INTERNSHIP PROJECT ON

ENTERPRISE NETWORK MANAGEMENT WITH MIKROTIK, CISCO, TP-LINK AND LINUX

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This Report Presented in Sectional Gratification of the Requirements of the Degree of Bachelor of Science in Computing and Information System.

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APPROVAL

This internship report titled **"INTERNSHIP PROJECT ON ENTERPRISE NETWORK MANAGEMENT WITH MIKROTIK, CISCO, TP-LINK AND LINUX"**, submitted by **Aklima Asha**, ID: **183-16-356** to the Department of Computing and Information System, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computing and Information System and approved as to its style and contents. The presentation was held on 14-11-2022.

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DECLARATION

I hereby declare that; this internship has been done by me under supervision of **Dr. Mohammed Nadir Bin Ali, Registrar (In-Charge)** of Daffodil International University. I am also declaring that this project or any part of there has never been submitted anywhere else for the award of any educational degree like, B.Sc., M.Sc., Diploma or other qualifications.

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Finally, we must respectfully appreciate our parents' continuous support and perseverance.

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DEDICATION

I would like to dedicate this internship project to my father **Alamgir Sheikh.** Because without him I am nothing. Without my parent's courage, support and inspiration I am nothing but incomplete. Today I am a student of computer science because of his courage and inspiration. I also dedicate my internship project to my best friend **Abdullah**, who was my guide and mentor.

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ABSTRACT

Network management has become one of the most difficult problems for network managers due to the continual expansion in size and diversity of networking and network components. In this study, I use Mikrotik and Cisco switch to analyze the state-of-the-art enabling technologies for modern network management, including security within large enterprise networks. I go over the fundamental idea behind each one, like- Modern routing protocols, bandwidth, remote monitoring, quality of service, troubleshooting, and strategies to safeguard business computer networks against data tampering, deletion, theft, and man-in-the-middle attacks, among other things. weigh the benefits and drawbacks, and talk about how they apply to network management. I demonstrate my natural inclination in network management design by doing this.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Enterprises operate with computer, network devices in this modern area. Networking knowledge and skills are very important to operate an enterprise network. For enterprise network management routers, switch devices are very important from network connection establishment to network serving processes. Among networking router Mikrotik router, OS is very popular for easy configuration, cost friendly, bandwidth management etc. and Cisco switch is best for network connection distribution to multiple computer devices, virtual lan, number of ports etc.

It is uncertain what, when, and where these technologies are best appropriate given the plethora of supporting technologies that have emerged in recent years, all of which offer different levels of network management dispersion and advantages. What would network management look like in the future? This study seeks to shed some light on the benefits and drawbacks of these cutting-edge enabling technologies while also speculating on their potential applications in network management in the future. The study will demonstrate a common tendency in their design concept—the push for dispersed intelligence—despite their variety. In essence, management agents are now utilized as powerful computing devices rather than being viewed as "dumb terminals."

There are not many components to this work. I'll start by providing a brief overview of network management concepts, purposes, and the particular issues that the future of network management offers. I will then look at the main technologies that make network management possible. Finally, I'll contrast these systems in terms of how much network capacity they need and distributed intelligence they provide.

1.2 Background & Problem Motivation

I gained insight about how to construct an Enterprise network and how to administrate the network while working for the networking company. I uncovered the most advanced network designers' exercise. They inspire me to pursue a career as a community engineer and to learn about cutting-edge networking using Mikrotik and Cisco infrastructure. The chance to train and work with them was a tremendous pleasure. As I was collaborating there, I learned a lot of new additional information about the Mikrotik server and ISP.

1.3 Objectives

The goal of this project-based internship:

- To Getting primary and backup internet connection from ISP to Mikrotik router, IP addressing, dynamically IP address hosting, wireless internet facility, vlan by switches for enterprise internet distribution to computer devices, bandwidth management for each enterprise section, firewall ruling for users, web hosting globally via port forwarding from local network.
- Configuring cisco switches for vlan, making trunk for vlan from switch to switches.
- Constructing a network that was individually constructed by each department.
- Evaluating the network system's bandwidth management, packet losses, and data traffic delay.

1.4 Report Layout

The report is sorted as follows-

Chapter 1- In this report there is a report introduction, inspiration to the internship, Intern objectives.

Chapter 2- I have written about the company.

Chapter 3- My activities and responsibilities are there. Challenges are also in chapter 3.

Chapter 4- We can see the competencies and I have written about the smart plan and reflections on my internship.

Chapter 5- there is a conclusion and some ideas about my future plans.

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CHAPTER 2

ORGANIZATION

2.1 About Daffodil Online Ltd.

The best Internet service provider (ISP) in Bangladesh is Daffodil Online Limited. It is also one of the oldest and most prestigious organizations in the ICT sector. One of the top ISP/ASPs in Bangladesh, Daffodil On-Line (DOL) offers comprehensive integrated services and solutions. WAN infrastructure owned by fiber optic and communications systems serves both commercial and residential clients. Daffodil Online works with several domestic and foreign organizations. It improves services as needed and makes use of the most recent technologies. Modern networking and telecommunications solutions are offered by the company's Network Solution Center at incredibly low technical costs. Its executive team and technically proficient engineers are members of the world's top computer associations, including IEEE, ACM, ACS, BCS, and PMI. They also hold certifications from Cisco, Microsoft, Linux, and Oracle as well as other relevant certifications. Corporate social responsibility, digital technology, geographic location, and market.

Relationships with clients over the long term are key to their company philosophy. They represent the extraordinary future. In 2002, they set off on their quest. because they had previously voiced their thanks for what they had learned, as well as being happier and more passionate about their exercise regimens. The administrative office respects the client's recommendations and takes time constraints into account.

2.2 Product and Market Situation

Daffodil Online Ltd. takes pleasure in being one of Bangladesh's top Internet service providers (ISPs) for the whole country. Their primary business ethics are long-term relationships with their clients, making them the most seasoned and experienced organization in the ICT sector. They are incredibly happy with what we have done and much more excited about our outlook for a similarly positive future as they observe the growth over the decade since our founding.

Additionally, Daffodil Online Ltd offers unique IT services and qualified training administrations. Daffodil Online Ltd offers us certain IT-based professional training services, which are listed below:

- Corporate Internet Solution
- Security solution.
- Domain registration and web hosting.
- Open-source application solution.

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- Internet Service Provider
- State of the Art Data Centers.
- Hi speed Wi-Fi Zone.
- Data Connectivity, Data center & Co-Location.
- Bulk SMS Service.
- Proxy & DNS Server solution
- Mail Server Solution.

Professional Training Services

- ISP Setup & Administration using Mikrotik.
- MYSQL and PHP for website Development.
- ISP setup & Administration using Linux.
- Red HAT Certified Engineer.
- Training Course on Ethical hacking (CEH).
- Red HAT Certified Security Specialist.
- E-Commerce & Open-source Joomla VirtueMart.

2.3 Target Group

All customers and all small-to medium-sized enterprises, including startups, are among the company's clients. Since SOHO customers are the ideal targets for our new high-speed solutions and have the greatest opportunity for business growth, the company intends to focus on them. These market sectors, in the opinion of Web Solutions, have unique price and service requirements and attract more devoted, trustworthy clients.

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2.4 SWOT Analysis

SWOT analysis is a planning technique for figuring out a person's and an organization's strengths, weaknesses, opportunities, and threats while planning a company or other endeavor.

Strengths:

- ➔ Good communication skill
- ➔ Good poison on market
- ➔ It’s a famous company
- ➔ Produce good service

Weakness:

- ➔ Lack of experience
- ➔ Crisis of employ
- ➔ Low assets
- ➔ Lake of management

Opportunities:

- ➔ When competitors start to accept new developments more cautiously.
- ➔ Expanding the company sector with new opportunities in the future.
- ➔ Strengthening local businesses

Threats:

- ➔ Ecological Crisis As broadband memberships increase, homeowners' faith in financial exchanges and the electronic mail market declines.
- ➔ How far customers may be convinced to accept Internet access is still up for debate.

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2.5 Organizational Structure of Daffodil Online Limited

Organizational Structure of Daffodil online limited is shown in fig: 2.5

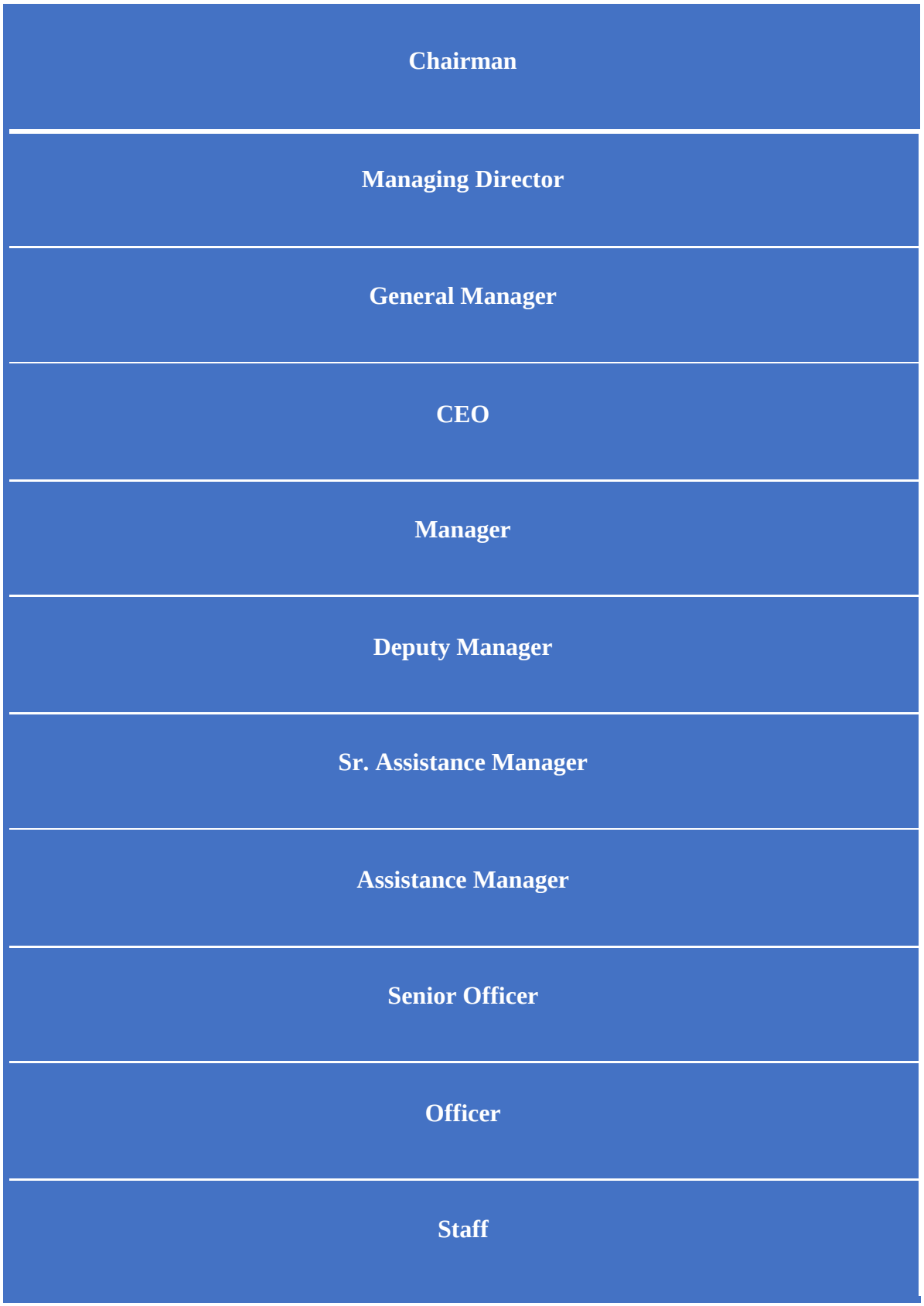

Figure 2.5: Organizational Structure of DOL

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CHAPTER 3

INTERNSHIP PROJECT ACTIVITIES

This chapter explains how I started to understand how a network diagram for an enterprise should be designed. How internet access is provided by ISPs.

3.1 Activities by Month

Planning for my Enterprise setup

- One Mikrotik Router as a core router for enterprise
- Three Cisco switches for VLANs
- Two wifi routers for wireless network setups and range extendings
- Laptop, desktop computers for configurations and connectivity testing
- Knowledge of Network IP range and class wise address.

3.2 Challenges

- Two internet connections from ISP are a challenge where everyone configures one internet connection first. The connections will load balanced bandwidths to the router.
- One ISP connection will take a bandwidth route for more than other ISP connections.
- Failover will be configured on the router for a backup internet connection.
- Bandwidth management for enterprise software, and web applications like Google Meet, ZOOM, Microsoft Teams, etc.
- VLAN from Mikrotik router to Cisco switches rather than from Cisco router to Cisco switch where everyone does this Cisco-to-Cisco configuration most.
- VLAN DHCP pool.
- Wireless device-to-device range extending

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3.3 Mikrotik, Cisco, TP-Link, Linux Server OS

3.3.1 Mikrotik OS

MikroTik RouterOS, a Linux-based operating system, is the company's flagship product. The software that runs on MikroTik RouterBOARD hardware is called MikroTik RouterOS. Moreover, it may be installed on a PC, converting it into a router with all the required functions, including routing, firewall protection, bandwidth control, wireless access points, backhaul connections, hotspot gateways, VPN servers, and more.

The stand-alone operating system RouterOS is based on the Linux v2.6 kernel, and MikroTik intends to provide all these characteristics with a quick and straightforward installation and an intuitive user interface.

A robust yet simple to use command-line configuration interface with built-in scripting capabilities is a feature of Mikrotik RouterOS.

- Winbox GUI via MAC and IP
- A CLI featuring Telnet, SSH, Local console, and Serial console; and
- A CLI including Telnet, SSH, Local console, and Serial console; and
- Web-based interface.

3.3.2 Cisco IOS

The majority of Cisco routers and switches run the multitasking operating system known as CISCO IOS (Internetwork Operating System). The command-line interface for IOS contains a fixed quantity of multi-word commands. Routing, switching, internetworking, and other features offered by Cisco equipment are configured using this operating system.

A network administrator can use the numerous additional services provided by Cisco IOS, in addition to routing and switching, to enhance the speed and security of network traffic. These services include proxy functionality, intelligent routing, deep packet inspection, policy enforcement, authentication, encryption, and firewall capabilities. IOS can provide call processing and unified communications in Cisco's Integrated Services Routers (ISRs).

IOS operating systems come in two different varieties:

IOS XE is implemented by the Linux kernel. While IOS XE and IOS share a lot of the same code, IOS XR is regarded as having a completely unique code base.

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IOS XR is a commercial, Unix-like real-time operating system that is based on QNX. The embedded systems segment and software-defined networking (SDN) are enabled by IOS XR.

3.3.3 TP-Link Wi-Fi Router OS

A TP-Link router is a device that allows communication between the internet and home and workplace computers that have internet connections. Its "routes" traffic between the devices and the internet, as its name suggests. This device is also built on the Router OS platform.

The foundation of our home's internet network is a router. Our laptop, phone, smart TV, and other gadgets can all connect to our home or business Wi-Fi as a result of it. The strength of TP-Link Wi-Fi signals within a house mostly depends on the size of the house and any obstructions in the way of the signals. Wi-Fi-connected devices including smartphones, laptops, tablets, and more are connected to wireless routers using radio frequencies to broadcast the internet. Speed and range are the main factors that separate 2.4 GHz and 5 GHz Wi-Fi. While 2.4 GHz frequencies offer slower speeds over a longer distance, 5 GHz frequencies offer greater speeds over a closer distance.

3.3.4 Linux Server OS

A software variant known as a "Linux server" is created to satisfy the more demanding operational and storage requirements of bigger enterprises and their software. Since Linux servers outperform ordinary Windows servers in terms of reliability, security, and flexibility, they are currently among the most extensively utilized and are also among the most well-liked.

The fact that Linux is completely open-source as opposed to closed-source programs like Windows is another significant advantage. Even many of the proprietary variations of the common Linux OS (such as Debian, CentOS, Ubuntu, and Red Hat) provide customers a great deal of freedom in terms of setting up, running, and maintaining their servers, which helps keep setup and maintenance costs low.
Furthermore, Linux servers are typically easier to run on both physical and cloud infrastructure.

Because Linux is well recognized for giving consumers a high level of control, it's also a great tool for software developers and even IT teams. Linux grants IT professionals complete root access to their servers, enabling teams to configure anything from the most fundamental settings to intricate authorization schemes that prevent duplication and lessen the need for hands-on supervision.

For a number of reasons, Linux servers are among the most popular in use globally. Linux is substantially less expensive than Windows and other proprietary software, and it allows you more flexibility when setting up your servers initially. One aspect of this is the capability to manage several apps on one server.

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3.4 How I Used Mikrotik, TP-Link, Cisco IOS and Linux Server in My Project

As my project is Enterprise Network Management and security with mikrotik and cisco switch. So here I use a router to manage the enterprise network, which is mikrotik OS. Two internet connections from both public IP addresses connect to Mikrotik red RB 2011 ether port. Here I have defined two ISPs in the core routes as labs. so that social media like Facebook, YouTube, bandwidth pressure and second ISP can load. I have declared two ISPs as fellows on the router so that the enterprise works with the other one if the internet is not available for backup. Three VLANs are defined on a port of the MikroTik router that is enterprise network distributed. MikroTik Router's Firewall Packets are Filtering like Google meet, Zoom, Microsoft teams for Bandwidth, so that when they are used they get higher internet speed. Internet speed is declared by tuning the Google cache server so that using YouTube in the lab will get higher Internet speed. The website is hosted with Xampp so that the website can be accessed from the public IP address after port forwarding on the Mikrotik router. Similarly, it is possible to forward CCTV port here.

I use three Cisco switches here to manage my enterprise network. VLANs are configured on the Cisco switches. The VLANs of the switch are passed by the trunk.

For managing an entire enterprise network, I prefer MikroTik routers and Cisco switches here. Because the bandwidth management of MikroTik routers can be done very easily. All types of client connections are available in the Mikrotik router. Cisco switches have multiple ports that are easy to connect with VLANs.

3.5 Features

3.5.1 Mikrotik Router features

- Bandwidth management.
- Client connection services.
- It supports OSPF, BGP, Multiprotocol Label Switching (VPLS/MPLS), Open Flow, and other protocols**.**
- It can operate as a switch or a bridge.
- Supports PPPoE Client-Server functionality.
- VPN-Virtual Private Network-provider.
- Firewall rules are provided.
- Enable DHCP Server support.
- Include a Wi-Fi and captive platform Hotspot System.
- It is incredibly simple to manage bandwidth.
- Simple graphical user interface.
- Simple administration.

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- IPv4 and IPv6 are both supported.

3.5.2 Cisco Switch features:

- Maximum switching capacity; up to 550 GB/s per slot, 15 TB/s per chassis
- Maximum aggregated density of 10 Gigabit Ethernet ports; up to 512 ports per chassis
- Increased high availability; in-service software update with no hitch (ISSU)
- Trust and virtual device context are optimized for secure virtualized settings.
- Ideal for central data center installations and congested campuses.

3.5.3 TP Link Router features:

- Control Method: Application; Security Protocol: Wps
- Wireless security methods 64/128/152-bit WEP / WPA / WPA2, WPA-PSK / WPA2-PSK
- Enhanced Coverage: Exterior antennas with beamforming technology that focus and enhance Wi-Fi transmissions are used.
- The 5GHz band's MU-MIMO technology enables several devices to operate at high speeds concurrently.
- An excellent wireless router for the house is one that supports access point mode (AP Mode), which turns your wired connection into a wireless network.
- WPA3's Advanced Security features give personal networks more cybersecurity protection. WPA3 is the newest Wi-Fi security standard.
- One Mesh from TP-Link is a convenient method to create a Wi-Fi network with a single Wi-Fi name for seamless whole-home coverage. Wi-Fi Extender One Mesh
- Compatible with all ISPs, including AT&T, Verizon, Xfinity, Charter, RCN, Cox, CenturyLink, and Frontier (a modem is required for most internet service providers)

3.5.4 Linux Server features:

- Multiple users can use the same system resources, such as RAM and hard drives, simultaneously. But in order to function, they must utilize several terminals.
- Multitasking: By wisely allocating the CPU's time, many tasks can be carried out at once.
- Its portability does not imply that it is lower in file size or that it can be carried in memory cards or pen drives. It indicates that it supports a variety of hardware kinds.
- Security: It offers three levels of security, including authentication (by assigning a password and login ID), authorization (by granting read, write, and execute access), and encryption (converts file into an unreadable format).

