

Design and Fabrication of Moveable Local Area Network (Lan) Trainer With In-Build Server And Backup Battery

To be harnessed in Developing Students Entrepreneurship Skills in the Department of Computer Engineering Technology

Umaru Faruku Adamu

Department of Computer Engineering Technology, Federal Polytechnic Mubi Adamawa State

Submitted: 01-01-2022

Revised: 05-01-2022

Accepted: 10-01-2022

ABSTRACT: This Fabrication of a moveable LAN trainer with an in-built server and backup battery would allow a small group of individuals to use it during their meeting or group discussion as well the students in a laboratory. Since the Fabricated system can be move from one place to another, it can be used at any place. The computers connected would also be communicated with any other devices like printers. The system would be tested by using the method of pinging command to make sure that there is communication between the connected devices. The fabricated Local Area Network may consists many ports that can connects a computers devices, printers, and high capacity disk storage devices called file server connected together, which enable the computer systems on the network to access a common of files.

Keywords: (LAN) Local Area Network, Pinging, Server, Access, Files

I. INTRODUCTION LOCAL AREA NETWORK

According to [1] a local area network (LAN) is a collection of devices connected in one physical location, such as a building, office, or home. A local area network will be small or large, ranging from a home network with one user to an enterprise network with thousands of users and devices in an office or school.

Regardless of size, a LAN's single defining characteristic is that it connects devices usually in a single, limited area. In contrast, a Wide area network (WAN) or Metropolitan area network (MAN) covers larger geographic areas. Some WANs and MANs connect many LANs [1]. A Local Area Network connects computers and peripheral devices in a limited physical area, such as a business, office, laboratory, or college campus

using permanent links (wires) that transmit data rapidly[2].

AIM

To Design & Fabricate a moveable local area network trainer that can be used for training students and also be used to share files among the computer systems connected locally.

OBJECTIVES

- i. To procuring all the requisite equipment that will expedite the fabrication and assembly of the moveable wired Local Area Network
- ii. To set up for the training of the networking course for students in the department of computer engineering and any other related courses
- iii. To access E-books from the server of the Fabricated project by the clients (users)
- iv. To share files during a cause of discussion or conference meeting.
- v. To use some devices like printers to communicate through the network in order print a hard copy file of the clients and internet access also be shared.
- vi. The Fabrication can also be displayed in Engineering exhibition day as well as the publishing the paper for it.

STATEMENT OF PROBLEM

The use of non-moveable wired local area network has been used since the inception of the computer network usually within a small geographical area such as schools, industries, media houses. The local area networks (LAN) are always located in a specified area like an ICT unit, computer studio, or in some offices which is not movable. If there is a need for a meeting or networking practical to be taking place it is only be done at the fixed connected local area network in a

lab, therefore, with the moveable wired local area network, the small group of people can use it in any desired location.

JUSTIFICATION OF FABRICATION

There has not been a record of a home-grown fabrication of the moveable local area network trainer with an in-build server and backup battery in Nigeria other than fixed-local area network in the computer laboratory in our institutions. This fabrication will afford our institution the technical knowledge about this developing technology and it will lead to the following benefits to the institution and the Polytechnic community.

SIGNIFICANCE AND BENEFIT OF THE FABRICATION

The fabrication will benefit the Polytechnic community:

- The Polytechnic can employ the fabricated local area network in the ICT unit or any conferences hall for meetings using computer systems.
- It will be used as one of the pieces of equipment for the LAN trainer needed by NBTE in the computer technology laboratory of the computer engineering department.
- It will enable the department of computer engineering, computer science, electrical engineering, mass communication, library science, and any other interested

unit/department to use for training both staff and students in computing.

- The department of computer engineering can use the fabricated project in creating local content in the certificate course of computer networking to train people in the community.
- It can be used to generate income for the federal polytechnic Mubi when the certificate course is at the networking outlet.

SCOPE OF THE FABRICATION

The prominence of this proposal will be to develop the moveable wired local area network that can connect up to twenty (20) computer systems at a time for students to use during the practice of networking course. The fabricated moveable wired local area network will be easy to maintain and troubleshoot.

