

OROMIA SEED ENTERPRISE



Summer internship program

Name: Eliyas Siyum

Campus name: Adama Science and Technology University

Project Title: Network distribution between head office and branches

Submitted to : Mr Tefera (Supervisor)

Addis Ababa, Ethiopia

Acknowledgement

I would like to express my deepest gratitude to my supervisor, Mr. Tefera, for his invaluable guidance, support, and encouragement throughout this summer internship. His expertise and insights have been instrumental in the successful completion of the project on transforming the company's main office into a secure and efficient data center.

I am also immensely grateful to my co-workers for their collaboration and assistance. Their teamwork and dedication have greatly contributed to the project's progress and success. Working alongside such a talented and supportive team has been a truly enriching experience.

Furthermore, I extend my heartfelt thanks to Adama Science and Technology University for providing me with this incredible opportunity. The knowledge and skills I have gained during this internship will undoubtedly be beneficial in my future endeavors.

Thank you all for making this internship a memorable and rewarding experience.

Table of contents

Table of contents.....	2
Background:.....	3
Statement of the Problem:.....	3
Objectives.....	4
General Objective.....	4
Specific Objectives:.....	4
Network requirement analysis.....	6
Hardware requirement.....	6
Network Design.....	9
IP network design guidelines.....	11
DHCP.....	11
DNS.....	12
Subnetting:.....	12
Some command code used.....	13
Conclusion.....	16
Reference.....	16

Background:

Imagine a company with a big main office and 6 smaller offices in different locations. The main office has three buildings, all within a kilometer from each other. Each building has 10 floors, and each floor has 60 people working there. To make things easier, each floor is divided into 3 smaller groups of people.

The company wants to make their main office a super-secure place where they store all their important data (like a data center). They also want to make sure that all their offices, both the main one and the branch ones, are protected and can share information safely.

Statement of the Problem:

This company needs to design a network that connects all their offices, is secure, and can handle all the data traffic from so many people. They need to figure out how to:

- Connect the three buildings in the main office:
- They need a fast and reliable way to share data between these buildings.
- Connect the main office to the branch offices:
- They need a way to securely connect all their offices and share data between them.
- Protect the data:
- They need to make sure that their data is safe from hackers and other threats.
- Manage the network:
- They need a way to easily manage and control the network, especially with so many users and devices.

Objectives

General Objective

Transform the head office into a secure and efficient data center, capable of centralizing data, distributing network security, and facilitating evidence sharing across the organization, including its six branches.

Specific Objectives:

- Centralize Data Storage:

- Consolidate all critical data from the head office's three buildings and six branches into a central data center within the head office.
- Implement a robust data storage and management system to ensure data integrity, availability, and accessibility.
- Distribute Network Security:
 - Implement a layered security approach across the entire network, including the head office buildings and branches.
 - Design and deploy a secure network infrastructure that effectively isolates "workgroup links" (VLANs or other logical groupings) for enhanced security.
- Facilitate Evidence Sharing:
 - Design and implement a high-speed network infrastructure to support data transfer between the head office and branches.
 - Addressing and Secure "Workgroup Links": Implement security measures for each "workgroup link" to isolate traffic and control access within specific groups by using vlans

Project Scope:

1. Network Infrastructure:

Head Office:

- Upgrade and secure the network infrastructure within the three head office buildings, including:

- Replacing existing network equipment (switches, routers) with newer, more secure models.
- Implementing a robust network security architecture, including firewalls, intrusion detection systems, and other security measures.
- Configuring VLANs to isolate traffic and enhance security.
- Branches
 - Upgrade and secure the network infrastructure at each of the six branches.
- Connectivity:
 - Ensure reliable and high-speed connectivity between the head office buildings and the branches.
 - Consider options like fiber optic cabling or dedicated leased lines for optimal performance.

2. Data Center Design and Implementation:

- Data Center Location:
 - Select a suitable location within the head office buildings for the data center, considering factors like power availability, cooling, and physical Data Management:

3.Data Security:

- Implement data encryption to protect sensitive data both at rest and in transit.
- Implement access control policies to restrict access to data based on user roles and permissions.
- Implement data loss prevention measures to prevent unauthorized data transfer.

