Integrated Lan Design for the Department of Civil and Electrical/Electronics Engineering, University of Agriculture, Makurdi Using the Enhanced Interior Gateway Routing Protocol

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Abstract:- **Enhanced Interior Gateway Routing Protocol (EIGRP) is an advanced distance-vector routing protocol that is used on a computer network for automating routing decisions and configuration. The protocol was designed by Cisco Systems as a proprietary protocol, available only on Cisco routers. Partial functionality of EIGRP was converted to an open standard in 2013 and was published with informational status as RFC 7868 in 2016.**

EIGRP is a dynamic routing protocol by which routers automatically share route information. This eases the workload on a network administrator who does not have to configure changes to the routing table manually. When a router running EIGRP is connected to another router also running EIGRP, information is exchanged between the two routers. They form a relationship, known as an adjacency.

I. INTRODUCTION

The design of a LAN (local area network) on a Cisco Packet tracer using an EIGRP protocol for the department of electrical/electronics engineering and civil engineering comprise of four routers; one placed at each of the department main buildings i.e. the admin block housing both electrical/electronics HOD office and HOD of civil engineering, the electrical/electronics [EEE] lab building, civil lab building, and the ETF building. 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 EIGRP.

II. MATERIALS AND METHODS

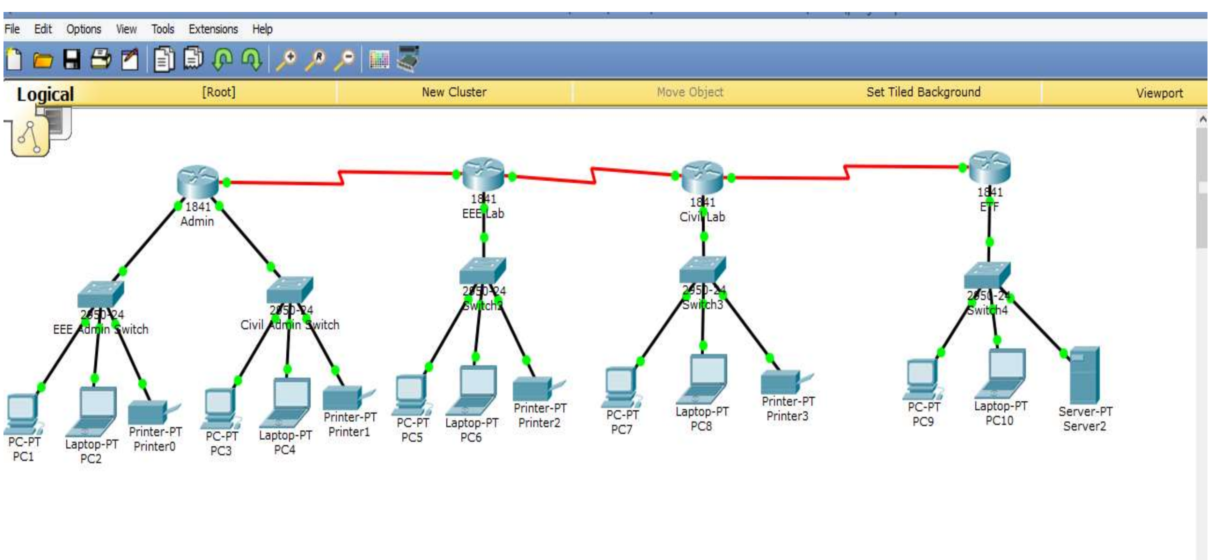

Figure 1: Design Circuit

Circuit Analysis

Number of networks

We are going to have 8 subnetworks

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.

