# 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

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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

his 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

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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; 11111111.1111111.1111111.111111.11110000 By using the network model below; 2<sup>5</sup>  $2^{8}$  $2^{6}$  $2^{7}$  $2^{4}$  $2^{3}$  $2^{2}$  $2^{1}$   $2^{0}$ 256 2 1 128 68 32 16 8 4 Therefore; 1 1 1 1 0 0 0 Ļ 128 64 32 16 128 + 64 + 32 + 16 = 240We 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 = 16The 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.

R	PC 1			
Physical Config	Desktop Custom Interface			
GLOBAL	Fas	stEthernet0		
Settings Algorithm Settings INTERFACE FastEthernet0	Port Status Bandwidth Duplex MAC Address IP Configuration O DHCP IP Address Subnet Mask	<ul> <li>✓ On         <ul> <li>● 100 Mbps</li> <li>● 10 Mbps</li> <li>✓ Auto</li> <li>● Half Duplex</li> <li>● Full Duplex</li> <li>✓ Auto</li> <li>○0003.E413.B35E</li> </ul> </li> <li>192.168.10.2</li> <li>255.255.255.240</li> </ul>		
	IPv6 Configuration O DHCP Auto Config Static IPv6 Address Link Local Address: FE80::2	203:E4FF:FE13:B35E		

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

Router configuration	Step 8: do write
Step 1: Enable	Step 9: exit
Step 2: configure terminal	Step 10: int f0/1
Step 3: hostname "name"	Step 11: no shut down
Step 4: enable secret "password"	Step 12: ip address "ip address" "subnet mask"
Step 5: int f0/0	Step 13: do write
Step 6: no shut down	Step 14: exit

Step 7: ip address "ip address" "subnet mask"

<i>₹</i>	ADMIN BLOCK		×
Physical Config			
	IOS Command Line Interface		
Cisco 1841 (revision Processor board ID ) M860 processor: par 2 FastEthernet/IEEE 2 Low-speed serial(5 191K bytes of NVRAM 63488K bytes of ATA Cisco IOS Software, RELEASE SOFTWARE (fr Technical Support: 1 Copyright (c) 1986- Compiled Wed 18-Jul- Press RETURN to get	<pre>1 5.0) with 114688K/16384K bytes of memory. TX0947Z18E i number 0, mask 49 802.3 interface(s) yync/async) network interface(s) CompactFlash (Read/Write) 1841 Software (C1841-ADVIPSERVICESK9-M), Versi 2) ittp://www.cisco.com/techsupport 2007 by Cisco Systems, Inc. 07 04:52 by pt_team started!</pre>	ion 12.4(15)T1,	
%LINEPROTO-5-UPDOWN	Line protocol on Interface FastEthernet0/0, o	changed state to	
%LINEPROTO-5-UPDOWN	Line protocol on Interface FastEthernet0/1, o	changed state to	
%LINK-5-CHANGED: Int	erface Serial0/0/0, changed state to up		
%LINEPROTO-5-UPDOWN	Line protocol on Interface Serial0/0/0, chang	ged state to up	
00:00:10: %OSPF-5-AI to FULL, Loading Dor 	NJCHG: Process 2, Nbr 192.168.10.98 on Serial0/ ne	/0/0 from LOADING	>
		Copy Past	e



To configure the routers globally	Configure terminal		
Router 0 Admin	Route ospf 2		
Enable	Network 192.168.10.0 0.0.0.15 area 0		
Configure terminal	Network 192.168.10.16 0.0.0.15 area 0		
Host name Admin	Network 192.168.10.80 0.0.0.15 area 0		
Enable secret router	Do write		
Int f0/0	III. TESTING, RESULTS AND DISCUSSION		
No shut down	3.1 Testing		
Ip address 192.168.10.1 255.255.255.240	For us to check the workability of our network, a ping		
Do write	message has to be sent from one system to the other. This ping		
Exit	tool on the tools bar or by using the command prompt.		
Int f0/1	How to ping		
No shut down	First method;		
Ip address 192.168.10.17 255.255.255.240	Step 1: Click on the message tool		
Do write	Step 2: Click on the first device then click on the second		
Exit	device. If the message gets to the second device a reply will be sent on the first device as "successful"		
Int serial f0/0/0	Second method:		
No shut down	Step 1: click on device		
Ip address 192.168.10.81 255.255.255.240	Step 2: Go to desktop		
Do write	Step 3: click on command prompt		
Exit	Step 4: Type ping "recipient IP address"		
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

# 3.2 Results

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

Command Prompt	×
PC>ping 192.168.10.68	^
Pinging 192.168.10.68 with 32 bytes of data:	
Reply from 192.168.10.68: bytes=32 time=42ms TTL=124 Reply from 192.168.10.68: bytes=32 time=14ms TTL=124 Reply from 192.168.10.68: bytes=32 time=11ms TTL=124 Reply from 192.168.10.68: bytes=32 time=13ms TTL=124	
<pre>Ping statistics for 192.168.10.68: Packets: Sent = 4, Received = 4, Lost = 0 (0% loss), Approximate round trip times in milli-seconds: Minimum = 11ms, Maximum = 42ms, Average = 20ms</pre>	
PC>ping 192.168.10.32	
Pinging 192.168.10.32 with 32 bytes of data:	
Reply from 192.168.10.84: bytes=32 time=11ms TTL=254 Reply from 192.168.10.84: bytes=32 time=1ms TTL=254 Reply from 192.168.10.84: bytes=32 time=1ms TTL=254 Reply from 192.168.10.84: bytes=32 time=1ms TTL=254	
<pre>Ping statistics for 192.168.10.32: Packets: Sent = 4, Received = 4, Lost = 0 (0% loss), Approximate round trip times in milli-seconds: Minimum = 1ms, Maximum = 11ms, Average = 3ms</pre>	
PC>	~

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

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

## Pinging from PC 10 to PC 2

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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