5.Evidence Collection and Sharing

Network requirement analysis

Hardware requirement

Network Devices:

a. Server

b. Distribution Switches:

distribution switches to connect the access layer to the core

c. Access Switches:

30 access switches (10 per building) for head office to provide connectivity to end-users and wireless access points and 2 access switches per branches with one multilayer switches.

d. Wireless Access Points:

wireless access points (1 per building) to provide ubiquitous wireless coverage in the designated lobby areas

e. Firewall:

1 high-performance firewall to secure the organization's network and provide internet gateway functionality

f. Internet Router:

3 routers.

g. Cables

- Serial DCE cables
- Straight through cable
- Fiber optic cabling for the core and distribution layer links
-

-

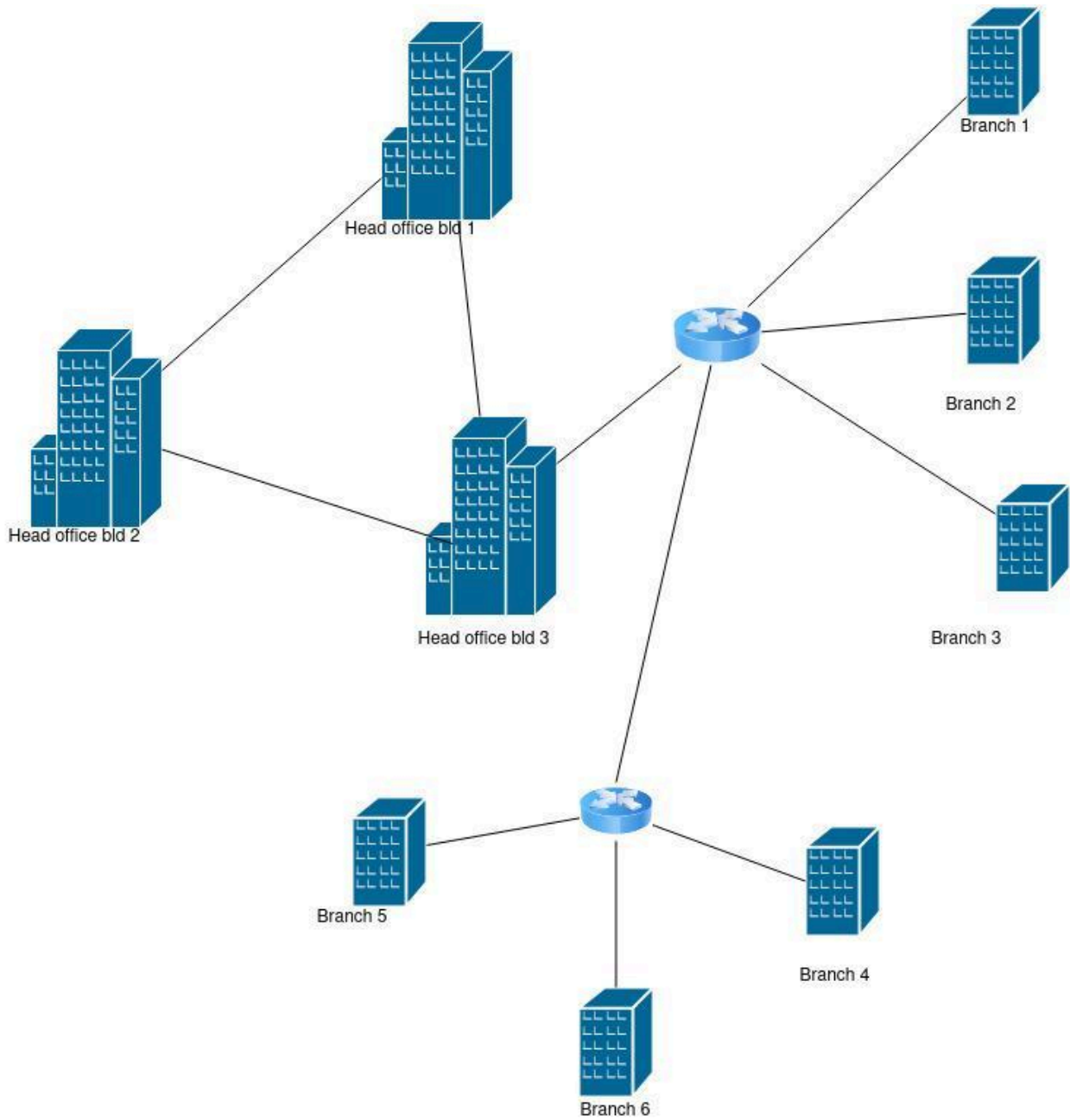
h. End devices

- PC
- printer

i. Core Switches: high-performance core switches to provide the backbone connectivity and redundancy

