A Simulation of the Local Area Network Design for Use in the Department of Civil and Electrical/Electronics Engineering, University of Agriculture, Makurdi Using the OSPF Routing Protocol

Peter A. Akor[1], Attai I. Abubakar[2], David Akhuwa[3]

[1, 2, 3] *Department of Electrical and Electronics Engineering, Federal University of Agriculture, P.M.B. 2373, Makurdi, Benue State, Nigeria*

***Abstract*-This project deals with the open shortest path first (OSPF) design of a local area network (LAN) for use in the department of Electrical/Electronics and Civil Engineering using the Cisco Packet Tracer. The aim of this project is to allow systems and devices to be able to communicate with each other and should be able to provide desired information, to reduce isolated users and workgroups, physical systems and devices should be able to maintain and provide satisfactory performance, reliability and security, resource sharing. For these devices to communicate on different networks, the networks must be routed to each other. Therefore after routing is done the LAN will be tested using a ping message command to test whether the devices can communicate.**

***Keywords*-LAN, OSPF, Subnet, Router**

I. INTRODUCTION

This design covers the Department of Electrical/Electronics Engineering and Civil Engineering. Which is further divided into four sections namely; the admin office (Electrical/Electronics Engineering office and Civil Engineering office), Electrical Lab, Civil Lab and ETF classrooms. Before the simulation was carried out a design was made which is shown in the circuit analysis, Switches were used to link system like computers, printers, scanners and servers within each block of the two departments using ports. A port in the switch is used to connect to the router. Routers are connected to each other using serial cables [this can be a wireless connection]. Type C class IP addressing was used to assign address to each component in the network after subnetting of the selected IP address. The system was configured on the packet tracer using OSPF.

II. MATERIALS AND METHODS

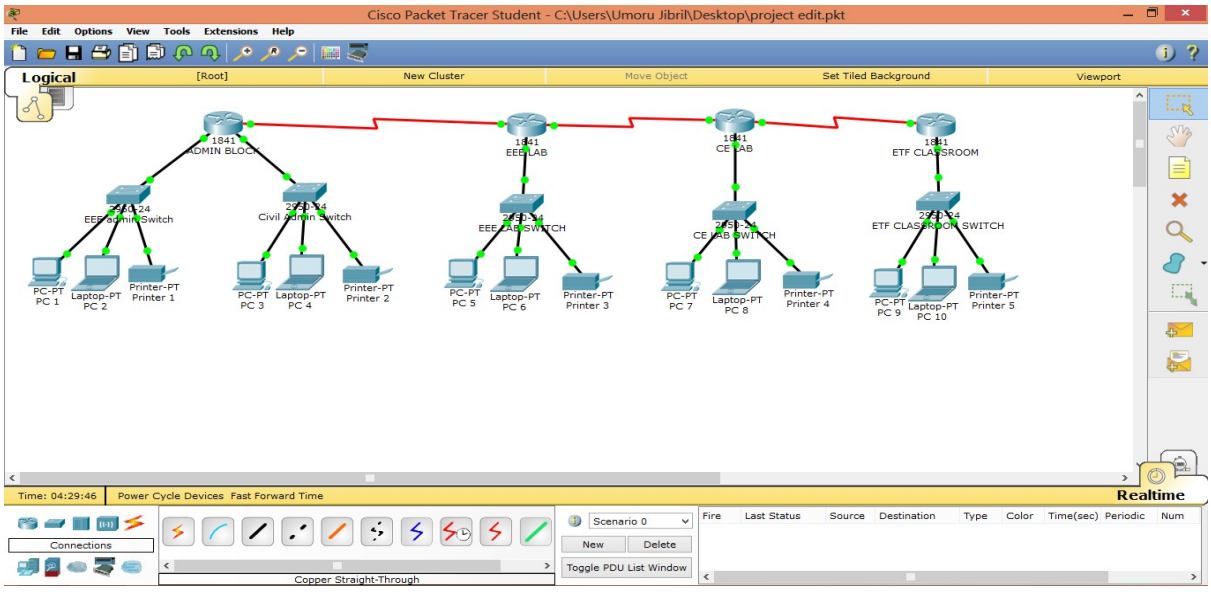


Figure 1: Design Circuit

Circuit Analysis

Number of networks

We are going to have 8 networks

Ip address

192.168.10.0/24---- Class C IP Address

Network. Network. Network. Host

192 .168 .10 .0

Subnet mask calculation

255.255.255.0------- Default Subnet Mask

The default subnet mask is given in Binary as;

