NETWORK DESIGN FOR SCHOOL

A COURSE PROJECT REPORT

By

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Under the guidance of
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In partial fulfillment for the course
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FACULTY OF ENGINEERING AND TECHNOLOGY

SRM INSTITUTE OF SCIENCE AND TECHNOLOGY

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SRM INSTITUTE OF SCIENCE AND TECHNOLOGY

(Under Section 3 of UGC Act, 1956)

BONAFIDE CERTIFICATE

Certified that this mini project report **"Network Design for School"** is the bonafide work of **Krishitaa Balamurali (RA2011003010115)** and **Putta Sri Naga Sanjana (RA2011003010123)** who carried out the project work under my supervision.

SIGNATURE

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ABSTRACT

A network has to be designed for a school. There are a total of 230 computers in the school computer lab. The users in the lab should belong to a single domain and receive IP addresses dynamically from a central server with the ability to share files on a central location. Some of the users have laptops with wireless cards for which wireless access is required. The total size of the lab is 1000 sq ft. Identify appropriate solutions with the detailed services, hardware and software requirements to design the appropriate network for the school. There are many devices that were used in designing the network, such as routers, switches, backup, firewall, and servers. All devices were connected to each other to make an integration network system and configured by putting IP addresses to all devices. Additionally, all devices in the network were secured by passwords, and these passwords were encrypted to be more secure. Moreover, each computer in the network was secured by antivirus programs and a backup system.

ACKNOWLEDGEMENT

We express our heartfelt thanks to our honorable **Vice Chancellor Dr. C. MUTHAMIZHCHELVAN**, for being the beacon in all our endeavors.

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TABLE OF CONTENTS

CHAPTER 2: INTRODUCTION

Technology has reached its highest peak of development, especially in making life easier for people. Well implemented technology is faster than human in processing calculation and is more accurate. Technology has become an important concept in our life. It assists in connecting communities together. Obviously, people have started to use technology in every field of life including education, health, the military, etc. The computer network represents a component, especially on how it enhances the functional performance in different fields and organizations, such as companies and schools. A school's computer network performs so many functions, such as connecting students with the university, faculty, and the library. Most universities today use the network to provide online education by connecting widely dispersed students with their professors directly. For this reason, computer networks play a vital role in the education area by providing efficient communications for the university environment.Networking is referred to as connecting computers electronically for the purpose of sharing information. Resources such as a file, applications, printers & software are some common information shared in a network. The advantages of networking can be seen clearly in terms of security, efficiency, manageability & and cost effectiveness as it allows collaboration between users in a wide range.

LAN network is made up of two or more computers connected together in a short distance usually at home, offices, buildings or school. WAN is a network that covers a wider area than LAN and usually covers cities, countries and the whole world. Several major LANs can be connected together to form a WAN. As several devices are connected to the network, it is important to ensure data collision does not happen when this device attempts to use the data channel simultaneously.

However, the design of computer networks differs from one university to another. This is as a result of many factors which determine the differences. Such factors include; adaptability,integration, resilience, security, and cost. Installing networks in a university relies on the university's budget, which differs by institution and from country to country. For instance, there are many countries whose universities do not have the financial capability for designing the 'perfect' or ideal network.

PROFESSIONAL & TECHNICAL LEARNING:

• Broadened my horizons – learnt that there is more to life than studies.

• Managed to set deadlines, and abide by them – so that there is no undue pressure near the end.

• Learned the OSI and the TCP/IP model in great detail.

• Learned about various protocols, and why there are (or not) in use.

• Learned to build complex networks using Packet Tracer.

• Learned in great detail about various components of a network – switches, hubs, routers, server, connecting wires, static and DHCP routings, and VLANs users etc.

CHAPTER 3: LITERATURE SURVEY

Computer network has become the most significant issue in our day-to-day life. Networking companies depend on the proper functioning and analysis of their networks for education, administration, communication, e-library, automation, etc. Mainly, interfacing with the network is induced by one user or all the users to share some data among them. So, this paper is about the communication among users present at remote sites, sharing the same School Area Network Scenario. So, in this work, the network is proposed to be designed using Cisco Packet Tracer, which describes how this tool can be used to develop a simulation model for the School network. Various literatures have been reviewed regarding the technology being used and its security aspect. This study provides in-depth information on various concepts such as network topology, IP address configuration and sending information in the form of packets in a single common network. It also provides the details of how to use virtual Local Area Network (VLANs) to separate the traffic generated by different departments keeping in mind the information security.

The objective of network design is to satisfy data communication requirements while minimizing expense. The main goal of this project is to present a Local Area Network design suitable for school in developing countries. Many schools in developing countries are searching for ways to integrate networks that have security, backup, and other features available in a university network in a developed country. The schools in developing countries are faced with challenges in designing a network that is equal in the standards used by developed countries. The main problem developing countries facedeals with a profound budget deficit. This research will help these schools to design a network that employs low-cost solutions without unacceptable compromises in security or quality.

CHAPTER 4: REQUIREMENTS

➔ Requirement Analysis

From the given scenario, we draw the following requirements:

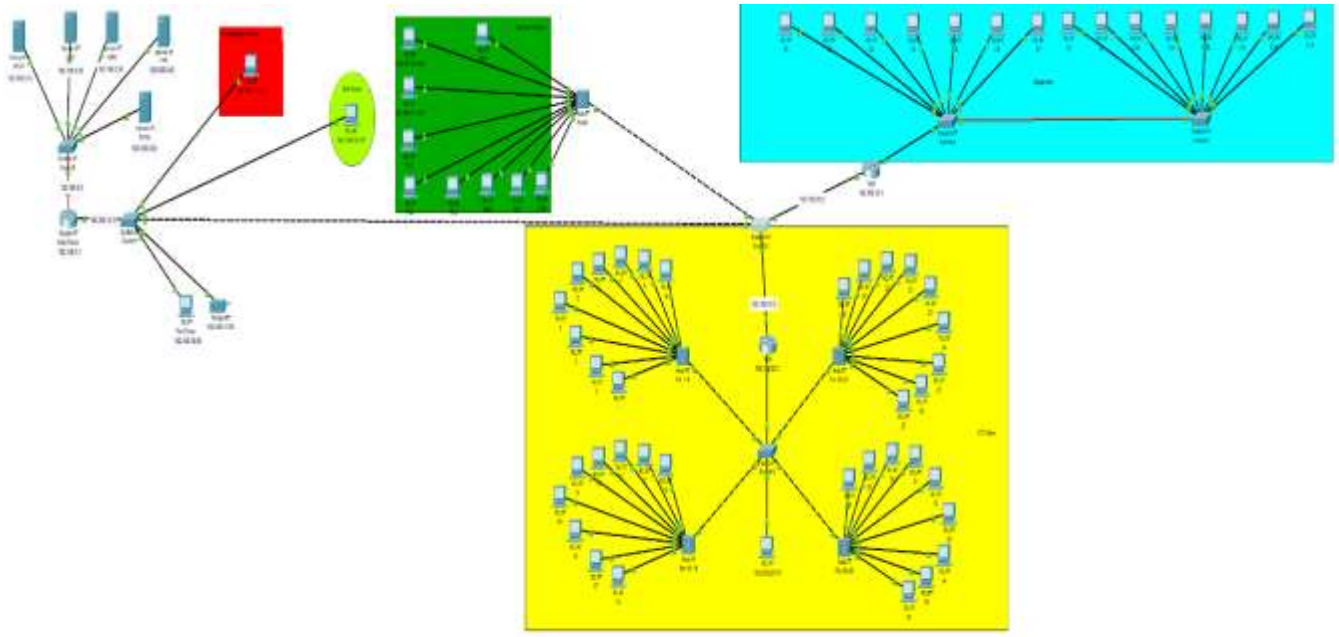
1. Identifying the appropriate hardware which would be used (Cisco Packet Tracer).
2. The users in the organization should have full access to the server.
3. Network design with IP addressing
4. Features and configuration required on the hardware with explanation

We need to configure a network design keeping the following requirements in mind.

➔ Hardware Requirements

- 6 Switches
- 3 Routers
- 5 Hubs
- 1 Printer Server
- 1 Web and 1 FTP Server
- 1 DHCP, 1 DNS, 1 Email Server
- 64 PC's
- 36 for Students (ICT Lab)
- 15 for Classroom
- 9 for Teacher (ICT)
- 1 for Lab Teacher
- 1 for Hall Room
- 1 for Head Master
- 1 for Printing

CHAPTER 5: ARCHITECTURE AND DESIGN



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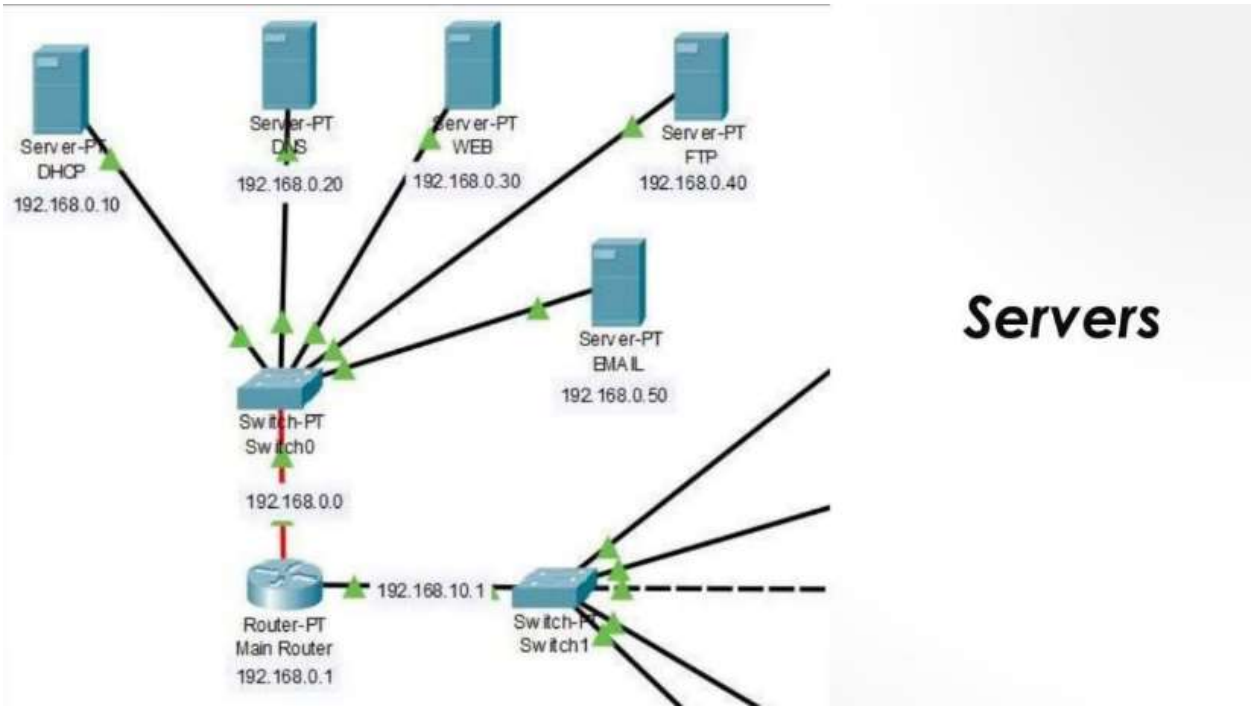