We use also power and cooling tools

Network Design



Network Topology Design

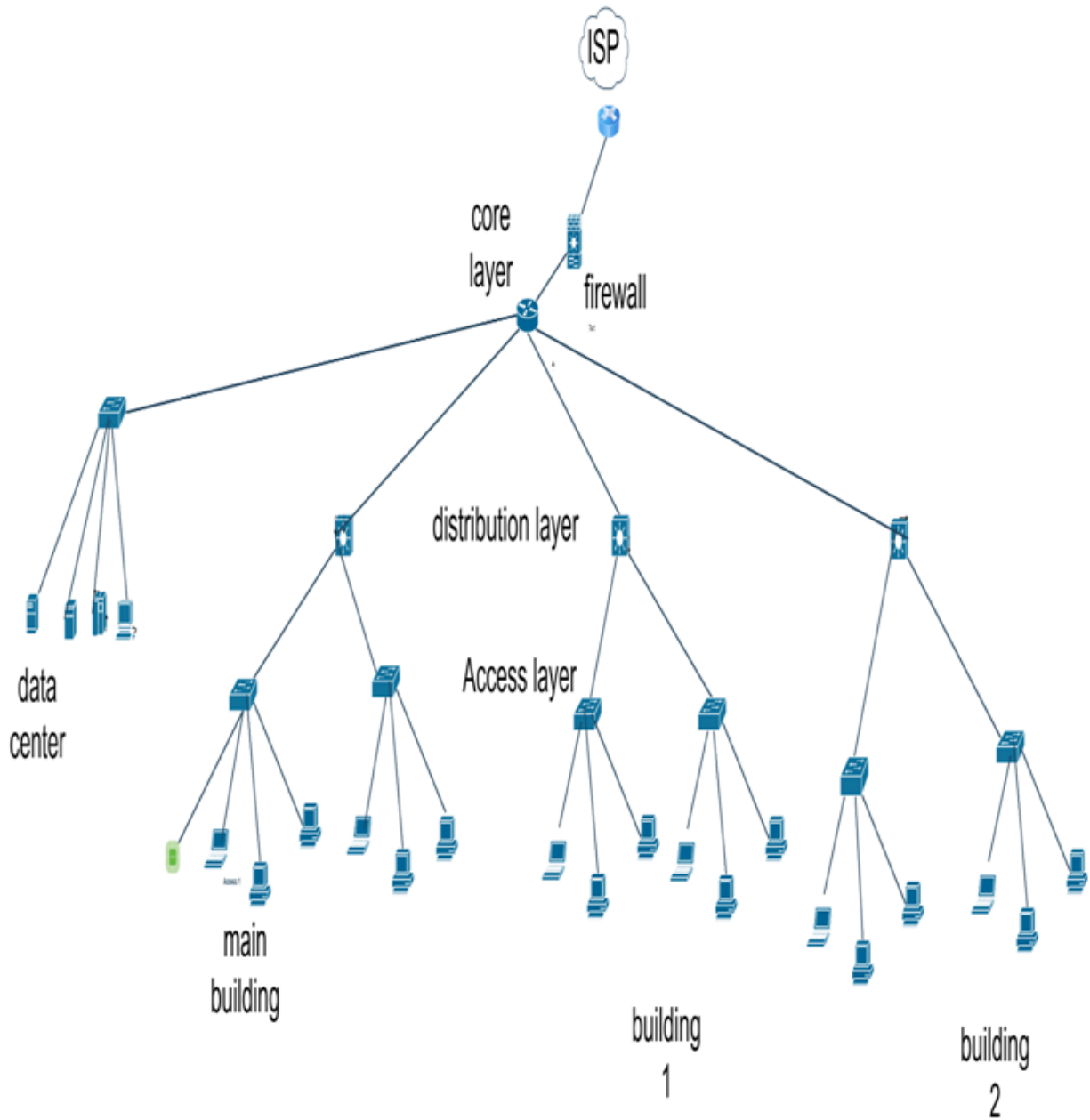


Figure 1. Three tier hierarchical design

Network Topology Design:

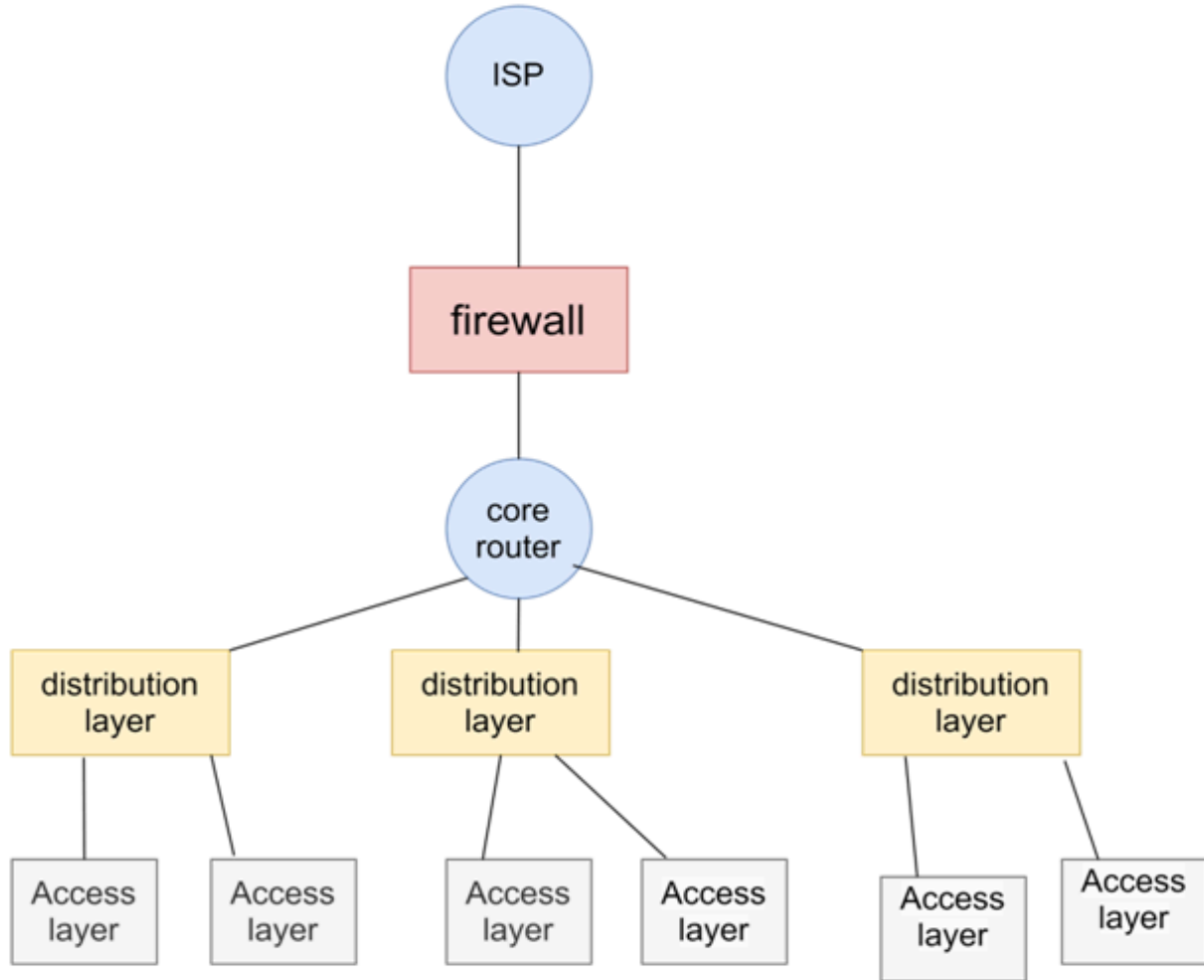


Fig2 network topology

IP network design guidelines

DHCP

- ❖ Use DHCP to assign addresses to individual PCs

- Use static addressing only for network equipment, printers, and servers DHCP
- ❖ Dynamic Host Configuration Protocol
- ❖ Used to assign IP address and provide basic IP configuration to a host.
- ❖ Simplifies your life greatly
 - Faster
 - Fewer mistakes
 - Easier renumbering
- ❖ In order to centralize your DHCP service, you need a DHCP relay on each subnet
 - Most routers provide this feature
- ❖ you grow, add another server and run as a failover pair

