

Design and Implementation of Network Administration for Corporate Office

BY

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This Report Presented in Partial Fulfillment of the Requirements for the Degree of
Bachelor of Science in Computer Science and Engineering.

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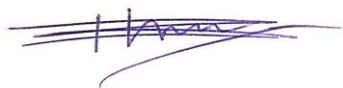
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APPROVAL

This Project titled “**Design and Implementation of Network Administration for Corporate Office**” submitted by Md. Lutfur Rahman Shikdar, ID: 182-15-11629 and Md. Jobaer Hossain, ID: 182-15-11635 to the Department of Computer Science and Engineering, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on APRIL 2021.

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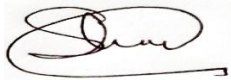
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DECLARATION

We hereby declare that, this project has been done by us under the supervision of **Sharmin Akter, Lecturer, Department of CSE** Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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Dedicated to

Daffodil Family

ABSTARCT

In this modern era, everything is going to be digitalized based on internet. Globalization networking is so important for a corporate office. Everything is need to upgrade. To upgrade a network need to infrastructure design. Each and every Company and Institute need a safe and efficient connectivity which can easier to accelerate their work. So, we decided to design a network infrastructure for corporate office as our final year project. But establishing a network infrastructure is never being an easy task. Our design is about to connect an office and their branches to the same network to safe and faster connectivity through internet. For designing the project, we used some networking devices, servers, personal computers, ISP connection, etc. For a design security and durability is such an important thing. We try our level best to design this project, so that design will be satisfied while the company will be benefited. During COVID 19 we used virtual simulator for designing this project. We used GNS3 Software to design this project and after implementing we tested this project on virtual machine (VMware). Our design will be usable not only corporate office also other institute, companies. This is not only a work for us, it was a passion which lead our team member to give the full effort to complete it.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

The project about Design and Implementation of Network Administration for Corporate office is an important aspect of networking which will make the networking sector more secure and easy to use for corporate offices. This project builds a relationship that brings a head office and their branches under a specific network from where easily maintain uninterrupted connect to share their data also can observe from a particular place. By the design user can exchange data easily where no need any kind of hassle to slow or data mess. We paid most attention about security and strong connectivity because everything becoming insecure. We have too much concern about that. We design a project which can be more user friendly which makes the environment sturdy. The design implement on a simulator software which name is GSN3. We use some networking devices, servers, virtual machine to different usability and also some user. We use virtual user as head office and their branches. After that the devices and servers connect on a particular network like MikroTik router. After configuration the devices and server it is an accomplished work. After implementation we tasted this design on several ways.

1.2 Project Goal

Our final year project about Design and Implementation of Network Administration for Corporate office. We design this Network Infrastructure to provide a batter service to the corporate offices. Each office contains their branches and the project goal about establish a network system that will connected head office to their branches. We will provide a network administration to provide also different kind of services. Where they can store and access these data by several user. Also, our goal is to provide a secure and faster network system. The main goal of this project is develop our network infrastructure to desire a batter and strong communication which is really needed for our corporate office. The offices are belongs various important and emergency services so they need a network where they can get a super sturdy communication to connect their all services at specific platform.

1.3 Motivation

As a student of Computer Science and Engineering, we have been interested in Networking. We also completed our six months internship after Diploma Engineering about Networking. The Internship has ponder to lead us a design implementation about networking. This project has given us opportunity to find out our inside questions about designing and implementing about networking administration .Our knowledge of networking field at the start was casual. We know generally about network developing without knowing anything specific about the networking devices, servers and overall structure of a networking that we using. As this a subject we interested in making our career in designing a network infrastructure and how this can be efficient by user. It seems a natural choice of study which we knew would be both challenging and interesting.

1.4 Objectives

The core objectives which have been designated as fundamental to the project are:

- Developing a networking infrastructure for all corporate offices, Institute, etc.
- Learning more about networking through this project.
- Making a positive view of computer networking.
- The immediate goal of our project is to anticipate competitive developments and move institute formation.
- Achieve a better understanding of the total competitive arena.
- To provide a secure and faster service.
- To provide comparatively money saving services.
- Gain experience about networking devices and servers through this project.
- To establish future career through this project.
- To desire to income of sources.

1.5 Scope of Studies

This report is based on Networking Infrastructure design and Implementation. Along with this, the project report will also specifically describe the whole Network System about Corporate Offices. This project is mainly valuable for the Networking related organizations to understand the network system that includes several networking devices, physical and wireless devices communications, routing protocol and configuration, network monitoring tools, servers, network security tool, and MikroTik router and so on.

Another thing is data storing easily, data access from branch office to head office, transferring files through private networking. Data will be encrypted on servers using some protocol to secure the data from hacker also unauthorized user.

Another thing is security using Firewall and VPN. Firewall is a security device which protect the networking system from unauthorized user or hacker. Virtual Private Network (VPN) is also make that network private or more secure. When branch office send any important file to another branch office or head office that time it need to be secure. The firewall and vpn ensure that security to protect from any threat.

1.6 Outcomes

When we start our project, we were very focused about expected outcomes. We found successful accomplished our project. We are proud to say that this project will bring positive outcomes at corporate arena. Few of major outcomes of our project is given bellow:

- The way of learning such as important continent about networking.
- The way of learning about multiple devices and servers.
- Provide an as expected consequences.
- Better proactive strategy.
- Better understanding about networking.

1.7 Report Layout

We described our whole project about designing and implementing about Design and Implementation of Network Administration for Corporate Office through this report. We divided our whole report into six different chapters.

First Chapter: I have described in this chapter, Introduction, Our goal, Motivation, Objectives of project, Scope of studies, Expected Outcome to introduce our Project.

Second Chapter: In second chapter we describe Introduction of Background, Related Works, Comparative Studies, Scope of Problem, and Challenges.

Third Chapter: In chapter three we mention our Required Hardware and Software and their specification.

Fourth Chapter: In this chapter we implement our design and configure these design also server configuration. We discuss about server such as Windows server, File Server, iSCSI Server.

Fifth Chapter: In this Chapter we tested our network after Implementation that is network working in system.

Sixth Chapter: Our project comes to an end with the conclusion chapter. In this chapter we write about our future plan, final words etc.

CHAPTER 2

BACKGROUND

2.1 Introduction

The background of our networking project is very simple. We just wanted to easier the network infrastructure design to corporate office level which will represent a system which are secure and faster. Everyone knows that, each part of communication is depend on networking system. Regularly the offices and companies use their old infrastructure design which are vulnerable and also have communication lagging to connect with other branches or head offices. There is data sharing, accessing, transferring and so on problem. The system we designed after implementing that will make easier the communication system. That will provide a smooth and secure services which will be accelerate the working through this network system.

In this system, head office can be monitor other branches, their work, and their update. The branches can send information, get access, data sharing, transferring over this network privately. The design belong with very efficient security system that makes the network system invulnerable also protect important data and files.

After all of these effort when the project is done and we will look that the customers are happy by this project then there was an absolute feeling of satisfaction which is a lot to us.

2.2 Related Works

Design and Simulation of Banking Network System: The banking system growth day by day and bring many security issues and increasing cost of implementing higher security system for both online banking user and the bank also their branches. In this modern age, the bank system update their networking sector between head office and their branches also online banking user. Several bank of Bangladesh, have been attacked many times by hacker [1]. After these attack the bank simulate the network system which are more secure than previous.

We are influenced by Design and Simulation of Banking Networking System. We followed the design of banking system to implement this project. But this project is completely different.

Design Implementation and Monitoring of an ISP's Network: The ISP Xenial Brodband in Baridhara area of Dhaka [2], monitoring their customers and bandwidth provider through a network system. Which have a good infrastructure design. They also provided some extra services through this network system like FTP Servers.

We also influenced by their network system. We collect some data to implement our project. But our project is completely different.

2.3 Comparative Studies

We are influenced by Design and Simulation by Banking Network System and ISP Network System. So we studied a lot about these two Network System to implement our project. In Banking Network System have improvement than previous network system. Now the system connected in a private network system where communicate between their branches and head office also online banking user. The system are now more secure.

We influenced by this two Networking System, but there is no similarity in our project. Our project is also based on same system as they use, but the infrastructure design and many extra services are totally different from their system. And we followed the better security system using by hardware devices and software packages like Firewalls, VPN, NAT, etc. Our project also provide some extra services which modernize this project and being user friendly. We collect data from these two system and we find that how to improve and how to provide a better services then which are belong in this market level.

2.4 Scope of Problem

In the time of internet, with the easy availability, every system has under the threat. The system attacked by several hacker in several times. The insecurity of system user doesn't feel safe. Not only user sometimes government networking system attacked by hacker. Also trafficking of system slow down the slow down the system. That can be make a major problem in a corporate office because they depend on this system where they need a better optimized and enough secured network system.

But in our project we try to include something that make sure the system is more secured and faster. The design will attract corporate offices to get better communication platform also. We designed this to provide not only network system also have the extra services like faster transferring, transmission, quick responsive, etc.

2.5 Challenges

At the time of designing our project we had faced a lot of challenges. During COVID 19 we didn't get proper guideline, we didn't managed any lab. Causes of lockdown we shifted our hometown where we faced huge internet connection issues. Also we have communication issue to each other. We faced major problem that we didn't arranged the requirement instrument and required machine to configure. Then we choose virtual simulator GSN3 to implement the design. After implement we had face the other problem that to taste the project. Then we create virtual machine in one pc and tasted the project. We know how to overcome and finally we did it by grace of Almighty.

CHAPTER 3

REQUIREMENT SPECIFICATION & USAGE

3.1 Hardware Requirements

For making a networking project, a pc must need a minimum hardware requirement. There is Figure 3.1 about hardware requirement which is shown below.



Device specifications	
Device name	DESKTOP-60II85C
Processor	Intel(R) Core(TM) i5-5200U CPU @ 2.20GHz 2.20 GHz
Installed RAM	8.00 GB
Device ID	AEB2B849-8D60-48A9-8FFD-C44FC2489234
Product ID	00331-10000-00001-AA887
System type	64-bit operating system, x64-based processor
Pen and touch	No pen or touch input is available for this display

Figure 3.1: Hardware Specification

Processor: Intel(R) Core(TM) i5-5200U

CPU: 2.2 GHz


RAM: 8.00 GB

GPU: 4.00 GB

We face several issues while render the project for low configuration PC.

3.2 Project Requirements

Table 3.1: Implementation Tool

Logo of Tools	Product of	Tools	Usage	Work Exp.
	Cisco[4]	Cisco Managed Switch	Connecting Devices	
	MikroTik[5]	MikroTik Ethernet Router	Internet Explore	Routing and Routed
	Cisco	Cisco Router	Networking Device	Routing and Routed
Software Requirements				
	Microsoft[6]	Windows 10, Windows 7	User operating system	
	Microsoft	Windows Servers	Establish Server	
	GSN3[7]	Simulator	Design Implement	
	MikroTik	Winbox	GUI Configuration	
	VMware[8]	VM Ware Workstation Pro Version 16.	To make virtual Computer	

In Table 3.1 we mentioned Networking Devices and Software are used in this project. We used also some software and hardware devices which we didn't mention on Table 3.1 but we used these device and software to implement this project.

3.3 Switch



Figure 3.2: Cisco Switch

Figure 3.2 Cisco Switch

We use some switches in our project to implement. We choose cisco switch, the switch design by cisco is too reliable and give better services. Basically Network Switch used for to connect networking devices in a particular platform like a computer connect to printer, router, server, other resources.

Systems Administration is the need to some component for the switches, and switches that let our connection associate at least one PCs to another PCS, even various systems. A network switch that operates in the Data Link Layer of OSI model. Which are belong Layer 2 of OSI model. A networking switch is also known a switching hub, bridging hub, MAC Bridge, etc. This is a device on a network. Which using packet switching to receive and sent again data to the destination device.

3.3 MikroTik Router



Figure 3.3: MikroTik Router

Figure 3.3: MikroTik Router

In Figure 3.2 we mention a router which developed by MikroTik. The name of the device MikroTik router. This is the major device in our project we use most. We choose use to MikroTik Router because the capability of this router. The MikroTik Router is a more powerful device than other routers, which has many good reason to use, including internet sharing and bandwidth control. It is a device like a switch/router, ranging in size from a small box to a large box. This device has one port for the internet connection and LAN port for local area network as like other routers. This router will act as an internet sharing server and is possible to use multiple devices on the same network using this device.

MikroTik Operating System (ISO): The developers of MikroTik Router have also developed it as an operating system.

Why we choose MikroTik Router the answer given below:

- Easily Bandwidth control and distribution,

- Auto system backup,
- Filtering, Firewalls, Hotspot, OSPF, MPLS Routing,
- Winbox graphical interface, remote,
- Website Blocking,
- Easy Monitoring,
- Virtual Private Network (VPN),
- Various benefits including load balancing.

3.5 GSN3: Graphical Network Simulator

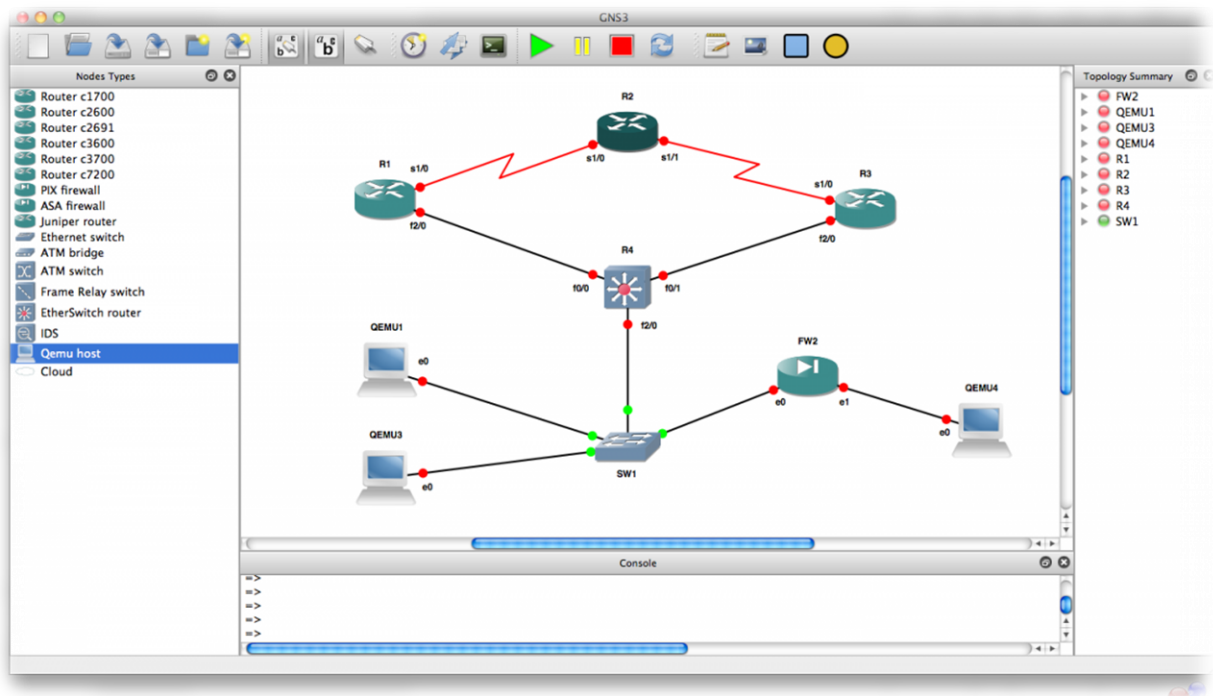


Figure 3.4: GSN3

In **Figure 3.4**, we mention the Graphical Network Simulator (GNS3). Where can design high quality and complex network topology. Basically it's used for to emulate, configure, test and troubleshoot virtual and real network. The simulator can run in low configure pc. GNS3 is an open source software which can download and use free. That support multiple switching, routing option. The availability of each and every networking devices. The configuration process are easier comparatively. Even some devices are pre –configured and optimized.

During COVID 19, we faced some major issues. We didn't arrange the devices, machine, PCs, resources. That's why we choose for a Simulator for implement this project. We used the devices for free whatever that was easy to configure in this platform. There are some simulator like Cisco Packet Tracer, Boson Netsim, EVE-NG, etc. But we choose to implement on GNS3. Some features of GNS3 attracted us.