FABRICATION AND METHOD OF ASSEMBLY

All the components of the moveable local area network will be carefully designed and will be fabricated to fit into the design case by a metal sheet and plywood using a specified dimension (1016mm x 508mm x 381mm). The case will be coupled using a screw or nuts and bolts with a selected tool and machine. The plastic glass will be used for the front view (cover) to see the components inside the fabricated project. The orthographic projections of the fabrication are in figure 1 below.

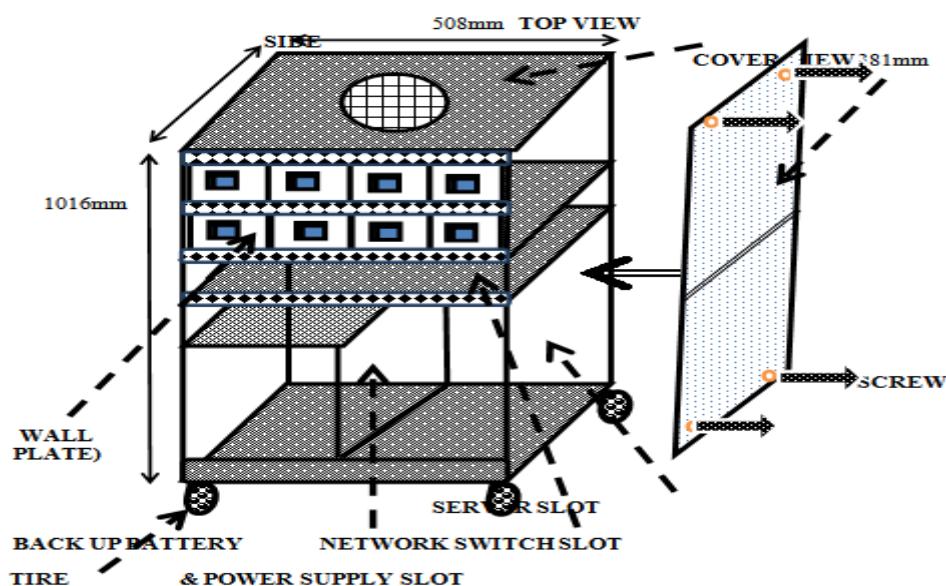


Figure 1: Orthographic Projection of Moveable Wired LAN

LIST OF THE BASIC COMPONENTS

HARDWARE COMPONENTS

1. CISCO Networking Switch
2. Computer System (Server)
3. Cat6e Networking copper cable
4. Wall Plate (Rj-45 Double Jack)
5. RJ-45 Connectors
6. Connector cover
7. UPS Backup Battery (DC to AC)
8. DC Cooling Fan
9. Power Control Switch (30 - 50amp)

SOFTWARE

10. Server Operating System
11. Firewall Security software
12. License Antivirus from authentic vendor
13. Application Software (Office, Network monitoring Software, Network simulation Software)

BRIEF EXPLANATION OF THE DEVICES AND SOFTWARE

1. **CISCO Networking Switch:** The CISCO 28-port Gigabit PoE+ Managed Switch (CISCO-SG300-28PP) Fast Ethernet ports to provide you with a seamless network connection [1].
2. **Computer Server:** A server is a computer system that provides data to other computers. It may serve data to computer systems on a local area network (LAN) or a wide area network (WAN) over the Internet. Many types of servers exist, including web servers, mail servers, and file servers[3].
3. **Cat6e Networking copper cable:** is a standardized twisted pair cable for Ethernet and other network physical layers that is backward compatible with the Category 5/5e and Category 3 cable standards.[12].
4. **Wall Plate:** Wall Plate a cabling fixture attached to a wall in a work area for connecting computers to the network. Also called a faceplate.[4].
5. **RJ 45 Connector (RJ):** An 8-pin/8-position plug or jack is commonly used to connect computers onto Ethernet-based local area networks (LAN). Two wiring schemes—T568A and T568B—are used to terminate the twisted-pair cable onto the connector interface[5].
6. **Connector Jacket:** Rj45 jacket is used to cover the connector after the cable was configured.
7. **UPS Backup Battery (DC to AC):** An uninterruptible power supply or uninterruptible power source (UPS) is an electrical apparatus that provides emergency power to a load when the input power source or mains power fails [2].
8. **DC Cooling Fan:** The DC fan is powered with a potential of fixed value such as the voltage of a battery [6].
9. **Power Control Switch:** A power control switch is a controlled electronic device that can switch between "on" and "off" states, and is used in PE converters to manipulate and shape the output voltage and currents.
10. **Patch panel:** is a mounted hardware assembly that contains ports used to connect and manage incoming and outgoing LAN cables.[7].
11. **Server Operating System:** A server operating system is an operating system specifically designed to run on servers, which are specialized computers that operate within client/server architecture to serve the requests of client computers on the network [8].
12. **Firewall:** A firewall is a network security system designed to prevent unauthorized access to or from a private network [9].
13. **License Antivirus:** Antivirus software is a type of utility used for scanning and removing viruses from your computer [10].
14. **Application Software (Office, Network monitoring Software, Network Simulation Software):** An application is any program or group of programs that is designed for the end-user [3].