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- Almost all Linux distributions include a live CD or USB so that users may run or test it out without installing it.
- Graphical User Interface (X Window System): Linux is a command line-based operating system, but adding packages allows it to become GUI-based.
- Because it is used globally, it supports several language keyboards. Supports customizable keyboard.
- Application support: Users may download and install a variety of programs from its own software repository.
- A hierarchical file system is provided, allowing for the organization of files and folders.
- Open Source: Linux is a community-based development project with code that is freely accessible to everyone.

3.6 Mikrotik, Tp-Link, Cisco Switch Device Details:

3.6.1 Mikrotik Details

The Mikrotik RB2011 is a cheap router having 10 ethernet ports that have LEDs that indicate how much use they are getting**.**A low cost multi-port device series is the RB2011Ui. designed for indoor use, available in a broad range of enclosures, and providing a variety of options.

The RB2011 is run by RouterOS, a fifteen-year-old routing operating system with all the bells and whistles. Just a few of the many capabilities offered by RouterOS include dynamic routing, hotspot, firewalls, MPLS, VPNs, sophisticated quality of service, bandwidth allocation and bonding, and real-time configuration and monitoring.

From all of our Wireless routers, RouterBOARD 2011UiAS-2HnD has the most functionality and interfaces. It has an SFP cage (SFP module not included!), 128MB RAM, five Gigabit LAN ports, five Fast Ethernet LAN ports, and a new Atheros 600MHz 74K MIPS network CPU. Additionally, it has a RouterOS L5 license and a strong twin chain 2.4Ghz (2312-2732MHz depending on region requirements) 802.11bgn wireless AP.

2011UAS-2HnD-IN RouterBOARD consists of a power supply, LCD panel, and desktop enclosure.

The final port (ETH10) on the RB2011Ui also supports passive PoE output, so you can power an additional device by simply connecting it through an ordinary Ethernet cable.

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Figure 3.6.1: Mikrotik RB2011 router

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3.6.2 TP-Link Details

TP-Link TL-WR940N 450Mbps Wireless N Router TP-Link, a company that manufactures of trustworthy network equipment and accessories, was launched in 1996 and is present in many facets of modern life.

With a track record of security, reliability, and quality, TP-Link has chosen a range of devices to satisfy every user's networking requirements.The firm is already growing now to meet the expectations of tomorrow as the connected lifestyle continues to develop.

Figure 3.6.2: TP-Link TL-WR940N 450Mbps Wireless N Router

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3.6.3 Cisco Details

Cisco switch SG350X-24PD For Enterprise Networks, data centers, and smaller enterprises, Cisco offers a wide range of switching solutions. These solutions are tailored for a variety of sectors, including the public sector, financial services

Figure 3.6.3: Cisco switch SG350X-24PD

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CHAPTER 4

INTERNSHIP PROJECT CONFIGURATION

4.1 Internship LAB Diagram

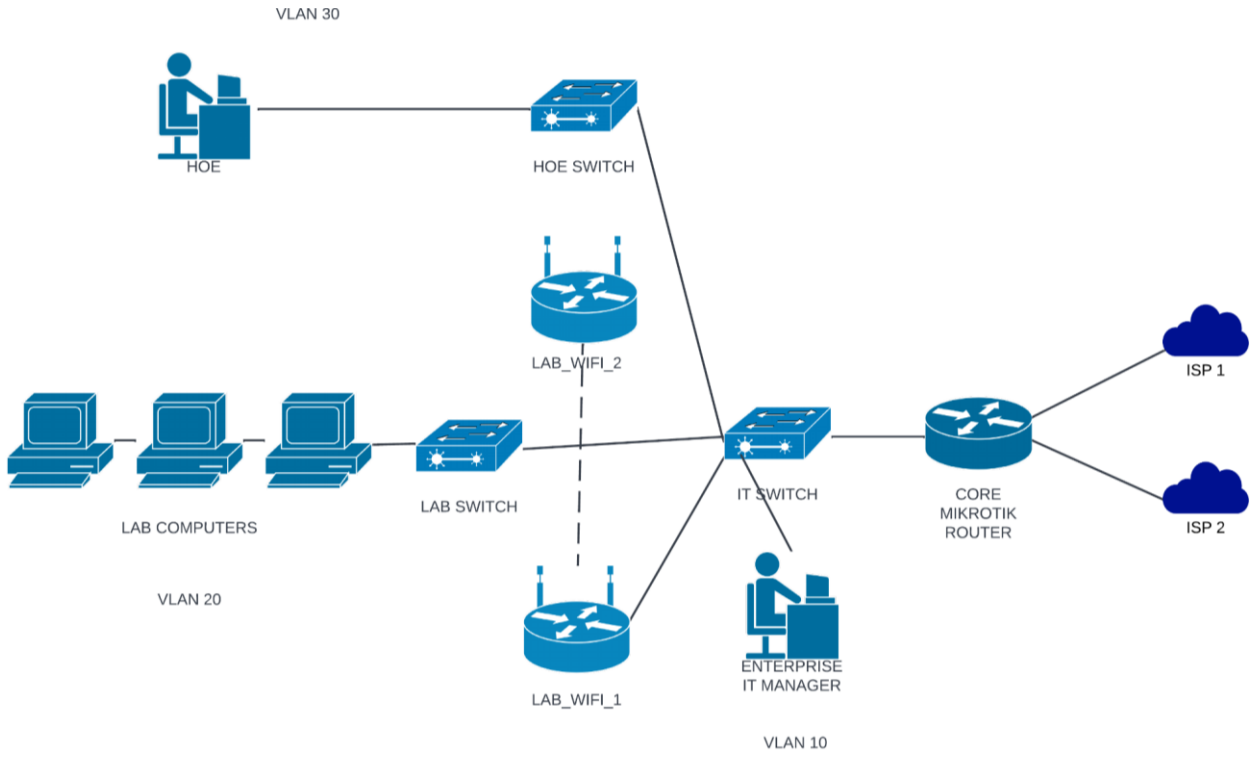

Figure 4.1: Diagram of enterprise devices

4.2 Mikrotik First, Basic Configurations

Connect ethernet port to Mikrotik router and PC

Figure 4.2.1: Mikrotik, Cisco, TP-Link device configuration at DOL

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- **Step 1 for Putty**

Download open “Putty”, connect to Mikrotik router.

Figure 4.2.2: WinBox GUI to connect Mikrotik router

- **Step 2 for Identity**

Click on System > Identity > set name “CORE_ROUTER” > click OK to save.

Figure 4.2.3: Mikrotik router identity named

- **Step 3 for Ethernet Port Name**

Click on Interface > double click to connect ether port > rename > click OK to save.

Etherports renamed to “ether1_fom_ISP_1”, “ether2_from_ISP_2” and “ether3_to_IT_SWITCH”.

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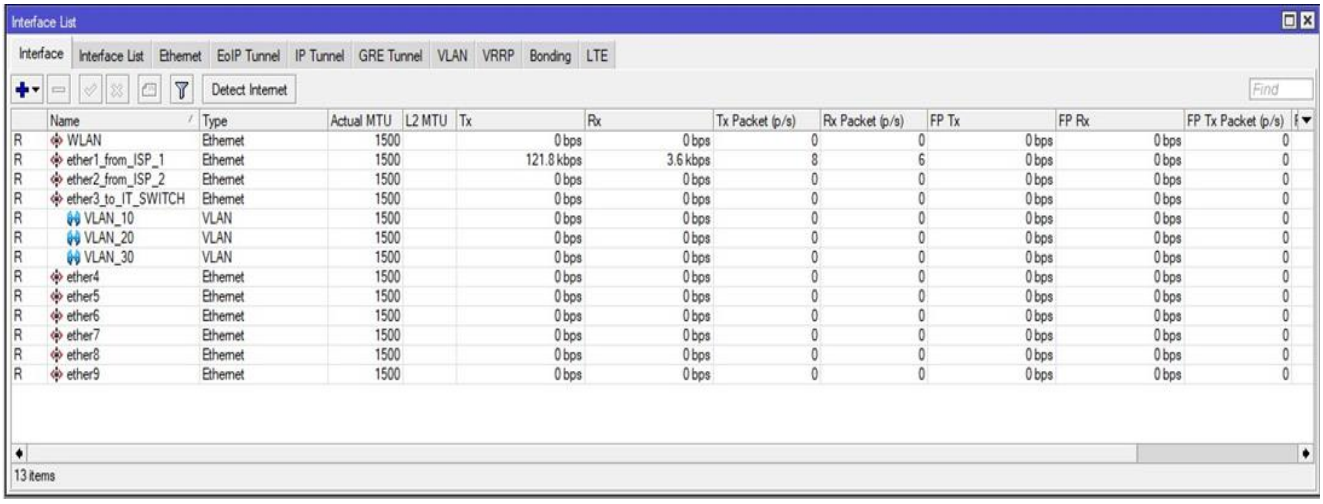
- **Step 4 for VLAN**

Click on VLAN > '+' click to add new vlan > set vlan name > select "VLAN ID" > click OK to save.

VLAN configured to "VLAN_10","VLAN_20","VLAN_30" and "VLAN_40".



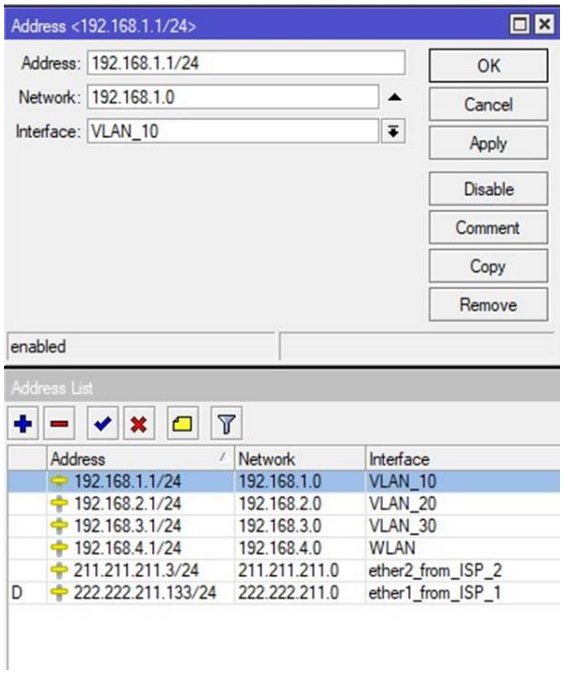
	Name	Type	Actual MTU	L2 MTU	Tx	Rx	Tx Packet (p/s)	Rx Packet (p/s)	FP Tx	FP Rx	FP Tx Packet (p/s)
R	WLAN	Ethernet	1500		0 bps	0 bps	0	0	0 bps	0 bps	0
R	ether1_from_ISP_1	Ethernet	1500		121.8 kbps	3.6 kbps	8	6	0 bps	0 bps	0
R	ether2_from_ISP_2	Ethernet	1500		0 bps	0 bps	0	0	0 bps	0 bps	0
R	ether3_to_IT_SWITCH	Ethernet	1500		0 bps	0 bps	0	0	0 bps	0 bps	0
R	VLAN_10	VLAN	1500		0 bps	0 bps	0	0	0 bps	0 bps	0
R	VLAN_20	VLAN	1500		0 bps	0 bps	0	0	0 bps	0 bps	0
R	VLAN_30	VLAN	1500		0 bps	0 bps	0	0	0 bps	0 bps	0
R	ether4	Ethernet	1500		0 bps	0 bps	0	0	0 bps	0 bps	0
R	ether5	Ethernet	1500		0 bps	0 bps	0	0	0 bps	0 bps	0
R	ether6	Ethernet	1500		0 bps	0 bps	0	0	0 bps	0 bps	0
R	ether7	Ethernet	1500		0 bps	0 bps	0	0	0 bps	0 bps	0
R	ether8	Ethernet	1500		0 bps	0 bps	0	0	0 bps	0 bps	0
R	ether9	Ethernet	1500		0 bps	0 bps	0	0	0 bps	0 bps	0

Figure 4.2.4: Renamed interfaces and VLANs on Mikrotik router

- **Step 5 for IP Address**

Click on IP > Address > '+' click to add new ip address > set Address name > select Network > select Interface > click OK to save.

Ip addresses added to "VLAN_10", "VLAN_20", "VLAN_30", "VLAN_40", "ether1_from_ISP_1", "ether2_from_ISP_2".



	Address	Network	Interface
	192.168.1.1/24	192.168.1.0	VLAN_10
	192.168.2.1/24	192.168.2.0	VLAN_20
	192.168.3.1/24	192.168.3.0	VLAN_30
	192.168.4.1/24	192.168.4.0	WLAN
	211.211.211.3/24	211.211.211.0	ether2_from_ISP_2
D	222.222.211.133/24	222.222.211.0	ether1_from_ISP_1

Figure 4.2.5: IP address configuration on interfaces and VLANs

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- **Step 6 for DNS**

Click on IP > DNS > set Servers > click OK to save.

DNS Servers set to 8.8.8.8, 8.8.4.4, 222.222.211.2

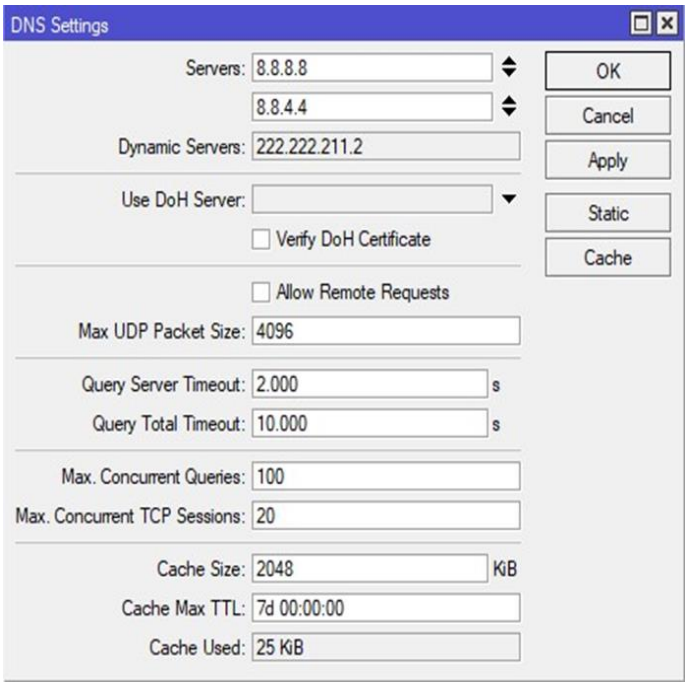

Figure 4.2.6: DNS configuration

- **Step 7 for NAT**

Click on IP > Firewall > NAT > '+' click to add new configuration > set chain to 'src-nat' > select action type to 'masquerade' > select Out Interface > click OK to save.

NAT configured for Out Interfaces of "ether1_from_ISP_1" and "ether2_from_ISP_2".

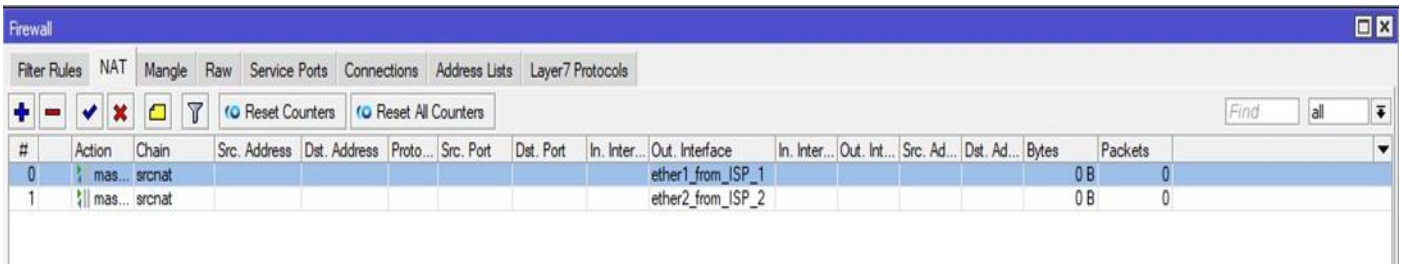

Figure 4.2.7: NAT configuration on firewall

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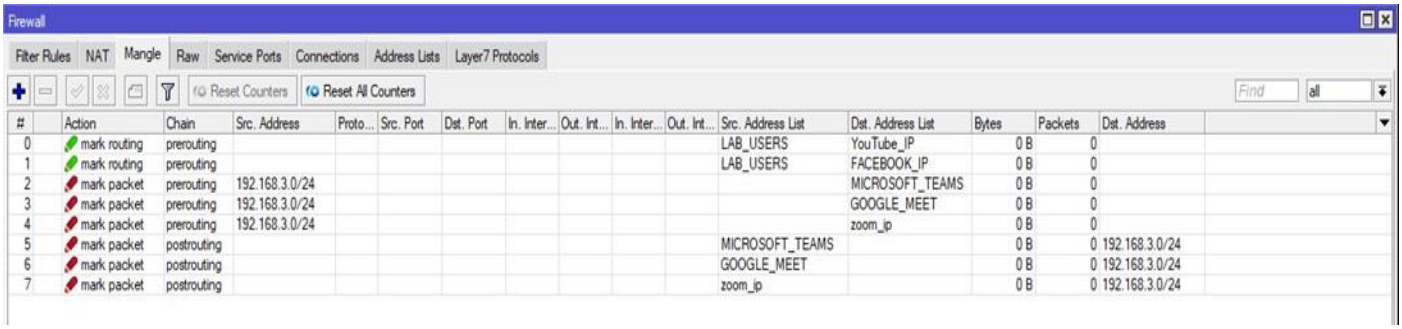
- **Step 8 for Load Route**

Click on IP > Firewall > Mangle > '+' click to add new configuration > set action to 'mark routing'/ 'mark packet' > select chain type to 'prerouting' > set src address > select Src. Address List > select Dst. Address List > set dst address > click OK to save.

Load route, prerouting, failover configured via Mangle.



Firewall

Filter Rules | NAT | Mangle | Raw | Service Ports | Connections | Address Lists | Layer7 Protocols

Reset Counters | Reset All Counters | Find | all

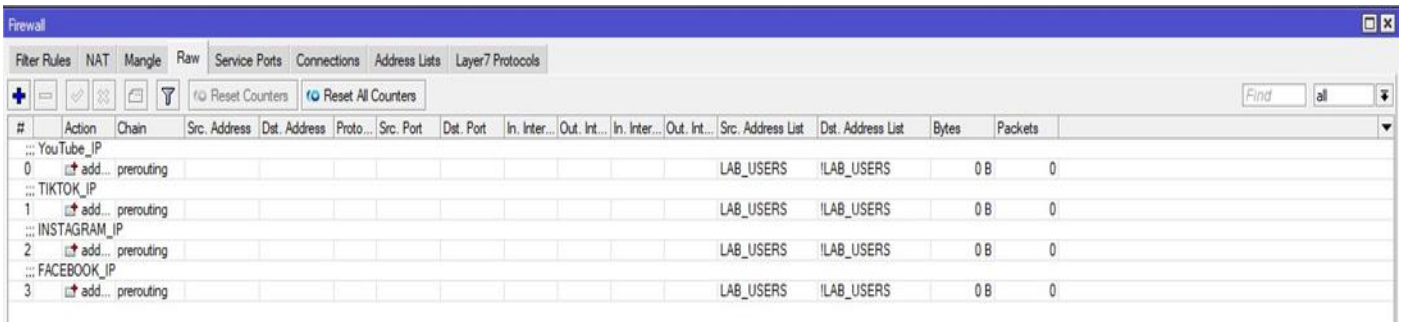
#	Action	Chain	Src. Address	Proto...	Src. Port	Dst. Port	In. Inter...	Out. Int...	In. Inter...	Out. Int...	Src. Address List	Dst. Address List	Bytes	Packets	Dst. Address
0	mark routing	prerouting									LAB_USERS	YouTube_IP	0 B	0	
1	mark routing	prerouting									LAB_USERS	FACEBOOK_IP	0 B	0	
2	mark packet	prerouting	192.168.3.0/24									MICROSOFT_TEAMS	0 B	0	
3	mark packet	prerouting	192.168.3.0/24									GOOGLE_MEET	0 B	0	
4	mark packet	prerouting	192.168.3.0/24									zoom_ip	0 B	0	
5	mark packet	postrouting									MICROSOFT_TEAMS		0 B	0	192.168.3.0/24
6	mark packet	postrouting									GOOGLE_MEET		0 B	0	192.168.3.0/24
7	mark packet	postrouting									zoom_ip		0 B	0	192.168.3.0/24

Figure 4.2.8: Load route, pre routing, failover configured

- **Step 9 for Load Route**

Click on IP > Firewall > RAW > '+' click to add new configuration > set action > select chain type to 'prerouting' > select Src. Address List > select Dst. Address List > set dst address > click OK to save.

