DAYANANDA SAGAR COLLEGE OF ENGINEERING

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Mini Project Report

on

"GIN (Generalization In Network)Topology with Client Server Architecture "

Submitted By

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in

Computer Network Lab

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ABSTRACT

Generalization/Inheritance is a feature in network topology that allows access control entry for an object whose network routes are being configured to be propagated to other objects.This project shows how a higher department in an organization gets access to multiple (here two) objects while the sub-departments gets access to their respective objects. Here lets consider the departments as department A with object A, department B with object B and department S which has access to both object A and object B, here objects can be a server,database etc.

To make sure the servers are accessed by genuine users, sniffers are implemented through which we can keep a track of MAC addresses of the Systems accessing the servers.

The above topology which was implemented for one organization with sub departments is expanded through a router and is connected to an another organization which implements the same concept.

The complete topology as mentioned above could be considered as a server organization. This server organization provides information regarding the organization to its clients through 2 information servers.

In the client side network OSPF has been implemented in order to provide faster access to the information servers and faster communication between the clients.

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INTRODUCTION

This project is about designing a topology that implements generalization property where objects from two LANs (departments) is being accessed by a super LAN, along with communication between the three LANs.

Consider a college network scenario which consists of two class departments and a teacher's department.For example,from secondary board of education , we are considering the classes as 11^{th} and 12^{th} .Assuming a scenario where 11^{th} class students are to receive a notice,question paper etc from server A and 12^{th} class students from server B.To validate these notices the teacher's department needs access to both server A and server B. This topology can also provide security and authentication from server side.Similarly we can also consider a network scenario in an organization with many departments arranged in hierarchical order.

This project also implements client server architecture topology where the server provides information about its environment to the client ,here we can consider an organization as a server and the clients as the customers, the organization provides the information regarding its nature of business through servers which can be accessed by the customers. The customers interact amongst themselves and with their servers in a well established and fast network.

TECHNOLOGIES USED:

CCNA: Cisco Certified Network Associate .CCNA is a well-liked certification in computer networking that is developed by Cisco Systems. CCNA is discovered by the Cisco, to identify basic capability in installation and maintenance of medium-sized networks. The technology is used for connecting various devices like routers, switches and different end devices to communicate with each other and interchanging data. To construct a methodical and reliable network, is scalable too. Portability is one of the characteristics of this work application of the CNS.

This job with respect to the GIN Topology is to provide a systematic, secure, valid, dependable communication/access among various departments/objects. The work is done keeping in mind the complexity and cost factor. The three departments can communicate with each other like any communication network scenario but the main agenda is to allow the high priority department to access all the available objects and to restrict one sub department's object to be accessed by another sub department.