SOME PHYSICAL VIEW OF THE BASIC HARD WARE COMPONENTS

1. CISCO SWITCH



2. SERVER



3. Cat6 UTP cable



4. WALL PLATE



5. RJ-45 CONNECTOR



6. CONNECTOR COVER



7. UPS BACKUP



8. DC COOLING FAN



9. POWER CONTROL SWITCH



COMPLETE PROPOSED FABRICATION

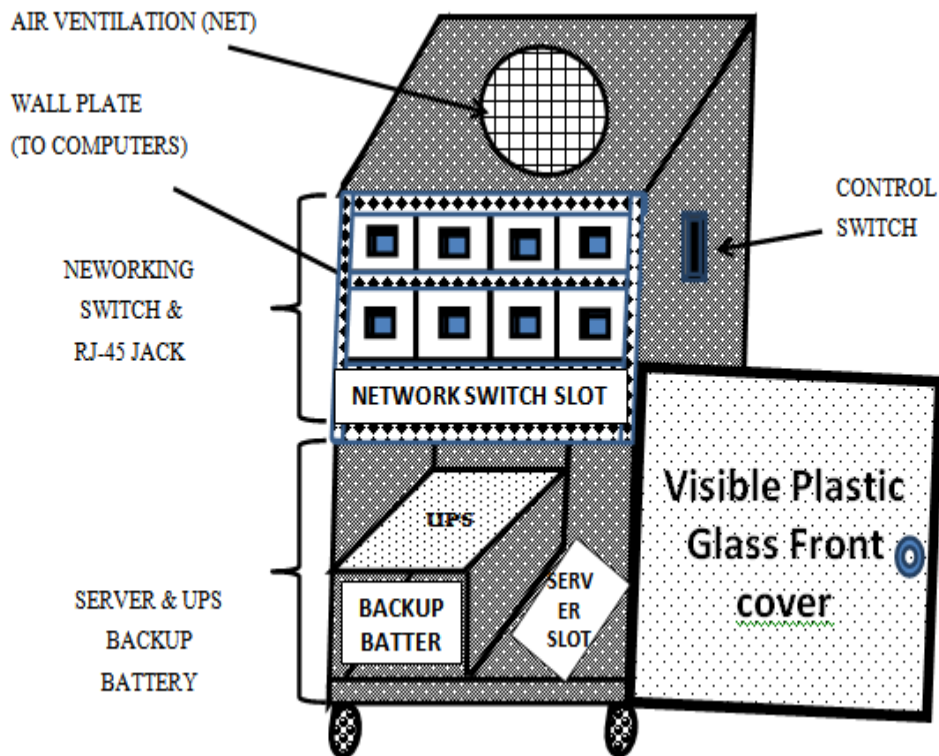


Figure 2: Front, Top and Side View of Moveable LAN

SPECIFICATION OF THE COMPONENTS

1. CISCO Networking Switch: CISCO-SG300-28PP
2. Computer System (Server): Intel core, Processor speed 3.5GHz, RAM 6GB, and Hard Disk 1 TB
3. Cat6e Networking copper cable: dB/. 100 ft.(305,00mm). DB/MHz.14 pF/ft. 46 pF/m. Nominal capacitance. Nominal attenuation is 100 ohms.
4. Wall face Plate (Rj-45 Double Jack): Standard size wall plates for all applications. Best fit for surface mount boxes. Extra 3/4" width and height than Standard size wall plates. Largest size wall plates tocover larger wall damage.
5. Rj-45 Connectors: 2x4 RJ45 module connector/rj45 pcb jack shielded * RoHS-6 peak wave solder temperature rating 260 0 C. * Operating temperature range: 0 0 C to +70 0 C. * Storage temperature range: -40 0 C to +85 0 C.
6. Connector cover: Material: polyethylene (PE)
7. Power Control Switch: the rate will be 2 - 15amp
8. Patch Panel: It is rectangular and has the N252-P24 supports EIA/TIA 568A and 568B wiring standards.
9. Server Operating System: Hardware minimum 32-bit Intel® Pentium® 4 or Compatible processor running at 2 GHz or greater, 512 MB RAM. Disk space: 1 GB for Pipeline Pilot plus 450 MB for server components. A DVD-ROM drive.
10. Firewall Security software: Should be from Microsoft or any authentication vendor.
11. License Antivirus from authentic vendor: Microsoft Security Essential antivirus or any trusted one.
12. Application Software (Office, Network monitoring Software, Network Simulation Software): depends on the requirement.