Social media load route configured for lab users.



Firewall

Filter Rules | NAT | Mangle | Raw | Service Ports | Connections | Address Lists | Layer7 Protocols

Reset Counters | Reset All Counters | Find | all

#	Action	Chain	Src. Address	Dst. Address	Proto...	Src. Port	Dst. Port	In. Inter...	Out. Int...	In. Inter...	Out. Int...	Src. Address List	Dst. Address List	Bytes	Packets
;;; YouTube_IP															
0	add...	prerouting										LAB_USERS	!LAB_USERS	0 B	0
;;; TIKTOK_IP															
1	add...	prerouting										LAB_USERS	!LAB_USERS	0 B	0
;;; INSTAGRAM_IP															
2	add...	prerouting										LAB_USERS	!LAB_USERS	0 B	0
;;; FACEBOOK_IP															
3	add...	prerouting										LAB_USERS	!LAB_USERS	0 B	0

Figure 4.2.9: Load route configuration

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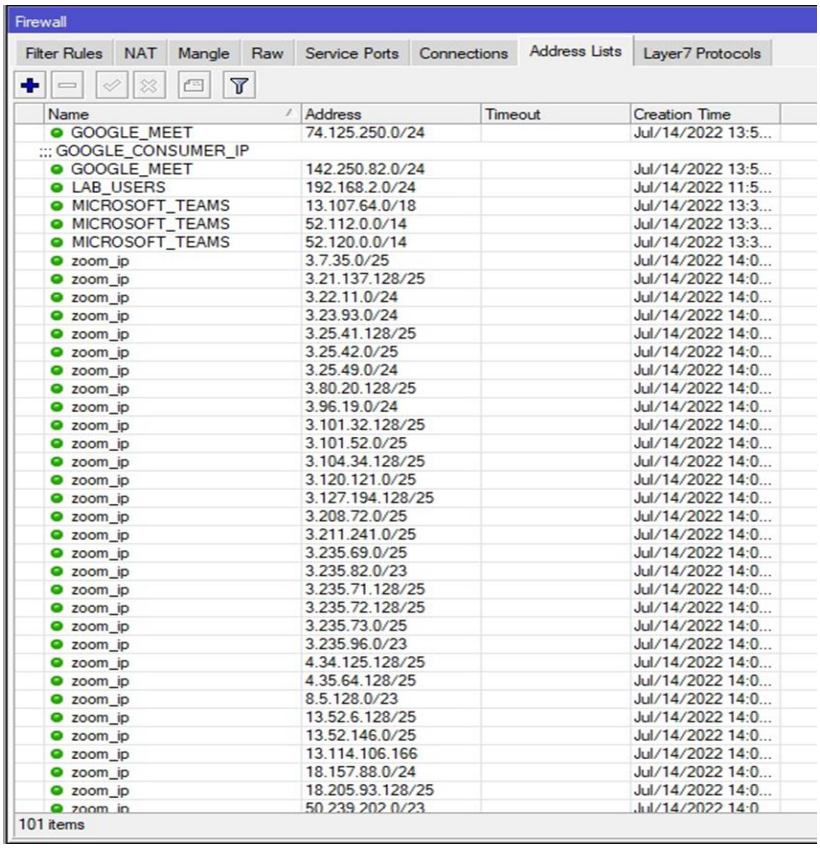
- **Step 10 for Address Lists**

Click on IP > Firewall > Address Lists > '+' click to add new configuration > set name > set Address > click OK to save.

Video calling softwares ip addresses added to Address Lists



Firewall

Filter Rules | NAT | Mangle | Raw | Service Ports | Connections | Address Lists | Layer7 Protocols

Name	Address	Timeout	Creation Time
GOOGLE_MEET	74.125.250.0/24		Jul/14/2022 13:5...
::: GOOGLE_CONSUMER_IP			
GOOGLE_MEET	142.250.82.0/24		Jul/14/2022 13:5...
LAB_USERS	192.168.2.0/24		Jul/14/2022 11:5...
MICROSOFT_TEAMS	13.107.64.0/18		Jul/14/2022 13:3...
MICROSOFT_TEAMS	52.112.0.0/14		Jul/14/2022 13:3...
MICROSOFT_TEAMS	52.120.0.0/14		Jul/14/2022 13:3...
zoom_ip	3.7.35.0/25		Jul/14/2022 14:0...
zoom_ip	3.21.137.128/25		Jul/14/2022 14:0...
zoom_ip	3.22.11.0/24		Jul/14/2022 14:0...
zoom_ip	3.23.93.0/24		Jul/14/2022 14:0...
zoom_ip	3.25.41.128/25		Jul/14/2022 14:0...
zoom_ip	3.25.42.0/25		Jul/14/2022 14:0...
zoom_ip	3.25.49.0/24		Jul/14/2022 14:0...
zoom_ip	3.80.20.128/25		Jul/14/2022 14:0...
zoom_ip	3.96.19.0/24		Jul/14/2022 14:0...
zoom_ip	3.101.32.128/25		Jul/14/2022 14:0...
zoom_ip	3.101.52.0/25		Jul/14/2022 14:0...
zoom_ip	3.104.34.128/25		Jul/14/2022 14:0...
zoom_ip	3.120.121.0/25		Jul/14/2022 14:0...
zoom_ip	3.127.194.128/25		Jul/14/2022 14:0...
zoom_ip	3.208.72.0/25		Jul/14/2022 14:0...
zoom_ip	3.211.241.0/25		Jul/14/2022 14:0...
zoom_ip	3.235.69.0/25		Jul/14/2022 14:0...
zoom_ip	3.235.82.0/23		Jul/14/2022 14:0...
zoom_ip	3.235.71.128/25		Jul/14/2022 14:0...
zoom_ip	3.235.72.128/25		Jul/14/2022 14:0...
zoom_ip	3.235.73.0/25		Jul/14/2022 14:0...
zoom_ip	3.235.96.0/23		Jul/14/2022 14:0...
zoom_ip	4.34.125.128/25		Jul/14/2022 14:0...
zoom_ip	4.35.64.128/25		Jul/14/2022 14:0...
zoom_ip	8.5.128.0/23		Jul/14/2022 14:0...
zoom_ip	13.52.6.128/25		Jul/14/2022 14:0...
zoom_ip	13.52.146.0/25		Jul/14/2022 14:0...
zoom_ip	13.114.106.166		Jul/14/2022 14:0...
zoom_ip	18.157.88.0/24		Jul/14/2022 14:0...
zoom_ip	18.205.93.128/25		Jul/14/2022 14:0...
zoom_ip	50.239.202.0/23		Jul/14/2022 14:0...

101 items

Figure 4.2.10: Address list of video meeting softwares and lab users

- **Step 11 for Failover**

Click on IP > Route List > double click to Gateway interface of ISP 2 address > set Distance to 2 > click OK to save.

Failover configured.

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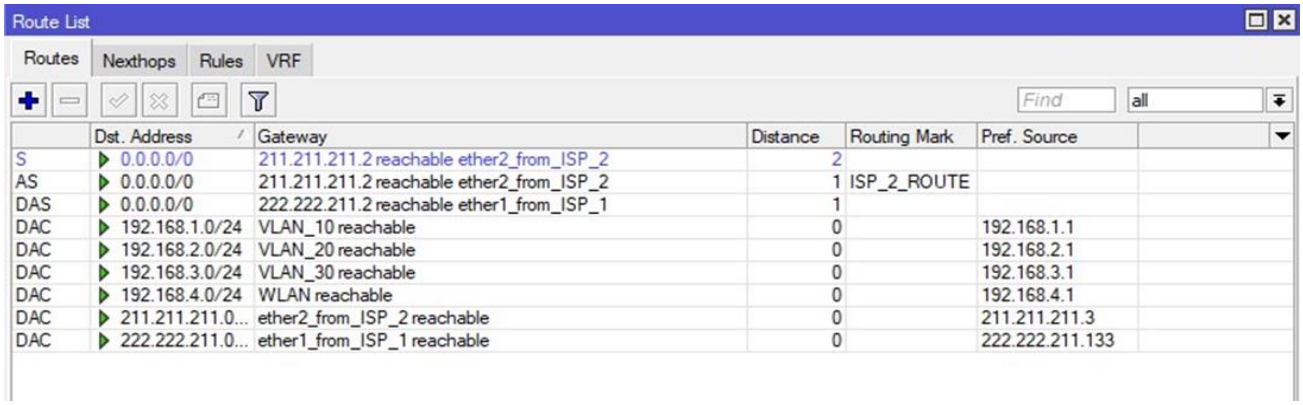

Route List

Routes | Nexthops | Rules | VRF

Find | all

	Dst. Address	Gateway	Distance	Routing Mark	Pref. Source
S	0.0.0.0/0	211.211.211.2 reachable ether2_from_ISP_2	2		
AS	0.0.0.0/0	211.211.211.2 reachable ether2_from_ISP_2	1	ISP_2_ROUTE	
DAS	0.0.0.0/0	222.222.211.2 reachable ether1_from_ISP_1	1		
DAC	192.168.1.0/24	VLAN_10 reachable	0		192.168.1.1
DAC	192.168.2.0/24	VLAN_20 reachable	0		192.168.2.1
DAC	192.168.3.0/24	VLAN_30 reachable	0		192.168.3.1
DAC	192.168.4.0/24	WLAN reachable	0		192.168.4.1
DAC	211.211.211.0...	ether2_from_ISP_2 reachable	0		211.211.211.3
DAC	222.222.211.0...	ether1_from_ISP_1 reachable	0		222.222.211.133

Figure 4.2.11: All route list of Mikrotik router

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- **Step 12 for Script**

Click on System > Script > '+' click to add new configuration > set name > set script > click OK to save > run script.

Script created for "Scheduled email backup" and "Video calling software ZOOM's" ip addresses added to Address List.

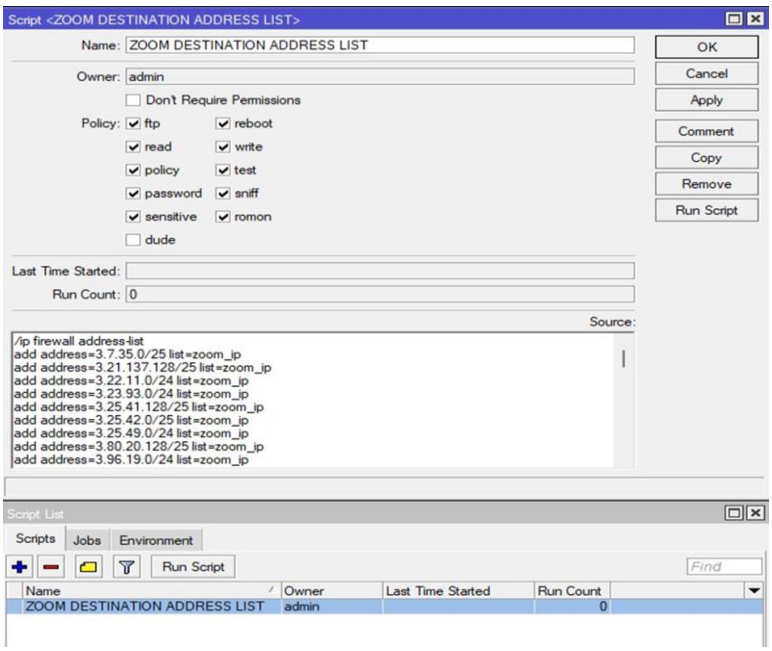

Figure 4.2.12: Mikrotik scripts configuration

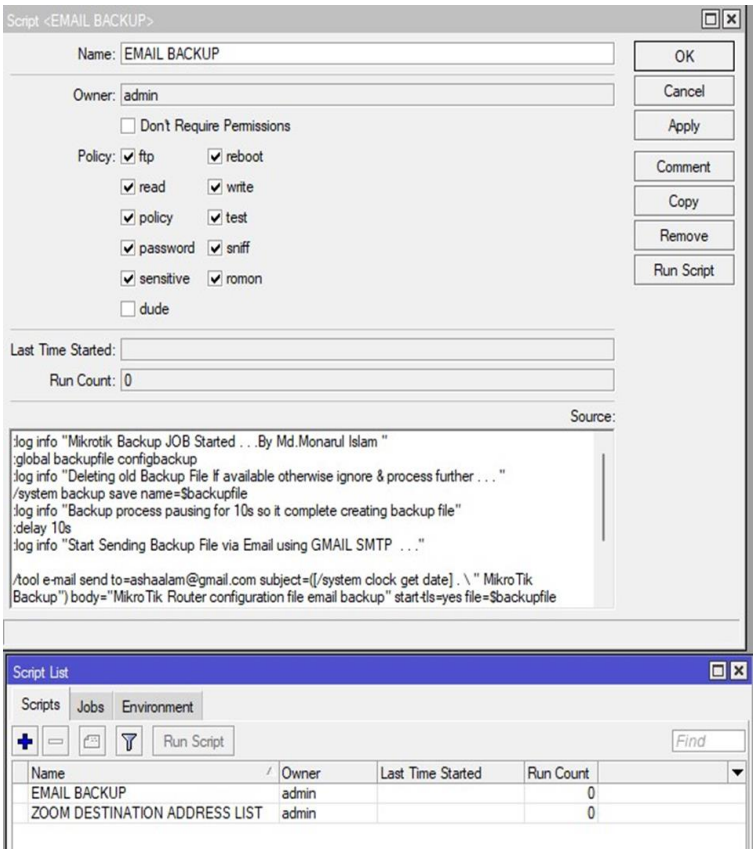

Figure 4.2.13: Script configuration, configured script list

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- **Step 13 for Queue Bandwidth**

Click on Queue > '+' click to add new configuration > set name > set Target address > set Target Upload, Target Download limit > click OK to save.

Queue bandwidth created for Video calling softwares, GGC server, Internet and users.

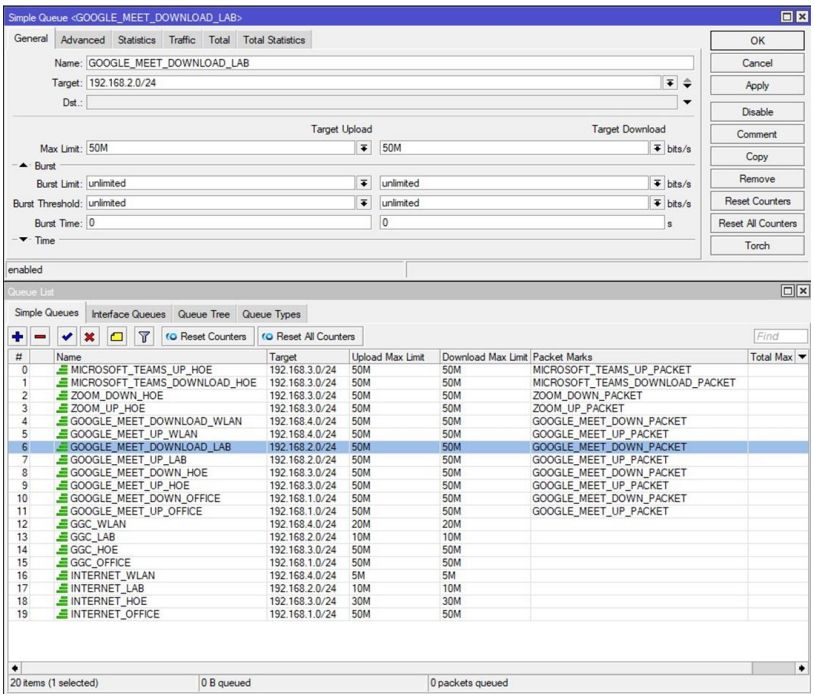

Figure 4.2.14: Queue configuration for LAB, queue list

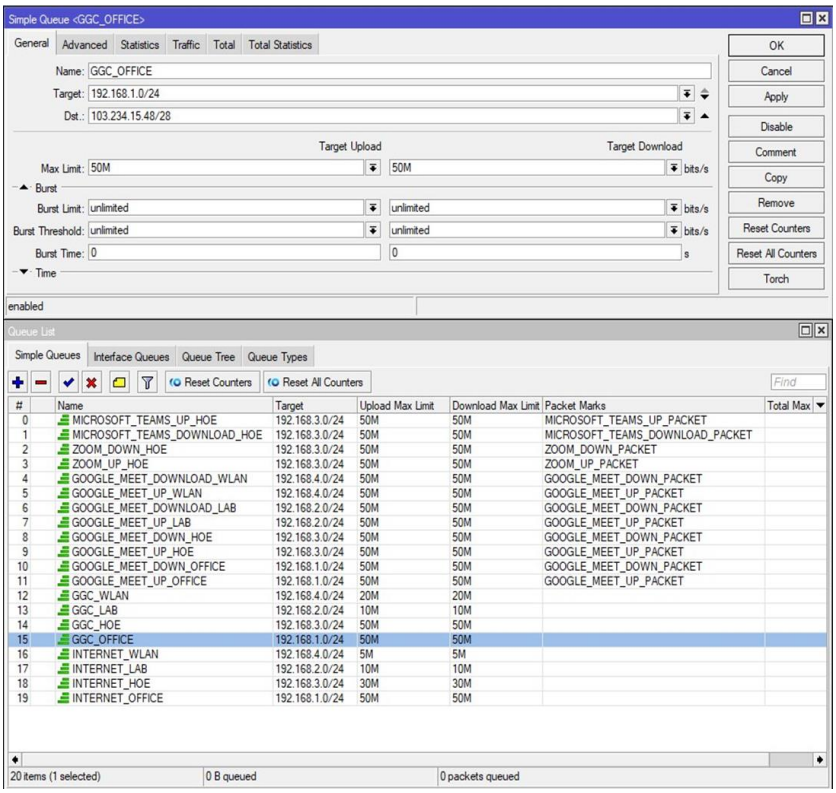

Figure 4.2.15: Queue configuration for Google cache server

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- **Step 14 for IP Pool**

Click on IP > Pool > '+' click to add new configuration > set name > set Addresses of ip range > set Next Pool as none > click OK to save.

IP Pool address of "VLAN_10" , "VLAN_20" , "VLAN_30" and "VLAN_40" created.