There are some features of GNS3:

- Design of high quality and complex network topologies.
- Packet capture using Wireshark.
- Simulation of simple Ethernet, Frame.
- GNS3 supports devices and IOS of more vendors.
- Easy to hardware emulation
- Connect and simulate VMware/Virtual Box to GNS3 and can create some of complex network labs.
- We can design network diagram and can represent network architecture easily.

3.6 Winbox

Winbox is a small utility software application which allow administration of MikroTik RouterOS using simple graphical user interface. Winbox Manage and configure MikroTik RouterOS. We choose Winbox to configure our router because in Winbox has some interesting features and services such as easy to configure devices and manage these devices. We used Winbox to configured MikroTik Router.

There are other some alternatives of Winbox but in the worst scenario comparatively easy to use and reliable to get expected outcome.

CHAPTER 4

DESIGN AND IMPLEMENTATION

4.1 Design a Network

Below the Step of project that define network design. It will fulfill all of the requirement of any

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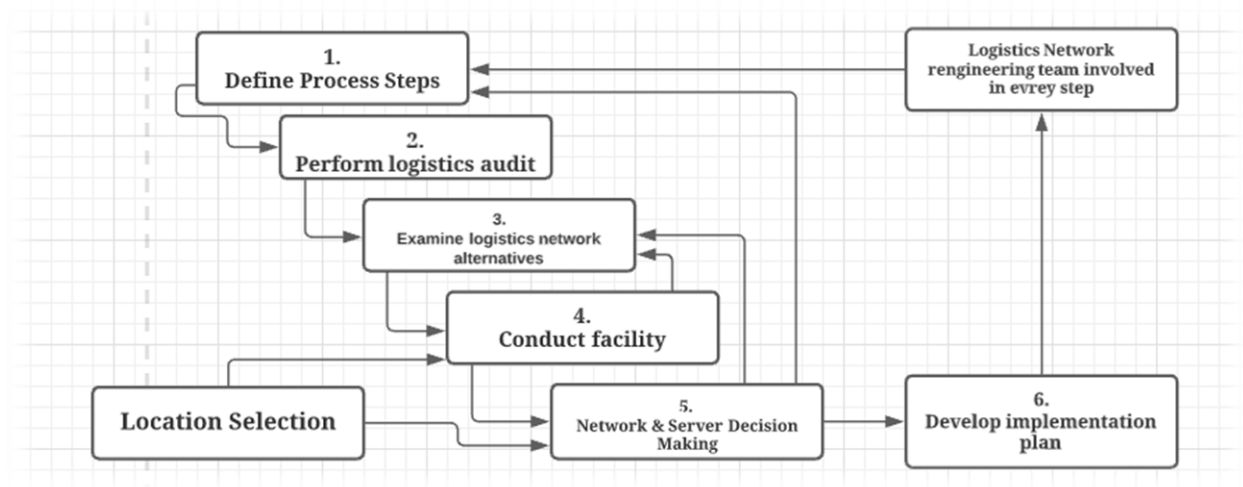


Figure 4.1: Network Design Process

In Figure 4.1 state that a process of designing network. This diagram show what are these step to designing network.

4.2 Backbone Network Design

To design a network, we would like to follw some rules make it more economical and provides high performance. There are some goal that squeare a designed network that mention earlier.

- Confidentiality
- Availability
- Scalability
- Security

To get better outcome a network should be well engineered that enable flexibility and growth. We try to manage.

4.3 Overall design of a Network Planning

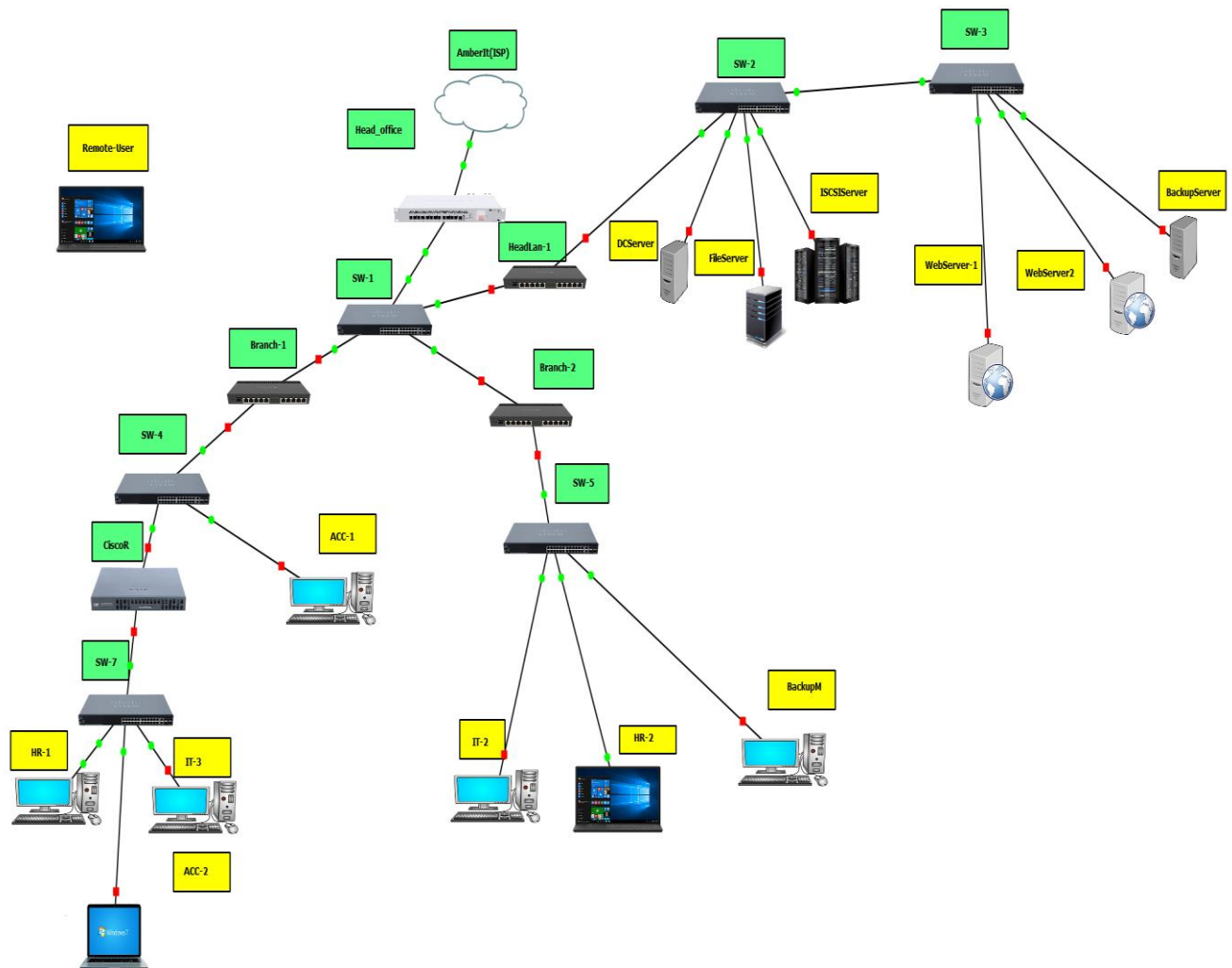


Figure 4.3: Overall Design of Network Planning for Corporate Office

In **Figure 4.3** state that Overall Design of Network Planning for Corporate Office. We designed this Network Infrastructure for corporate office as our final year project. We designed this project on a simulator which name is GNS3.

Some important info given below about our designed Network planning:

- The mentioned Image above shown that it consist with several WAN and LAN and its Head office and their branches and servers. Servers and Head office and their branches communicate each other via internet.
- We can see in Figure 4.3 that the server and Offices associated by using routers and switches.
- In Figure 4.3 we see a small connecting using some workstation and server is LAN stands for Local Area Network.
- Here we see another network connected to internet that consist with three branch office and every branches workstation .This is WAN stand for Wide Area Network.

4.4 Layer Network

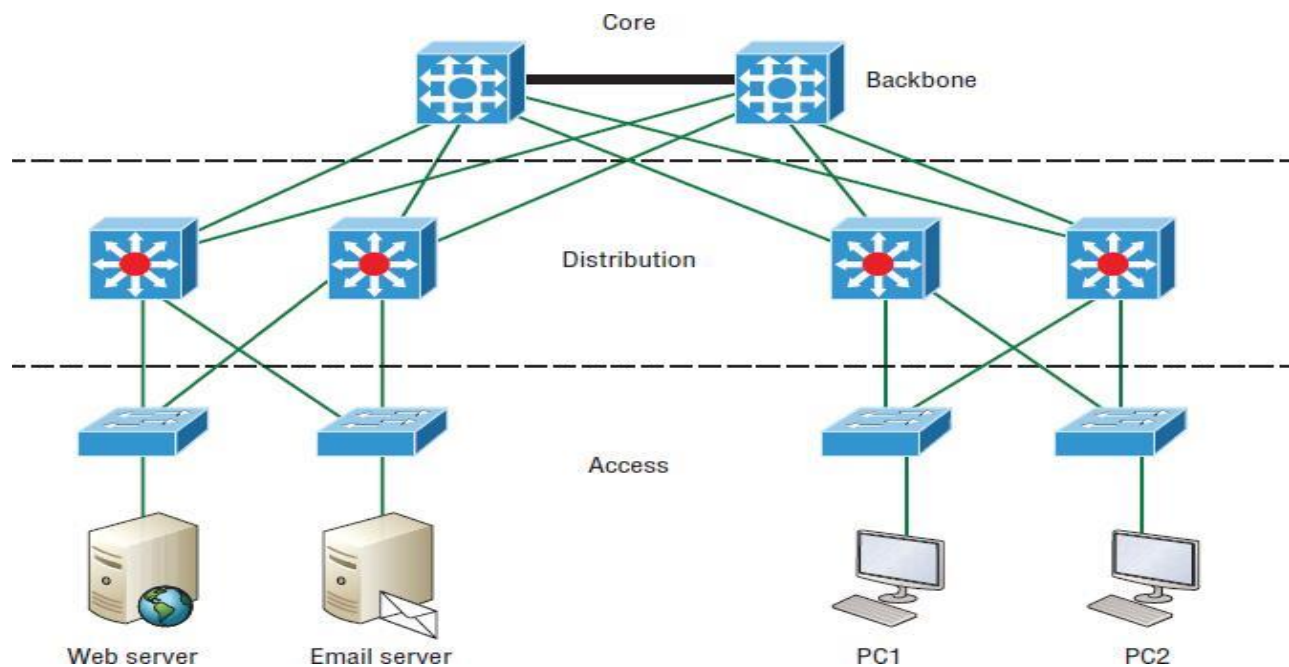


Figure 4.4: Layer Network of Designed Project

4.5 Design Implementation on Head Office

At first we implement our design to organize Head Office. Our step to implement design for Head Offices are need to establish Internet Connection, Installation of Networking devices, Configuration of Networking Devices, Checking Connectivity to get expected outcome. Instance

get information from a reputed ISP to establish connection like IP Address, Subnet Mask, Gateway, and DNS and so on.

4.6 Internet Connectivity

To implement the design we must need a good internet connection. In this design, we used several networking devices which need a strong and reliable internet connection to associate each other. So, we explore a package of corporate offices. Which are provided by AMBER IT LTD [9]. The package specially featured for corporate purpose. There are some features of ISP that are Real IP, Free Talk Time, Reduce Call Costs, Redundant Link, Safe DNS, and Video Conferencing and so on.

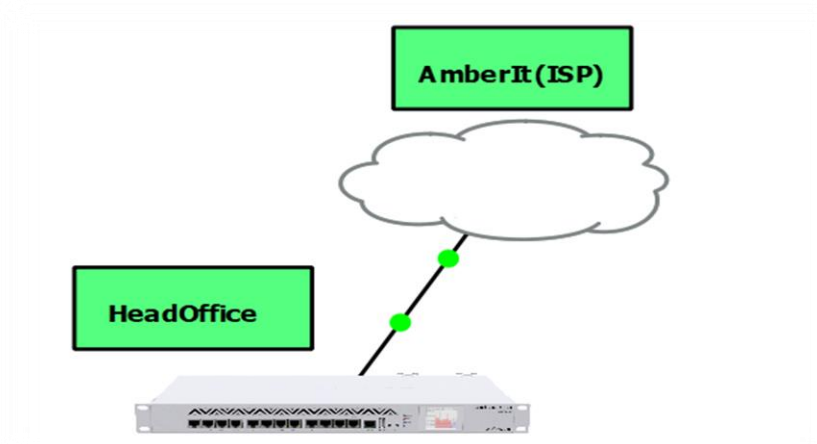


Figure 4.6: Internet Connectivity

In **Figure 4.6** shown that we taking broadband connection to our head office which provided by Amber IT.

Connection Information:

IP Address: 192.168.101.156

Subnet Mask: 255.255.255.0

Gateway: 192.168.101.254

Primary DNS: 8.8.8.8

4.7 Local Area Network of Head Office

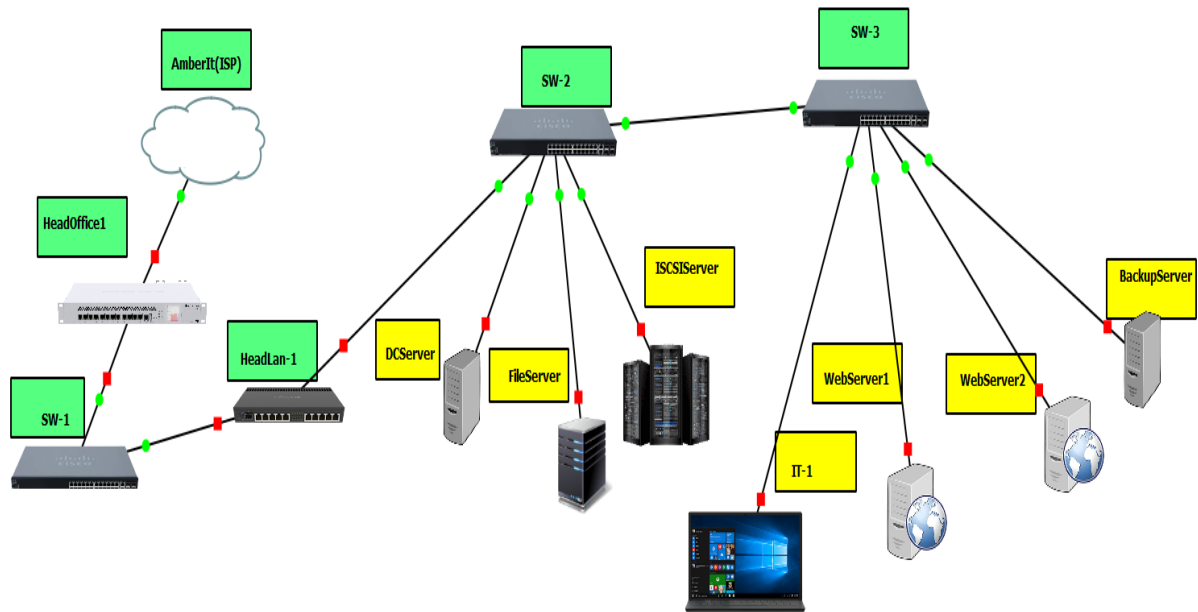


Figure 4.7: Local Area Network Connection

In Figure 4.7 that shown local area network of head office. It is a group of associate Networking Devices that share a common communication channel or wireless to communicate a server or user. LAN encompasses computer and peripherals associate a server or among head office. User of head office use LAN affiliation to share resources such as DC Server and Other servers to PCs.

In Figure 4.7 shown that the design, we used MikroTik Router which combined with another MikroTik router which also associate with SW1 then SW2 which connect HR-1 and several servers. And also use another switch Sw4 to extend some servers. Sw4 switch also connecting user which is IT-1.