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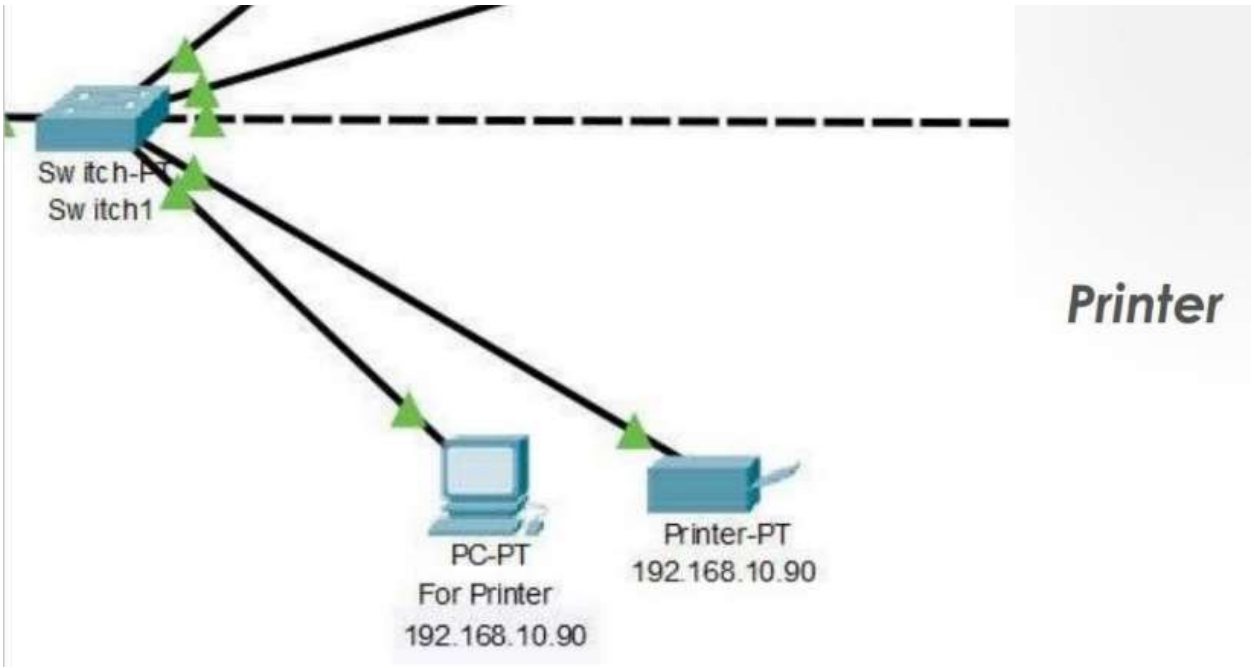

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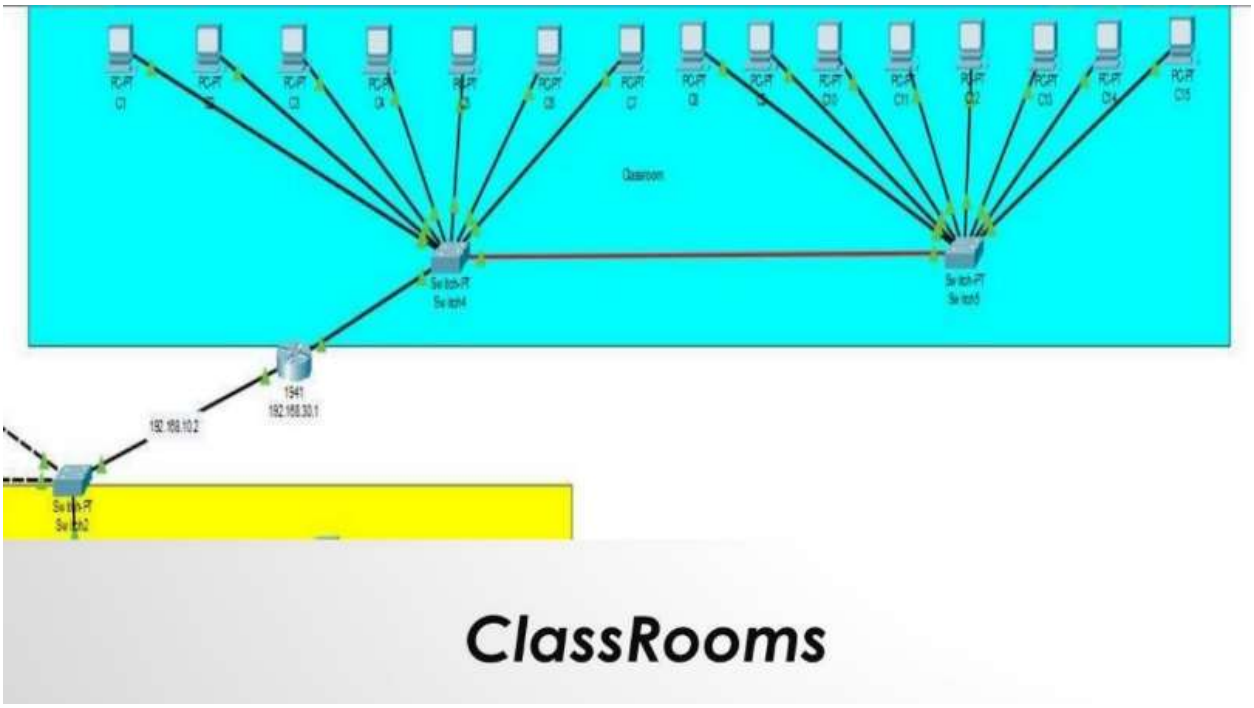