DNS

- ❖ DNS reliability is essential to your network
 - No DNS == No services
- ❖ Server location
 - On different subnets, off of different routers – Air conditioned, dual power supplies, etc.
- ❖ Separate duties – Authoritative and recursive on different machines
- 1. IP Address Class: Use a Class C IP address block.
 - Class C addresses have the network prefix 192.168.0.0/24 to 192.168.255.255/24.
 - This provides a total of 256 IP addresses, with 254 usable addresses (excluding the network and broadcast addresses).

Subnetting:

- ❖ is the process of dividing a larger network into smaller, more manageable sub-networks, or subnets. It involves taking a single IP address and splitting it into multiple, smaller IP addresses that can be used to create separate networks.

We know that there are a total 32 bits in IP address /24 means that 24 bits are parts of the network portion and the remaining $32-24 = 8$ bits are the parts of the host portion

Some command code used

on each access layer switch switch

```
int range fa0/1-24
```

```
switchport mode access
```

```
switchport access vlan number
```

```
exit
```

```
do wr
```

on multi layer switch

```
to trunk the mode
```

```
switchport trunk encapsulation dot1q
```

```
switchport mode trunk
```

on multilayer switch

```
Switch(config)#int fa0/4
```

```
Switch(config-if)#switchport mode access
```

```
Switch(config-if)#switchport access vlan 130
```

```
% Access VLAN does not exist. Creating vlan 130
```

```
Switch(config)#int fa0/5
```

```
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 180
% Access VLAN does not exist. Creating vlan 180
Switch(config-if)#ex
Switch(config)#int fa0/6
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 1
```

```
Router>enable
Router#config t
Router(config)#int gig0/0.10
Router(config-subif)#encapsulation dot1q 10
Router(config-subif)#ip add 192.168.1.1 255.255.255.0
Router(config-subif)#ex
Router(config-subif)#ex
Router(config)#int gig0/0.50
Router(config-subif)#
Router(config-subif)#encapsulation dot1q 50
Router(config-subif)#ip add 192.168.5.1 255.255.255.0
Router(config-subif)#encapsulation dot1q 70
Router(config-subif)#ip add 192.168.7.1 255.255.255.0
Router(config-subif)#ex
```

dhcp ip giving

on router sample

```
Router(config)#service dhcp
```

```
Router(config)#ip dhcp pool B4office1-pool
```

```
Router(dhcp-config)#network 192.168.37.0 255.255.255.0
```

```
Router(dhcp-config)#default-router 192.168.37.1
```

```
Router(dhcp-config)#dns-server 192.168.37.1
```

```
Router(dhcp-config)#ex
```

```
Router(config)#service dhcp
```

```
Router(config)#ip dhcp pool B5office2-pool
```

```
Router(dhcp-config)#network 192.168.39.0 255.255.255.0
```

```
Router(dhcp-config)#default-router 192.168.39.1
```

```
Router(dhcp-config)#dns-server 192.168.39.1
```

```
Router(dhcp-config)#ex
```

Conclusion

In conclusion, transforming the head office into a secure and efficient data center will centralize data management, enhance network security, and streamline evidence sharing across the organization. This approach ensures that the main office and its six branches are well-protected and can communicate securely. By implementing robust security measures and efficient data management practices, the company can achieve a stable, scalable, and secure network infrastructure that supports its operational needs and growth.

- At the end the project worked almost meet what required to be.
- Server gave the ip address for each pc using dhcp.
- Head office and branches can communicate within themselves and to one another.

Reference

Network Infrastructure Design – Planning a Campus Network
(networkencyclopedia.com)

Computer Network Tutorial - GeeksforGeeks

Campus Network Design Guideline - Cisco Community