4.8 LAN Configuration for Head Office

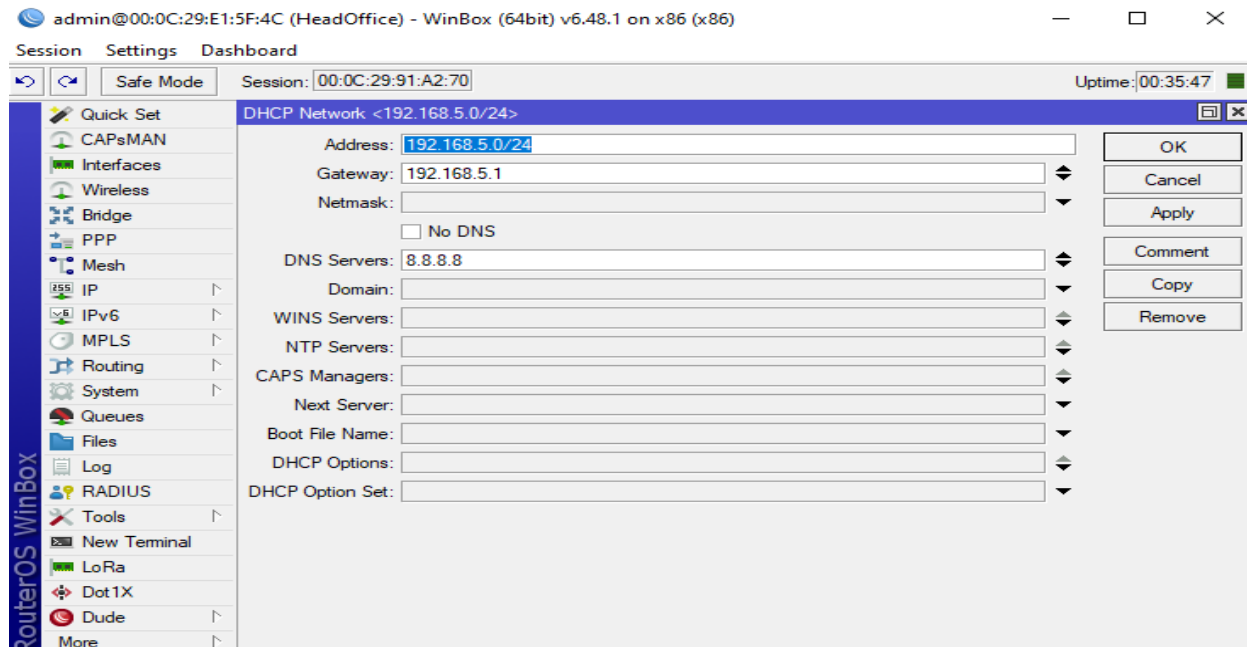


Figure 4.8.1: DHCP configuration

In **Figure 4.8** we configured DHCP for Head Office Router 2. We follow certain steps to configure DHCP for Head Office Router 2 which given below.

DHCP Configuration Procedures:

➤ **Step-1:**

Login into head office main router through Winbox.

➤ **Step-2:**

IP> Addresses > ether3 > 192.168.5.1/24 > enable > apply > ok.

➤ **Step-3:**

IP> DHCP Sever > DHCP Setup > DHCP Interface > ether3 > DHCP Address > 192.168.5.0/24 > Gateway > 192.168.5.1 > Address to give out > 192.168.5.2-192.168.5.254 > DNS > 8.8.8.8 > lease time > 24:00:00 > ok.

➤ **Step-4:**

IP > Firewall > NAT > Action > Masquerade.

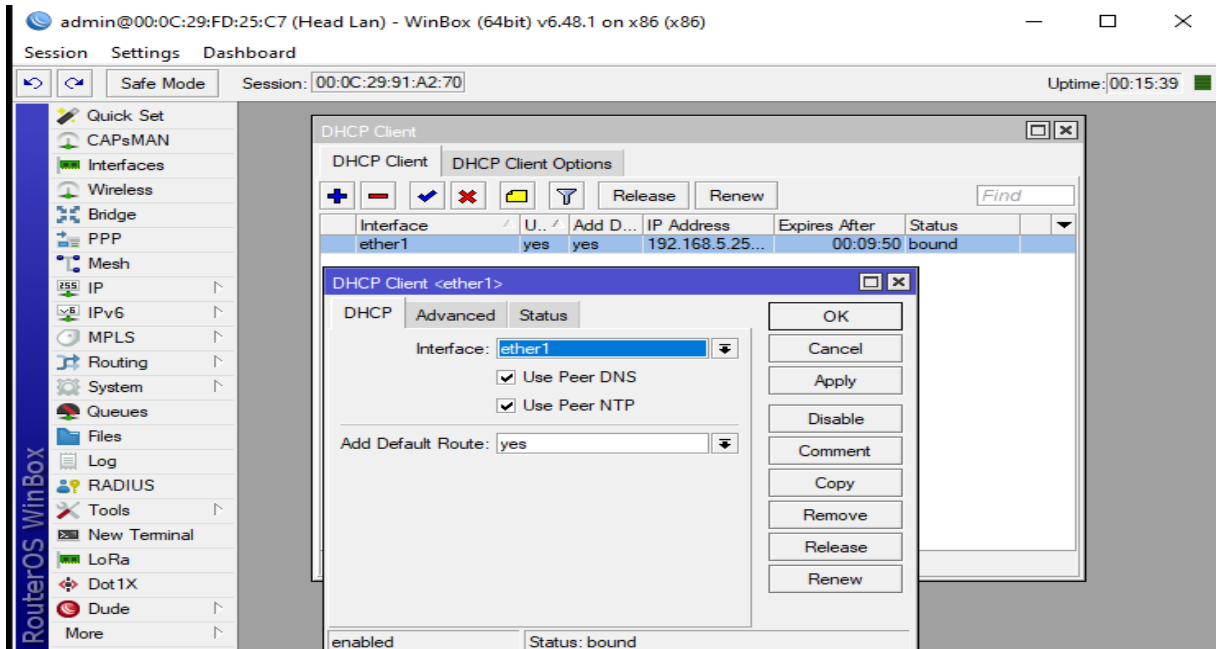


Figure 4.8.2: WAN and LAN Connectivity in Head Office

In **Figure 4.9** establish WAN and LAN Connectivity for Head Office router 2. In figure shown that DHCP Client and DHCP Server Setup. We follow some step to establish connectivity for Head Office. The steps are given below.

WAN Connectivity through DHCP Client:

- **Step-1:**
Login into Head Office router 2.
- **Step-2:**
IP > DHCP Client > New DHCP Client > Interface > ether1 > Enable > Apply > Ok.

DHCP Server Setup:

- **Step-1:**
IP > DHCP Sever > DHCP Setup > DHCP Interface > ether2 > DHCP Address > 10.1.1.0/24 > Gateway > 10.1.1.1 > Address to give out > 10.1.1.2-10.1.1.254 > DNS > 8.8.8.8 > lease time > 24:00:00 > Ok.
- **Step-2:**
IP > Firewall > NAT > Action > Masquerade.

Machine Connectivity:

➤ Step-1:

Login DC Server

➤ Step-2:

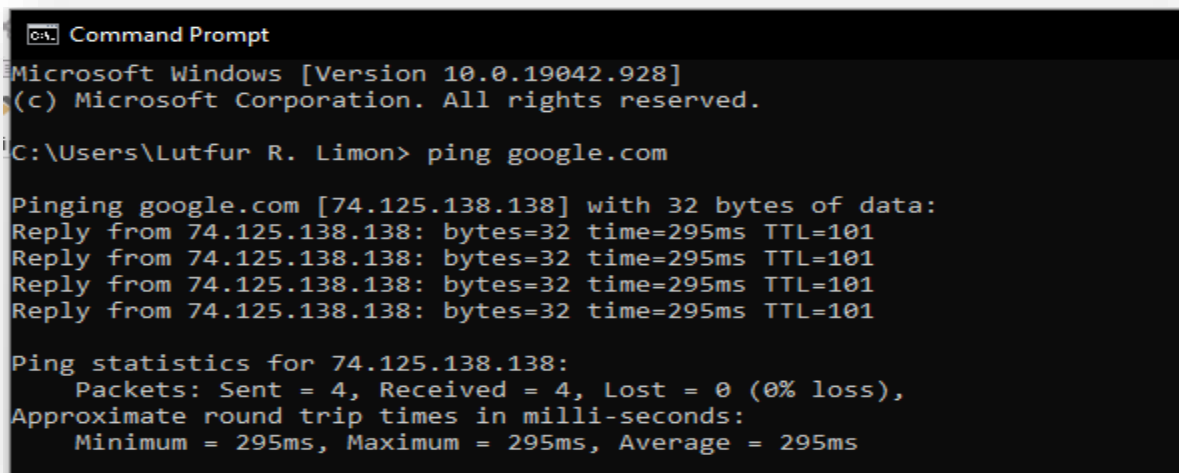
Go to Internet and Network setting > Change Adapter Setting > Ethernet > Properties > IPV4 > Obtain an IP address automatically > Obtain DNS server address automatically > Apply > Ok.

Now each of devices of LAN will get IP from DHCP Server. Now need to check connectivity that configuration are ok.

Connectivity Check:

➤ Step-1:

Open cmd > type 'ping google.com' > Enter.



```
Command Prompt
Microsoft Windows [Version 10.0.19042.928]
(c) Microsoft Corporation. All rights reserved.

C:\Users\Lutfur R. Limon> ping google.com

Pinging google.com [74.125.138.138] with 32 bytes of data:
Reply from 74.125.138.138: bytes=32 time=295ms TTL=101
Reply from 74.125.138.138: bytes=32 time=295ms TTL=101
Reply from 74.125.138.138: bytes=32 time=295ms TTL=101
Reply from 74.125.138.138: bytes=32 time=295ms TTL=101

Ping statistics for 74.125.138.138:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 295ms, Maximum = 295ms, Average = 295ms
```

Figure 4.8.3: Connectivity Check

In Figure 4.8.3 we tested LAN Connectivity. We can see in shown image we type “ping google.com” on cmd. The outcome ensure that the connection established. Our configuration are all ok.

4.9 Design implantation on branch 1

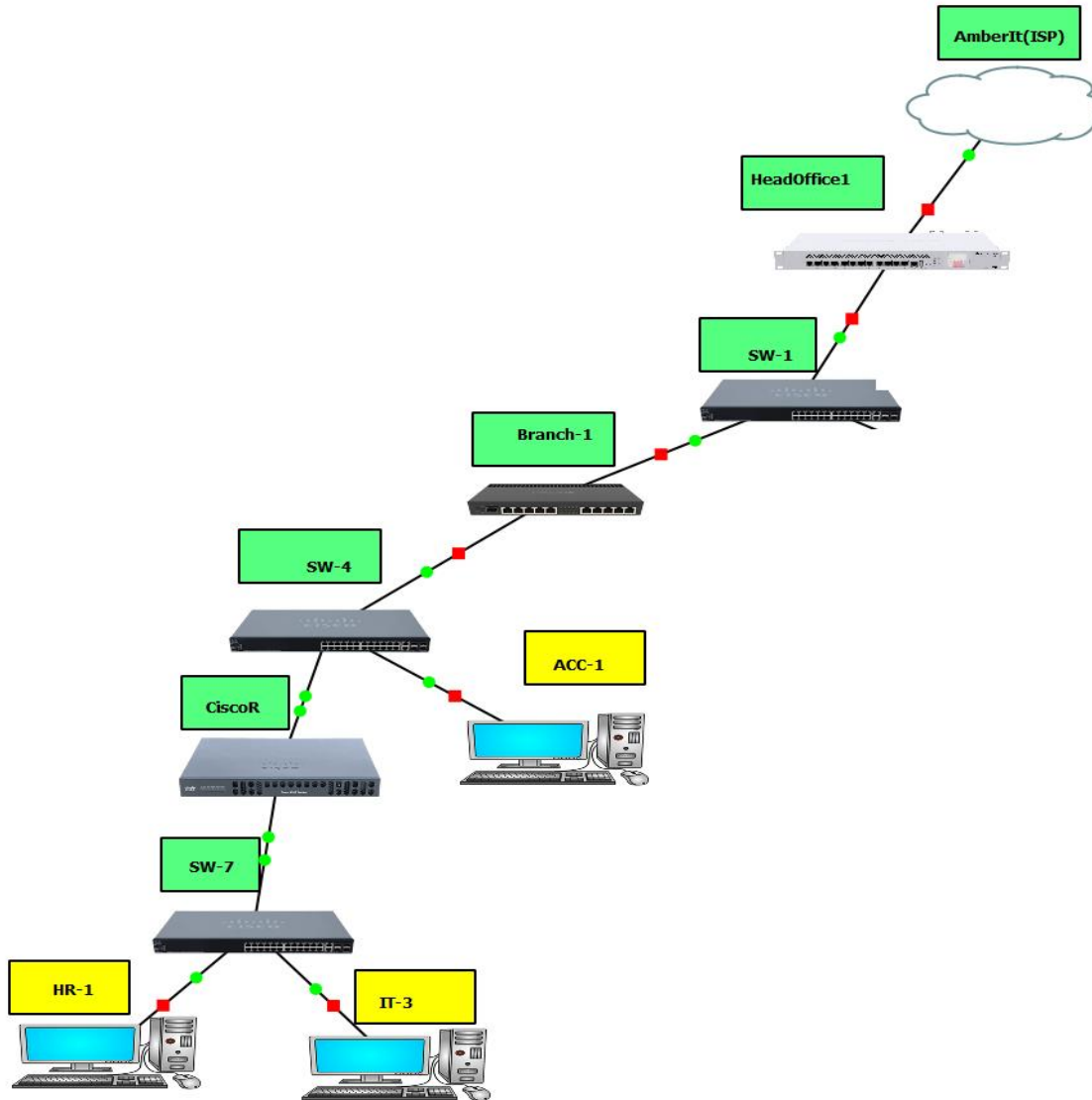


Figure 4.9: Design Implementation for Branch 1

According to **Figure 4.9**, we got some static IP from Head Office to connect Branch1. We used a switch which associate with IT2 then connect with a Cisco router which make internet connection with user by using another switch. To configure Branch1 we need addresses to assign and configure Cisco router.

4.10 Branch1 Configuration

Address Assign for Branch1

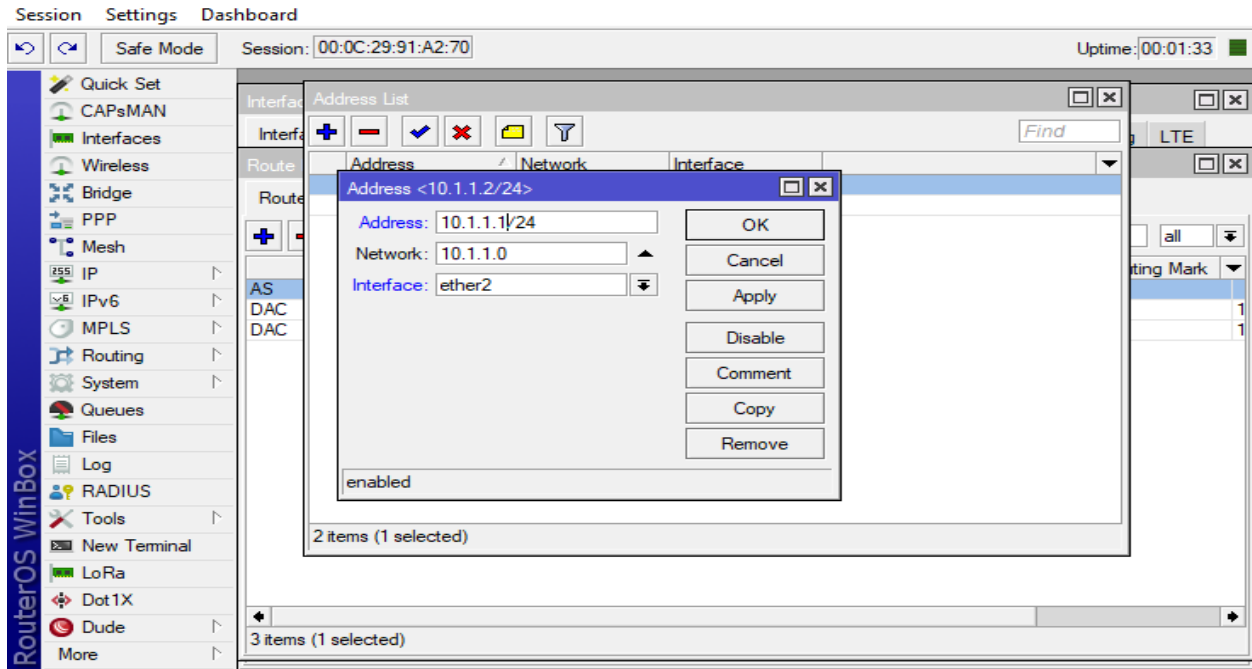


Figure 4.10.1: Address Assign for Branch1

In Figure 4.10.1 we assigning Addresses for Branch 1 on head office. The configuration procedures of Static IP given below.