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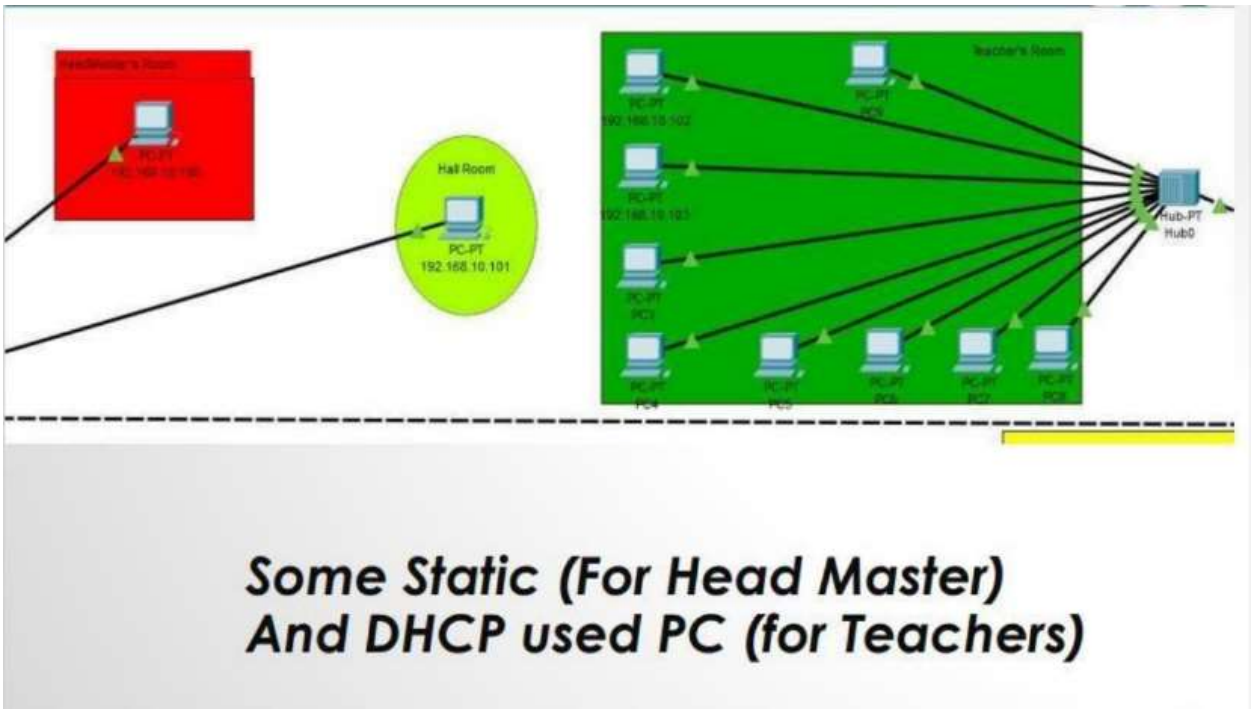

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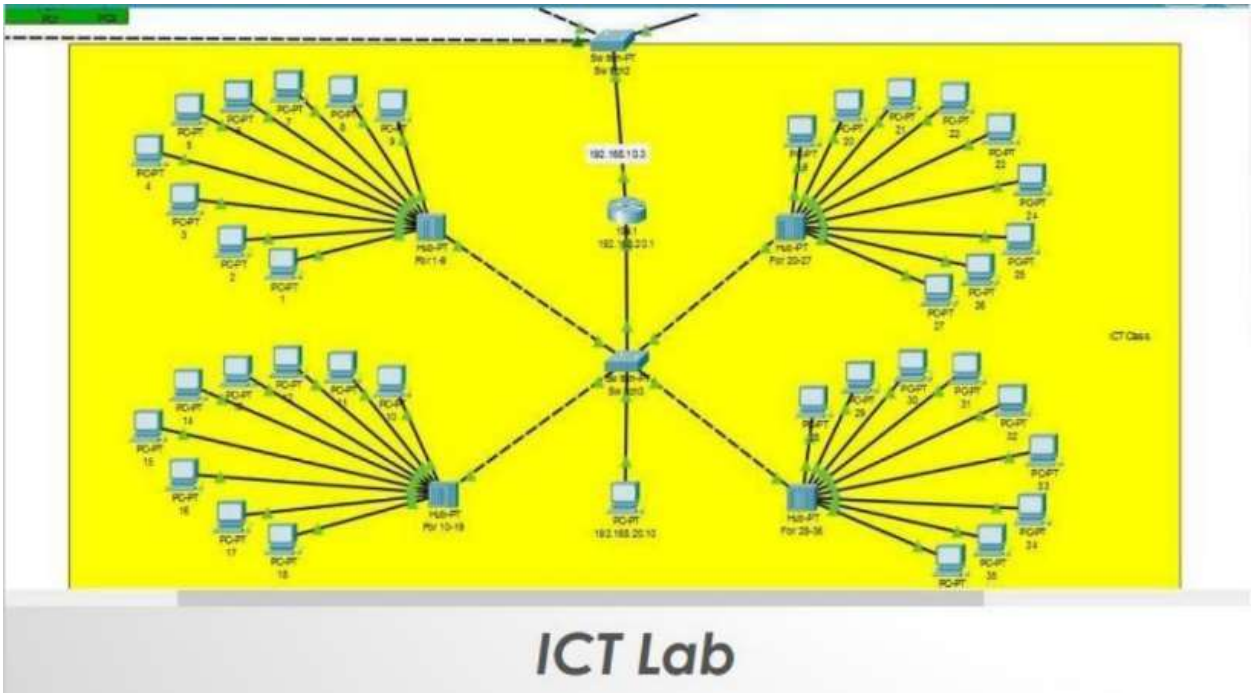


Figure no. 5.6.

TOOLS USED AND KEY HIGHLIGHTS:

• The main tool used is Cisco Packet Tracer, provided free of charge for education for academic use, by Cisco Inc.

• DHCP

• DNS

• WEB

• VLANs

• FTP

• EMAIL

• ROUTING

• PRINTER

CHAPTER 6: IMPLEMENTATION

Each module description:

Three routers are connected to each other representing a separate lab. Every two PCs are connected to each other through a switch and further switches are connected through a router. Thus, LAN configuration is implemented. We have used RIP Configuration in this. It is a dynamic routing protocol that uses hop count as a routing metric to find the best path between the source and the destination network. It is a distance-vector routing protocol that has an AD value of 120 and works on the Network layer of the OSI model. RIP uses port number 520.