DESIGN AND IMPLEMENTATION

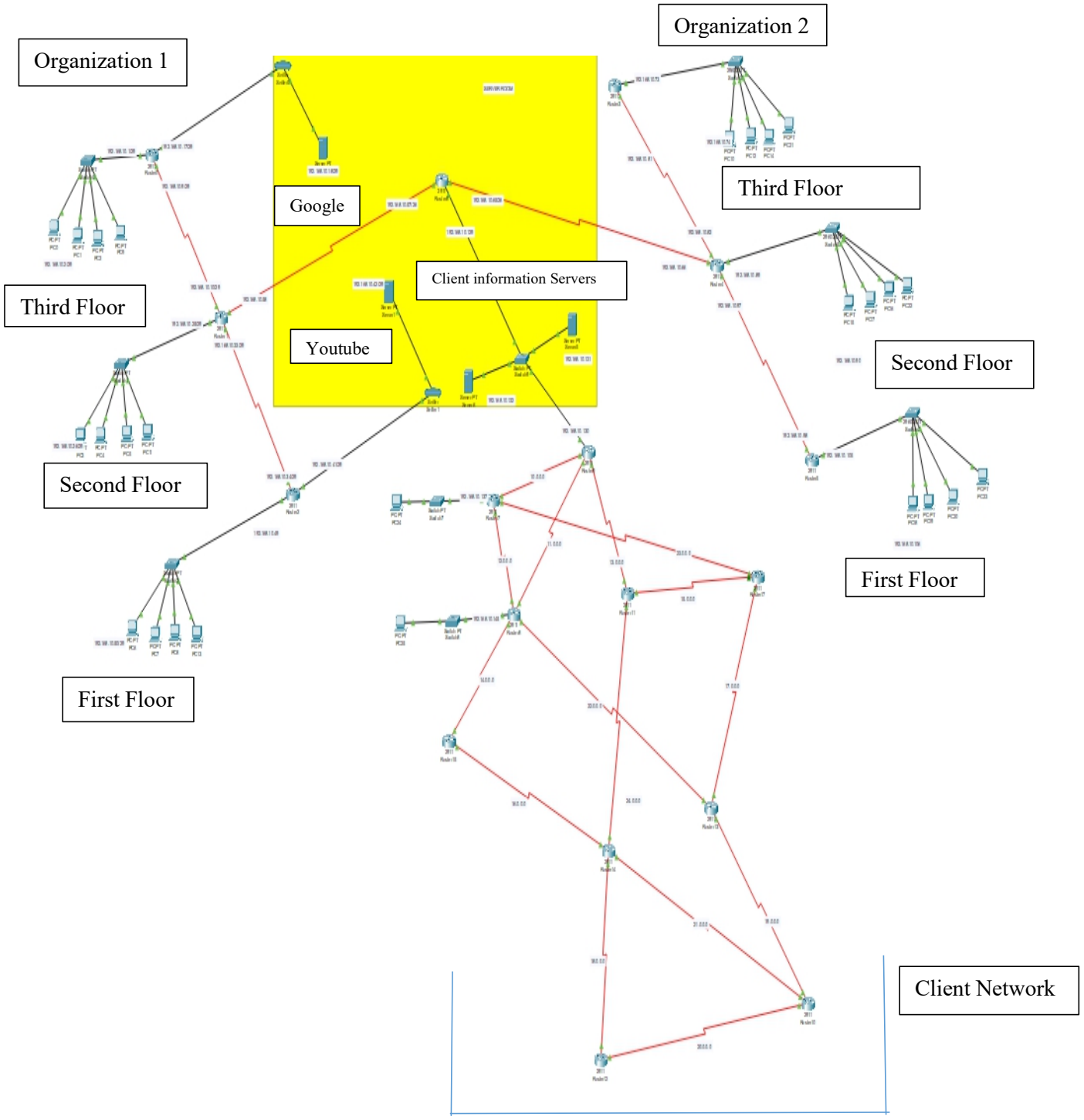


Figure 1 : Complete Topology

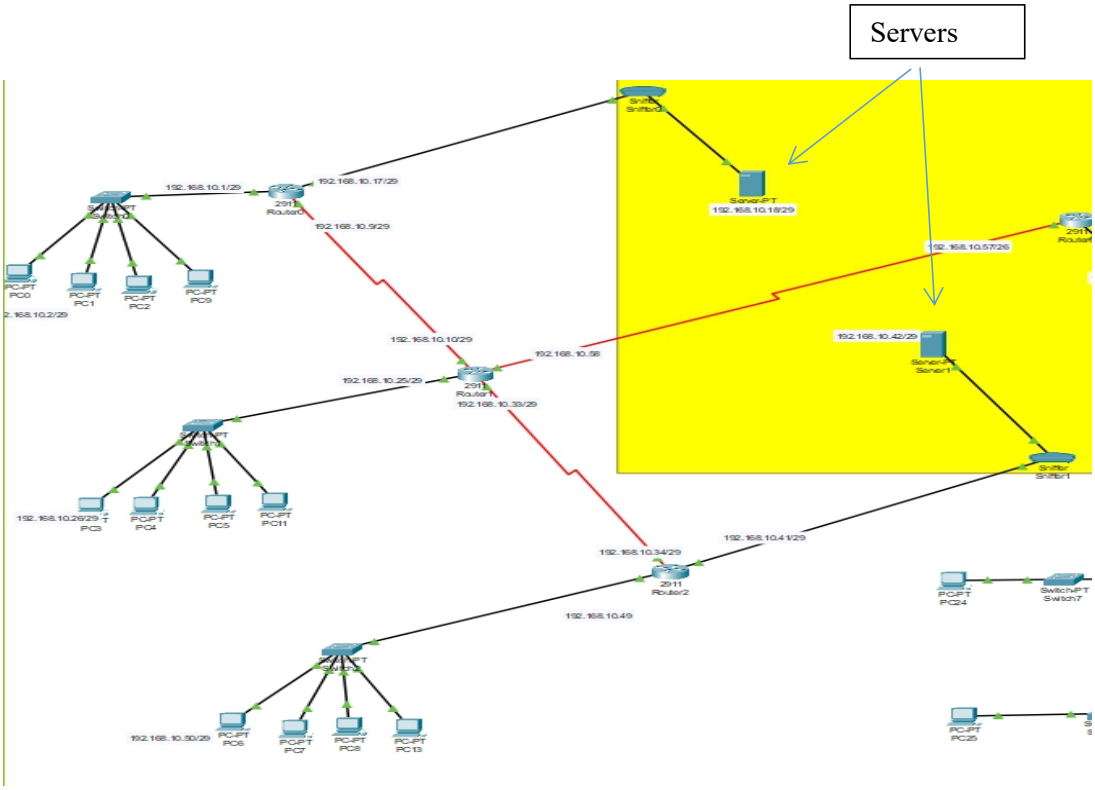


Figure 2 : Organization 1 with the servers

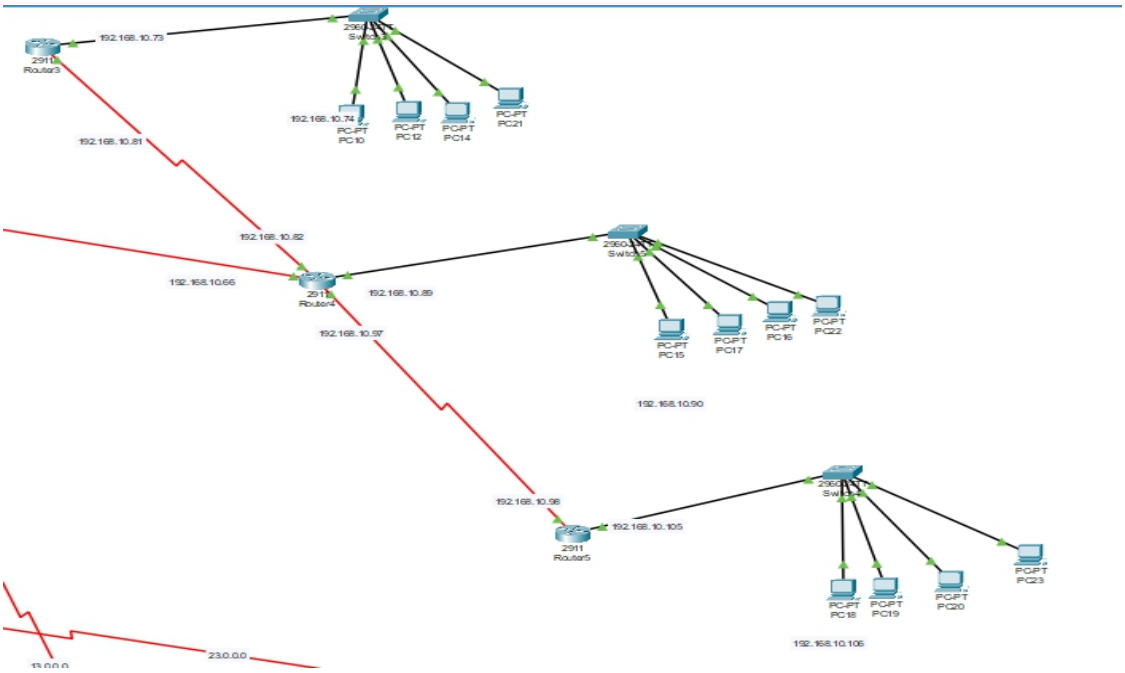


Figure 3 : Organization 2 , connected to a router

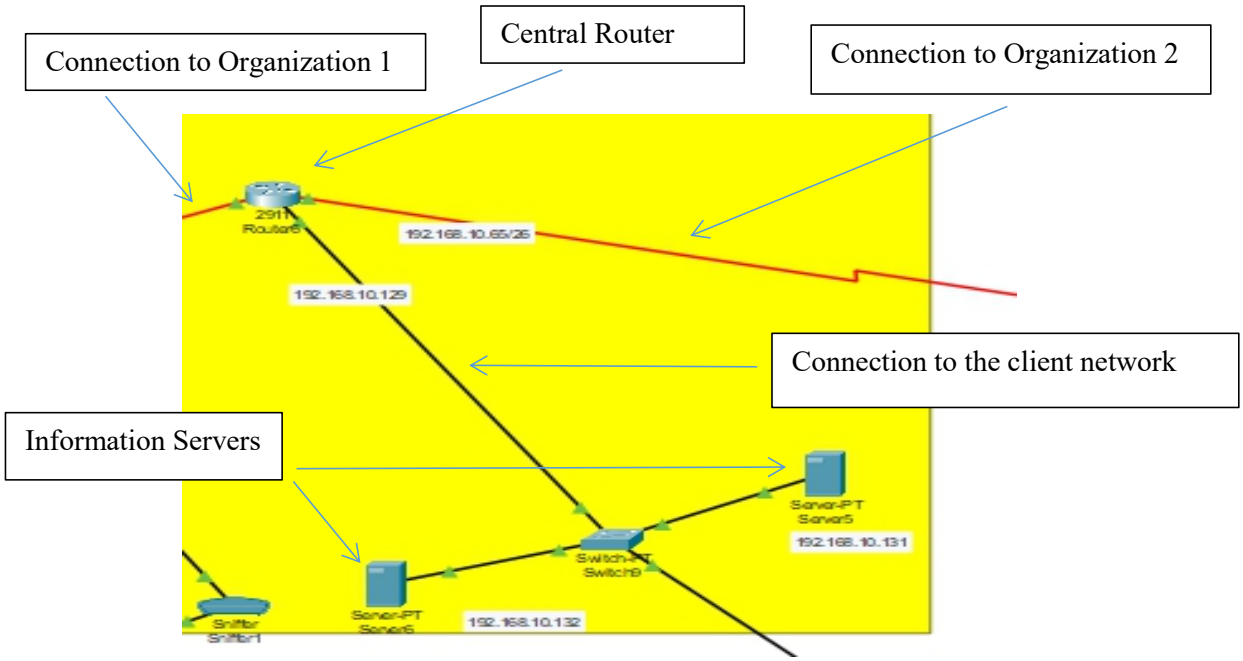


Figure 4 : Central router and its connections

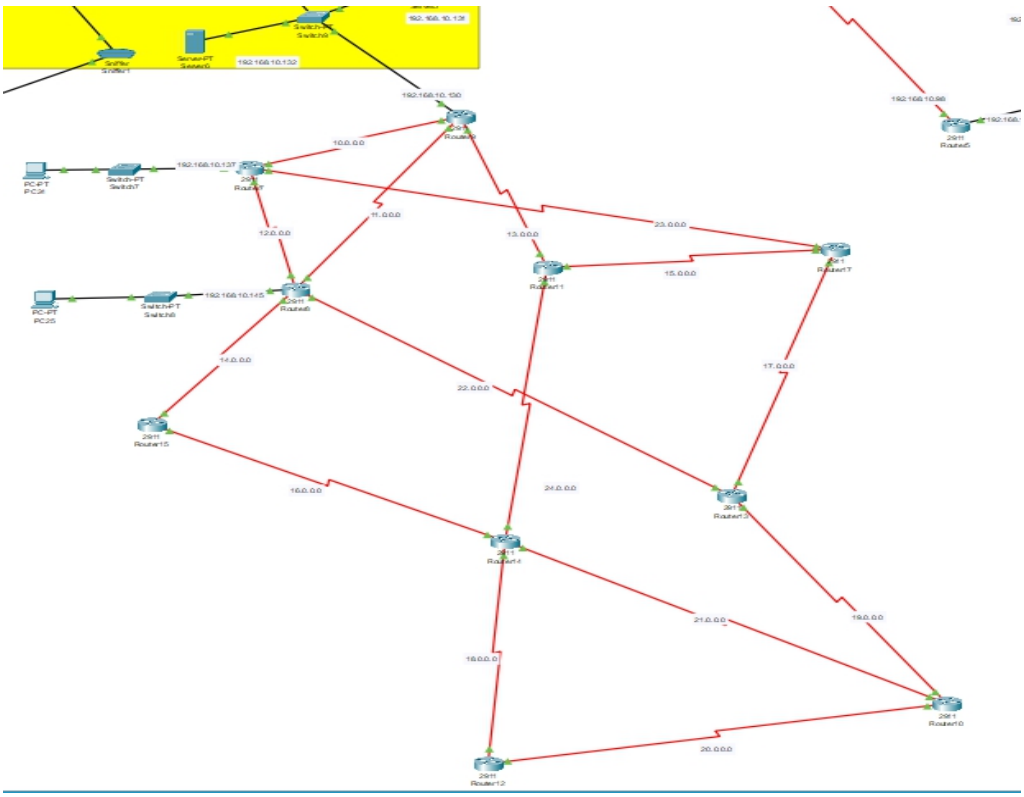


Figure 5 : Client network (implementation of OSPF protocol)

The above design demonstrates GIN topology.

The hardware requirements are:

9 Switches (Cisco Switch PT)

17 Routers (Cisco 2911 router)

26 Computer Systems (PC-PT)

4 Servers(2 organization , 2 information servers)

2 Sniffers

Connection Types:

- Serial DCE
- Copper Straight through

Switches - a device for making and breaking the connection in an electric circuit.

Routers - A router is a networking device that forwards data packets between computer networks.

Computer Systems - A computer system is a set of integrated devices that input, output, process, and store data and information. Computer systems are currently built around at least one digital processing device.

Servers - In computing, a server is a piece of computer hardware or software (computer program) that provides functionality for other programs or devices, called "clients". This architecture is called the client–server model.

Sniffers - A sniffer is a software or hardware tool that allows the user to “sniff” or monitor your internet traffic in real time, capturing all the data flowing to and from your computer.