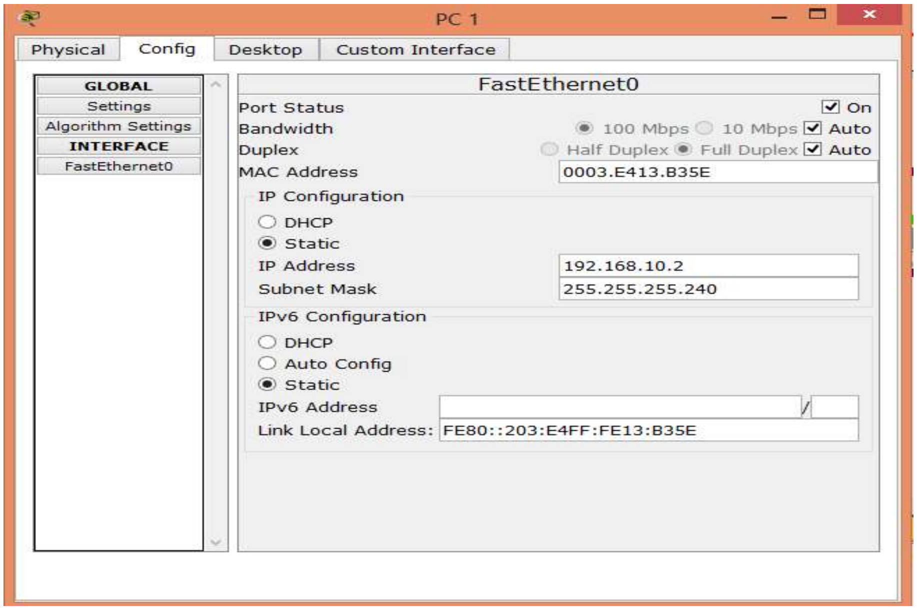

Figure 2: System IP Address, Gateway and Subnet mask Configuration

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

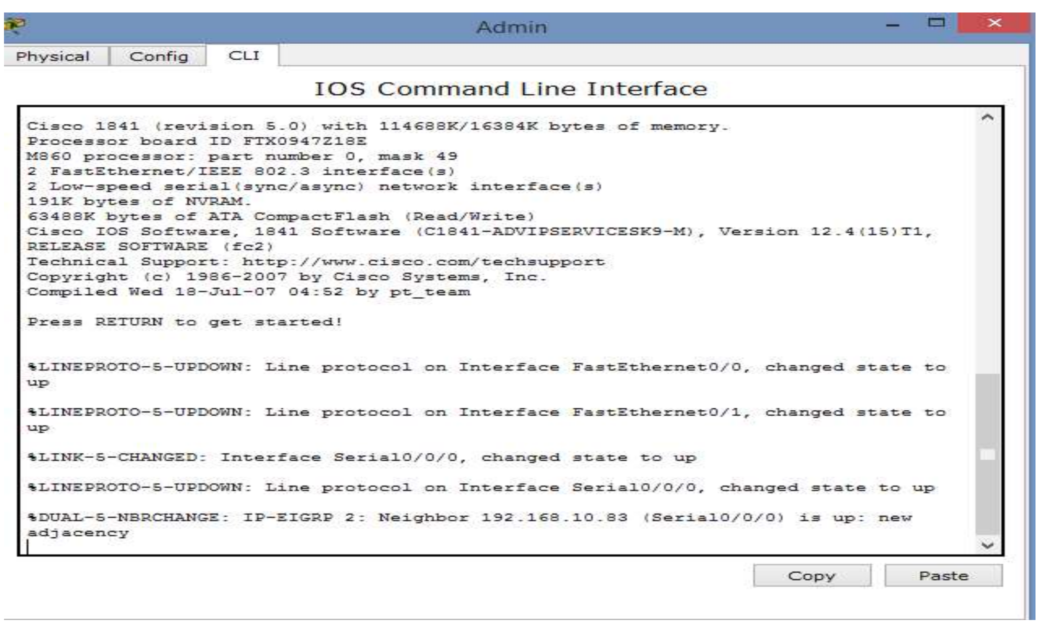

Figure 3: Command Line Interface (CLI

III. TESTING, RESULTS AND DISCUSSION

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”