FEATURES:

1. Updates of the network are exchanged periodically.
2. Updates (routing information) are always broadcast.
3. Full routing tables are sent in updates.
4. Routers always trust routing information received from neighbor routers. This is also known as Routing on rumors.

CHAPTER 7: RESULTS AND DISCUSSION

The network connections were checked by ping requests:

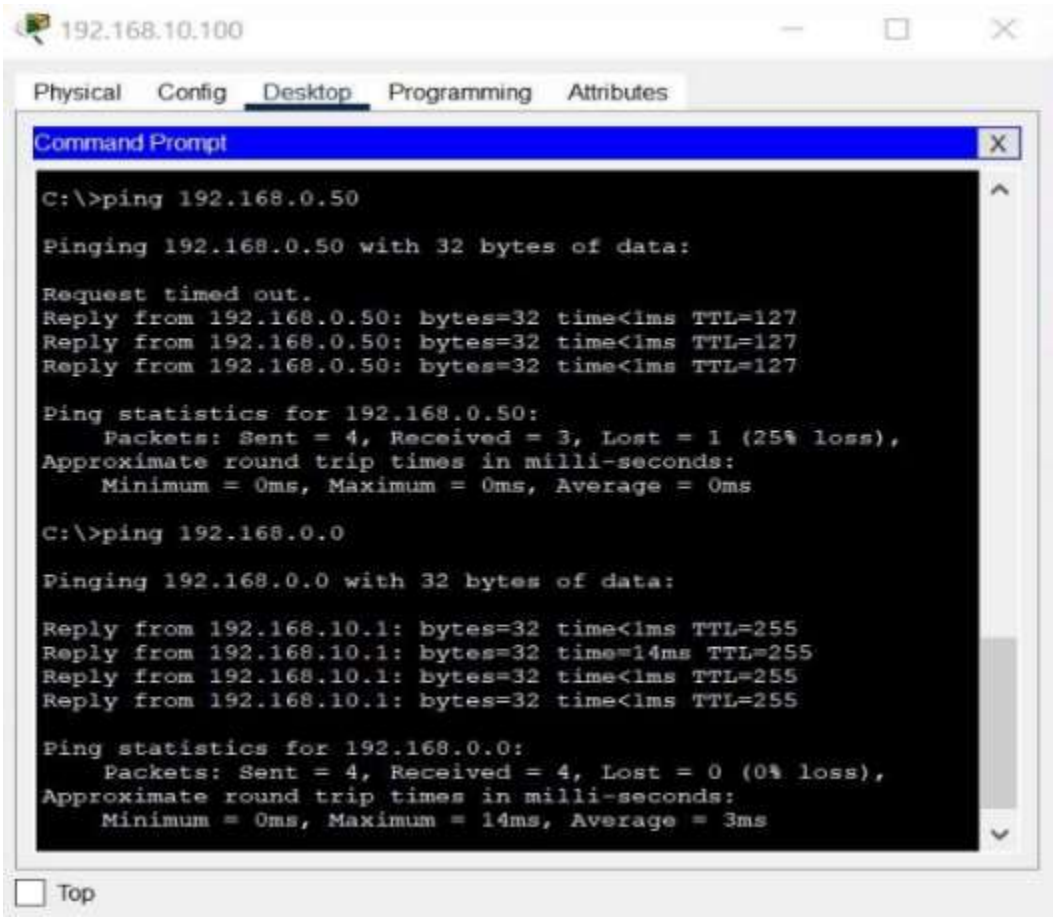
```
Cisco Packet Tracer PC Command Line 1.0
C:\> ping 192.168.0.1

Pinging 192.168.0.1 with 32 bytes of data:

Reply from 192.168.0.1: bytes=32 time<1ms TTL=255
Reply from 192.168.0.1: bytes=32 time<1ms TTL=255
Reply from 192.168.0.1: bytes=32 time<1ms TTL=255
Reply from 192.168.0.1: bytes=32 time<1ms TTL=255

Ping statistics for 192.168.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

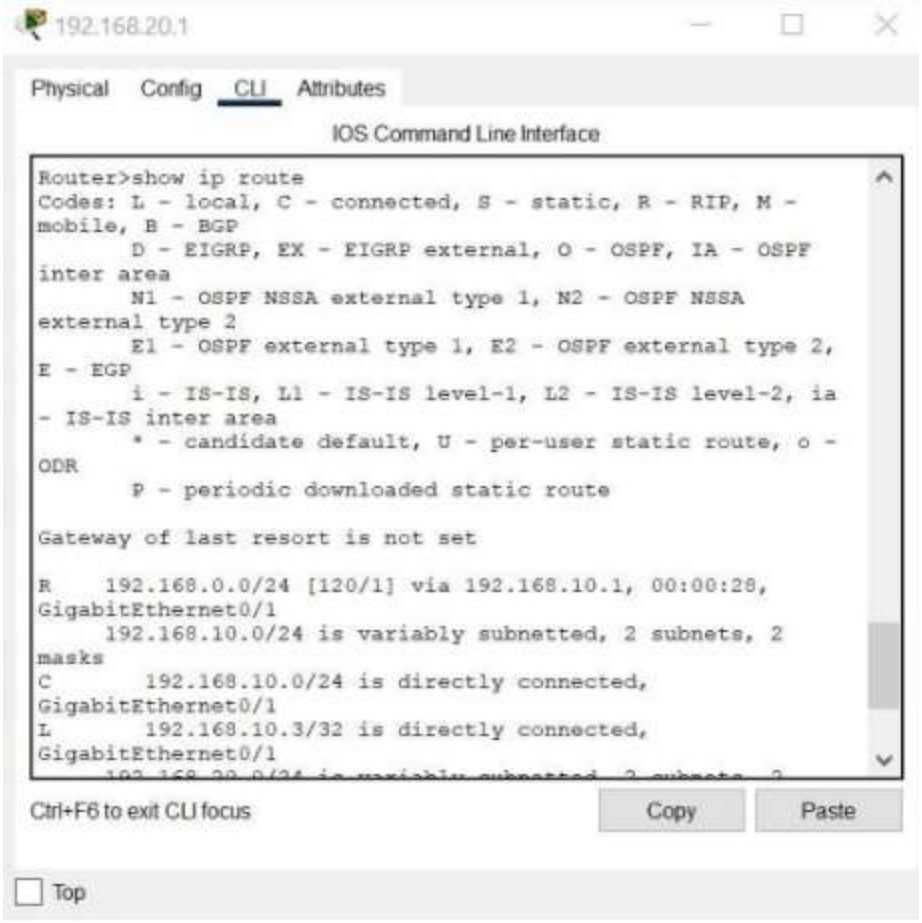
```
C:\>ping 192.168.0.10