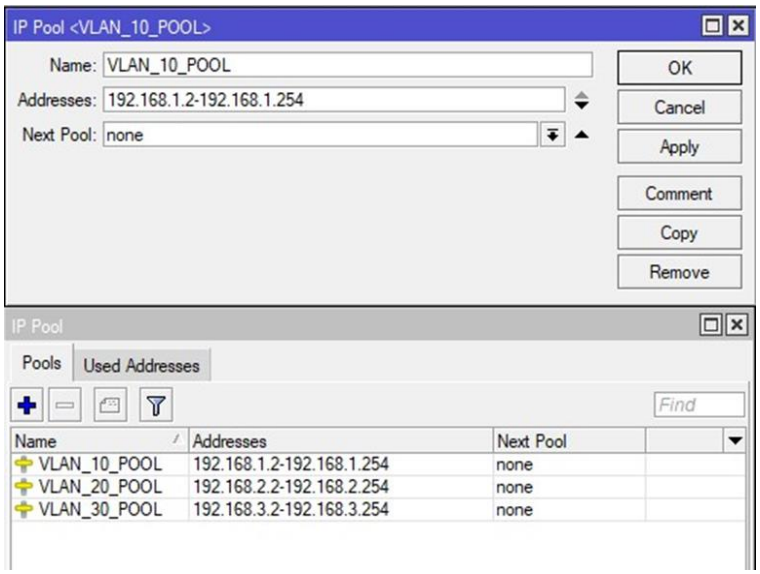

Figure 4.2.16: VLAN ip pool address configuration, ip pool list

- **Step 15 for DHCP Server**

Click on IP > DHCP Server > '+' click to add new configuration > set name > select Interface of VLAN > set Lease Time > select Address Pool > click OK to save.

DHCP Server of "VLAN_10" , "VLAN_20" , "VLAN_30" and "VLAN_40" created.

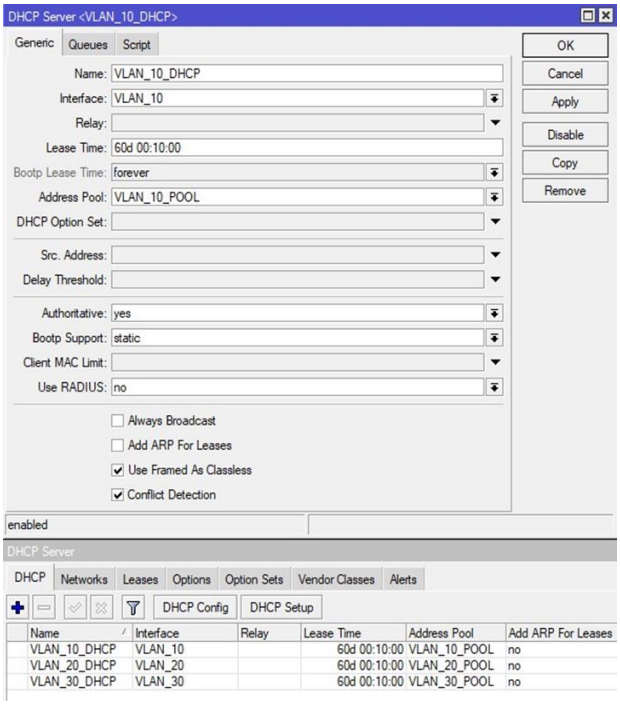

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Figure 4.2.17: DHCP server configuration, DHCP server list

- **Step 16 for Port Forward**

Click on IP > Firewall > NAT > '+' click to add new configuration > set chain to 'dst-nat' > set Dst. Address > select Protocol as (6 tcp) > select Dst. Port as '80' > set To Addresses > click OK to save.

Port forward configured for 80 port http web hosting.

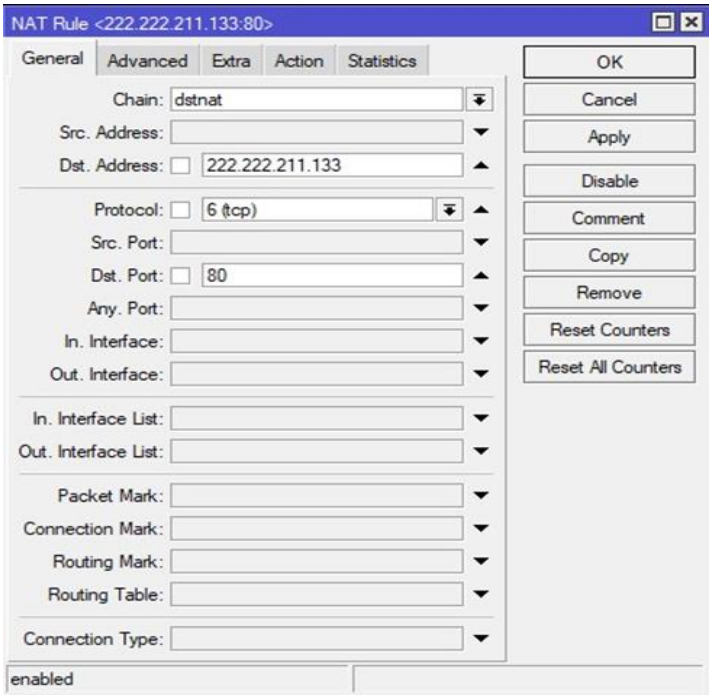

Figure 4.2.18: Port forwarding configuration

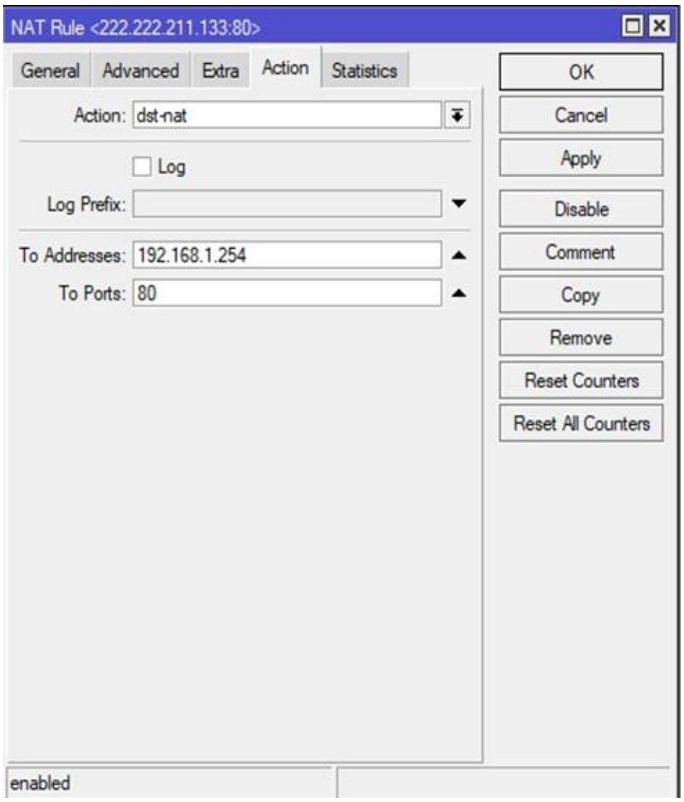

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Figure 4.2.19: Port forwarding configuration

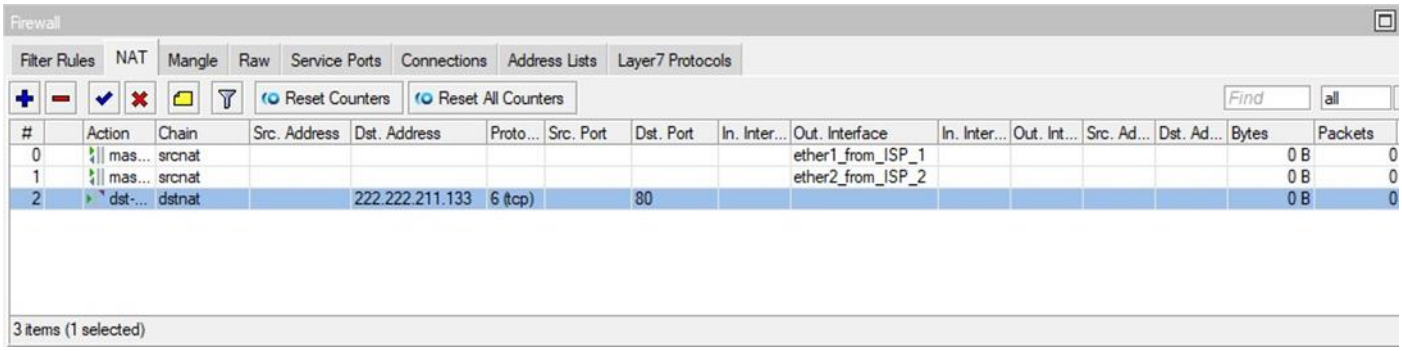

Figure 4.2.20: Configured port forward and NAT

- **Step 17 for Backup**

Click on Files > Backup > set File Name > select encryption mode as aes > click OK to save.

Mikrotik routers manual backup created as per router's name CORE_ROUTER

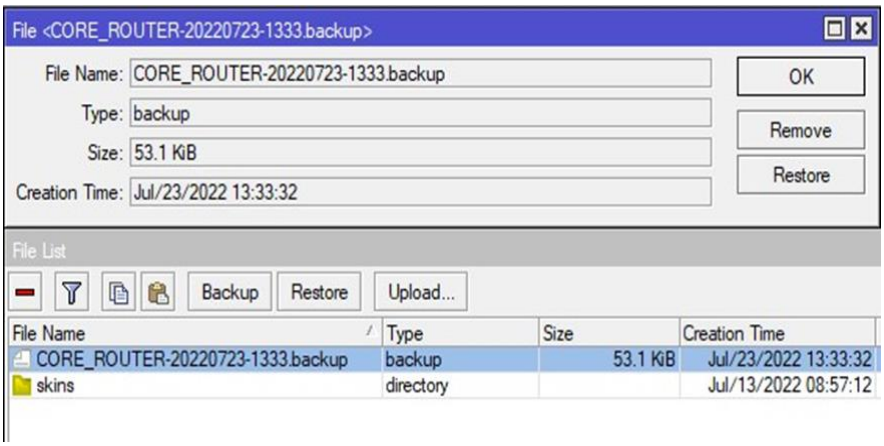

Figure 4.2.21: Router backup configuration, backup list

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4.3 Mikrotik Router's Fundamental Security Configurations

Three main components make up router security: the router's physical security, operating system security, and configuration-affectable security. Access to the router must be restricted for physical security. If an attacker has access to the router's management port or console, it is extremely difficult or impossible to stop exploits that can be readily stopped from a distance. The built-in security of the MikroTik OS is also crucial to router security. The MikroTik OS is very reliable and stable. You may configure the router to reduce vulnerabilities using the security measures offered by MikroTik OS.

Every communication network is open to different security risks. Many of these threats have evolved into robbery or assault with the intent to cause damage. One of them is gaining illegal access to the network. significant online risks. It's crucial to take precautions to prevent unwanted users from accessing the network. In addition to preventing unwanted access, it's important to identify intruders and stop them from accessing the network. A valuable resource, information needs to be safeguarded. Many individuals, businesses, and governments run the danger of losing such resources in the absence of adequate protection or network security. Network security is the procedure used to safeguard information assets. It tries to uphold availability, preserve integrity, and protect privacy. However, it matters if a network is subject to attacks from several security risks and security vulnerabilities. Take the appropriate steps to address problems and guarantee the data and infrastructure's security.

- **Step 1 for Administrative Users Credentials**

The default username for a MikroTik router is "admin." If the default username is used, it can be simply assumed. Therefore, it is advised to change the admin-privileged user's username and create a secure password.

Step 1: Log in 'WinBox'

Step 2: Click on 'Systems' > 'Users'

Step 3: Click on 'admin' and change the default username (we use 'asha' as username)

Step 4: Click on 'Password' and assign a password

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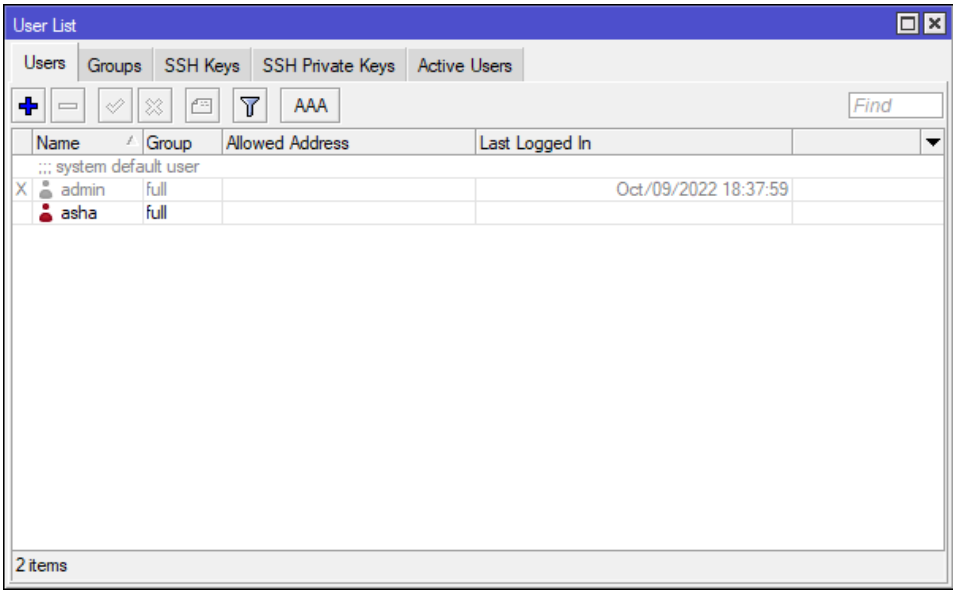

Figure 4.3.1: Mikrotik routers administrative user configuration

- **Step 2 for Change Winbox Default Port Number**

When logging into the admin panel of a MikroTik router, we often utilize the WinBox program. WinBox uses port 8291 by default. To access the admin panel if the default port has been changed to a custom port, the precise port number is needed. When checking in using an IP address, username, and password, it will be safe.

Step 1: Log in WinBox

Step 2: Click on 'IP' > 'Services'

Step 3: Click on Name: 'Winbox' Port: '8291' and change the port number (we use '8310' as our WinBox port number)

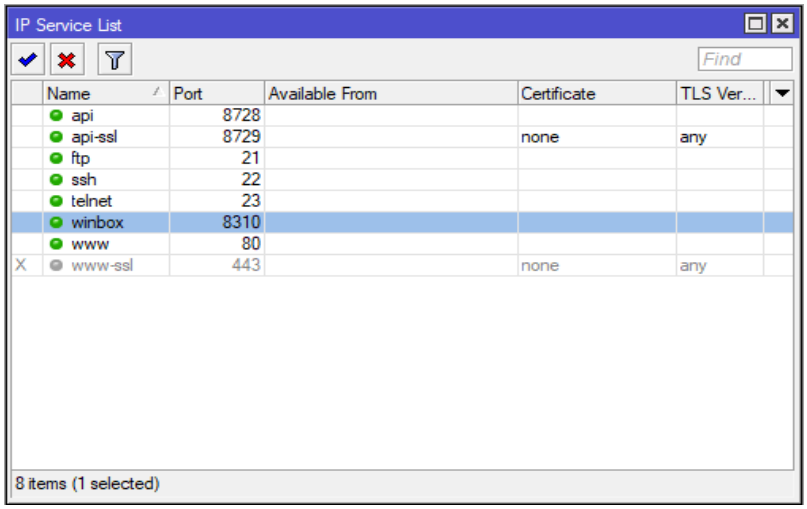

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Figure 4.3.2: WinBox accessible port assigned

- **Step 3 for MAC-Access Restriction**

A built-in feature of the MikroTik Router OS allows for simple management access to network devices by MAC address. However, for security reasons, it is best to disable the specific services on production networks. Therefore, to limit access using a MAC address, we need to block the functionality of revealing MAC addresses.

Configure

Step 1: Log in WinBox

Step 2: Click on 'Tools' > 'MAC Server'

Step 3: Select 'WinBox Interfaces' and finally disable 'all'

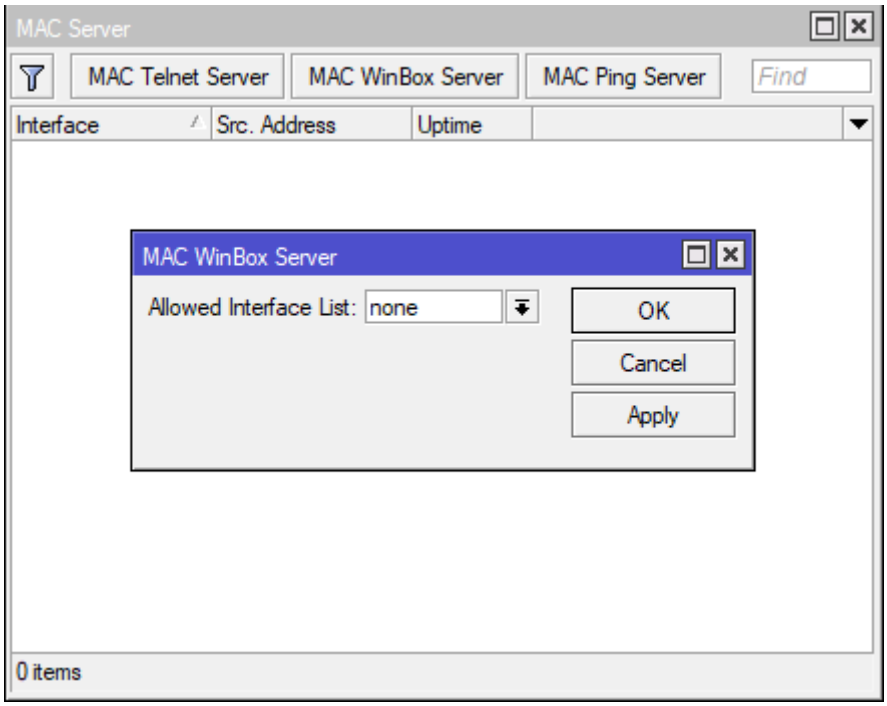

Figure 4.3.3: WinBox accessible MAC address configured

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4.4 TP-Link Wifi Router Configurations

- **Step 1 for Login**

Open web browser, type wifi router accessing ip address from router manual.

Login as Admin.

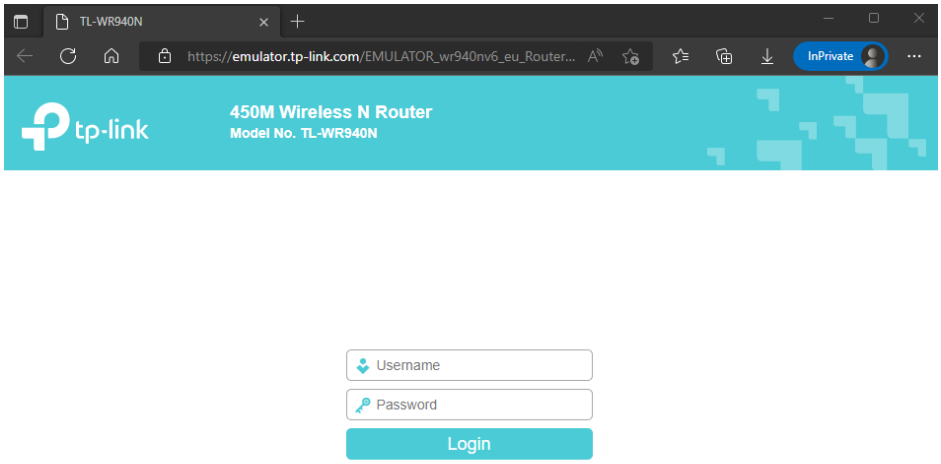

Figure 4.4.1: TP-Link router browser access, login webpage

- **Step 2 for Quick Setup**

Click Next.