Organization 1 Configurations - 192.168.10.0/26

Systems with DHCP server	Network address	Broadcast add	Subnet mask
In 1st floor	192.168.10.0	192.168.10.7	29
In 2nd floor	192.168.10.24	192.168.10.31	29
In 3rd floor	192.168.10.48	192.168.10.55	29
Web server 1(DNS Server)	192.168.10.16	192.168.10.23	29
Web server 2(DNS Server)	192.168.10.40	192.168.10.47	29

Organization 2 Configurations - 192.168.10.64/26

Systems with DHCP server	Network address	Broadcast add	Subnet mask
In 1st floor	192.168.10.72	192.168.10.79	29
In 2nd floor	192.168.10.88	192.168.10.95	29
In 3rd floor	192.168.10.104	192.168.10.111	29

Client Configurations - 192.168.10.128/26

Networks between Routers	Network address	Subnet mask
Router 7 and Router 9	10.0.0.0	8
Router 7 and Router 8	12.0.0.0	8
Router 7 and Router 17	23.0.0.0	8
Router 9 and Router 8	11.0.0.0	8
Router 9 and Router 11	13.0.0.0	8
Router 8 and Router 15	14.0.0.0	8

Router 8 and Router 3	22.0.0.0	8
Router 11 and Router 17	15.0.0.0	8
Router 11 and Router 14	24.0.0.0	8
Router 17 and Router 13	17.0.0.0	8
Router 15 and Router 14	16.0.0.0	8
Router 14 and Router 12	18.0.0.0	8
Router 14 and Router 10	21.0.0.0	8
Router 13 and Router 10	19.0.0.0	8
Router 12 and Router 10	20.0.0.0	8

PC and information server configurations in client network

Systems	Network address	Broadcast address	IP address	Subnet mask
PC 24	192.168.10.136	192.168.10.143	192.168.10.138	29
PC 25	192.168.10.144	192.168.10.151	192.168.10.146	29
Server 5	192.168.10.128	192.168.10.135	192.168.10.131	29
Server 6	192.168.10.128	192.168.10.135	192.168.10.132	29