Static IP configuration:

➤ **Step-1:**

Login into Head Office main router through Winbox.

➤ **Step-2:**

IP > Addresses > ether2 > 10.1.1.1/24 > enable > Apply > Ok.

Addresses Assign for WAN Connectivity

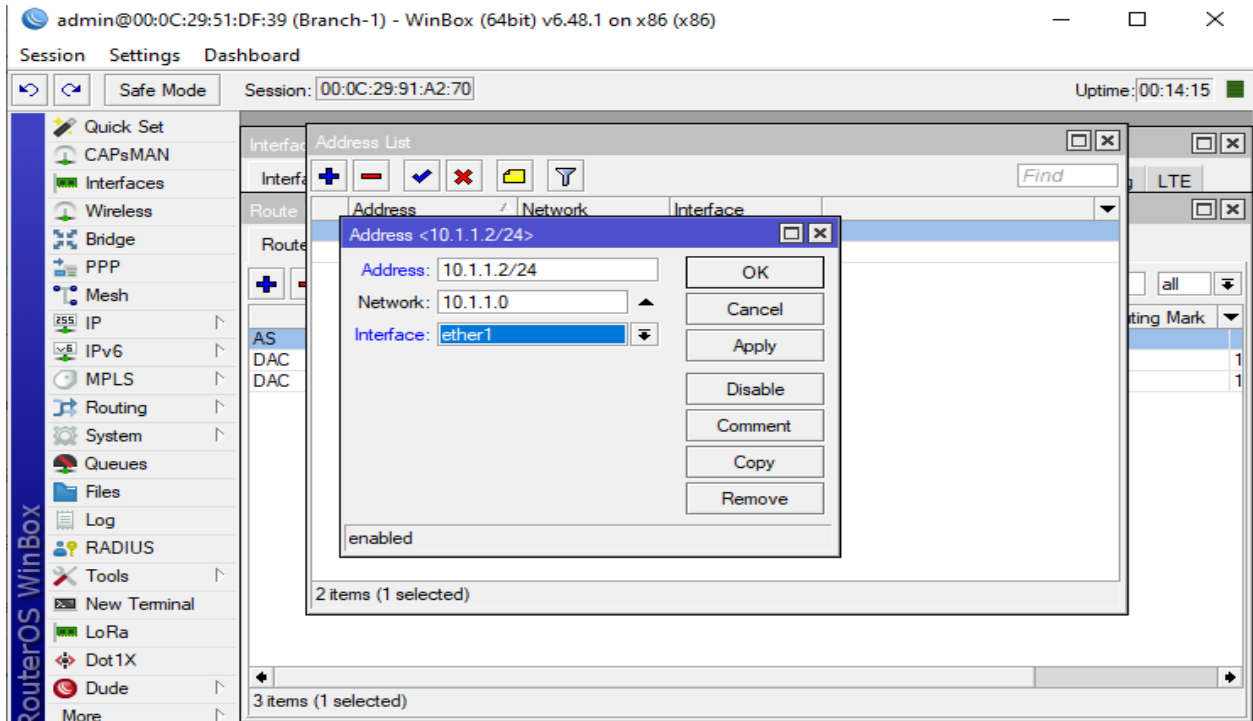


Figure 4.10.2: Add Assigning for WAN Connectivity for Branch1

In Figure 4.10.2, we assigned addresses to Branch1 main router for set up WAN Connectivity. Configured with static IP from Head office. The processes are mentioned below.

Connection through Static IP:

➤ **Step-1:**

Login into Branch1 main router through Winbox.

➤ **Step-2:**

IP > Addresses > ether1 > 10.1.1.2/24 > Enable > Apply > Ok.

Branch1 Static Configuration

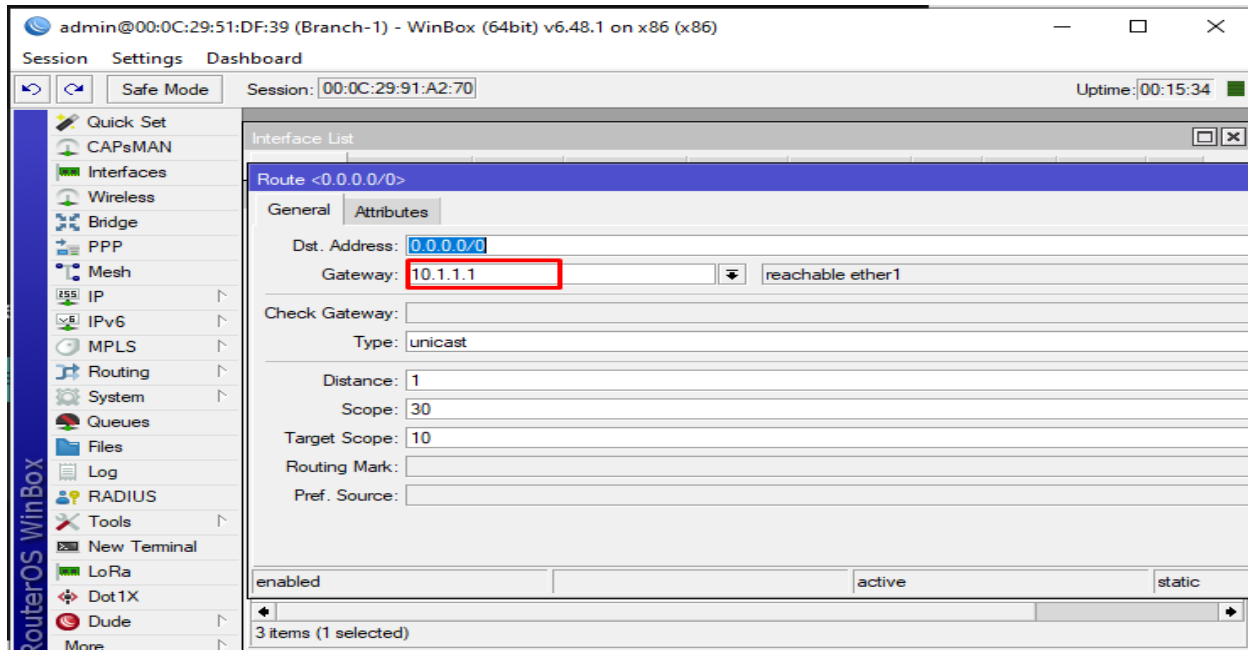


Figure 4.10.3: Branch1 static configure

In Figure 4.10.3 we assigned Gateway and DNS through Static IP. Previous Figure 4.10.2 we assigned address to initiate connection through static IP. Now we need to configure by allocate Gateway Addresses and DNS.

Gateway and DNS Assigning

- **Step-1:**
IP > route > gateway > 10.1.1.1 > Ok.
- **Step-2:**
IP > DNS > 8.8.8.8 > Ok.

Connectivity check for branch1

- **Step-1:**
Go to cmd
- **Step-2:**
Type 'ping google.com'

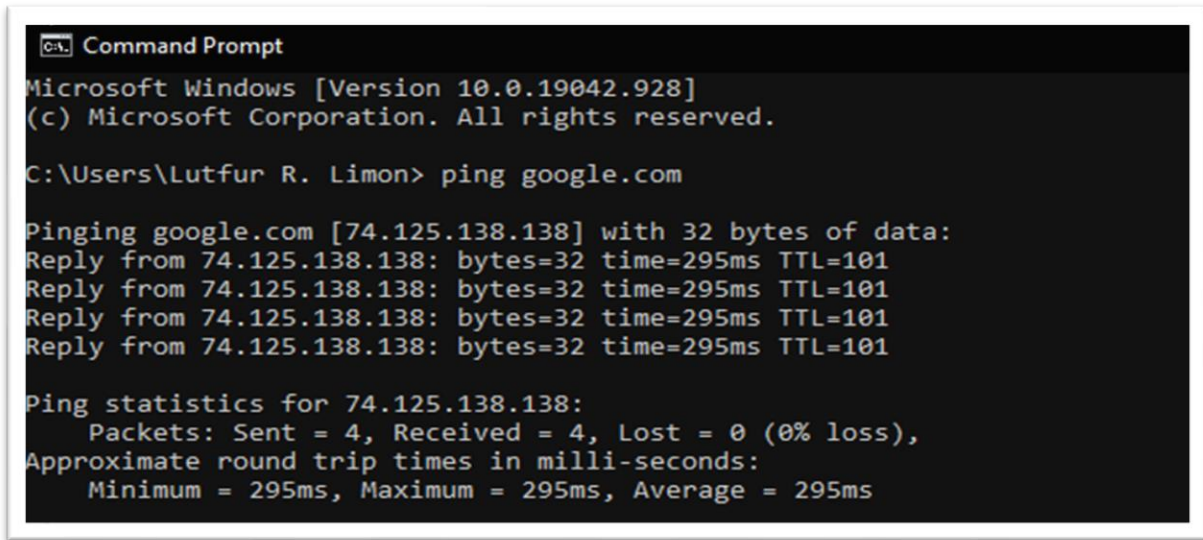


Figure 4.10.4: Connectivity Check Branch1

In Figure 4.10.4 ensure that the connection are established.

Address Assign for Cisco Router

We used a cisco router in our Branch1. We assigned addresses then we configured the router.

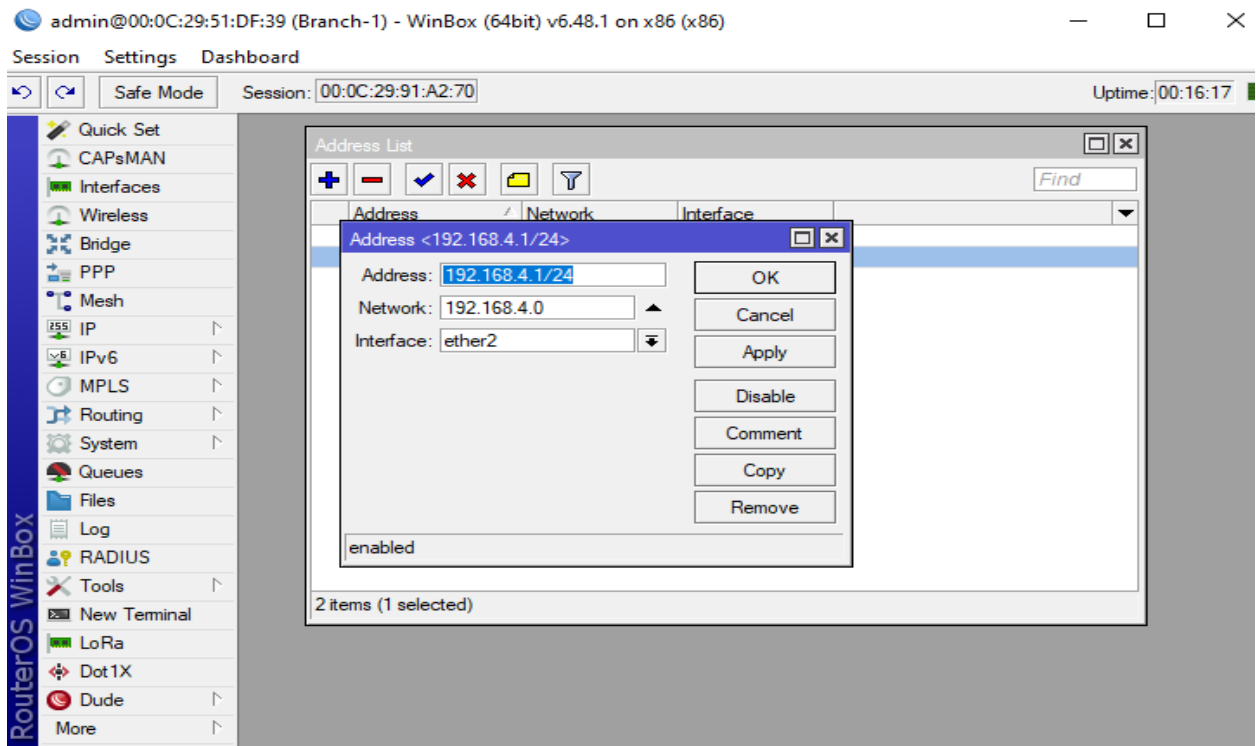


Figure 4.10.5 Address assign for Cisco Router

In **Figure 4.10.5** state that we used a Cisco router in Branch1 which build connection from Head office. The router connect Branch1 user into Network System.

Assigning Address Procedure on Cisco Router for Branch1

➤ **Step-1:**

Login into Branch1 main router through Winbox.

➤ **Step-2:**

IP > Addresses > ether2 > 192.168.4.1/24 > Enable > Apply > Ok.

➤ **Step-3:**

IP > DHCP Sever > DHCP Setup > DHCP Interface > ether3 > DHCP Address > 192.168.4.0/24 > Gateway > 192.168.4.1 > Address to give out > 192.168.4.2-192.168.4.254 > DNS > 8.8.8.8 > lease time > 24:00:00 > Ok.

➤ **Step-4:**

IP > Firewall > NAT > Action > Masquerade.

Now, Addresses are assigned in Cisco Router of Branch1.

Configuration of Cisco Router for Branch1

➤ **Step-1:**

Open Cisco Router Console

➤ **Step-2:**

Type Command for WAN connectivity.

Command:

```
CiscoR#conf t
CiscoR(config)#IP domain lookup
CiscoR(config)#int f0/0
CiscoR(config)#IP add dhcp
CiscoR(config-if)#no sh
CiscoR(config-if)#exit

CiscoR(config)#int f0/0
CiscoR(config-if)#IP nat outside
CiscoR(config-if)#exit
CiscoR(config-if)#int f0/6
CiscoR(config-if)#IP nat inside
```



```
CiscoR(config-if)#iexit
CiscoR(config)#IP access-list standard 1
CiscoR(config-std-nacl)#permit any
CiscoR(config-std-nacl)#exit
CiscoR(config)#IP nat inside list 1 int f0/0 overload
CiscoR(config)#exit
```

- **Step-3:** DHCP Configuration for Branch1 users under Cisco Router

Commands:

```
CiscoR(config)#int f0/6
CiscoR(config-if)# IP add 10.1.1.1 255.255.255.0
CiscoR(config-if)#no sh

CiscoR(config-if)# IP dhcp pool 1
CiscoR(dhcp-config-if)#network 10.1.1.0 255.255.255.0

CiscoR(dhcp-config-if)# default-gateway 10.1.1.1
CiscoR(dhcp-config)# dns-server 8.8.8.8
```

Now Cisco router is configured by above command. Which commanded from CLI.

User connectivity

After configured Cisco Router we need to connect user to the network of Branch1 for they can use internet connection. The steps are mentioned below that how initiate user connectivity.

- **Step-1:**
Boot and Sign in into User Machine
- **Step-2:**
Go to Internet and Network setting > Change Adapter Setting > Ethernet > Properties > IPV4 > Obtain IP Address Automatically > Obtain DNS Server Address Automatically > Apply > Ok.

Check Connectivity

After Configured Cisco router and also ensure User connectivity we should to check that user of Branch1 getting internet. To check the internet of Branch1:

Open Terminal Type 'ping google.com' > Enter.