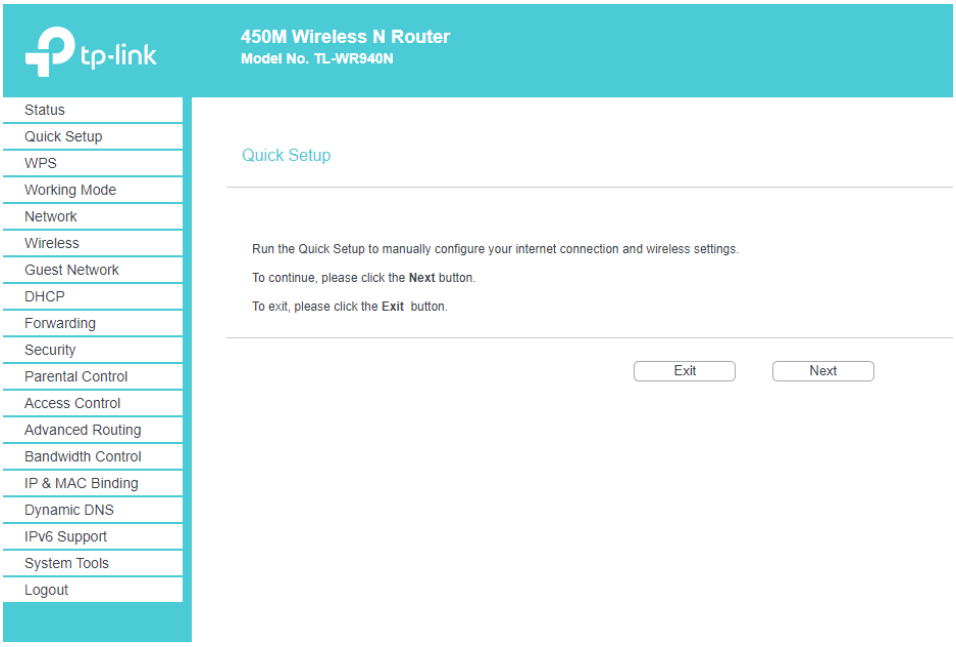

Figure 4.4.2: TP-Link router configuration steps on browser

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- **Step 3 for Working Mode**

Select Working Mode as “Standard Wireless Router” > click Next

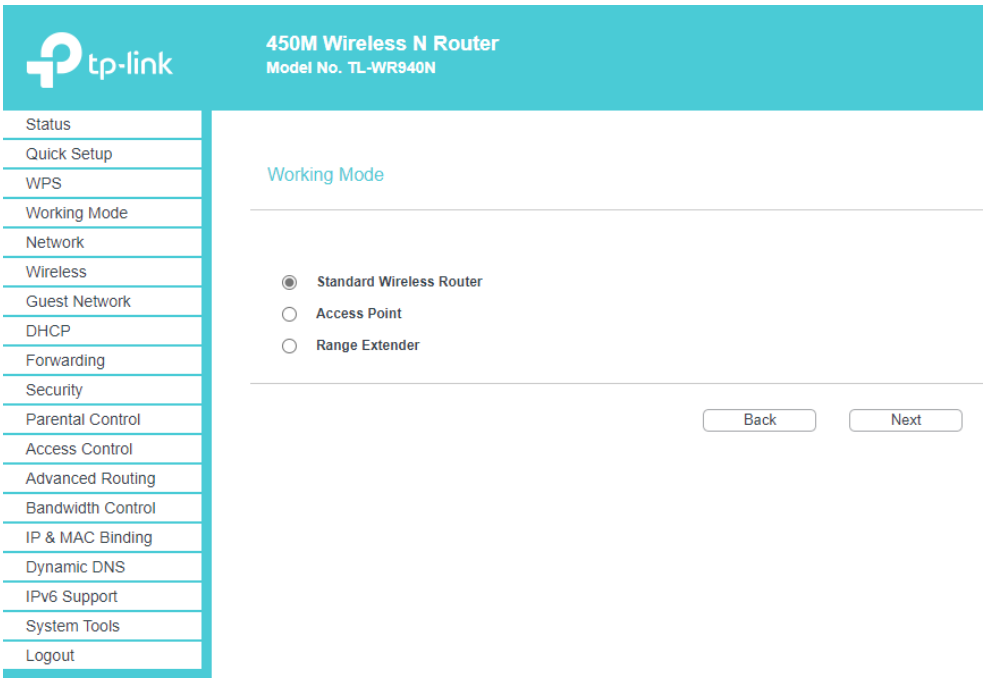

Figure 4.4.3: Selected as standard wireless router

- **Step 4 for Quick Setup – WAN Connection Type**

Select “Dynamic IP” > click Next

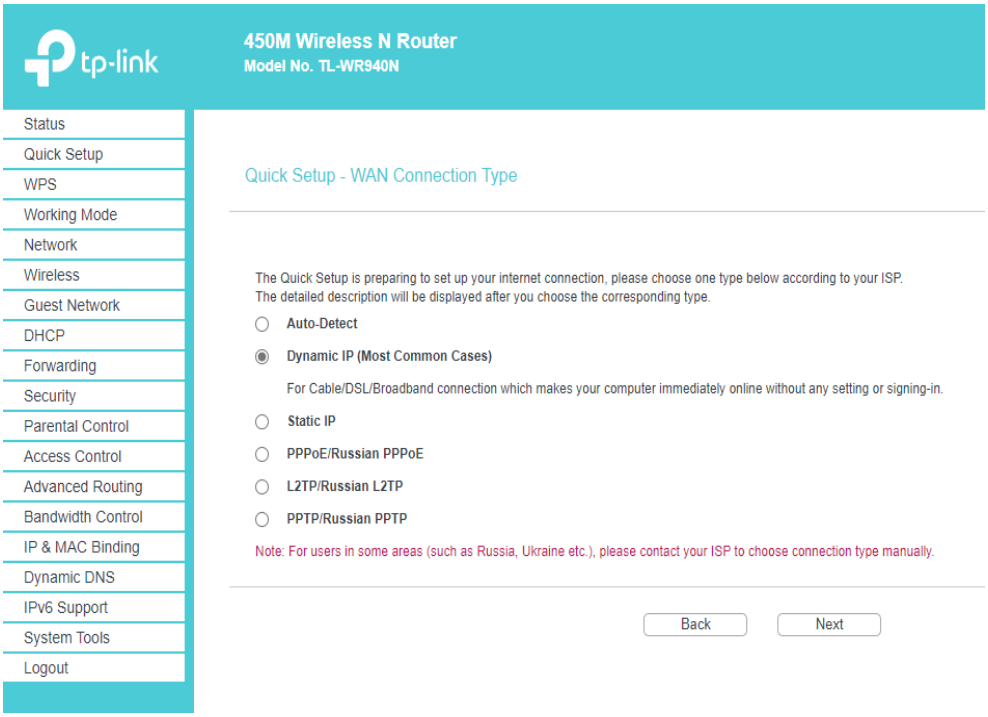

Figure 4.4.4: Selected as Dynamic IP

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- **Step 5 for Quick Setup – MAC Clone**

Select Quick Setup – MAC Clone as “YES, I need to clone MAC address.” > click Next

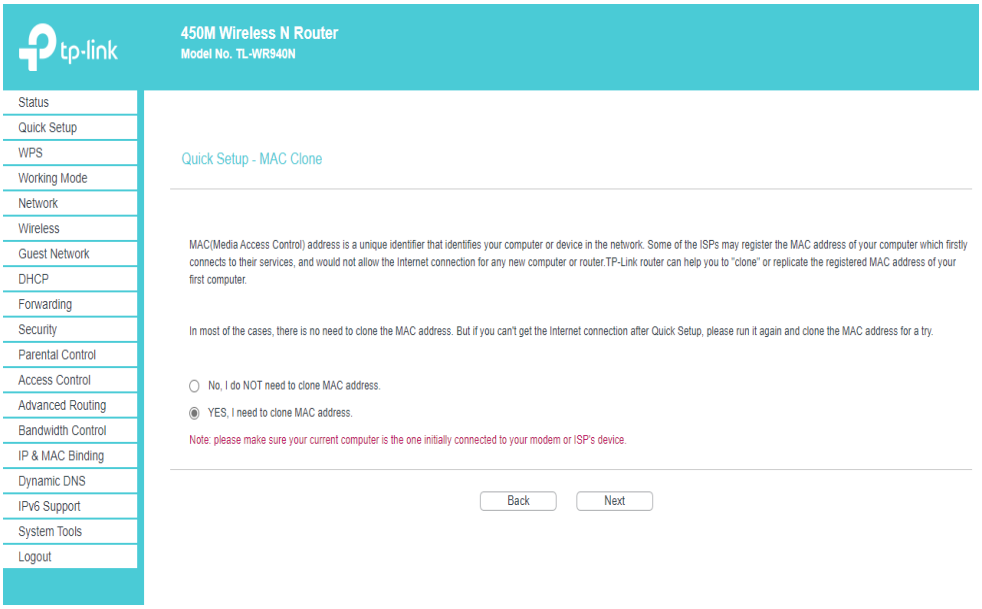

Figure 4.4.5: TP-Link router configuration steps

- **Step 6 for Quick Setup - Wireless**

Select Quick Setup – Wireless, Wireless Radio as Enable > set Wireless Network Name > Select Wireless Security as “WPA-PSK/WPA2-PSK” > set Wireless Password > click Next

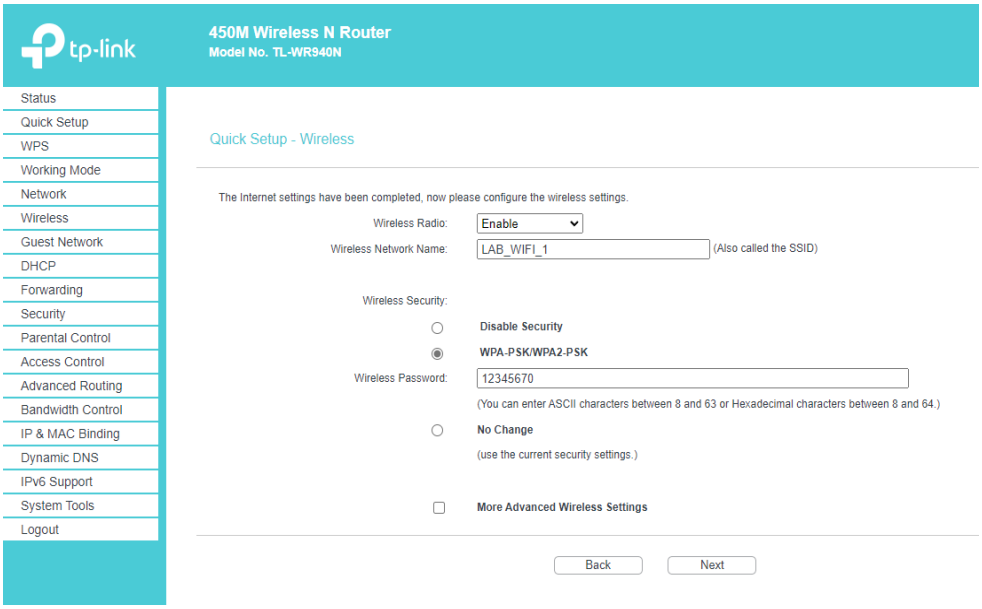

Figure 4.4.6: WPA-2-PSK configuration

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4.5 TP-Link Router as Range Extender Configurations

- **Step 1 for Login**

Open web browser, type wifi router accessing ip address from router manual.

Login as Admin.

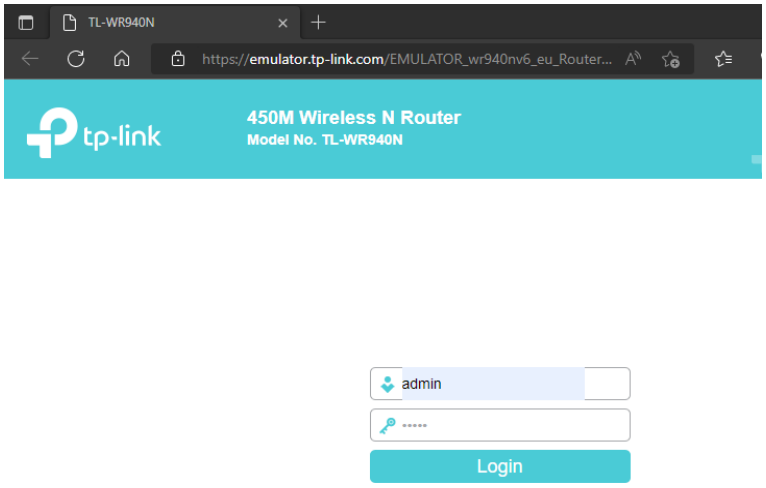

Figure 4.5.1: TP-Link configuration browser webpage

- **Step 2 for Quick Setup**

Click Next.

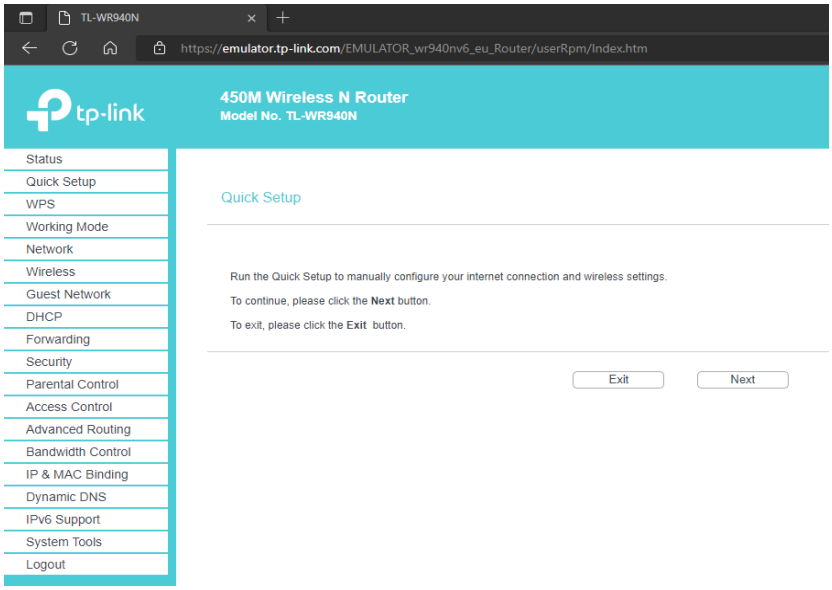

Figure 4.3.2.2: TP-Link router configuration steps on browser

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- **Step 3 for Working Mode**

Select Working Mode as “Range Extender” > click Next

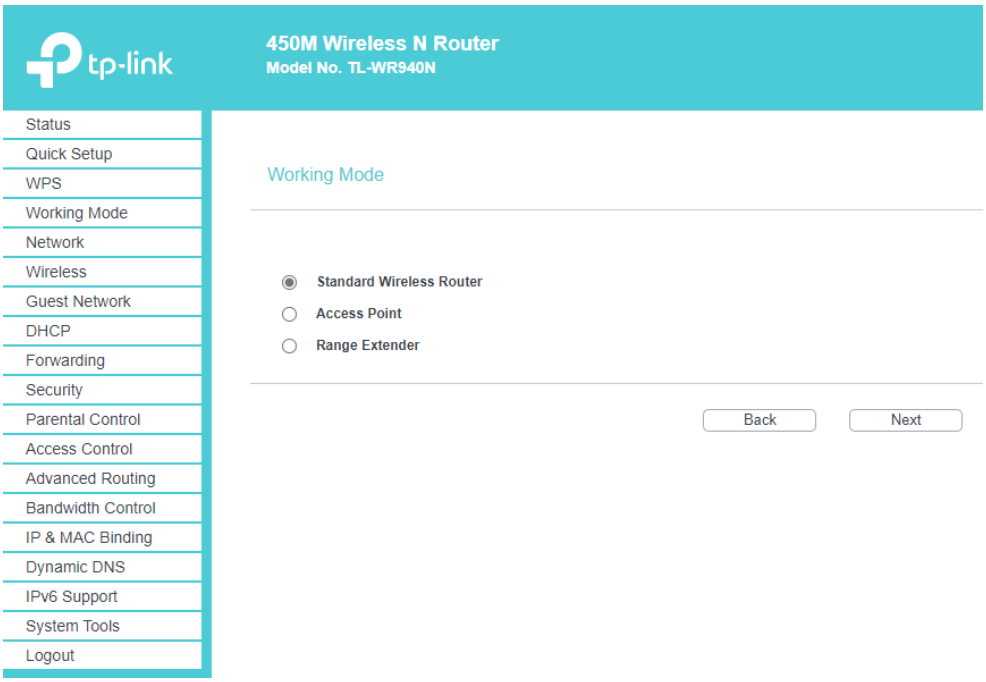

Figure 4.4.3: Selected as Range Extender

- **Step 4 for Wireless Setting**

Set Wireless Name of Root AP > Set MAC Address of Root AP > Select WDS Mode as Auto > Select Wireless Security Mode as WPA/WPA-2 PSK > Set Wireless Password > click Next

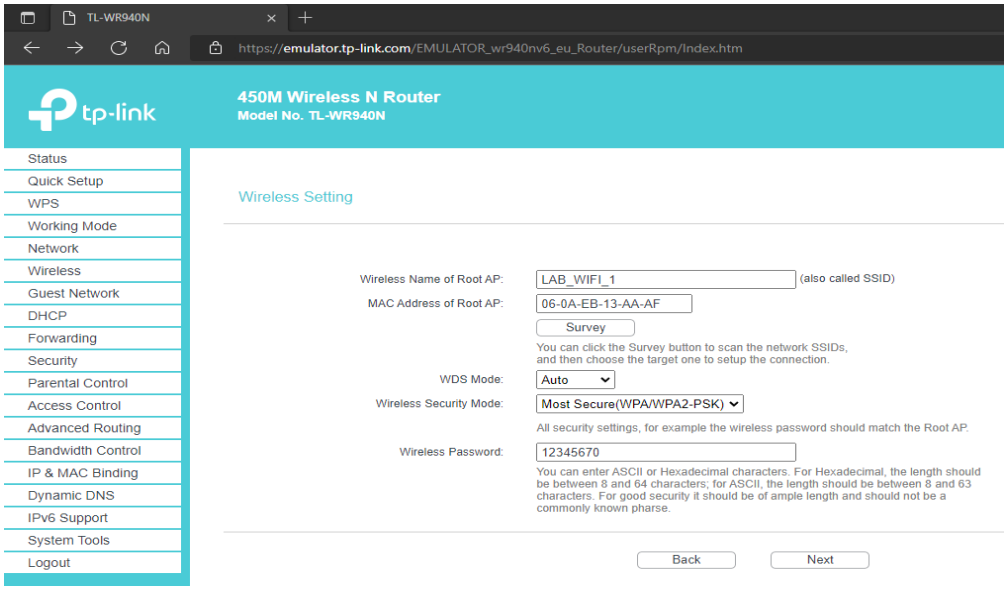

Figure 4.4.4: Wireless repeater name, wireless password configuration

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- **Step 5 for Network Settings**

Select Network Setting Type as Smart IP(DHCP) > select DHCP Server as Disable > click Next

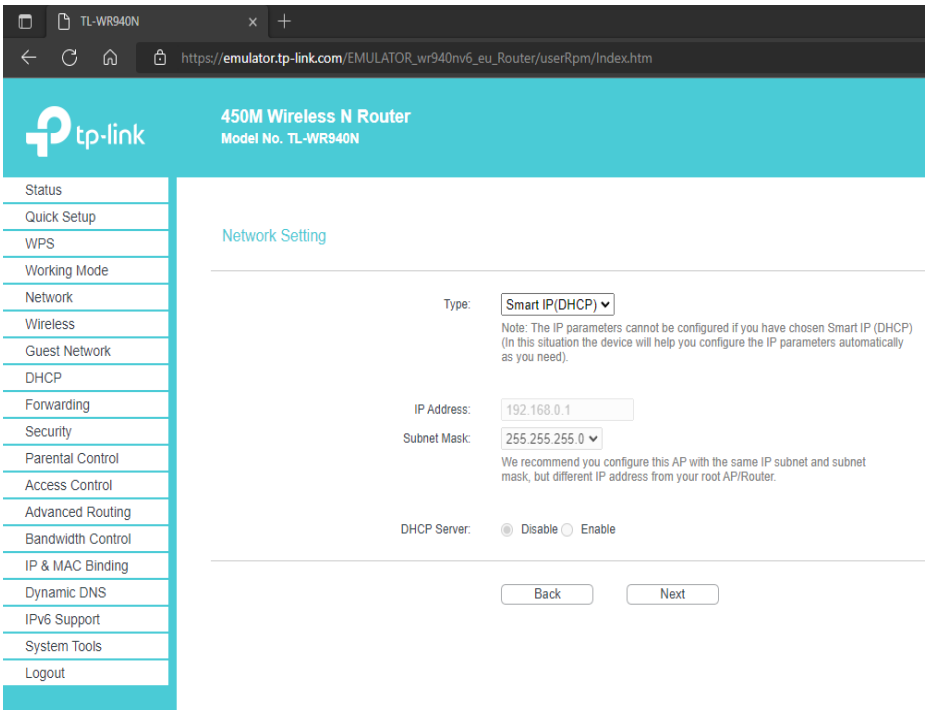

Figure 4.4.5: Selected as DHCP pool

- **Step 6 for Quick Setup - Finish**

Click Finish.