Central Router configuration

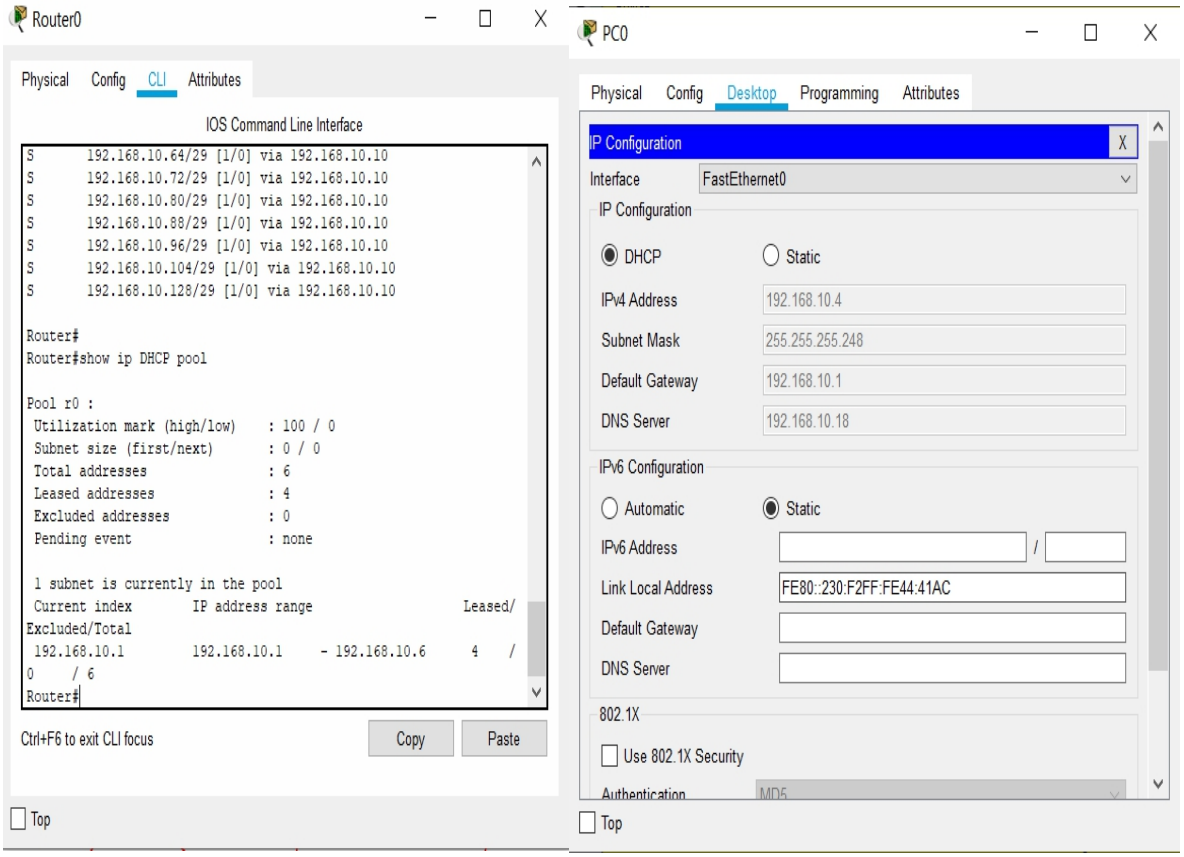
Router interfaces	Network address	Broadcast address	Subnet mask
Serial 0/3/0	192.168.10.0	192.168.10.63	26
Serial 0/3/1	192.168.10.64	192.168.10.127	26
Giga 0/0	192.168.10.128	192.168.10.191	26

DNS Servers

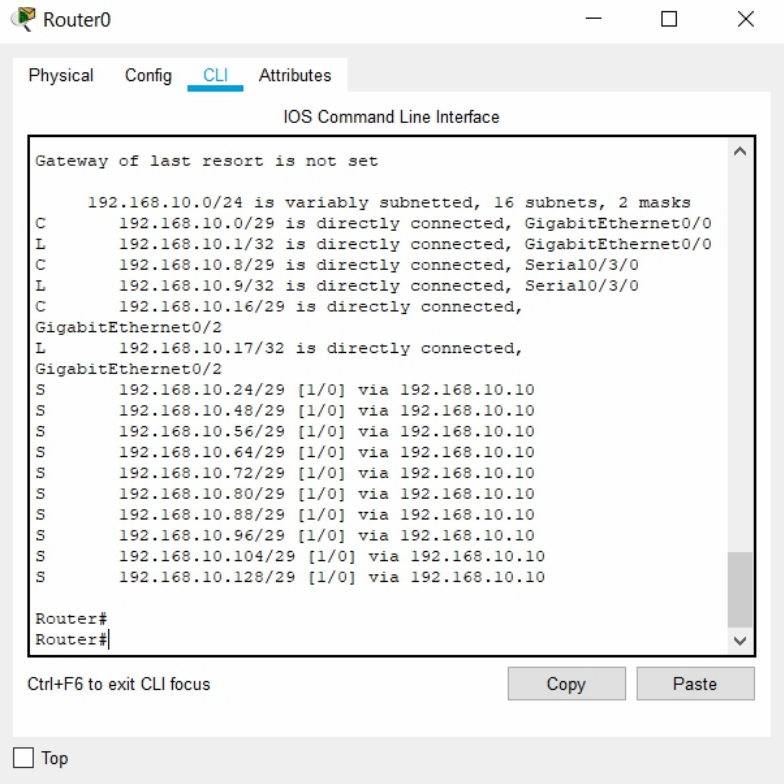
Website name	IP address	Accessed by
www.google.com	192.168.10.18	3rd and 2nd floor of organization 1 and 2
www.youtube.com	192.168.10.42	1st and 2nd floor of organization 1 and 2
www.c1info.com	192.168.10.131	Client network
www.c2info.com	192.168.10.132	Client network

- www.c1info.com and www.c2info.com can be accessed by organization 1 and organization 2 using their IP addresses.

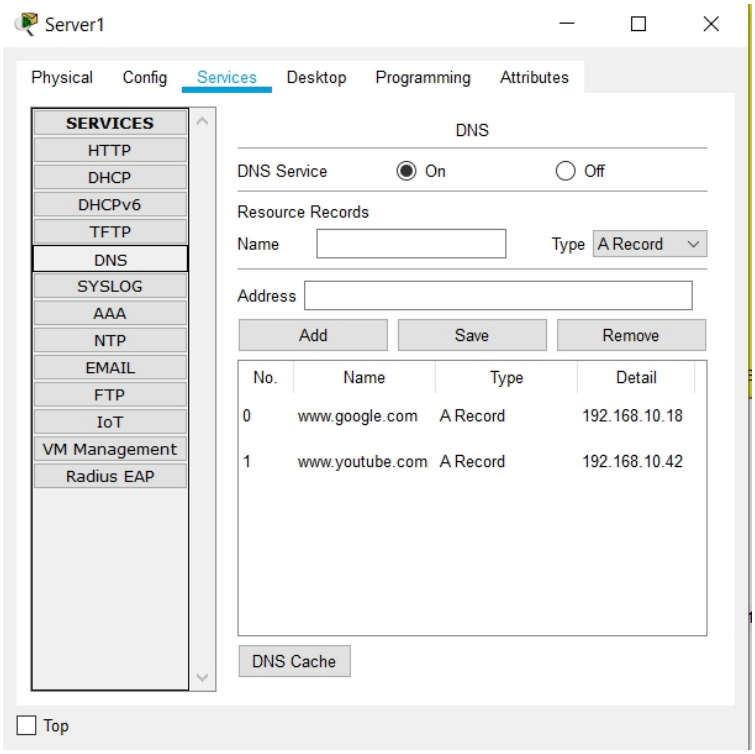
TESTING AND ANALYSIS



1. Above is the picture showing the implementation of DHCP in router 0 of organization .Similarly all the routers in the 2 organizations and client network are configured using DHCP.
2. In this network topology, the 1st floor in organization 1 and 2 can access only Youtube server. Similarly the 3rd floor in organization 1 and 2 can access only Google server . Where as the 2nd floor in organization 1 and 2 can access both google and youtube server. This kind of access was implemented with the help of static routing. The routers in these organizations are statically routed to access the respective servers.
3. For example , below is the figure of router 0 with static routing configuration.