Results

Pinging computer 2 from computer 1; type the ping message as shown below

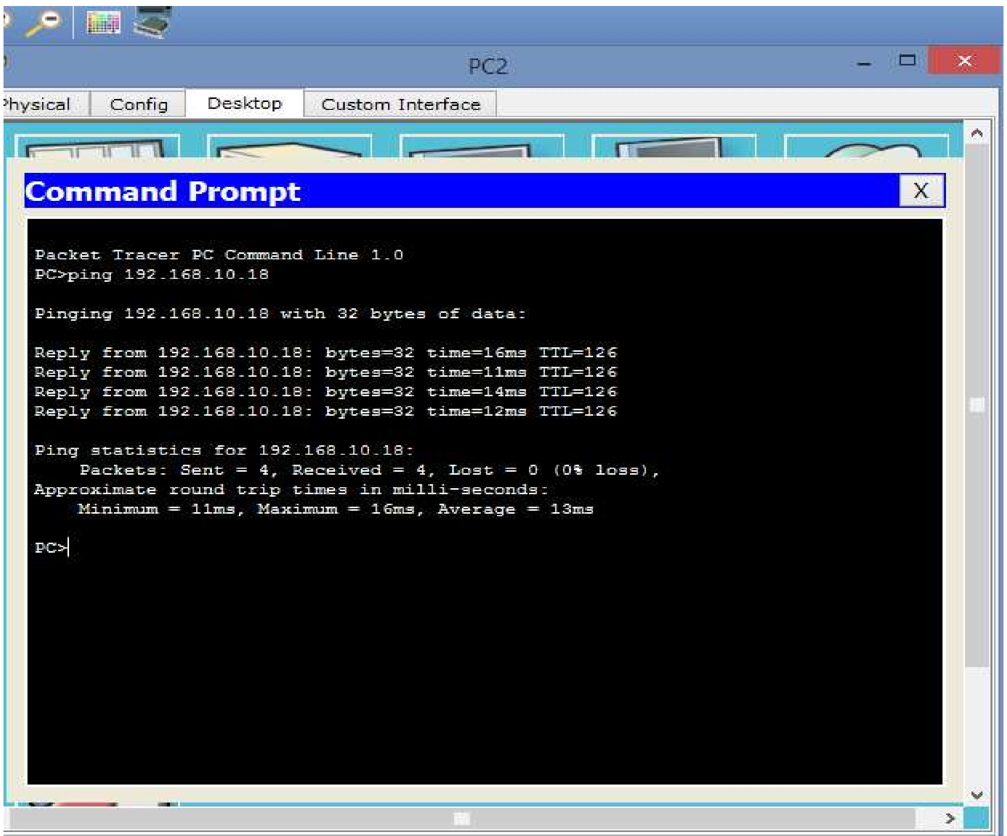

Figure 4: Command PromptResults gotten from pinging PC 2 to PC1

Pinging from PC 2 to PC 1

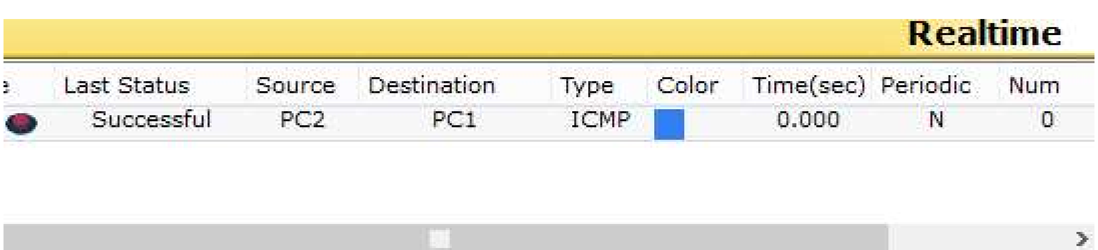

Figure 5: Result gotten from Pinging PC 2 to PC 1

Pinging from Printer 2 to PC 0

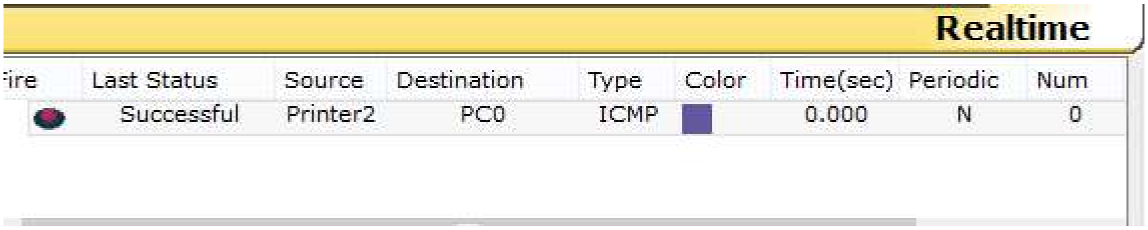

Figure 6: Result gotten from Pinging from Printer 2 to PC 0

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.

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