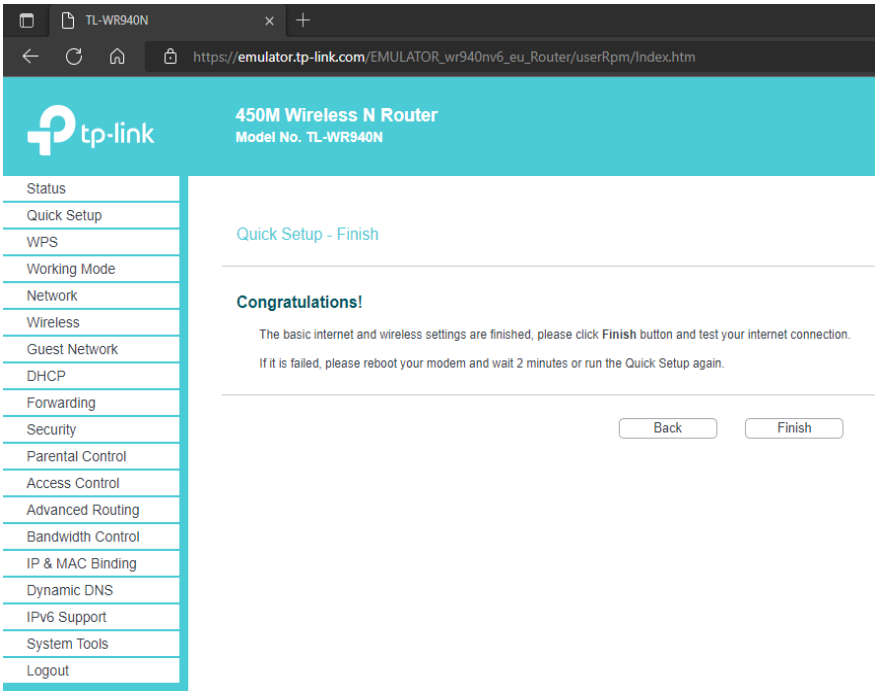

Figure 4.4.6: TP-Link range extender configured

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4.6 Cisco Switch Configurations

- **Step 1 for Connection**

Connect COM Serial Port to Cisco Switch with PC

Click > Start > search “Device Manager” > Expand Ports > Identify COM PORT serial number

Download, Open “Putty” > Connect by COM serial port.

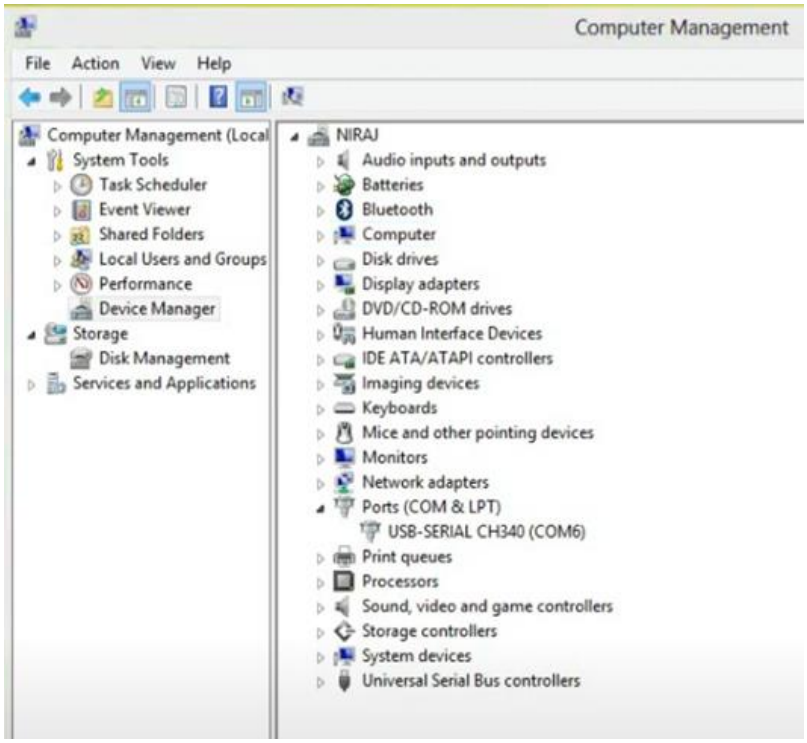

Figure 4.6.1: Windows device manager, COM port

- **Step 2 for Hostname**

Configuration console command > enable > configure terminal > hostname IT_SWITCH

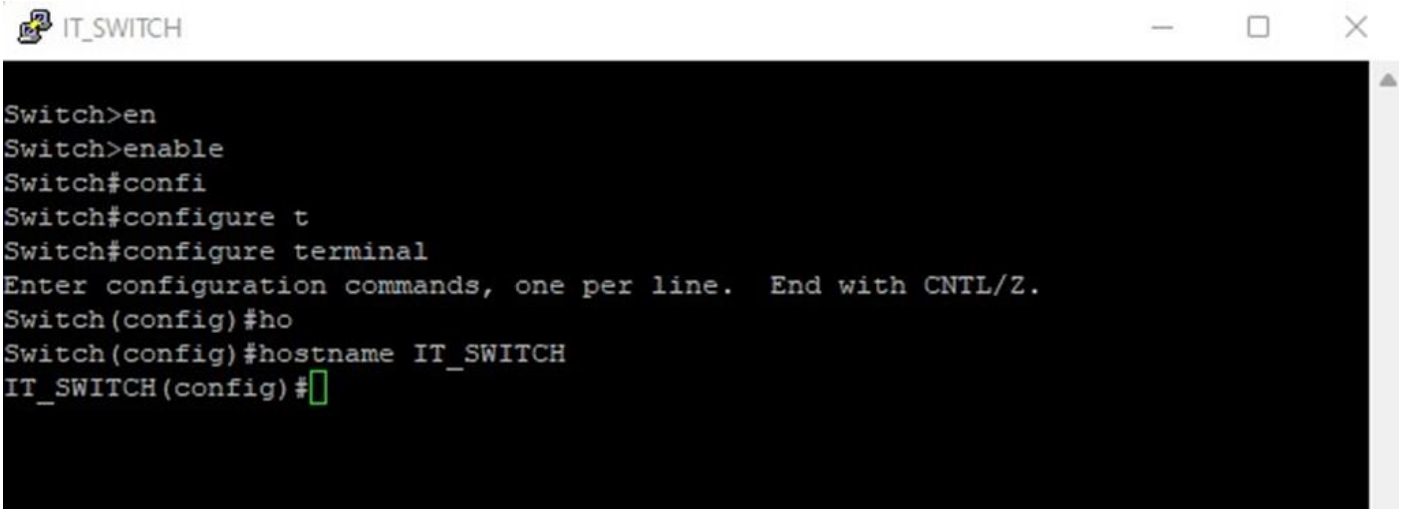

Figure 4.6.2: Putty console enable, configuration hostname

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- **Step 3 for VLAN**

Configuration console command > configure terminal > vlan id > name vlan name > exit

VLAN id and name configured to “VLAN_10” , “VLAN_20” , “VLAN_30” and “VLAN_40”

```
IT_SWITCH
IT_SWITCH#conf
IT_SWITCH#configure t
IT_SWITCH#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
IT_SWITCH(config)#vlan 10
IT_SWITCH(config-vlan)#name VLAN_10
IT_SWITCH(config-vlan)#exit
IT_SWITCH(config)#vlan 20
IT_SWITCH(config-vlan)#name VLAN_20
IT_SWITCH(config-vlan)#exit
IT_SWITCH(config)#vlan 30
IT_SWITCH(config-vlan)#name VLAN_30
IT_SWITCH(config-vlan)#exit
```

Figure 4.6.3: VLAN configuration

- **Step 4 for VLAN Range**

Configuration console command > configure terminal > interface range ethernet port serial > switchport mode access > switchport access vlan id > no shut

VLAN applied to interface range

```
IT_SWITCH(config)#interface range et
IT_SWITCH(config)#interface range ethernet 0/1-3
IT_SWITCH(config-if-range)#switchport mode acc
IT_SWITCH(config-if-range)#switchport mode access
IT_SWITCH(config-if-range)#swit
IT_SWITCH(config-if-range)#switchport access vlan 10
IT_SWITCH(config-if-range)#no shut
```

Figure 4.6.4: VLAN assigning to interface range

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- **Step 5 for VLAN Trunk**

Configuration console command > interface ethernet port serial > switchport trunk encapsulation dotlq > switchport mode trunk > no shut > exit

```
IT_SWITCH(config)#interface et
IT_SWITCH(config)#interface ethernet 0/0
IT_SWITCH(config-if)#swi
IT_SWITCH(config-if)#switchport mo
IT_SWITCH(config-if)#switchport mode tr
IT_SWITCH(config-if)#switchport tru
IT_SWITCH(config-if)#switchport trunk do
IT_SWITCH(config-if)#switchport trunk d
IT_SWITCH(config-if)#switchport trunk e
IT_SWITCH(config-if)#switchport trunk encapsulation d
IT_SWITCH(config-if)#switchport trunk encapsulation dotlq
IT_SWITCH(config-if)#swit
IT_SWITCH(config-if)#switchport
*Jul 23 15:23:30.216: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet0/
0, changed state to down
IT_SWITCH(config-if)#switchport mo
IT_SWITCH(config-if)#switchport mode tr
IT_SWITCH(config-if)#switchport mode trunk u
*Jul 23 15:23:33.229: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet0/
0, changed state to up
IT_SWITCH(config-if)#switchport mode trunk
IT_SWITCH(config-if)#no shu
*Jul 23 15:23:36.578: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet0/
0, changed state to down
IT_SWITCH(config-if)#no shut
IT_SWITCH(config-if)#
*Jul 23 15:23:39.596: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet0/
0, changed state to up
IT_SWITCH(config-if)#exit
```

Figure 4.6.5: VLAN trunk configuration

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4.7 Ubuntu Linux Server Installation

- **Step 1 for Download**

Download, install VMWare 15.5 Pro and Ubuntu Server 20.04 LTS

Press Ctrl + N to create new virtual machine

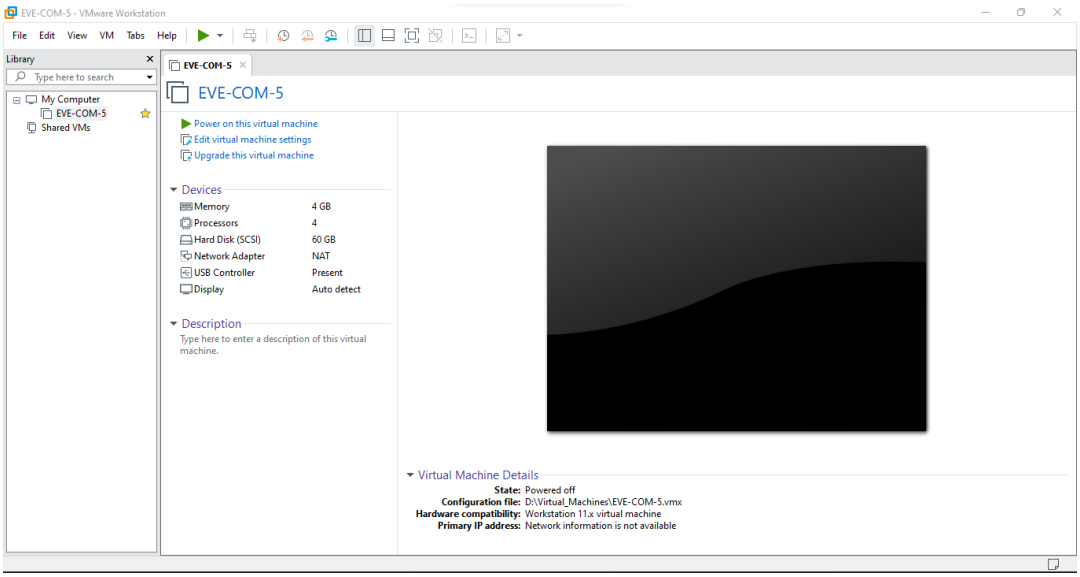

Figure 4.7.1: VMWare Interface

- **Step 2 for New Virtual Machine**

Select Typical > click Next >

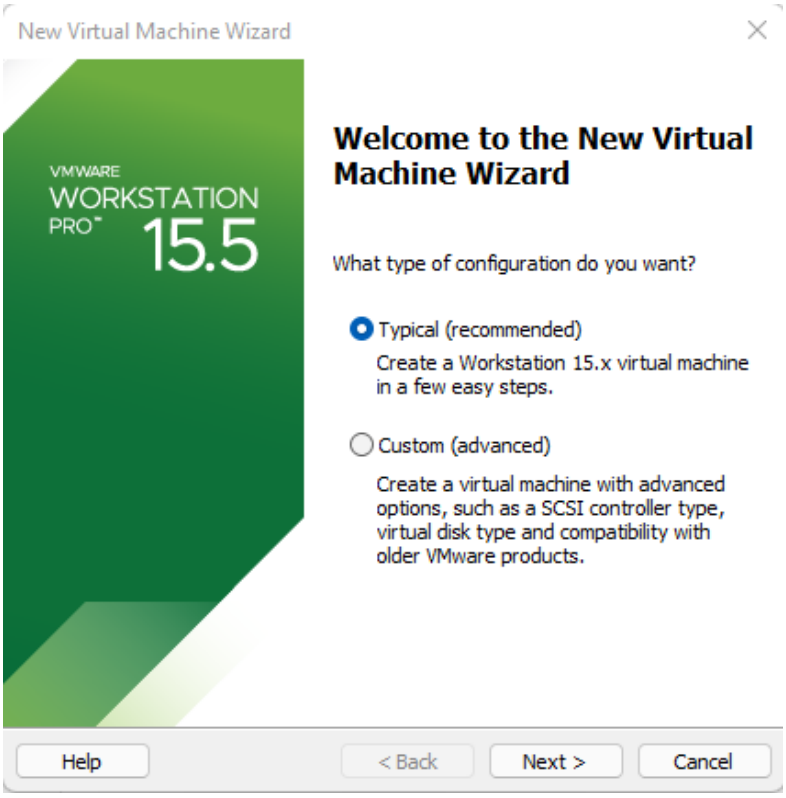

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Figure 4.7.2: New Virtual Machine Wizard

- **Step 3 for ISO**

Select Installer disc image file (iso): > select Ubuntu 20.04 ISO

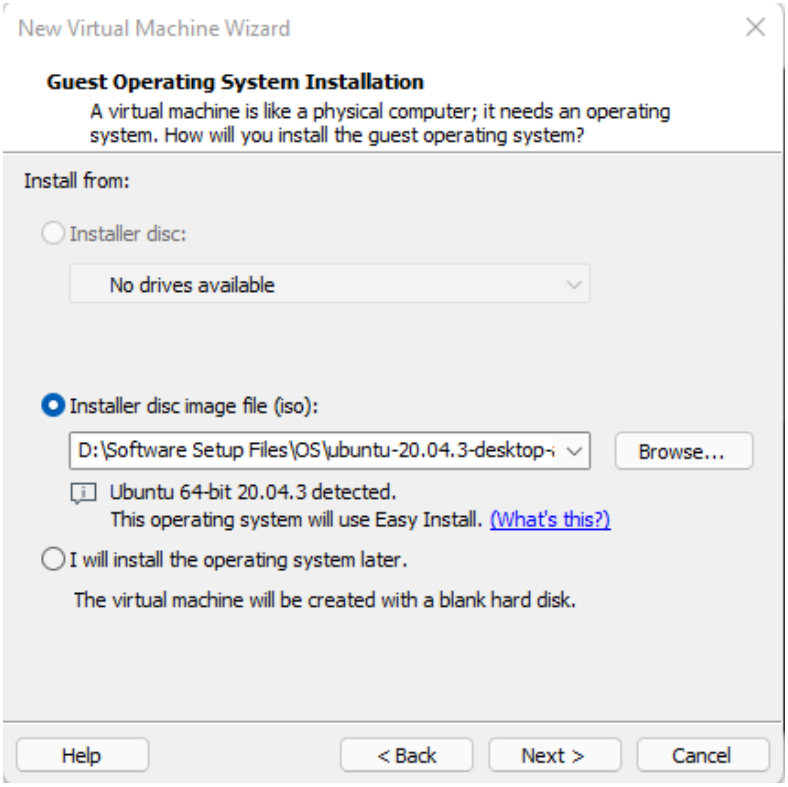

Figure 4.7.3: Operating System installation

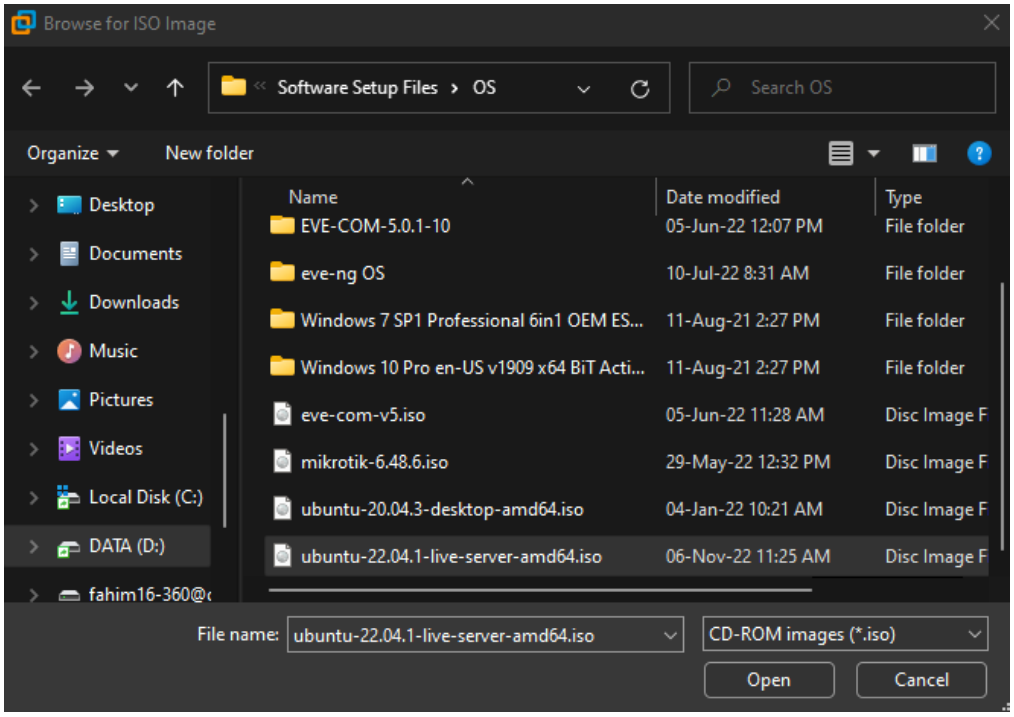

Figure 4.7.4: File Explorer OS installation

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- **Step 4 for Disk Capacity**