Pinging 192.168.0.10 with 32 bytes of data:

Reply from 192.168.0.10: bytes=32 time=2ms TTL=127
Reply from 192.168.0.10: bytes=32 time<1ms TTL=127
Reply from 192.168.0.10: bytes=32 time=1ms TTL=127
Reply from 192.168.0.10: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.0.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 2ms, Average = 0ms
```

```
C:\>ping 192.168.0.20

Pinging 192.168.0.20 with 32 bytes of data:

Request timed out.
Reply from 192.168.0.20: bytes=32 time<1ms TTL=127
Reply from 192.168.0.20: bytes=32 time<1ms TTL=127
Reply from 192.168.0.20: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.0.20:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

```
C:\>ping 192.168.0.30

Pinging 192.168.0.30 with 32 bytes of data:

Request timed out.
Reply from 192.168.0.30: bytes=32 time<1ms TTL=127
Reply from 192.168.0.30: bytes=32 time<1ms TTL=127
Reply from 192.168.0.30: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.0.30:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

```
C:\>ping 192.168.0.40

Pinging 192.168.0.40 with 32 bytes of data:

Request timed out.
Reply from 192.168.0.40: bytes=32 time<1ms TTL=127
Reply from 192.168.0.40: bytes=32 time<1ms TTL=127
Reply from 192.168.0.40: bytes=32 time=1ms TTL=127