4.11 Design Implementation for Branch2

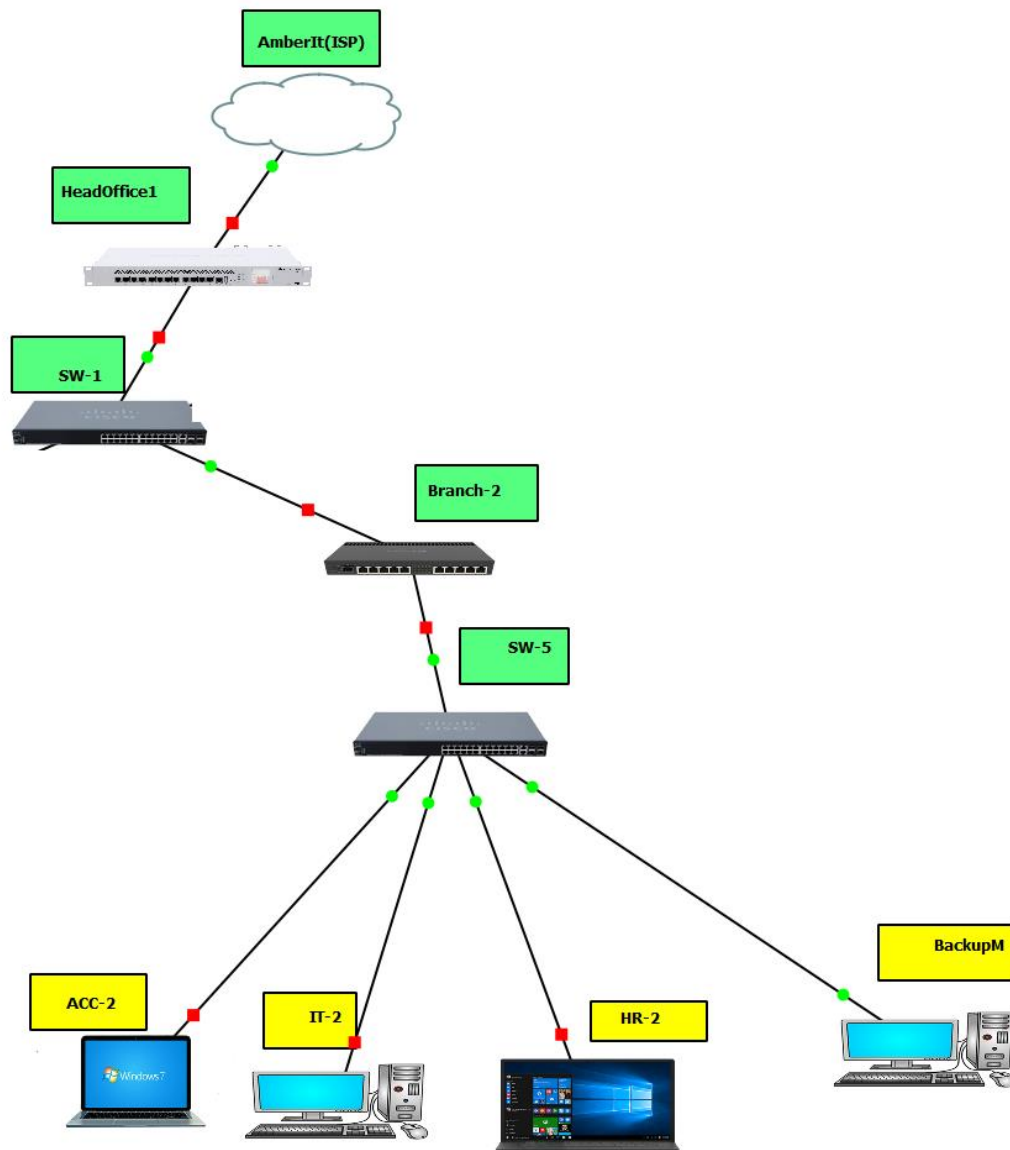


Figure 4.11: Overall Design for Branch2

According to **Figure 4.11**, by using PPPOE we connect Branch2 and Head Office. PPPOE stand for Point-to-Point over Ethernet. The overall design of Branch2 state that the design to connect each device to on a network which associate with Head office. From Head Office can monitor Branch2. Devices Installation and Configuration processes explain below.

Why We Choose PPPOE?

Point-to-Point over Ethernet refers to the system used in connecting multiple devices, computer, laptop, smartphone and so on an Ethernet Local Area Network (LAN). The main purpose of PPPoE used in a building or office allow that user can share a common digital subscriber line. PPPoE has some specified features. That's why we choose to use this system. The feature of PPPoE are mentioned here.

Advantages of PPPoE:

- Easy to Configure
- Support Multiple Devices and Users on a local area network (LAN)
- Authentication, Encryption, Data Compression
- Widely Deployed and 8 bytes Header
- DHCP Based on User Login

4.12 PPPOE Server Configuration

i. Address Assigning in PPPOE

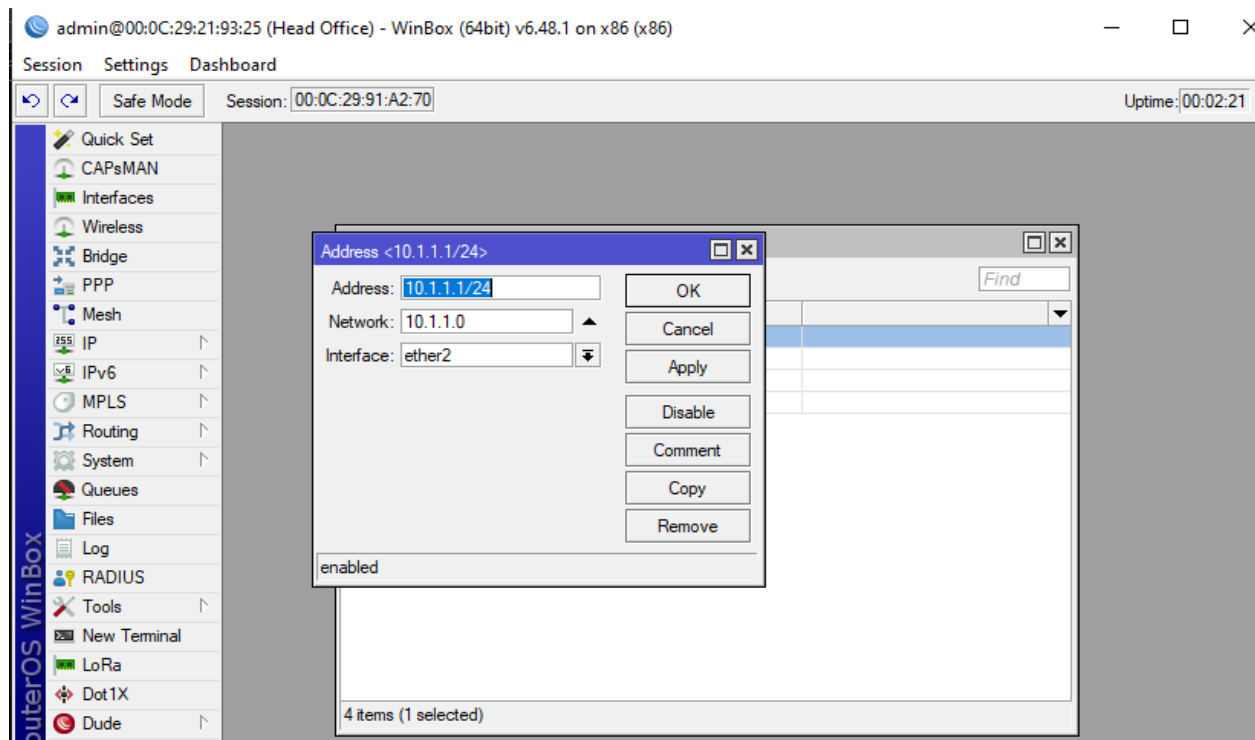


Figure 4.12.1: Assign PPPOE IP Addresses

PPPOE IP Address Assign:

➤ Step-1:

Login into Head Office Main router through Winbox.

➤ Step-2:

IP > Addresses > ether2 > 10.1.1.1/24 > enable > Apply > Ok.

In **Figure 4.12.1** above mentioned, we need to assign IP Addresses to configure PPPOE Server.

PPPOE Server Configuration:

ii. PPPoE Profile Generate

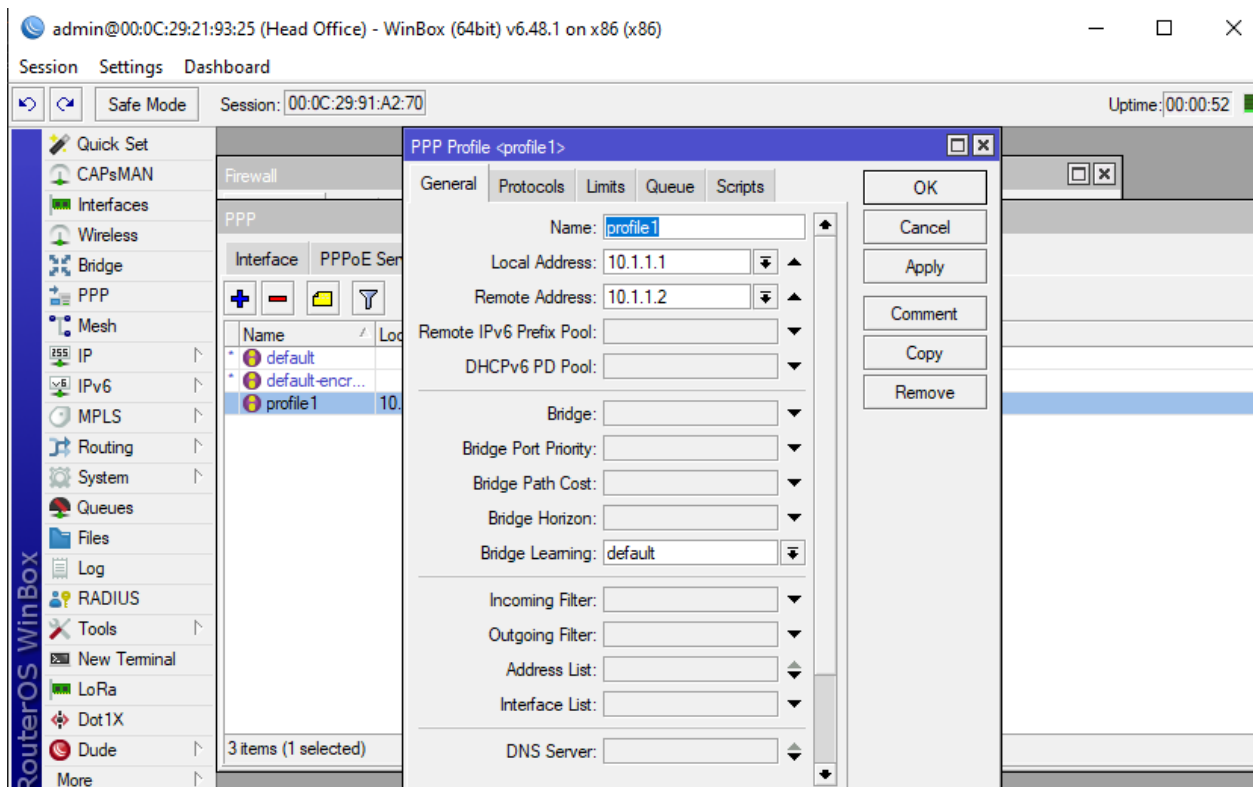


Figure 4.12.2: PPPOE Profile Generate

Configuration of PPPoE Profile Generate:

- PPP > Profile > General > Name > Profile1 > Local Address > 10.1.1.1 > Remote Address > 10.1.1.2 > Apply > Ok.

iii. PPPoE User Generate

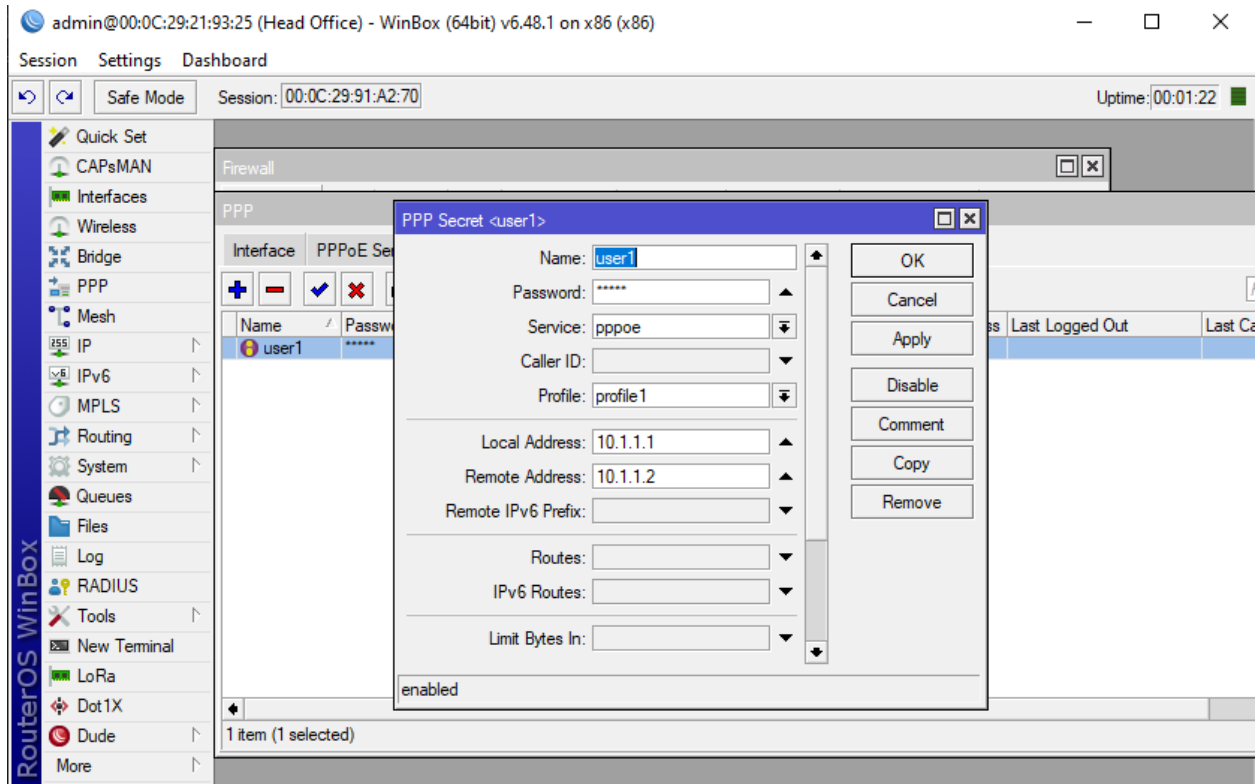


Figure 4.12.3: PPPoE Secret/User

Configuration of User

- PPP > Secret > Name > user1 > Password > user1 > Service > PPPOE > Profile > Profile1 > Local Address > 10.1.1.1 > Remote Address > 10.1.1.2 > Apply > Ok.

iv. PPPOE Server Generate

Configuration of PPPoE Server:

- PPP > PPPOE Server > Server Name > service1 > Interface > ether2 > default profile > profile1 > Apply > Ok.

v. PPPoE Client configuration:

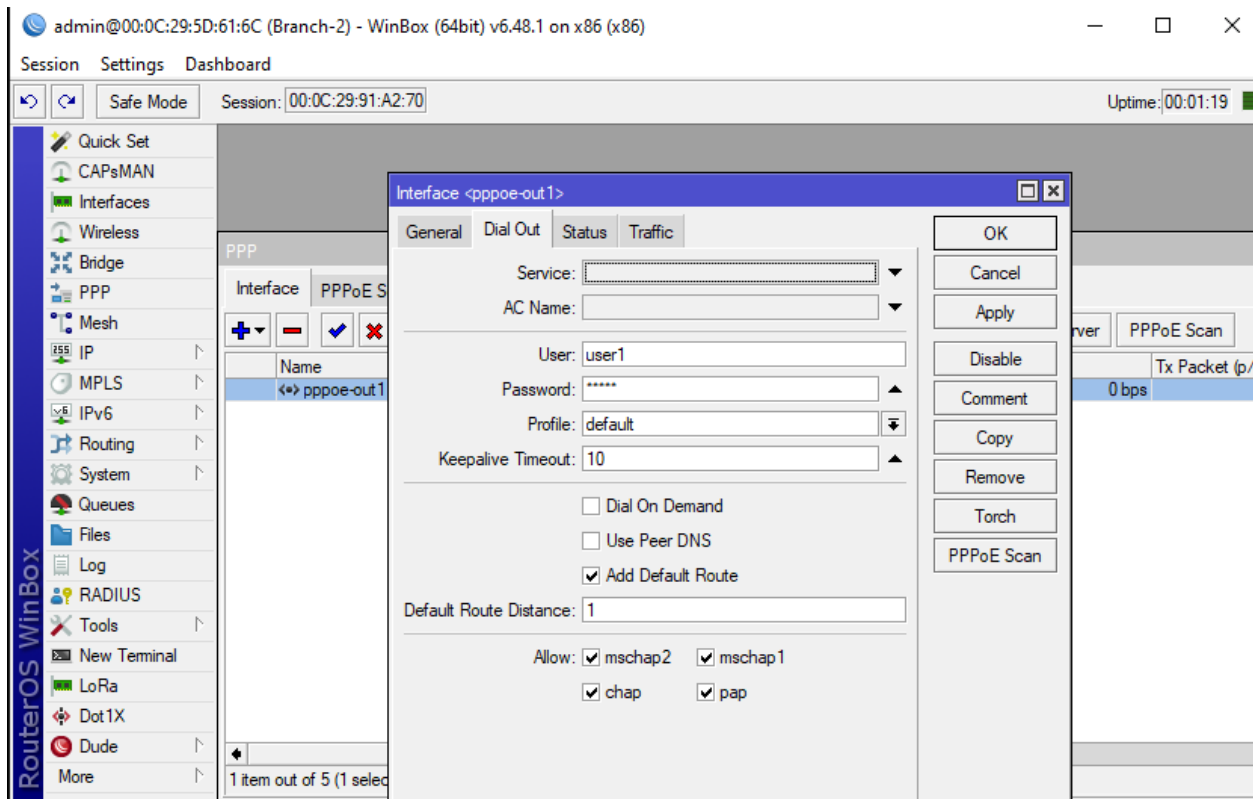


Figure 4.12.4: Configuration of PPPOE Client

Configuration of PPPoE Client:

➤ Step-1:

Login into Branch2 router through Winbox.