.255 . 255 . 255 . 0

11111111 . 11111111 . 11111111 . 00000000

Since the BCD system makes use of 4 bits. We turn up 4 bits from the Subnet Mask;

11111111 . 11111111 . 11111111 . 11110000

By using the network model below;

2^8 2^7 2^6 2^5 2^4 2^3 2^2 2^1 2^0

256 128 68 32 16 8 4 2 1

Therefore;

1 1 1 1 0 0 0 0

128 64 32 16

128 + 64 + 32 + 16 = 240

We have;

11111111 .1111111 .11111111 .11110000

255 . 255 . 255 . 240

Increment

To find the increment, the value of the last bit of the 4 bits that were turned up is used; i.e

11111111 . 1111111 . 11111111 . 11110000

16

Therefore the increment = 16

The range of the network

The ranges of the networks are;

Network 1: 192.168.10.0 - 192.168.10.15 _Admin EEE Department

Network 2: 192.168.10.16 - 192.168.10.31_ Admin Civil Department

Network 3: 192.168.10.32 - 192.168.10.47 _EEE Lab

Network 4: 192.168.10.48 - 192.168.10.63_CE Lab

Network 5: 192.168.10.64 - 192.168.10.79 ETF Classes

Network 6: 192.168.10.80 - 192.168.10.95 Admin/EEE Lab

Network 7: 192.168.10.96 - 192.168.10.111 EEE Lab/Civil Lab

Network 8: 192.168.10.112 - 192.168.10.127 Civil Lab/ETF Classes

Gateway assigned to each networks.

NETWORK 1: 192.168.10.1

NETWORK 2: 192.168.10.17

NETWORK 3: 192.168.10.33

NETWORK 4: 192.168.10.49

NETWORK 5: 192.168.10.65

NETWORK 6: 192.168.10.81

NETWORK 7: 192.168.10.97

NETWORK 8: 192.168.10.113

The design and simulation of the LAN was done using the Cisco Packet Tracer (Version 6.2). Our design was done using the twisted pair cables, routers, switches, personal computers, serial cables.

Steps On How To Assign Ip Address, Gateway And Subnet Mask On Any Computer Using Packet Tracer.

Step 1: click on the computer.

Step 2: click on IP Address from the dialogue box that appears.

Step 3: Type in the IP Address, Gateway, and Subnetmask.

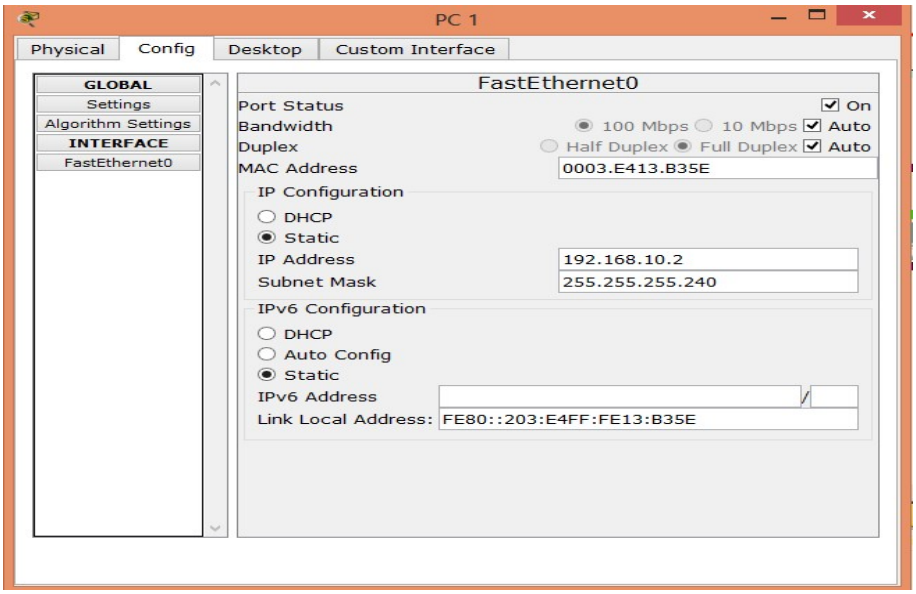


Figure 2: System IP Address, Gateway and Subnet mask Configuration

Router configuration

Step 1: Enable

Step 2: configure terminal

Step 3: hostname “name”