4. Similarly all the other routers are statically routed keeping from point 1 .
5. Below is the image showing the DNS (domain name system) server similarly , server 2 is also configured as DNS server .Here the servers act as both web server and DNS s.



6. Lets see the implementation of point 1 in cisco packet tracer .

- Here PC0 which is in 3rd floor can access only google server but cannot access youtube server , result is shown in figure 6.1.

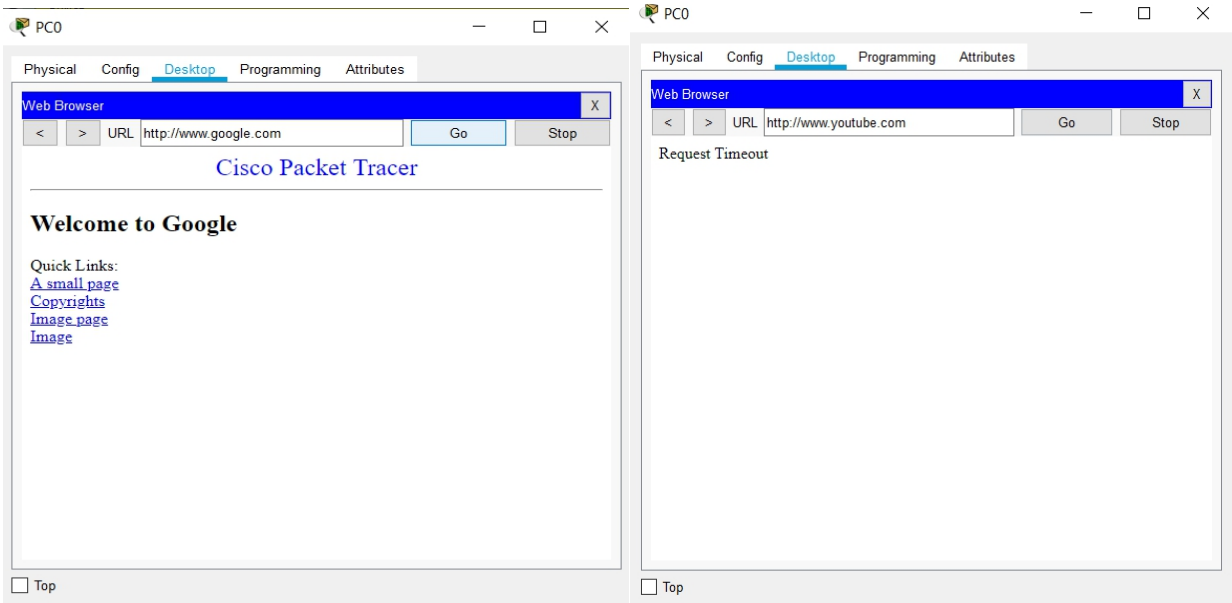


Figure 6.1

- Here PC0 which is in 1st floor can access only youtube server but cannot access google server , result is shown in figure 6.2.

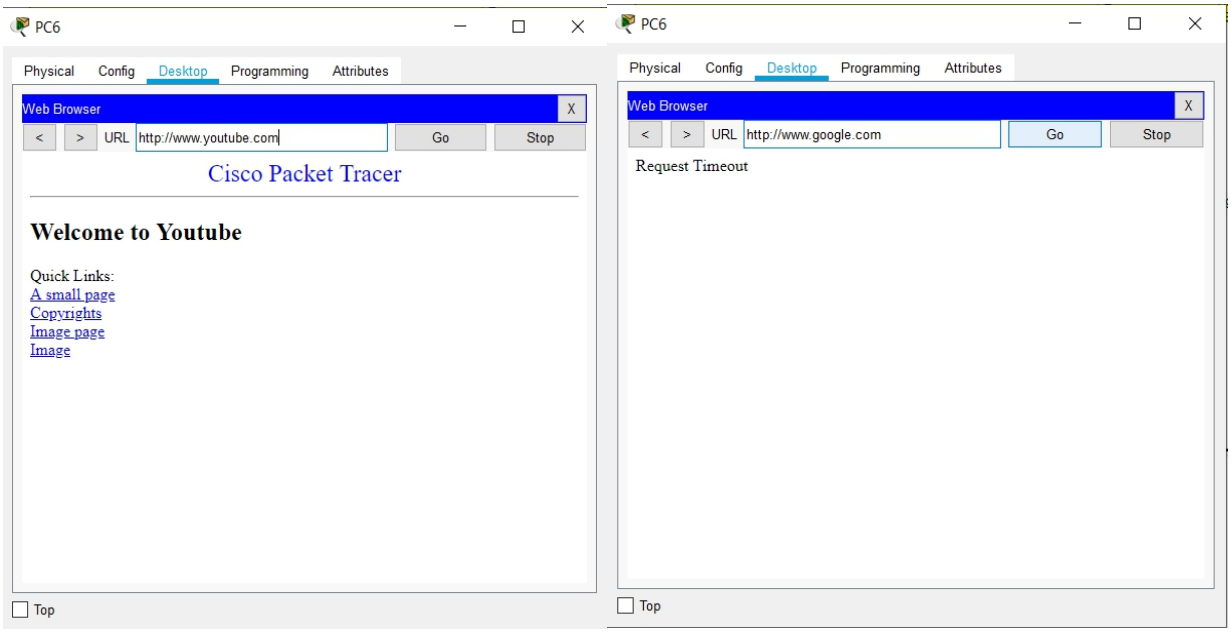


Figure 6.2

- Here PC0 which is in 2nd floor can access both youtube server and google server , result is shown in figure 6.3.