➤ Step-2:

PPP > Interface > PPPOE Client > Dial Out > User > user1 > Password > user1 > Apply
Ok.

Connectivity Check of Branch2:

➤ Open cmd

➤ Command: ping google.com

We need to check that Branch2 internet connection that are established by above command.

4.13 Windows Server Installation

In our designed Network Infrastructure, we used several server such as Windows Server, File Server, ISCSI Server, etc. So we need to install and configure our servers. We install these servers in our Virtual Machine.

Firstly we installed Windows Server. The version of Windows Server is Windows Server 2019. We install the server in VM Machine due to physical opportunity. Windows Server 2019 is a one kind of operating system which use as a server. The installation process are same as like how we install operating system in our Pc.

4.14 ADDS Install in Windows Server

Active Directory Domain Services (ADDS) is a server role in Active Directory. Active Directory helps that organize our office's users, computer and more. IT admin of Head Office uses Active Directory to organize our office's complete hierarchy from which computers belong on head office network. There are to division to install Active Directory Domain Services on Windows Server System mention are below.

Prerequisite of ADDS Installation

- Assign Static IP Address
- Set strong Administration Password
- Set Time zone

ADDS installation processes

- Open Server Manager

- Server Manager > Dashboard > Manage > Add Roles and Feature > Installation Type > Role based > server selection > current server > Server Roles > ADDS > Features > Default Features > Overview > Install > Result > Restart Machine.

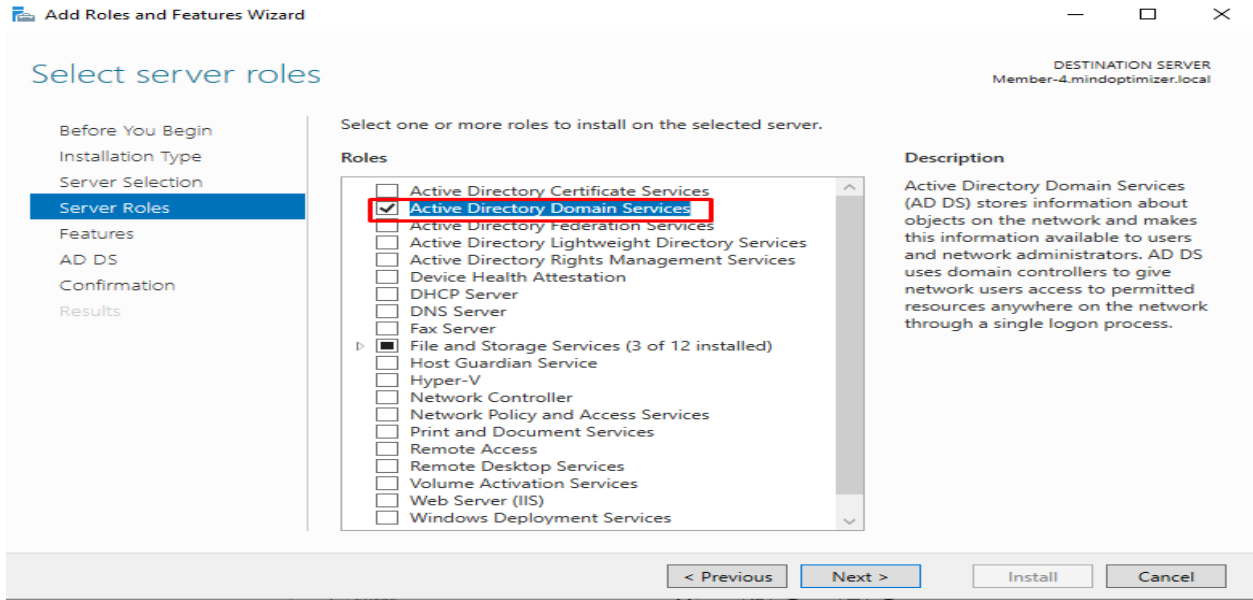


Figure 4.14.1: Selecting ADDS Role

In **Figure 4.14.1**, Shown that Selecting Active Directory Domain Services (ADDS) Role.

4.15 Promote Server as a Domain Controller

- Server Manager > Dashboard > Task > Promote this server to a Domain Controller > Deployment Configuration > Add a new forest > domain > mindoptimizer.local > domain controller options > Set DSRM Password > DNS Option > Additional Option > Path > Review Options > Prerequisite Check > Install > Installation > Result > Restart Machine.

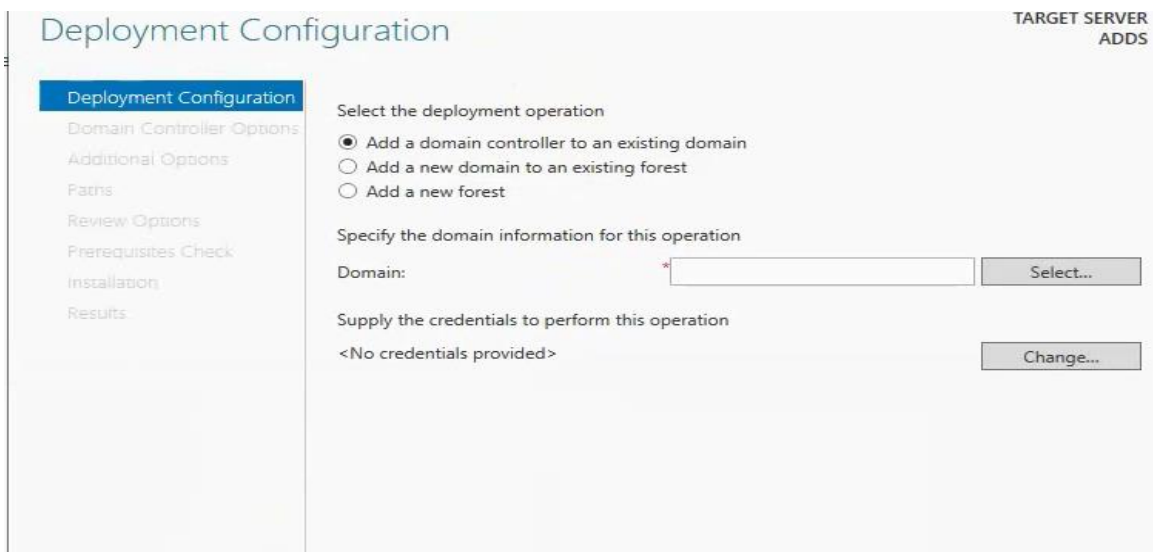


Figure 4.15.1: Server to Domain Controller

In **Figure 4.15.1** mentioned that the promoting of Windows Server 2019 as a Domain Controller. Domain Controller Promotion is a tool in active directory which install and removes ADDS and promotes domain controllers.

After Promoting to DC (Domain Controller)

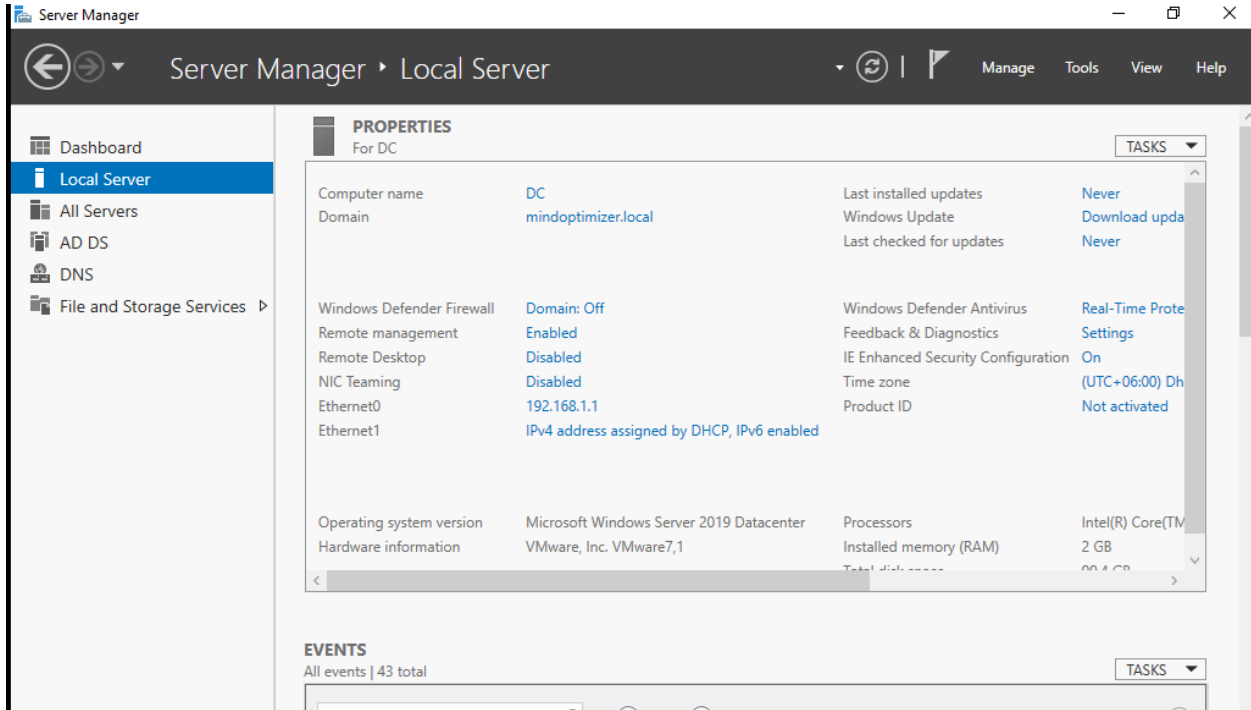


Figure 4.15.2: Promoted server as a Domain Controller

Domain Joining in Windows Operating System

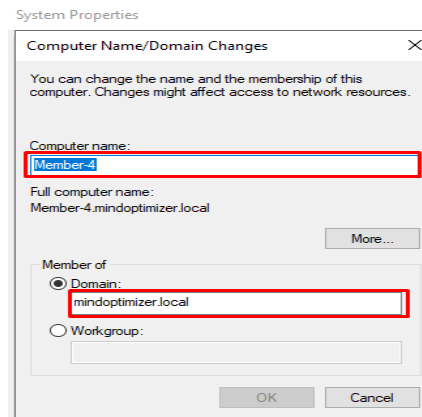


Figure 4.15.3: Attaching Domain with OS

We follow some procedure to joining Domain into Operating System and mark in **Figure 4.13.4**.

- Go to Setting > about your PC > Properties > Computer Name > Change > Member of > Select Domain > mindoptimizer.local > Ok.

For approval of Domain User need to provide DC Username and Password. (We can do it via into specific user). By the same process we can associate each machine to Domain Controller.

4.16 Organizational Unit, Groups, User Creating

- Go to Server Manager > Tools > Active Directory Users and Computer > Expand mindoptimizer.local > Right Click > New > OU > Name > IT > Ok.
- Right Click on OU > New > User > First Name > IT > Last Name > 1 > Username > it1 > Password > Confirm Password > Check in User can't change password > Ok > Finish.
- Right Click on OU > New > Groups > Group Name > it > Group Scope > Global > Group Type > Security > Ok.
- Right Click on user it1 > Add queue group > select group it > ok.

We can create multiple Organizational Unit (OU) groups, user though CSV File in windows PowerShell.

User Login via Domain User

Boot User Machine > Username > it1@mindoptimizer.local > Password > admin@i1 > hit Enter.

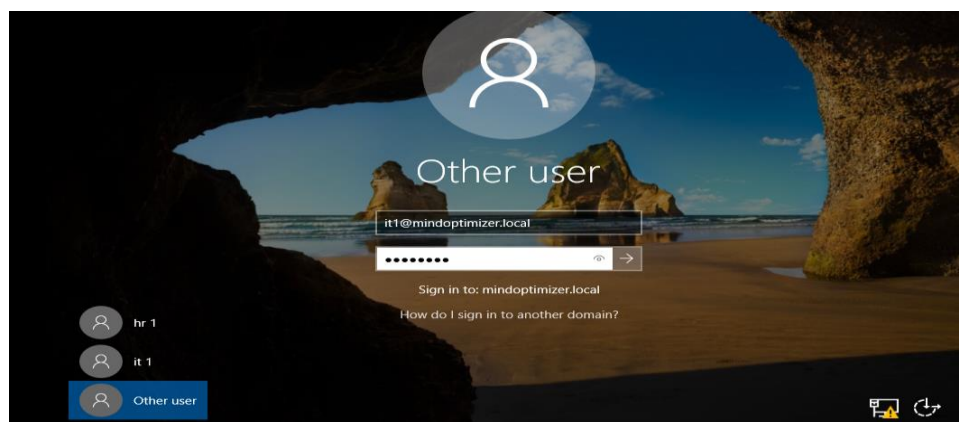


Figure 4.16.1: Sign in with Domain User

In **Figure 4.16.1** sign in machine with domain user which we Create d above.

Check Domain User



```
C:\Windows\system32\cmd.exe
Microsoft Windows [Version 10.0.17763.1]
(c) 2018 Microsoft Corporation. All rights reserved.

C:\Users\it1>whoami
mindoptimizer\it1

C:\Users\it1>_
```

Figure 4.16.2: Check Domain User Presence

After Sign in with domain user of Branches. To ensure that domain user can their work in the network. Above **Figure 4.16.2** ensure that the domain user who login into server are correct.

4.17 File Server

File Server is a one kind of server that provides access to files. File Server take action as main file storage location that can be access by multiple users. A file server could be dedicated system as like NAS which means Network attached Storage Device, or it can be simply a computer that host share computer.

In our design, we create a file server which monitoring by Head office. Such as corporate office they can easily work with the same document, spreadsheet and other data.