Step 4: enable secret “password”

Step 5: int f0/0

Step 6: no shut down

Step 7: ip address “ip address” “subnet mask”

Step 8: do write

Step 9: exit

Step 10: int f0/1

Step 11: no shut down

Step 12: ip address “ip address” “subnet mask”

Step 13: do write

Step 14: exit

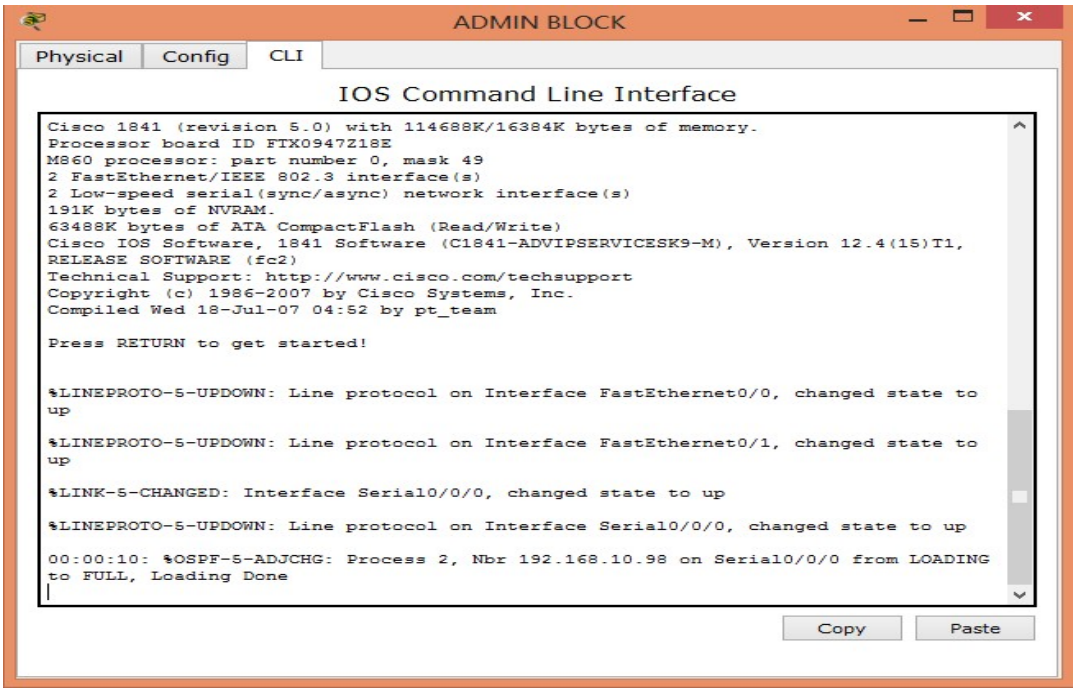


Figure 3: Command Line Interface (CLI)

To configure the routers globally

Router 0 ----- Admin

Enable

Configure terminal

Host name Admin

Enable secret router

Int f0/0

No shut down

Ip address 192.168.10.1 255.255.255.240

Do write

Exit

Int f0/1

No shut down

Ip address 192.168.10.17 255.255.255.240

Do write

Exit

Int serial f0/0/0

No shut down

Ip address 192.168.10.81 255.255.255.240

Do write

Exit

Assigning OSPF Protocol to Routers

Assigning the OSPF protocol to the routers makes it possible for the routers to communicate to each other. The command code is as follows.