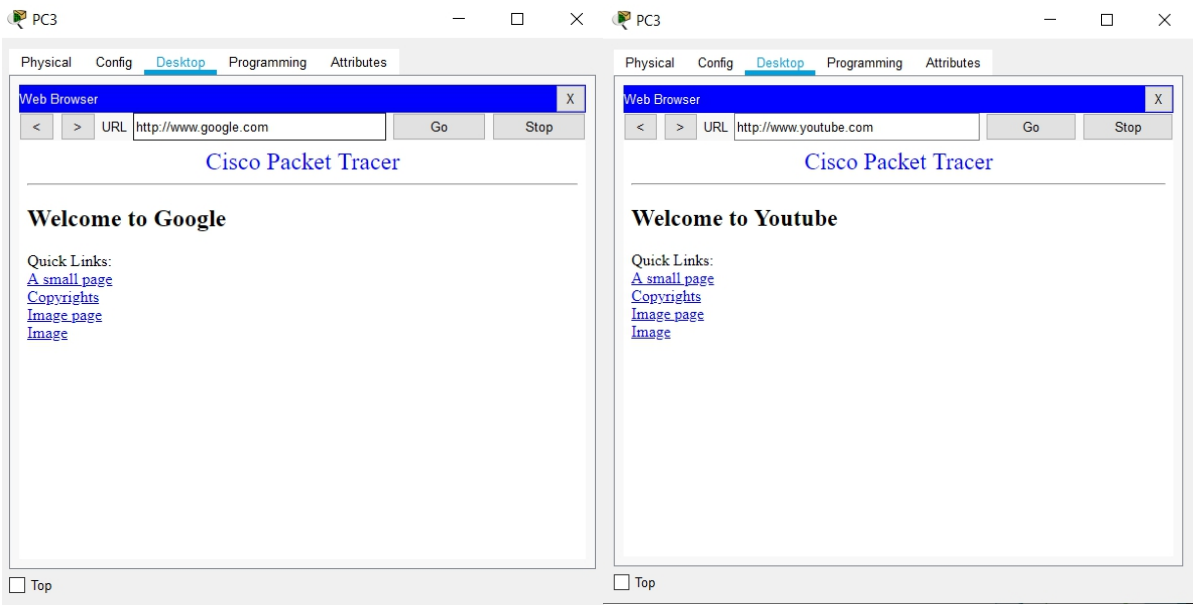
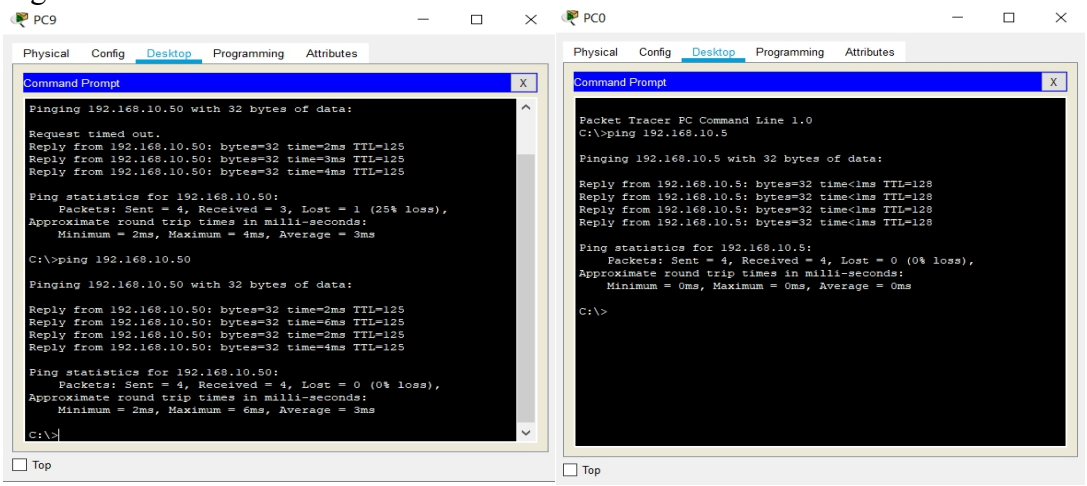
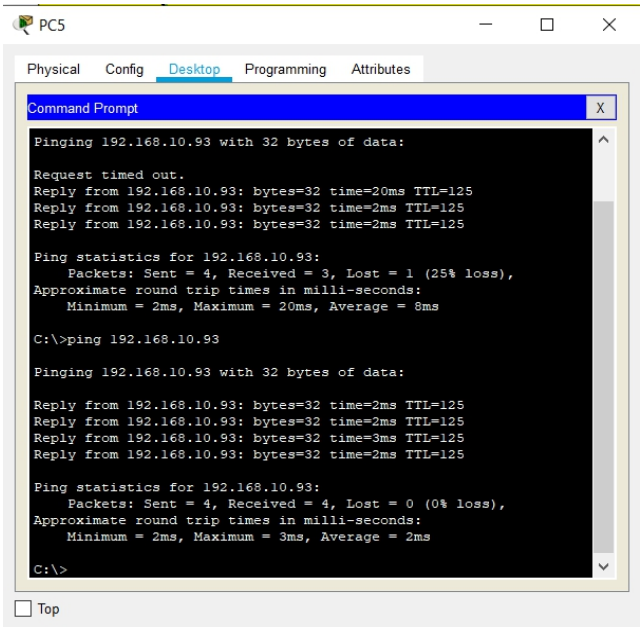


Figure 6.3

7. There is intra-network and inter-network communication between the PCs of the organizations.Below is an example of such communication.

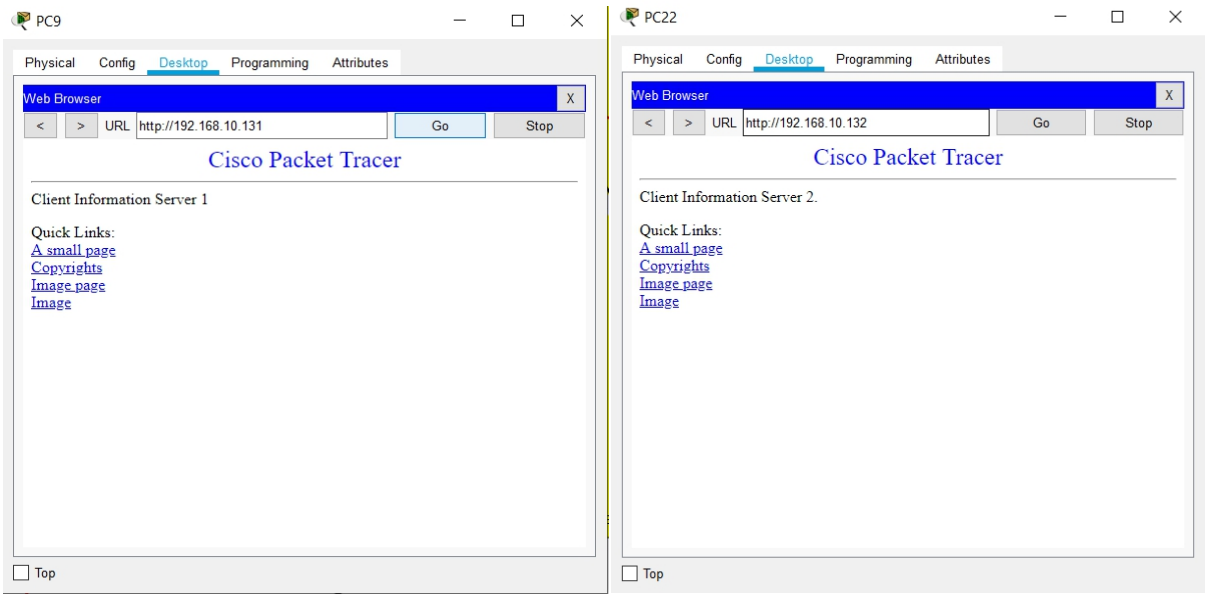
- Here we ping PC6 with IP address 192.168.10.50 from PC9 with IP address 192.168.10.3.
- Here we ping PC0 with IP address 192.168.10.4 to PC2 with IP address 192.168.10.5.
- Here we ping PC5 of organization 1 with IP address 192.168.10.26 to PC17 of organization 2 with IP address 192.168.10.93.