File server Installation

- Open Server Manager
- Server Manager > Dashboard > Manage > Add Roles and Feature > Installation Type > Role based > server selection > current server > Server Roles > File Storage Service > Expand >File and ISCSI Service > Expand > File Server Recourse Manager > Features > Default Features > Overview > Install > Result.

i. File Server Role Selection

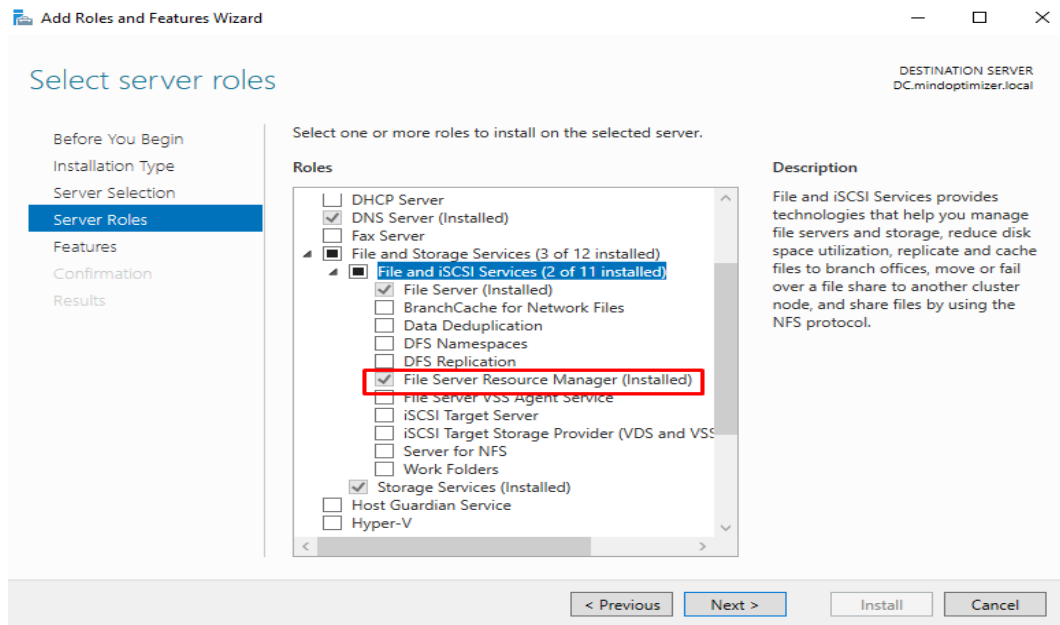


Figure 4.17: Role Selection for File Server

In **Figure 4.17**, we select the file server role from windows features. To installation of File Server we must need to add server role. After selecting role we check that the role is installed in our windows feature then we configure the server from server manager.

4.18 File Server Configure

To install File Server in our system. We need to follow some step. After installing File Server Resources Manager (FSRM) the major part of server installation that configuration of File server. There are few steps below that can create a file server on our system.

i. Create Quota Template: Configuration of File server, firstly we need create quota template. We Create Quota Template by using following step that given below.

- Go to Server Manager
- Server Manager > Tools > FSRM > Expand Quota Management > Create Quota Template > Template Name > Storage > Limit > 50 Gigabyte > Hard Quota > Notification Threshold > Add > Event Log > Check in Send warning to event log > Report > Check in Generate Report > Check in duplicate files, file screening, large files > Ok.

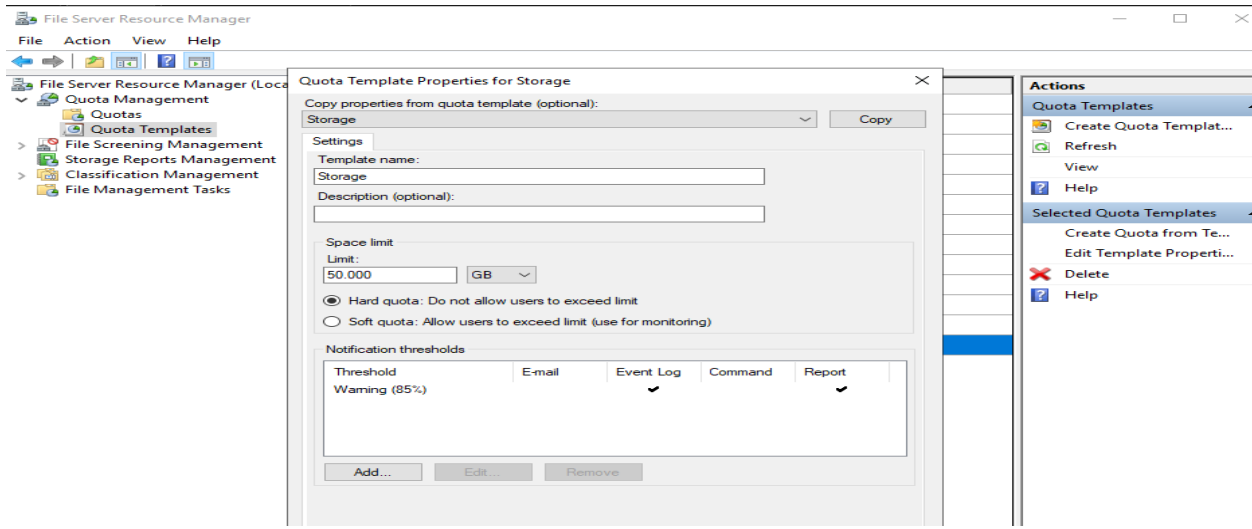


Figure 4.18.1: Creating Quota Template

After Creating Quota Template to share Folder where Domain user store Data.

Go to File Manager and Create folder > File Server > Right click > Properties > Sharing > Advanced sharing > check in share this folder > Permission > Full Control > Add groups > it > Ok.

ii. Quota Apply

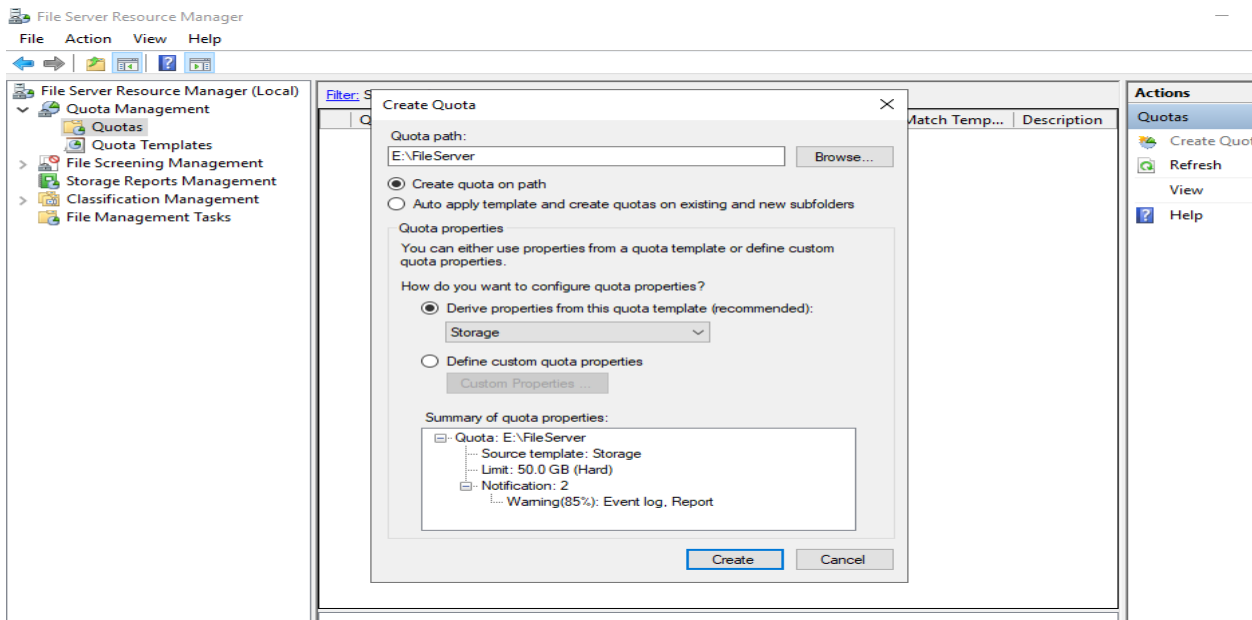


Figure 4.18.2: Quota Applying

For apply quota, Go to Server Manager > Tools > FSRM > Expand Quota Management > Quota > Create Quota > Drive Quota Path > Drive Properties Storage which we Create d > Create.

iii. File Screening Management

File Screening Management is a feature that we can control the types of files that user can store on a file server. We can set limit to user that can access and store. File management also blocking specific types of files from specific user. In our system we use once more like Head office HR department can access and edit specific files which worker of branches cant access. We can File Screening Management by using following step given below.

Firstly, we need to Create File Screening Management Template.

File Screening Management Template Create:

Go to Server Manager > Tools > FSRM > Expand File Screening Management > Create file Screening Management> Settings>Template Name>Block Audio and Video>Screening Type>Active Screening>Select file groups>Audio and Video files>ok

Now we need to Apply File Screening after creating template.

Apply File Screening

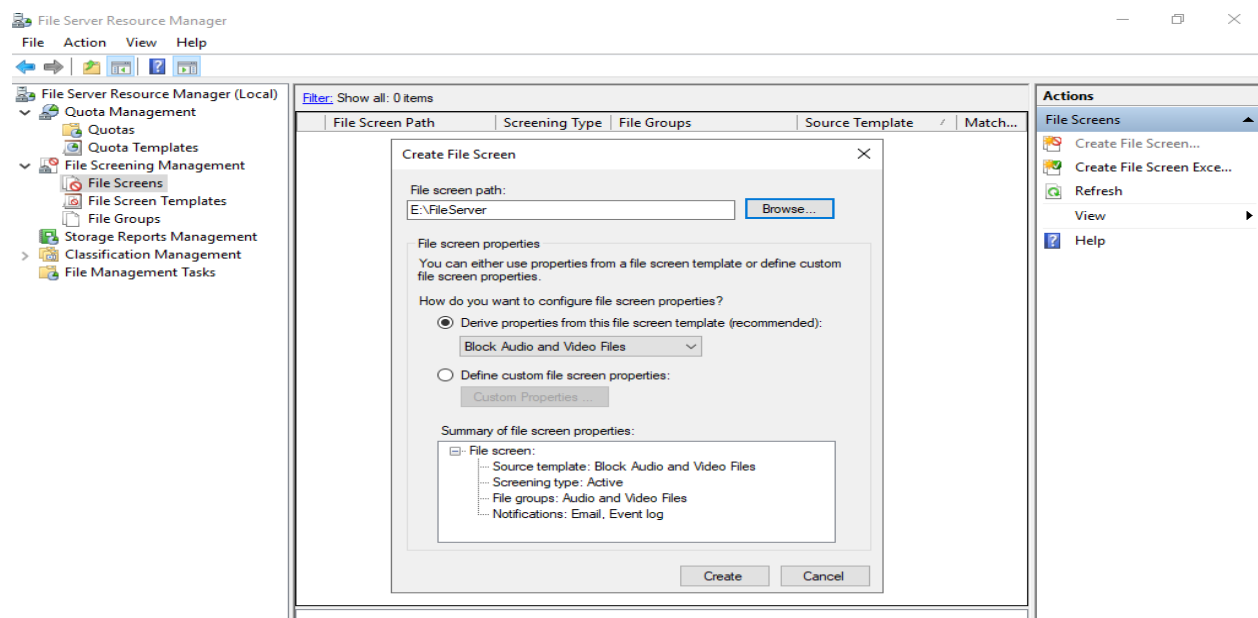


Figure 4.18.3: Applying File Screening

In **Figure 4.18.3**, after creating template we applying File Screening.

Fore applying File Screening, Go to Server Manager > Tools > FSRM > Expand File Screening Management >File Screens> Create Screen >Drive File Screen Path>Drive Properties which we Create d> Create.

Now, we can block or compress files to multiple user.

4.19 iSCSI Server

iSCSI Server stands for Internet Small Computer System Interface Server is a storage networking protocol that easy to data transfer, share storage over IP/TCP. iSCSI server has two part such as iSCSI Target and iSCSI Initiator. iSCSI target software run into iSCSI Server and define logical units as iSCSI target devices. In other hand iSCSI initiator run on different servers and connect to target server to make the storage visible that server. We configured that two part of iSCSI Server in our design. The configuration mentioned below.

iSCSI Storage Target Server Configuration:

At first we need to configure target server. For configure Target Server we need to select server role as like installing others server.

Go to ISCSI Server Manager > Dashboard > Manage > Add Roles and Features > Installation Type > Role based > Server Selection > Default > Server Role > Expand File and Storage Services > Expand File & ISCSI Services > Check in ISCSI Target Server > Features > Default > Overview > Result.

After installing Target Server it create a storage which act as backup. The installed services of the iSCSI storage that can never fault. If main server storage are full then head office and branches can use iSCSI server as a cloud server.

iSCSI Server configuration

Go to Server manager > File & Storage Services > iSCSI > Create New iSCSI Virtual Disk > Virtual Disk Location > Select Server > ISCSI Server > Select Volume > C: > Virtual Disk Name > iSCSI1 > Select Virtual Disc Size > 10GB > Dynamically Expanding > ISCSI Target > New

ISCSI Target > Name > iSCSI1 > Add > Select enter a value > Type > IP Address > Value > 10.1.1.2, 10.1.1.3 (Clients IP) > Confirmation > Result.

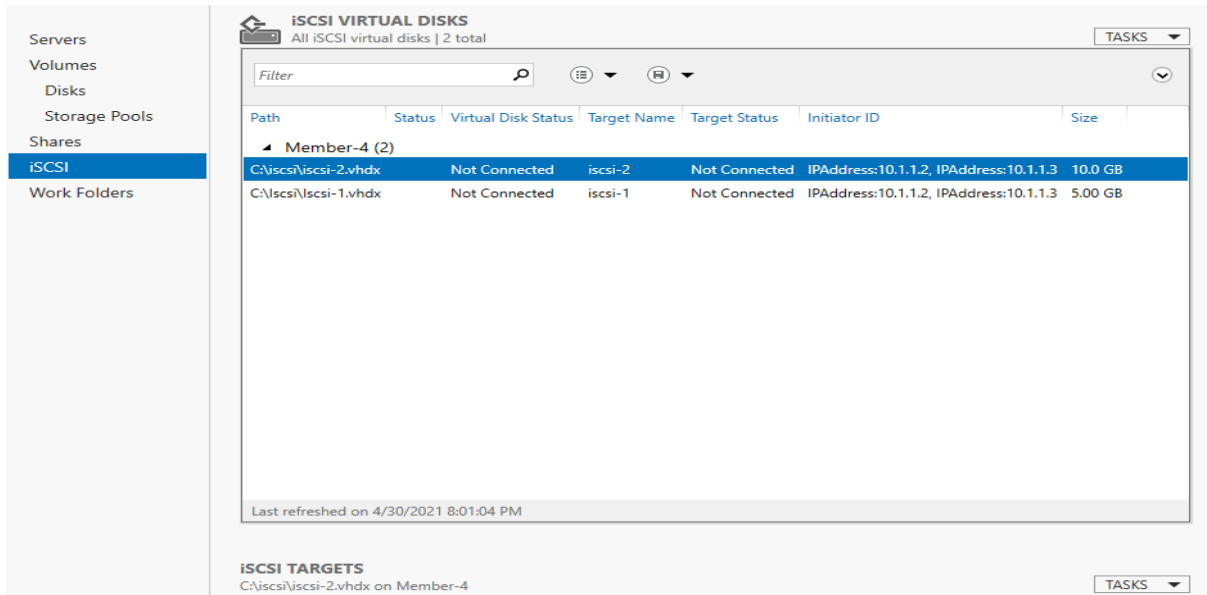


Figure 4.19.1: iSCSI Virtual Disk Management

In **Figure 4.19.1** iSCSI Virtual Disk Management state creating iSCSI virtual Disk which can use multiple user if main server are full.

Disk Enabling to Client Side

Now need to enable that into Client Side. For enabling Disk:

Go to disk management > select iSCSI storage > new storage > name > iSCSI-2 > OK.