Enable

Configure terminal

Route ospf 2

Network 192.168.10.0 0.0.0.15 area 0

Network 192.168.10.16 0.0.0.15 area 0

Network 192.168.10.80 0.0.0.15 area 0

Do write

III. TESTING, RESULTS AND DISCUSSION

3.1 Testing

For us to check the workability of our network, a ping message has to be sent from one system to the other. This ping message can be sent using two ways; by using the message tool on the tools bar or by using the command prompt.

How to ping

First method;

Step 1: Click on the message tool

Step 2: Click on the first device then click on the second device. If the message gets to the second device a reply will be sent on the first device as "successful"

Second method;

Step 1: click on device

Step 2: Go to desktop

Step 3: click on command prompt

Step 4: Type ping "recipient IP address"

3.2 Results

Pinging computer 5 and printer 5 from computer 1; type the ping message as shown below

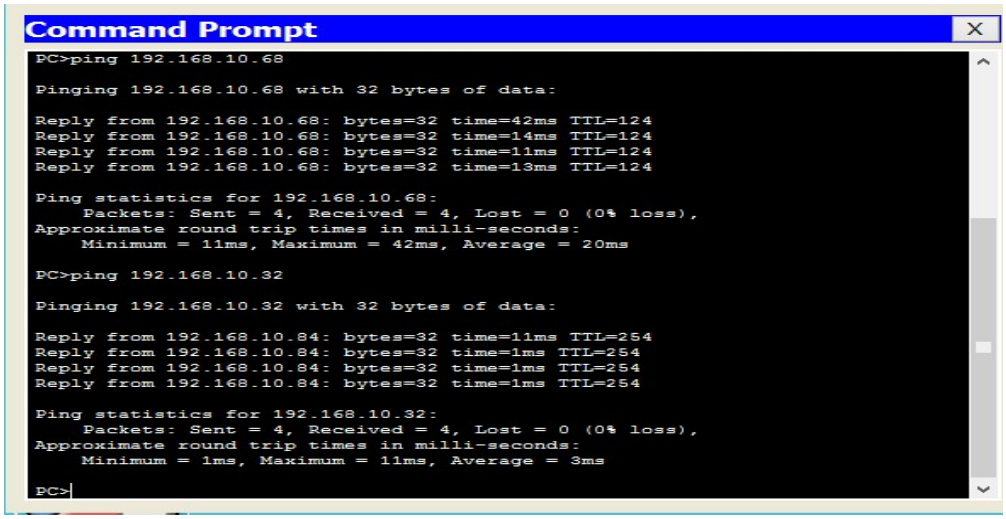
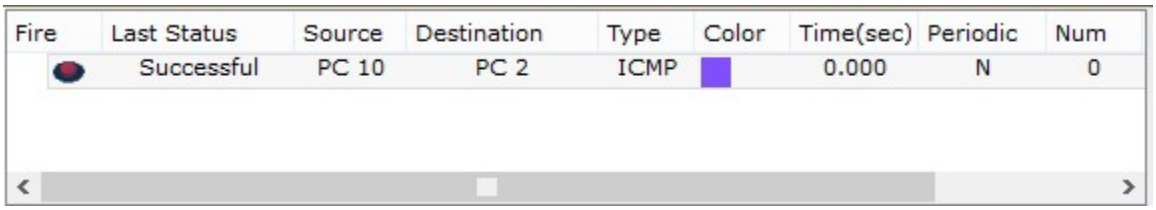


Figure 4: Results gotten from pinging computer 5 and printer 5 from computer 1

Pinging from PC 10 to PC 2



Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num
	Successful	PC 10	PC 2	ICMP		0.000	N	0

Figure 5: Result gotten from Pinging PC 10 to PC 2

3.3 Discussion

The results gotten from the pinging shows that our design can be implemented and also be successful. The time taken for the ping message to be sent to other devices on the network is very small (in milliseconds). Therefore, the systems can share files, resources and printers on the same network

IV. CONCLUSION

At the end of the simulation, the aims and objectives were accomplished. The Local Area Network designed using the OSPF routing protocol is able to

i. Ease sharing of resources
ii. Reduce the cost of transporting files
iii. Reduce the Time taken for files to be transferred files from the departments of Electrical and Electronics Engineering to Civil Engineering to milliseconds.

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