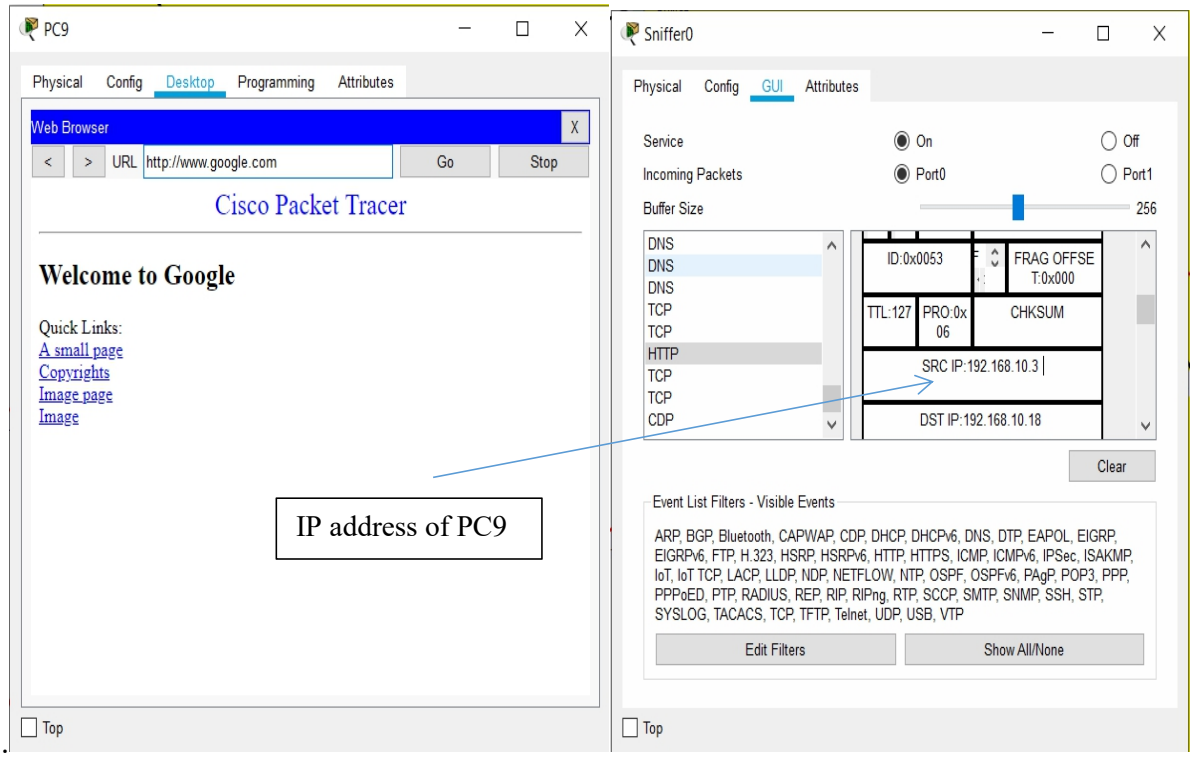


8. Apart from google and youtube servers , the 2 organizations can also access the 2 information client servers

- Below is the image showing PC9 of organization 1 accessing client information Server 1.
- Below is the image showing PC22 of organization 2 accessing client information Server 2.



9. To keep a track of the PCs accessing the servers sniffers are being implemented.Below is the image showing PC 9 of organization 1 (first floor) accessing google server and the sniffer keeps a track of the MAC address.



10. In the client network topology OSPF has been implemented for faster communication and accessing of the client information servers. Below are the image 10.1 showing OSPF protocol configuration in router 15 and the image 10.2 showing OSPF protocol configuration in router 13 .