Set Maximum disk size (GB): > select Split virtual disk into multiple files

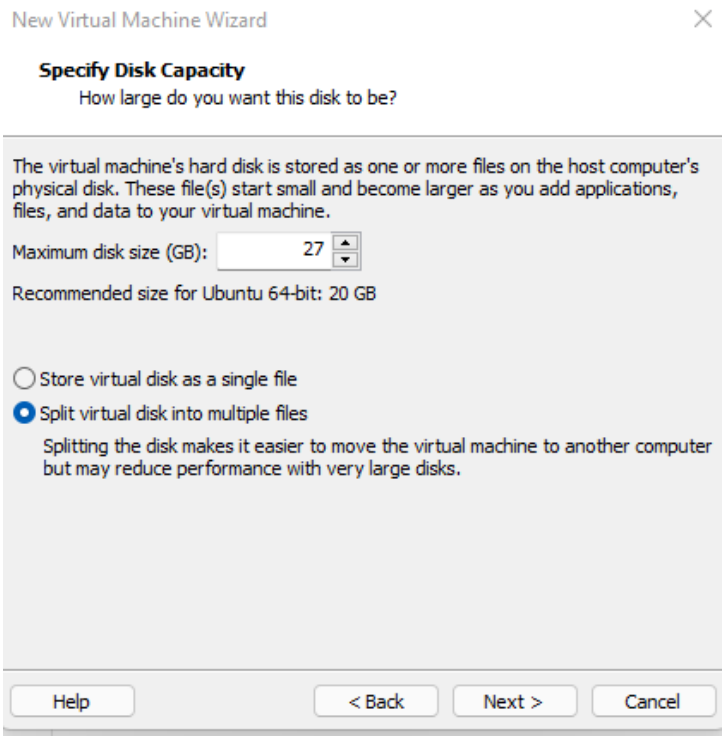

Figure 4.7.5: Disc capacity selected

- **Step 5 for Virtual Machine Finish**

Set Maximum disk size (GB): > select Split virtual disk into multiple files

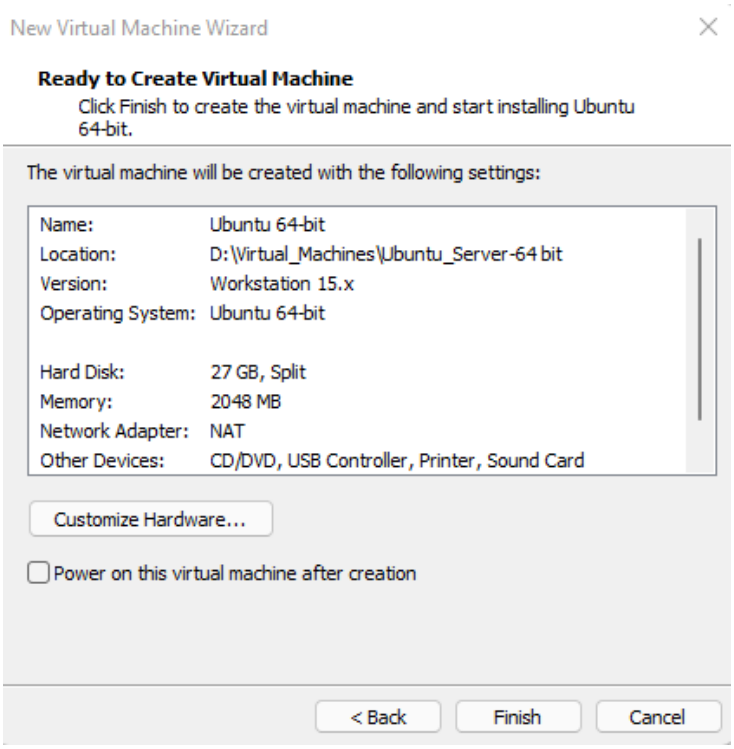

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Figure 4.7.6: Virtual Machine created

- **Step 6 for Virtual Machine Play**

Select Try or Install Ubuntu Server

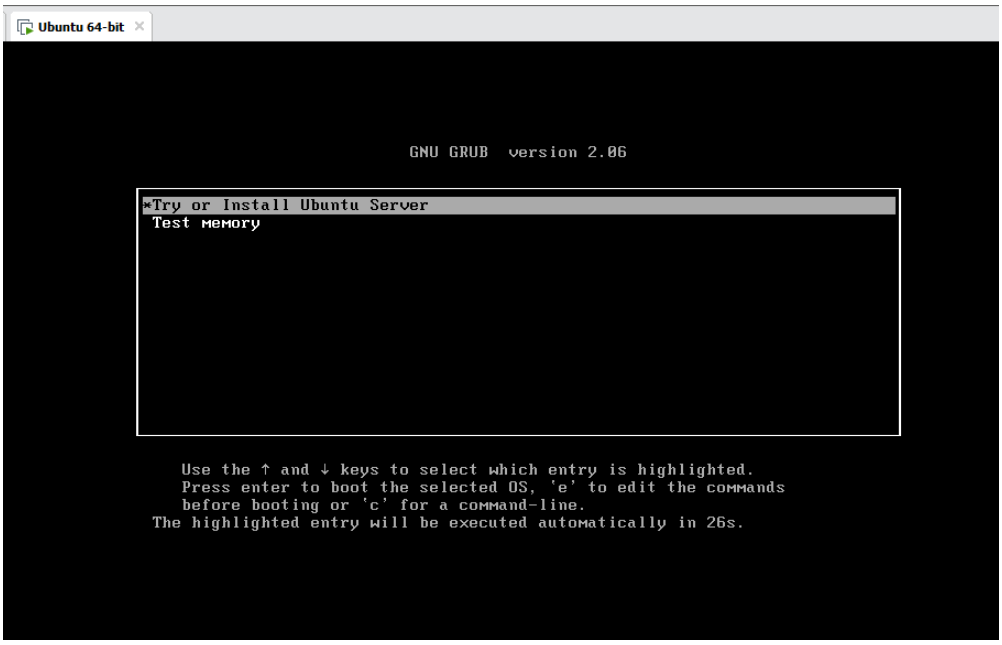

Figure 4.7.7: Linux installation GUI

- **Step 7 for Language**

Select English > press enter.

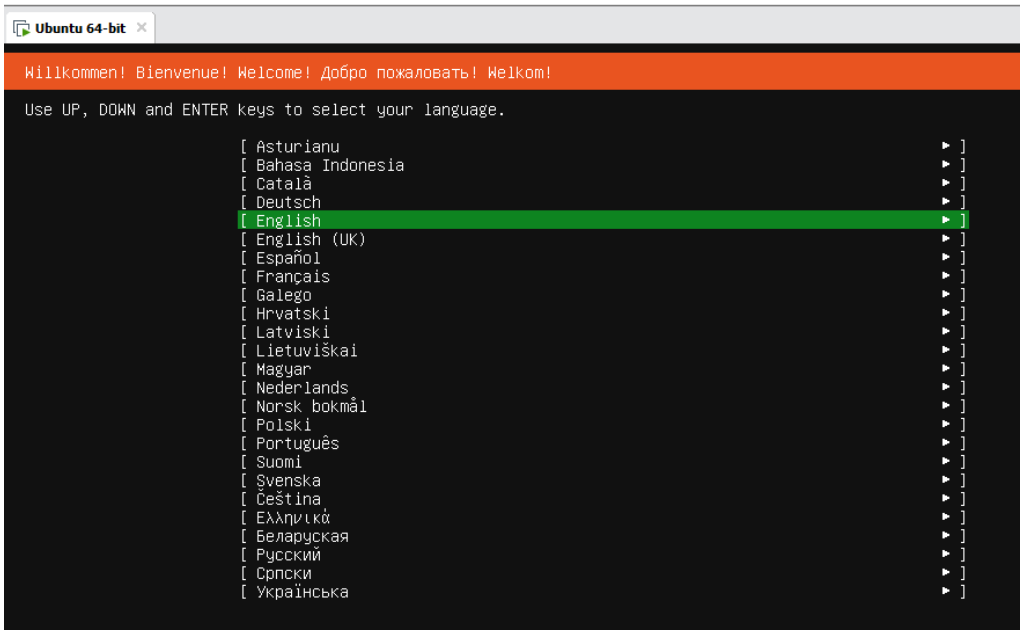

Figure 4.7.8: Language selection menu

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- **Step 8 for Network Adapter**

Select DHCPv4

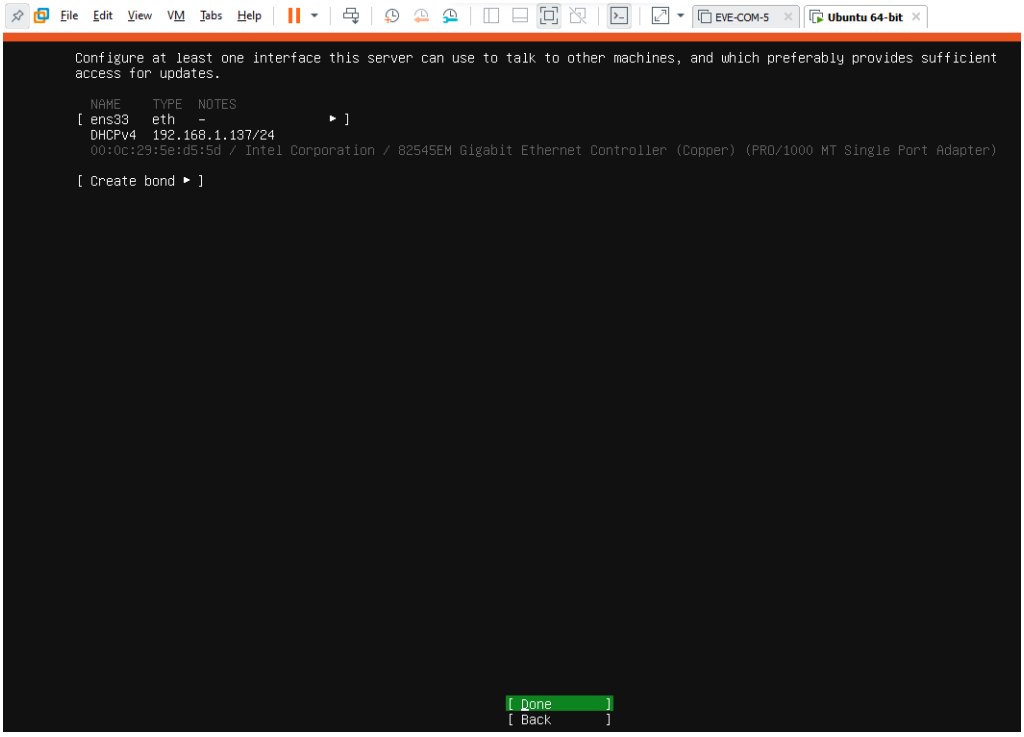

Figure 4.7.9: Network adapter information

- **Step 9 for Disk Partition**

Select DHCPv4

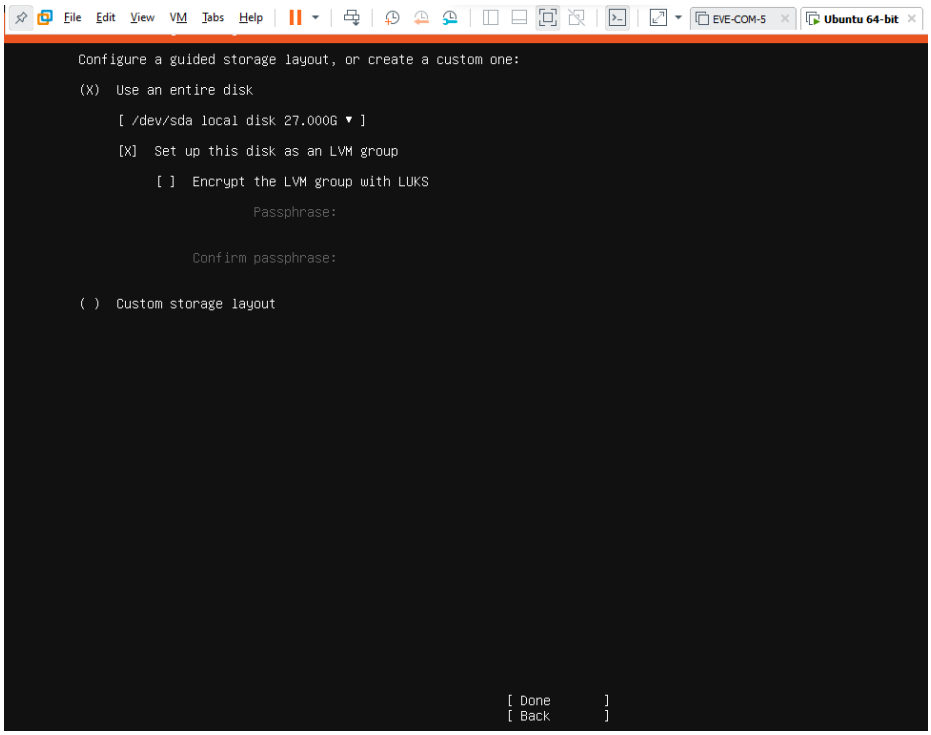

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Figure 4.7.10: Disk partition menu

- **Step 10 for User Profile**

Set name > server's name > username > password > confirm password

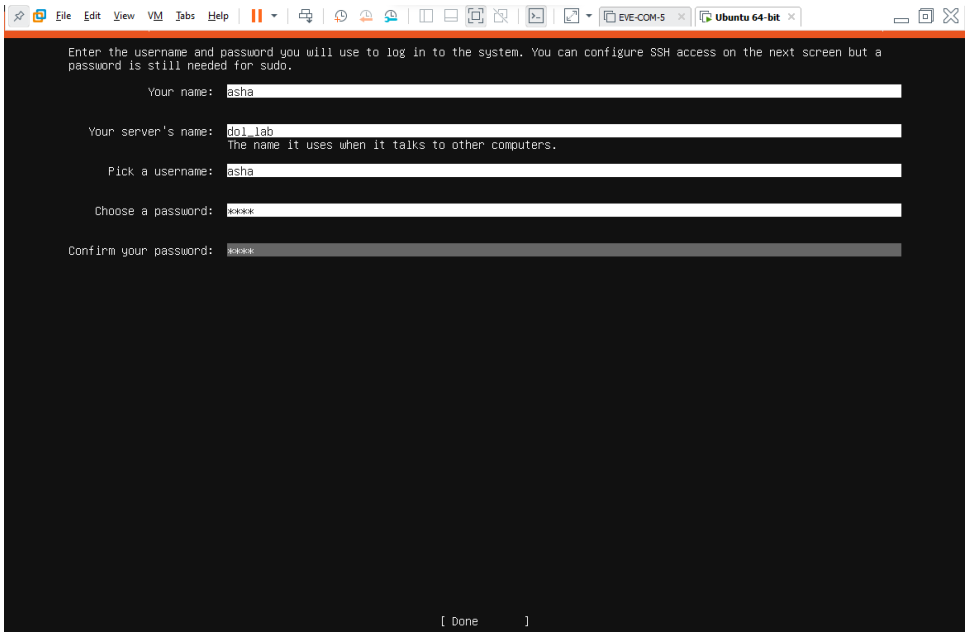

Figure 4.7.11: Username, password creation menu

- **Step 11 for Installation**

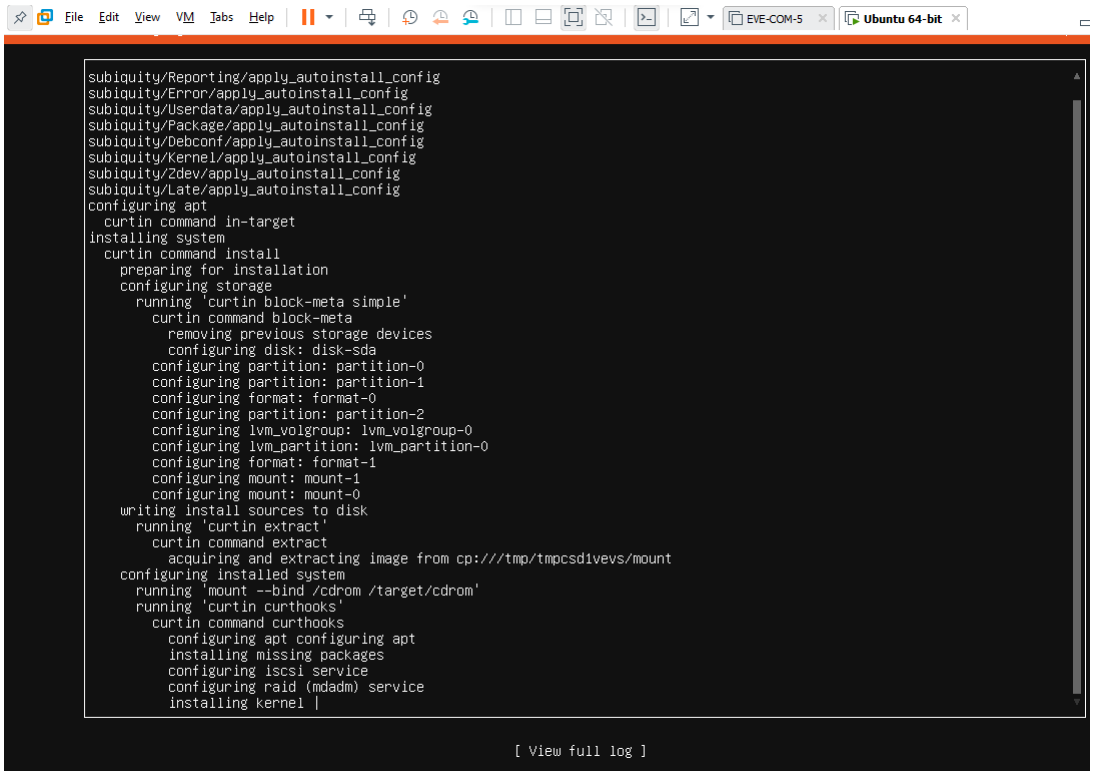

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Figure 4.7.12: Linux Server installing

- **Step 12 for Login**

Select user > password > login

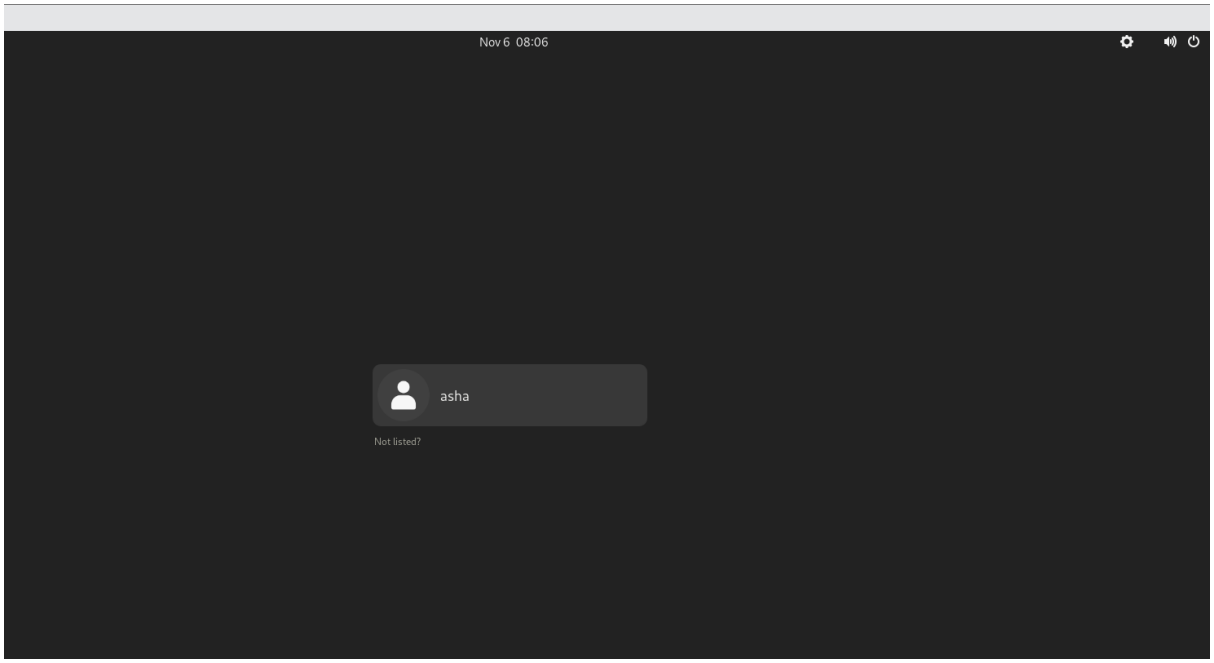

Figure 4.7.13: Login interface

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4.8 Linux Server Basic Commands

