue .	$39900
PC(x10)	Connect the all pc to our network	$2000
Serial link (5m)	Link our router to the nokia router	$50

Software	Purpose	Price
WAMP server	WampServer is a Windows web development environment. It allows to create web applications And upload files to users and host to the website	Free
WinSCP	For the secure file transfer between a local and a remote computer and access to ftp site to upload files to the server.	Free
Wireshark	To detect the Packet sniffing tool for the test of the wireless network.	Free

Kali Linux	For the testing of the operating system for various areas of the system.	Free
Nmap	To know the Network and port scanner to find hosts and ports they have open.	Free