COMPLETED FABRICATED SYSTEM



Figure 3: Complete View of the Fabrication



Figure 4: Left Side View



Figure 5: Right Side View



Figure 6: Patch panel and Cables

TESTING

The system was tested using the Ping command between two and more computer systems to ensure that there is communication between the connected systems. IP addresses were assigned in both server and the computer systems. The following IP was used 192.168.0.2 for the Server and 192.168.0.3, .4, .5 etc. for the systems.

II. RESULTS

The ping results show that the computer system was communicated and the users were able to share information or to browse when it is connected to the internet access. The figure 7 below shows the pinging result of 192.168.0.3 from 192.168.0.2.

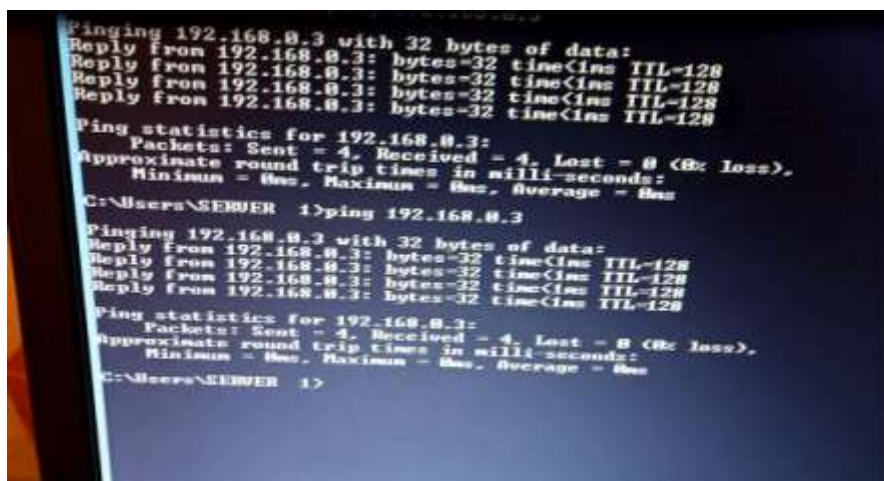


Figure 7: Pinging result of 192.168.0.3 from 192.168.0.2

III. CONCLUSION

After completing the fabrication, the cables connected to the systems were first tested using a cable tester to ensure that there is no error based on the cable arrangements. Two computer systems were connected and the class C IP address was assigned for the server and the computer. The ping command was run using the CMD command prompt and to verify the system connectivity which

is perfectly done without any loss in communication.

The wireless access router was mounted on the system so that the system will be connected to the internet access where the users can browse.

RECOMMENDATION

Based on the fabricated system, the following recommendation was made:

- i. The system will be used for students training in a networking laboratory
- ii. The system will recommend in a small conference meeting where the computers are being connected for discussion.
- iii. The wireless devices also are communicated through a server of the system.

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