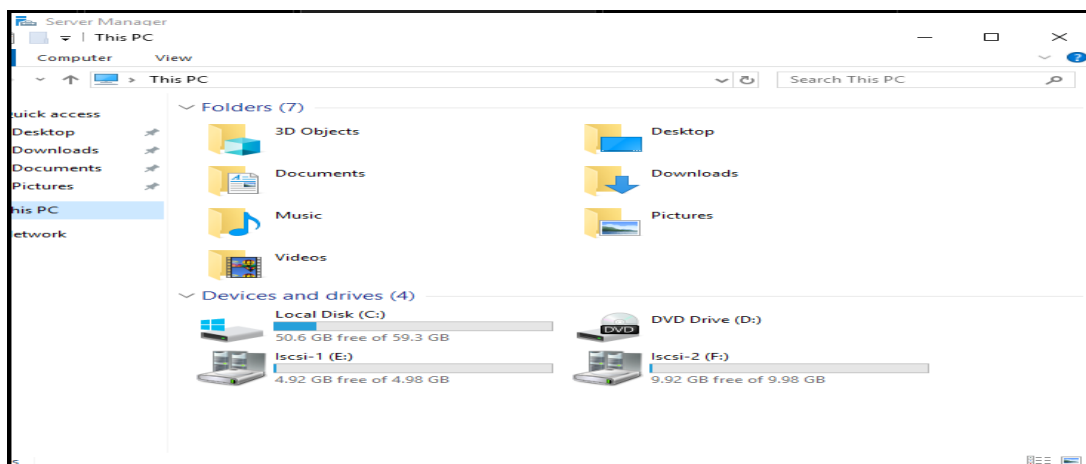


Figure 4.19.2: Creating iSCSI-2 Storage

4.20 Failover Clustering

Failover Clustering is group of server that work together to the ensure availability and scalability of clustered role. The Failover Clustering is independent group where servers work simultaneously for increase more activity in server. Like when a server fail the failover cluster make sure same services from another servers.

In our design of head office if any server fail of fault then by the failover clustering user can get same services from another server in the same time. The main advantages of Failover Cluster is without data losing server can switch if occur any problem of fail.

Failover Clustering Configuration

➤ **Step-1:**

Need to install failover clustering feature to machine which are want to setup failover cluster.

➤ **Step-2:**

Each Cluster Node are must ensure that contain same iSCSI Storage.

➤ **Step-3:**

Validity Configuration Check of nodes that cluster nodes are suitable for failover clustering.

Access Point for Administering the Cluster:

After checking validity Create new cluster > Access Point for administering the cluster > Assign a unique cluster IP > Confirmation > Creating New Cluster > Summary > Ok.

In **Figure 4.20.1**, we assigning IP for creating New Cluster from Access Point for Administering the Cluster which are mentioned below.

After creating Failover Cluster by assigning two IP we have got failover cluster manager from where we can switch server if any server fail we can get same services from another server in the same time.

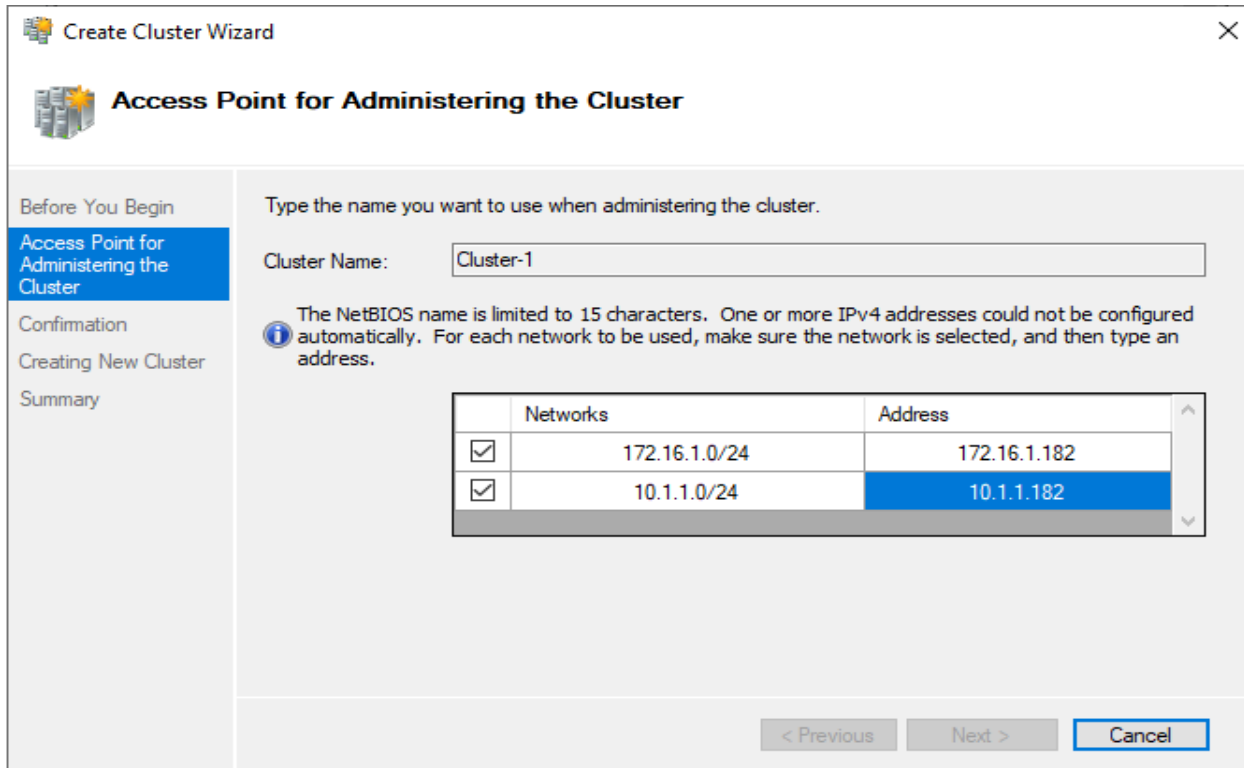


Figure 4.20.1: IP Assign for Creating Cluster

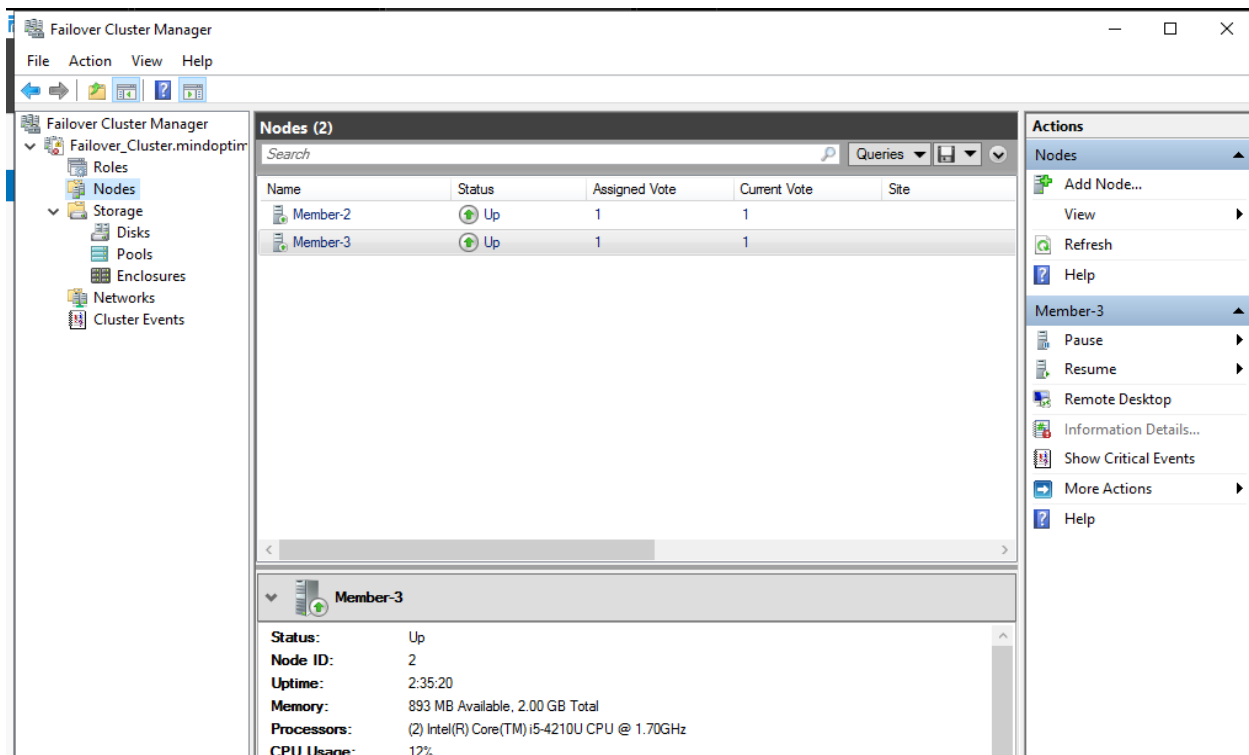


Figure 4.20.2: Failover Cluster Manager

4.21 NLB Clustering

Network Load Balancing (NLB) Clustering is the ability to balance traffic of web server. When user use single channel in web server then increase the traffic of server and it's going to slow or fail. In this case NLB balance the load of web server. If hundreds of user try to access the server it getting busy in this time NLB divided user into two channels that can be reduce trafficking in server. That ensure the scalability of server. In our design we configured Network Load Balancing which explain below.

Network Load Balancing Configuration:

- **Step-1:**

Firstly need to install NLB Feature on nodes where we want to cluster.

- **Step-2:**

Server Manager > Tools > NLB > New Cluster > Connect to host1 > Priority > 1 > Dedicated IP > Add IP Address > 192.168.1.250 > Cluster Permeates > Select IP Address > 192.168.1.250 > Internet Name > www.mindoptimizer.local > Cluster operation mode> multicast > Add Port > Port Range > 80, 443 > Protocol > Both> Ok.

- **Step-3:**

From NLB Manager > Add Host to Cluster > Host IP Address > Priority > 2 > Finish.

Figure 4.19 mentioned below state that Networking Load Balancing configured.

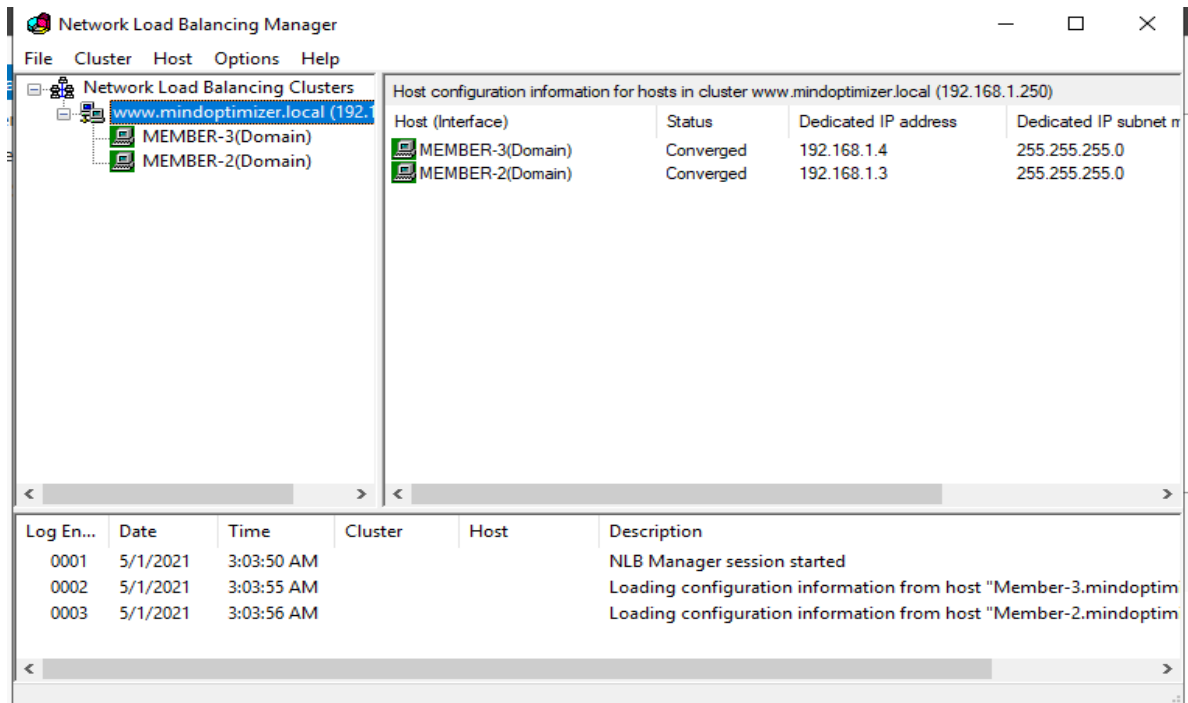


Figure 4.21: Network Load Balancing

4.22 Group Policy Management

Group Policy Management is an interface that simplifies administering GPOs. Group Policy Management has key feature that monitoring ensure limitation of user computer from admin panel which means GPOs uniform the user.

In our design, we installed some features like worker's machine doesn't able to access on control manager that means they can't install or uninstall any packages. We have used so many features like that which we are mentioned below.

Features we used in machines under this network:

- Prohibited Control Panel,
- Lock taskbar,
- Software Deployment,
- Password Policy,
- Audit Policy,

- Task Manager,
- Inbound /Outbound Rules,
- Disable Windows update,
- Bitlocker,
- Disable Local Admin,
- User Rights Assignments
- Mapped Driver,
- Prohibited Changing Proxy Settings,
- Setting the default lock screen,
- Prevent changing background,
- Set wallpaper, and so on.

CHAPTER 5

TESTING

5.1 What is testing?

Network Testing, a subset of designing and development, is a whole design testing for quality control of network infrastructure.

We tested several times to maintain quality and also check expected outcome. The testing, ensure that the environment of networking is working perfectly. We are giving few test case for different situation.

5.2 Test case 1

Test Case : This test will be check internet connectivity Head Office and Branches.

Test Procedure : Open terminal and Type ‘ping 8.8.8.8’ and hit enter.

Expected Result : Internet works perfectly in this infrastructure.

Actual Result : Internet connection filed on Branch1.

Comment : Need to check for Masquerade configuration on Firewall NAT Action.
Masquerade not configured properly. Configure it.

Conditional Test : Again open terminal and type ‘ping 8.8.8.8’ and hit enter.

Expected Result : Successfully data stored.

Actual Result : Internet working properly.

Accuracy : Accuracy depends on Networking Devices.

5.3 Test case 2

Test Case : Domain Controller (DC) control all the domain user perfectly.

Test Procedure : Try to share data in file server.

Expected Result : Successfully data stored.

Actual Result : Can’t share data in file server.

Comment : Networking and Sharing issue. Turn on Network Discovery and File and Printer Sharing.

Conditional Test : Try again to share data.

Expected Result : Successfully data stored.

Actual Result : Data shared successfully.

Accuracy : Perfectly accurate

5.4 Test Case 3

Test Case : This test will check remotely connect using VPN.

Text Procedure : Try to connect VPN connection by username and password which provided by VPN Server.

Expected Result : VPN connected successfully.

Actual Result : Working perfectly.

Comment : VPN working as expected

CHAPTER 6

CONCLUSION

7.1 Obstacles

A network project means a lot of experience. In this section we summarize the experience gained by project team during development of “Design and Implementation of Network Administration for Corporate Office”. At the same time, we faced so many problems.

1. Working with networking devices completely a new experience for us. Normally we are working with simple networking, using simple devices, servers, etc.
2. We adopt these things by video tutorials, text tutorials, and internet and learning materials given by the tools themselves. It's a matter of time, patience and hard work.
3. It is very sensible work and it demands much time because the networking designing try to connect networking environment with the real world.
4. Network designing is very difficult because you need to work with each and every point of the model.
5. The Exists design demands vast knowledge about its properties, sections and sub-sections.

After all the thing is that a networking project is not a project of 6 or 8 months for two people.

7.2 Achievements

1. Now we know much more about networking device. How it works? The properties, objects and others.
2. We know how design and implement.
3. Co-Operation between group members.
4. Develop communication skills.
5. Growing creative thinking and imagination capability.

7.3 Future Plan

- Level Extension
- Improve Hardware Configuration
- Develop Infrastructure of Networking project
- Introduce new environment and scenes
- Maintenance Server
- Now our final year project designing and implementing virtually. In future, we will make it using physical Devices and Server.

7.4 Appendices

We learned a lot through this project. This project has sharpened our concept in Networking sector, installation devices and the software-hardware interface.

We learned a lot about networking. The success of this project may give pleasure to corporate user among in our country. This project only tested our technical skills but also our temperament.

There were times that we almost lost hope but we recovered through constant concentration and hard work.

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