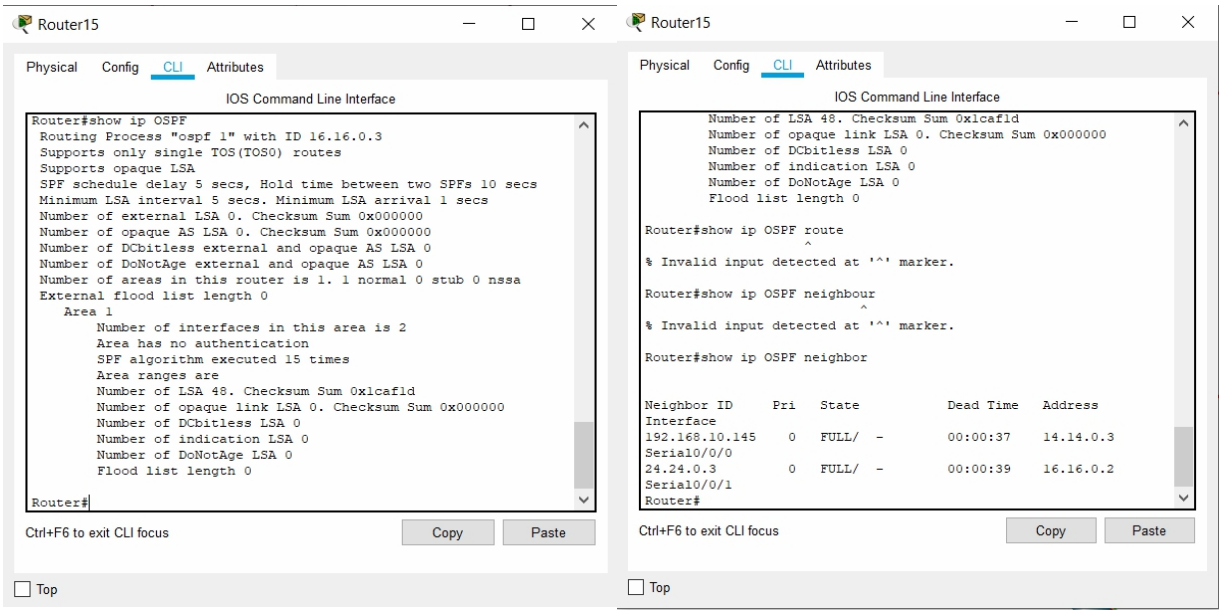


Figure 10.1

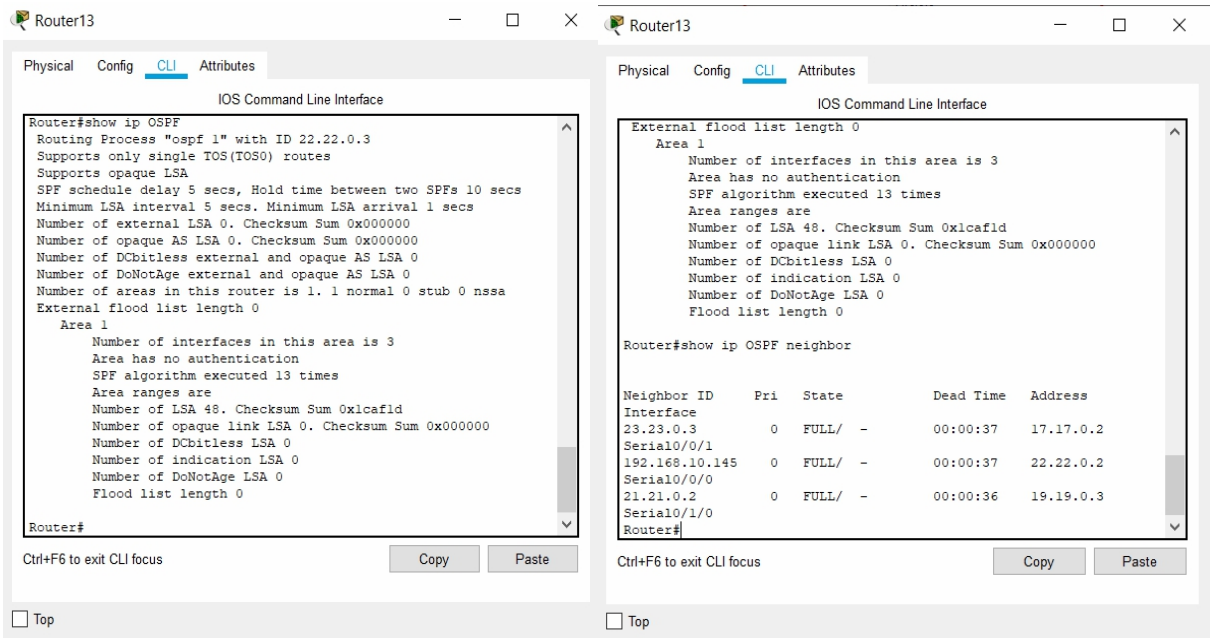
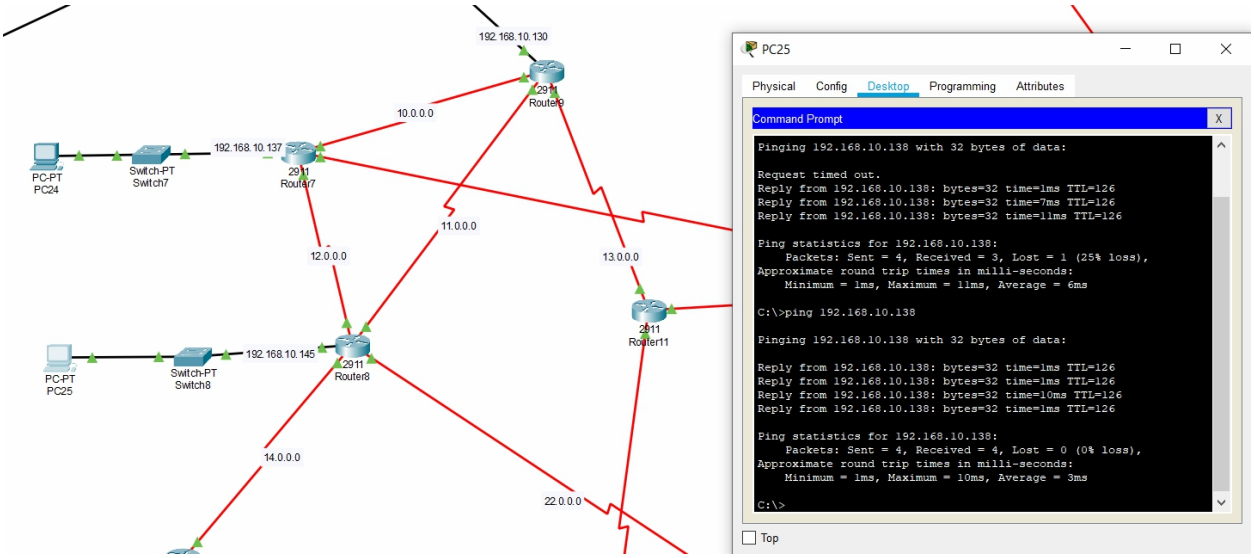
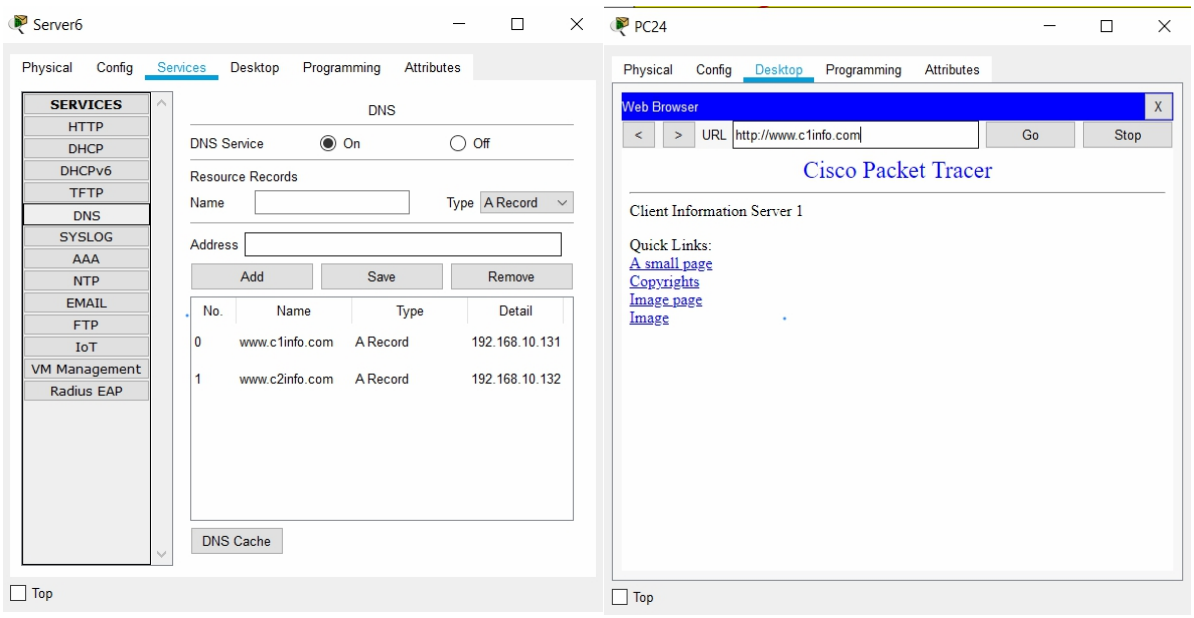


Figure 10.2

11. Below image shows that OSPF protocol implementation.



12. The client information servers are DNS (domain name system) servers .The PCs access these servers for information from the organizations .



13. The above image shows DNS server configuration and PC 24 accessing the server.

CONCLUSIONS AND FUTURE ENHANCEMENTS

This Network topology could be used for an organization which is departmentalized and arranged in hierarchical order ,where the superior department gets to access all the resources of the sub departments . This network topology also implements client server architecture where the servers provide information to the clients.

DHCP(dynamic host configuration protocol) has been implemented in the router to configure PCs. In this topology, the web servers also act as DNS servers.

Here the client network topology implements OSPF protocol for fast multi LAN access and communication.

For Security purpose ,sniffers have been implemented to keep a track of the PCs accessing the servers.

Under Future Enhancements, the yellow rectangular area of the topology which is the area consisting of all the servers could be protected by providing security devices or implementing security using IOT devices and creating a network for the server room and providing access to those who are responsible .

Further expansion of this network is a general future enhancement .Apart from this we can provide VLAN connection for the private networks. We can also add proxy servers to the web servers to provide firewall and web filtering.

REFERENCES

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- OSPF Proctocol Configuration- https://youtu.be/LvdIk93Q9W8 https://youtu.be/B7-7RcZCIbM