Ping statistics for 192.168.0.40:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms
```




192.168.20.1
Physical
Config
CLI
Attributes
IOS Command Line Interface
Router>show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route
Gateway of last resort is not set
R 192.168.0.0/24 [120/1] via 192.168.10.1, 00:00:28, GigabitEthernet0/1
192.168.10.0/24 is variably subnetted, 2 subnets, 2 masks
C 192.168.10.0/24 is directly connected, GigabitEthernet0/1
L 192.168.10.3/32 is directly connected, GigabitEthernet0/1
Ctrl+F6 to exit CLI focus
Copy
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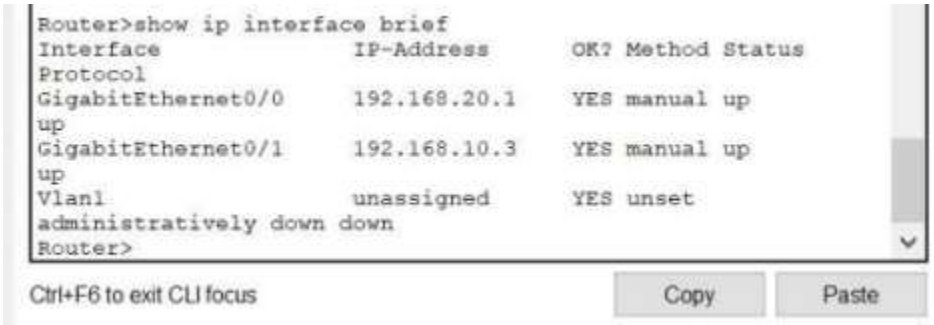
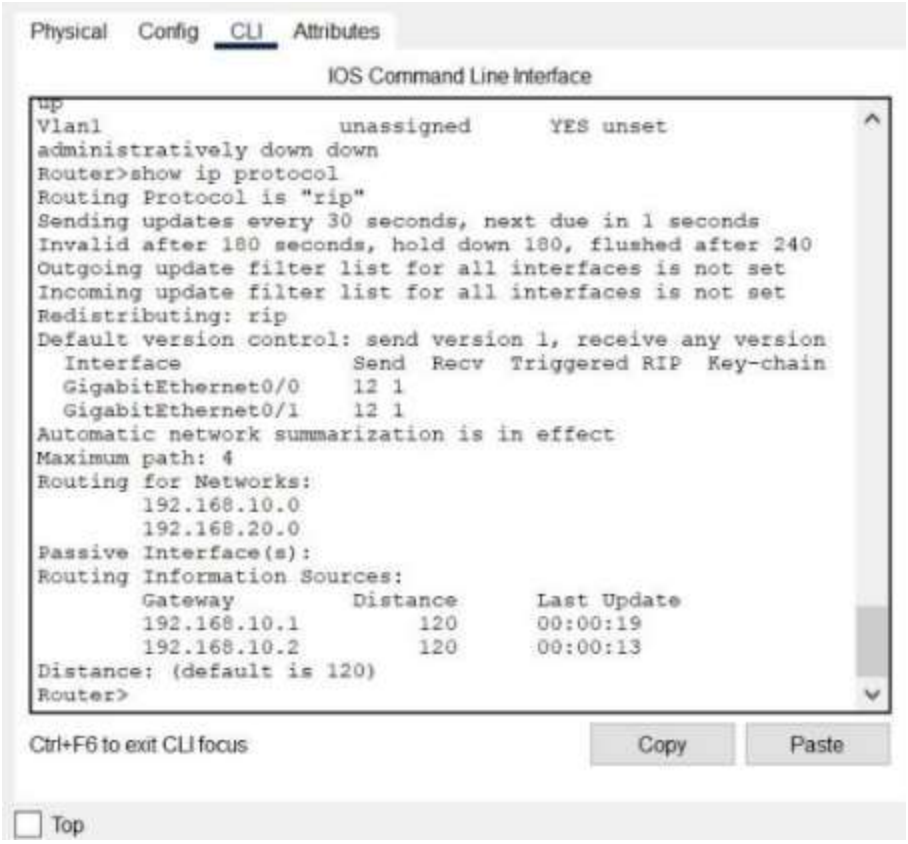
Top


Router>show ip interface brief
Interface IP-Address OK? Method Status Protocol
GigabitEthernet0/0 192.168.20.1 YES manual up up
GigabitEthernet0/1 192.168.10.3 YES manual up up
Vlan1 unassigned YES unset administratively down down
Router>
Ctrl+F6 to exit CLI focus
Copy
Paste


Physical Config CLI Attributes
IOS Command Line Interface
up
Vlan1 unassigned YES unset
administratively down down
Router>show ip protocol
Routing Protocol is "rip"
Sending updates every 30 seconds, next due in 1 seconds
Invalid after 180 seconds, hold down 180, flushed after 240
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
Redistributing: rip
Default version control: send version 1, receive any version
Interface Send Recv Triggered RIP Key-chain
GigabitEthernet0/0 12 1
GigabitEthernet0/1 12 1
Automatic network summarization is in effect
Maximum path: 4
Routing for Networks:
192.168.10.0
192.168.20.0
Passive Interface(s):
Routing Information Sources:
Gateway Distance Last Update
192.168.10.1 120 00:00:19
192.168.10.2 120 00:00:13
Distance: (default is 120)
Router>
Ctrl+F6 to exit CLI focus
Copy
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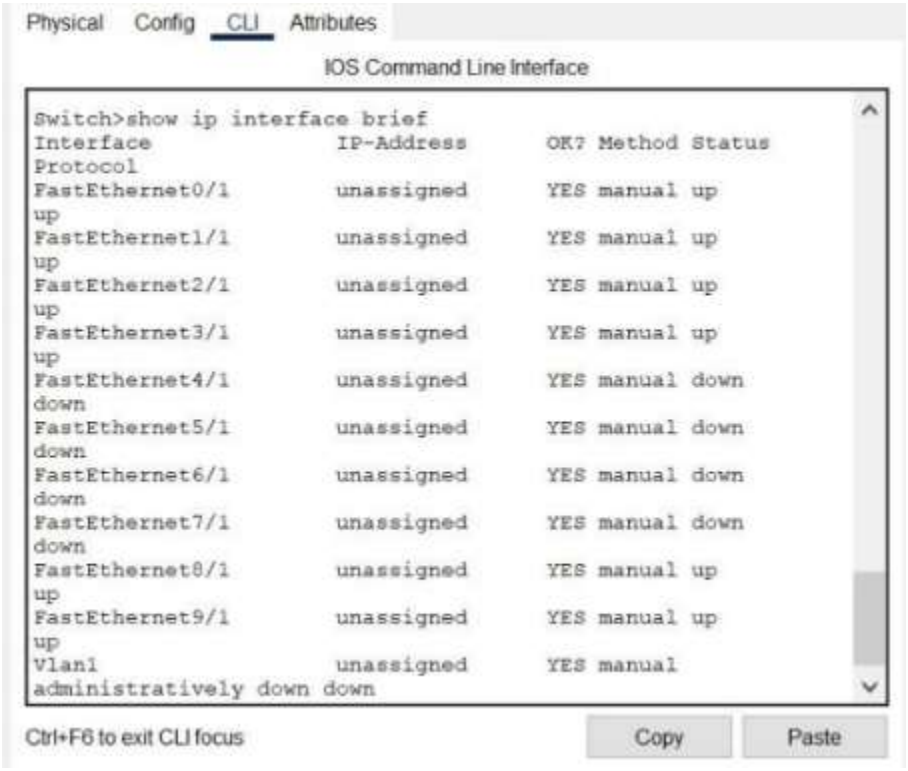
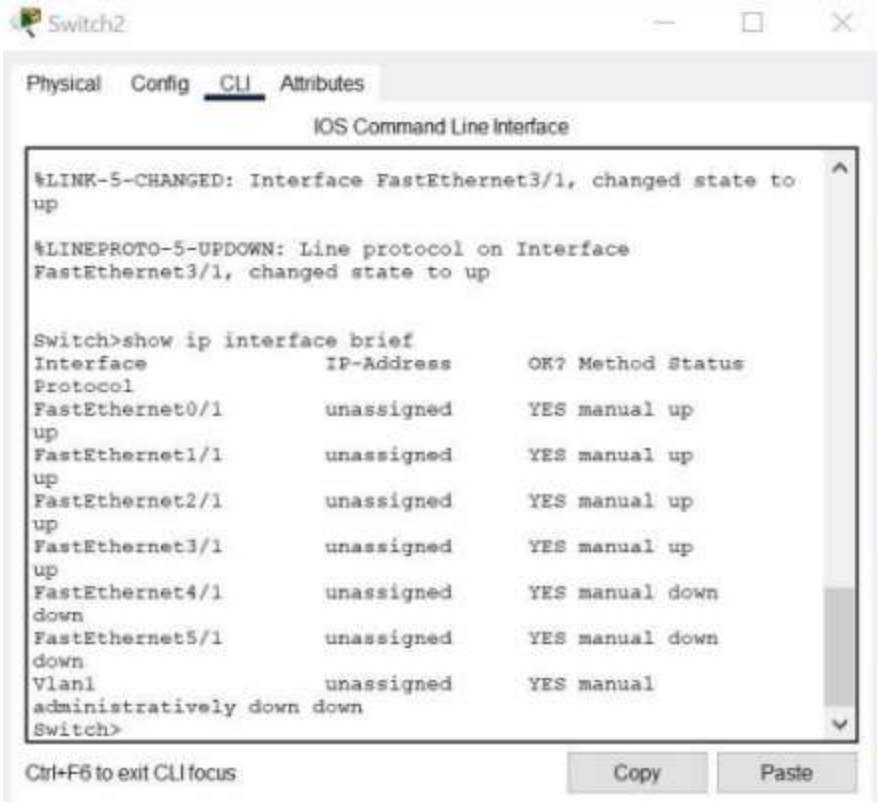
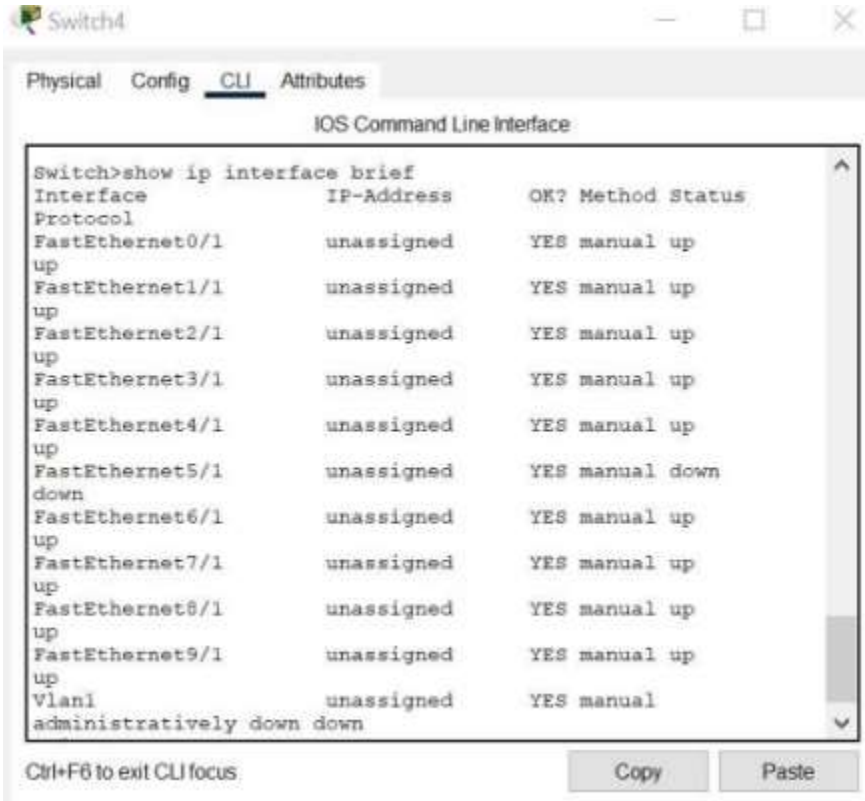

Physical Config CLI Attributes
IOS Command Line Interface
Switch>show ip interface brief
Interface IP-Address OK? Method Status
Protocol
FastEthernet0/1 unassigned YES manual up
up
FastEthernet1/1 unassigned YES manual up
up
FastEthernet2/1 unassigned YES manual up
up
FastEthernet3/1 unassigned YES manual up
up
FastEthernet4/1 unassigned YES manual down
down
FastEthernet5/1 unassigned YES manual down
down
FastEthernet6/1 unassigned YES manual down
down
FastEthernet7/1 unassigned YES manual down
down
FastEthernet8/1 unassigned YES manual up
up
FastEthernet9/1 unassigned YES manual up
up
Vlan1 unassigned YES manual
administratively down down
Ctrl+F6 to exit CLI focus
Copy
Paste


Switch2
Physical Config CLI Attributes
IOS Command Line Interface
%LINK-5-CHANGED: Interface FastEthernet3/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet3/1, changed state to up
Switch>show ip interface brief
Interface IP-Address OK? Method Status Protocol
FastEthernet0/1 unassigned YES manual up up
FastEthernet1/1 unassigned YES manual up up
FastEthernet2/1 unassigned YES manual up up
FastEthernet3/1 unassigned YES manual up up
FastEthernet4/1 unassigned YES manual down down
FastEthernet5/1 unassigned YES manual down down
Vlan1 unassigned YES manual administratively down down
Switch>
Ctrl+F6 to exit CLI focus
Copy
Paste


Switch4
Physical Config CLI Attributes
IOS Command Line Interface
Switch>show ip interface brief
Interface IP-Address OK? Method Status Protocol
FastEthernet0/1 unassigned YES manual up up
FastEthernet1/1 unassigned YES manual up up
FastEthernet2/1 unassigned YES manual up up
FastEthernet3/1 unassigned YES manual up up
FastEthernet4/1 unassigned YES manual up up
FastEthernet5/1 unassigned YES manual down down
FastEthernet6/1 unassigned YES manual up up
FastEthernet7/1 unassigned YES manual up up
FastEthernet8/1 unassigned YES manual up up
FastEthernet9/1 unassigned YES manual up up
Vlan1 unassigned YES manual administratively down down
Ctrl+F6 to exit CLI focus
Copy
Paste

CHAPTER 8: CONCLUSION & FUTURE ENHANCEMENT

This project is to design a suitable network system for a school. The aim was to design a network with high security and low cost. This project will help enhance education. The advantages of networking can be seen clearly in terms of efficiency, security, manageability and cost as it allows collaboration between users.

This project has proven that a standard network system can be designed with less cost. Although we used the cheapest devices in designing the network, the security of this network turned out to be very strong. This is because the firewall and backup devices used in this network are of good quality. All networks need many servers for doing their work. These servers help the network to perform their functions in a smooth way.

This research has also demonstrated that economic problems of a country cannot hinder the success of a technological invention. Many developing countries who aspire to be in the same technological league as the developed countries, will be very hopeful. This is because this project has deeply provided a way to adopt a cheap and effective solution to designing a standard network, especially when a budget is not favorable. Lastly, as cheap and effective as the methods of designing a network in this research are, it is not limited to only developing countries. Developed countries that are trying to cut costs in any of their network design projects can also adopt the methods used in this research.

CHAPTER 9: REFERENCES

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