Basic commands for directory create, list, remove.

```
asha@dollab:~$ pwd
/home/asha
asha@dollab:~$ cd
asha@dollab:~$ df -Th
Filesystem                         Type   Size  Used Avail Use% Mounted on
tmpfs                              tmpfs  195M  1.6M  193M   1% /run
/dev/mapper/ubuntu--vg-ubuntu--lv ext4    13G  7.9G  3.7G  69% /
tmpfs                              tmpfs  971M     0  971M   0% /dev/shm
tmpfs                              tmpfs  5.0M  4.0K  5.0M   1% /run/lock
/dev/sda2                          ext4   2.0G  127M  1.7G   7% /boot
tmpfs                              tmpfs  195M  104K  195M   1% /run/user/1000
asha@dollab:~$ uname
Linux
asha@dollab:~$ free -m
               total        used        free      shared  buff/cache   available
Mem:            1941         844          99           3         998         933
Swap:           2047           0        2047
asha@dollab:~$ echo $SHELL
/bin/bash
asha@dollab:~$
```

Figure 4.8.1: Linux terminal basic commands

```
asha@dollab:~$ mkdir test
asha@dollab:~$ ls -lh
total 36K
drwxr-xr-x 2 asha asha 4.0K Nov  6 08:07 Desktop
drwxr-xr-x 2 asha asha 4.0K Nov  6 08:07 Documents
drwxr-xr-x 2 asha asha 4.0K Nov  6 08:07 Downloads
drwxr-xr-x 2 asha asha 4.0K Nov  6 08:07 Music
drwxr-xr-x 2 asha asha 4.0K Nov  6 08:07 Pictures
drwxr-xr-x 2 asha asha 4.0K Nov  6 08:07 Public
drwxr-xr-x 2 asha asha 4.0K Nov  6 08:07 Templates
drwxrwxr-x 2 asha asha 4.0K Nov  6 08:23 test
drwxr-xr-x 2 asha asha 4.0K Nov  6 08:07 Videos
asha@dollab:~$ rm -rf test
asha@dollab:~$ ls -lh
total 32K
drwxr-xr-x 2 asha asha 4.0K Nov  6 08:07 Desktop
drwxr-xr-x 2 asha asha 4.0K Nov  6 08:07 Documents
drwxr-xr-x 2 asha asha 4.0K Nov  6 08:07 Downloads
drwxr-xr-x 2 asha asha 4.0K Nov  6 08:07 Music
drwxr-xr-x 2 asha asha 4.0K Nov  6 08:07 Pictures
drwxr-xr-x 2 asha asha 4.0K Nov  6 08:07 Public
drwxr-xr-x 2 asha asha 4.0K Nov  6 08:07 Templates
drwxr-xr-x 2 asha asha 4.0K Nov  6 08:07 Videos
asha@dollab:~$
```

Figure 4.8.2: Linux terminal basic commands

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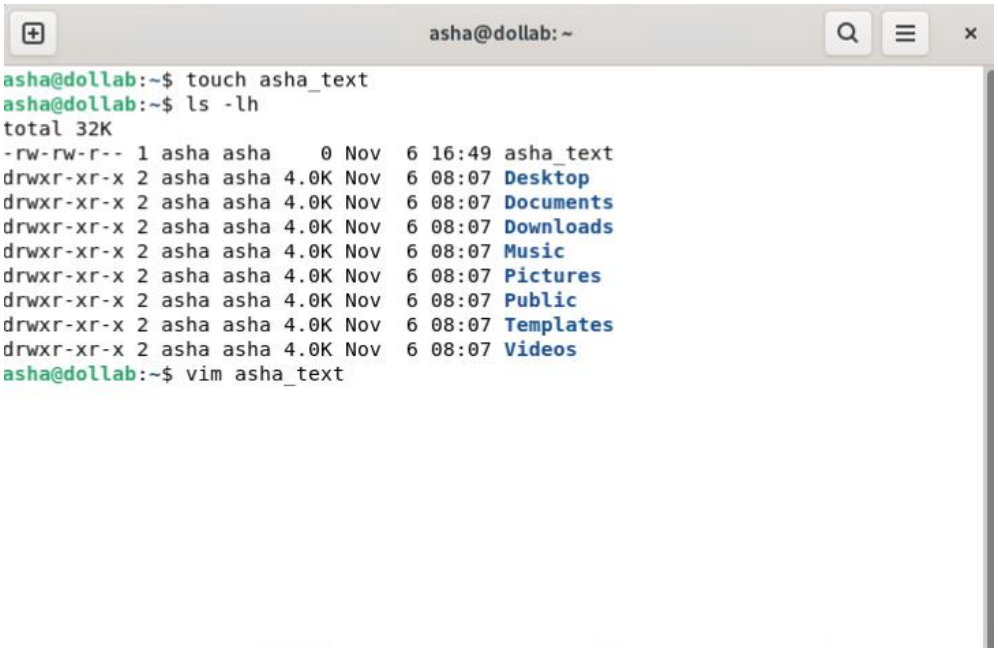

Figure 4.8.3: Linux terminal file creation command

Figure 4.8.4: Vim command for text editor

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4.9 Linux Network Configurations

- **Step 1 for Network Information**

Command ifconfig > sudor apt install net-tools.

Enter command ifconfig.

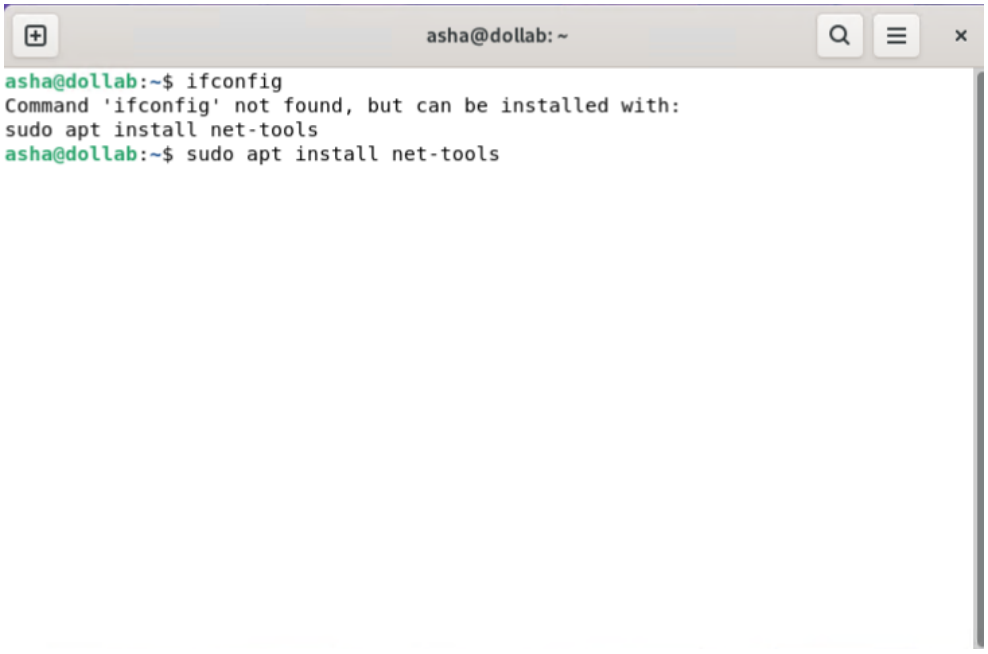

Figure 4.9.1: ifconfig command

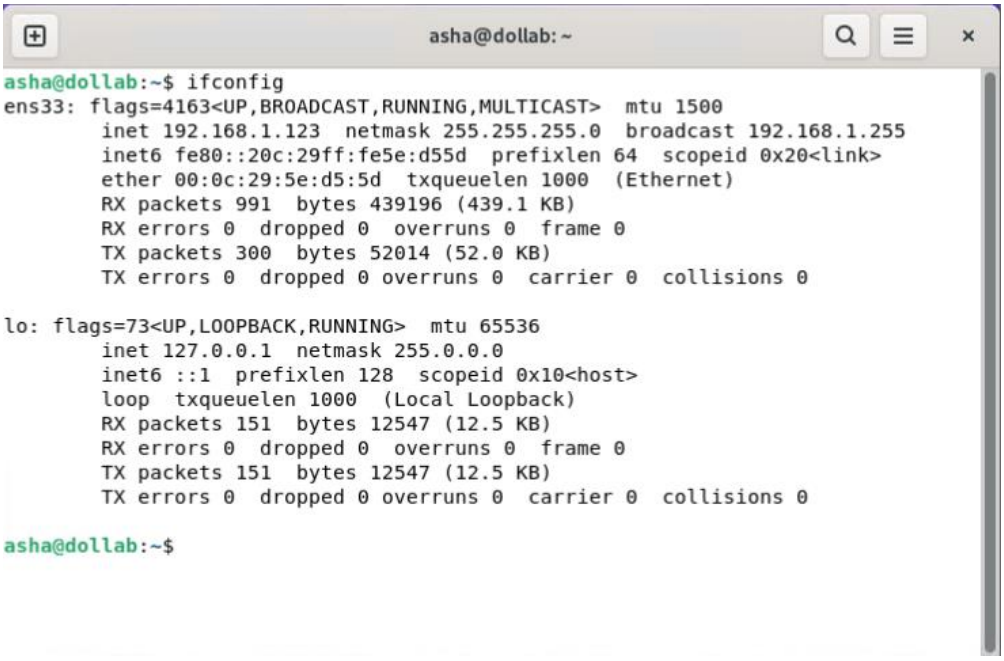

Figure 4.9.2: ifconfig command information

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- **Step 2 for Network Configuration**

Command vim > add ip address, subnet mask, default gateway etc.

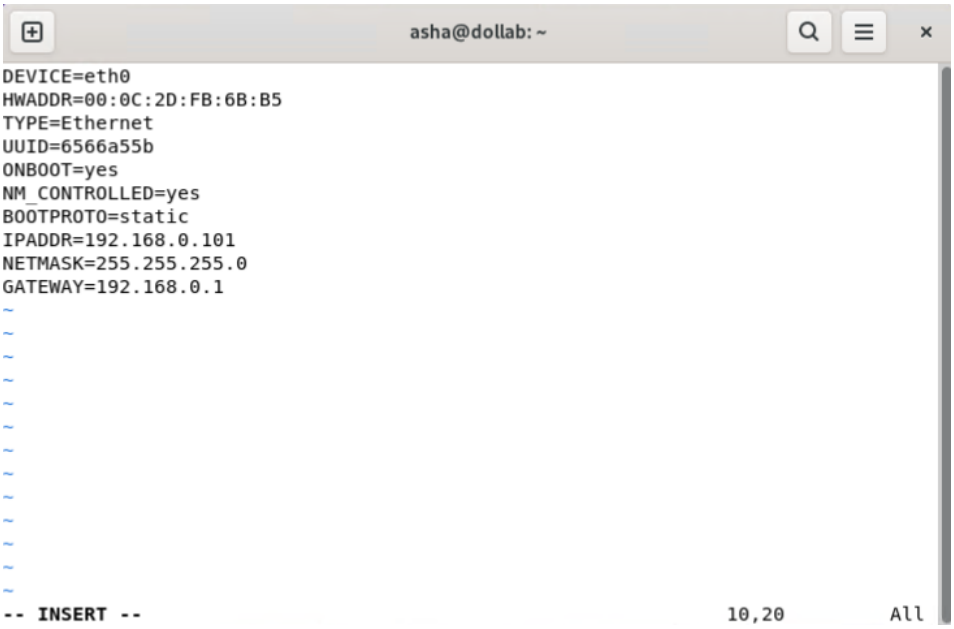

Figure 4.9.3: network-scripts edited

- **Step 3 for Network Manager**

Command systemically status Network Manager for active status.

Command vim > /etc./resolve's and add DNS servers.

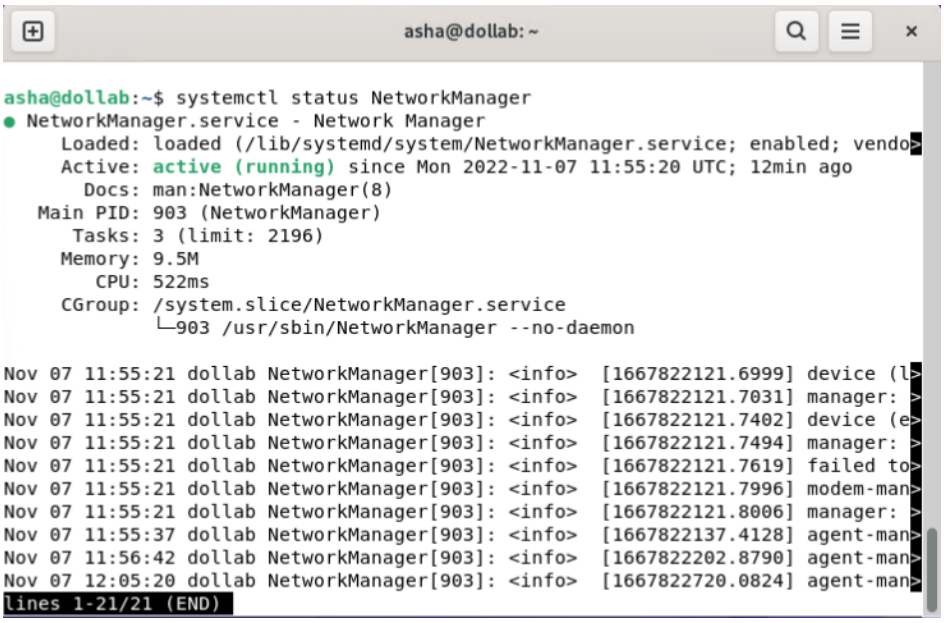

Figure 4.9.4: Network Manager status command

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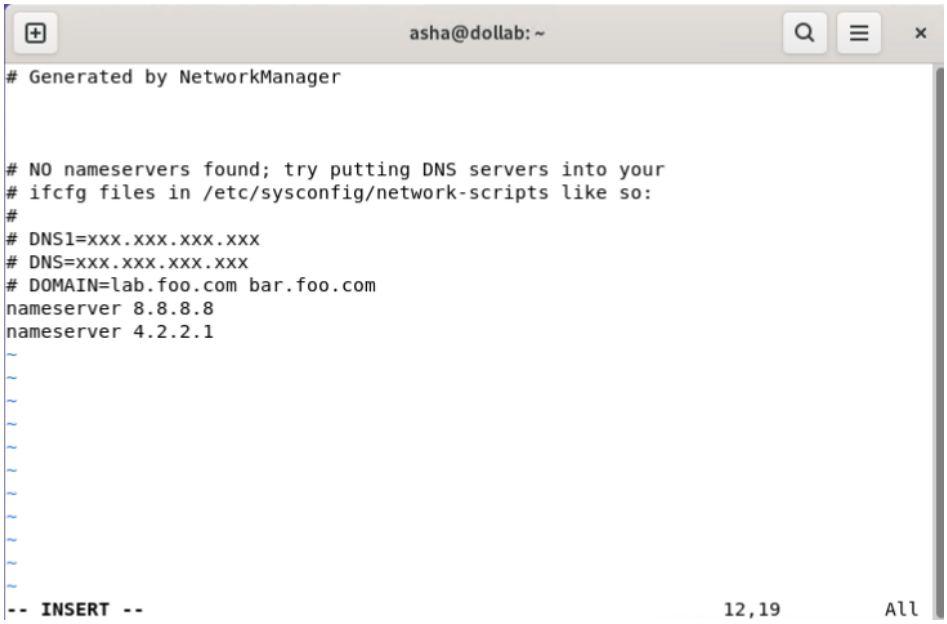

Figure 4.9.5: Nameserver text editor

- **Step 4 for Browser Internet**

Open Firefox browser, search from web address bar to access the internet.

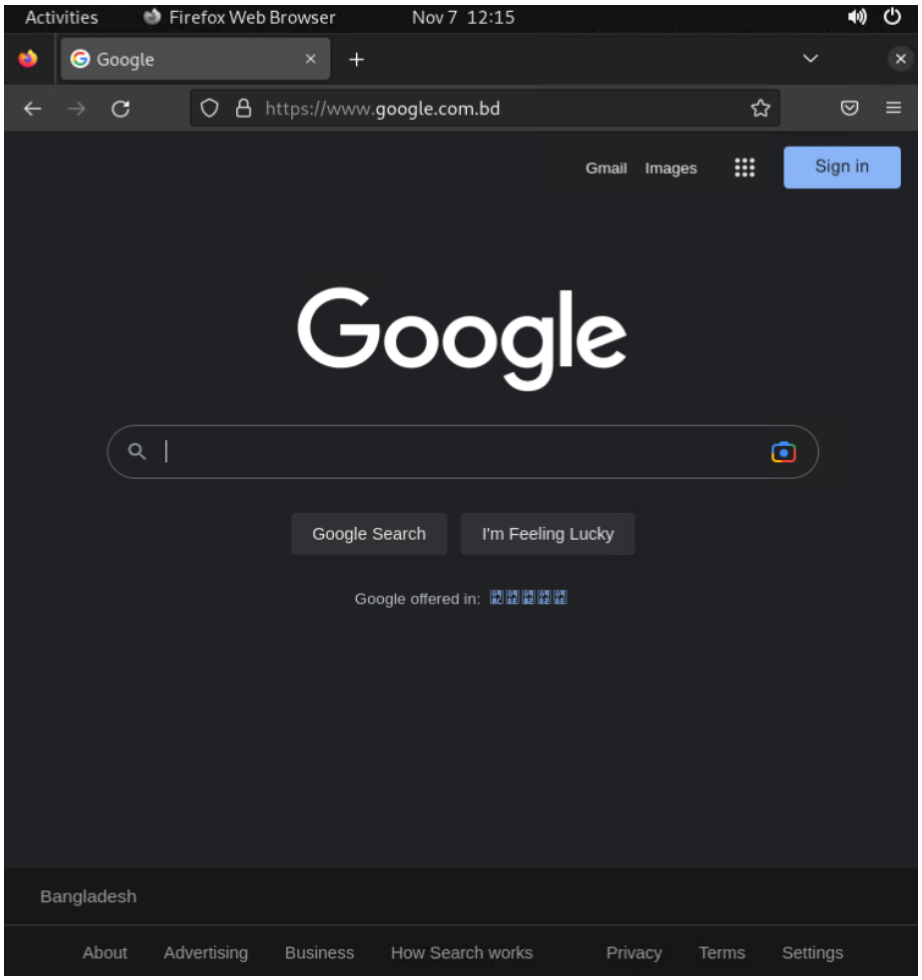

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Figure 4.9.6: Internet access to browser

4.10 Linux NFS Server Configurations

- **Step 1 for SELINUX Disabling**

Servers SELINUX to verify by command get enforce.

Must be disabled to create NFS Server.

Figure 4.10.1: Getenforce command on terminal

- **Step 2 for NFS Package**

Command sudor apt install nfs-kernel-server to install NFS packages.

Command systemically enable nfs-kernel-server command to enable NFS server.

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```
asha@dollab:~$ sudo apt install nfs-kernel-server
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
nfs-kernel-server is already the newest version (1:2.6.1-1ubuntu1.1).
0 upgraded, 0 newly installed, 0 to remove and 38 not upgraded.
asha@dollab:~$ systemctl status nfs-kernel-server
● nfs-server.service - NFS server and services
     Loaded: loaded (/lib/systemd/system/nfs-server.service; enabled; vendor pr>
     Active: active (exited) since Mon 2022-11-07 12:22:11 UTC; 2min 13s ago
   Main PID: 5318 (code=exited, status=0/SUCCESS)
        CPU: 10ms

Nov 07 12:22:11 dollab exportfs[5317]: exportfs: can't open /etc/exports for re>
Nov 07 12:22:11 dollab systemd[1]: Starting NFS server and services...
Nov 07 12:22:11 dollab systemd[1]: Finished NFS server and services.
lines 1-9/9 (END)
```

Figure 4.10.2: NFS package installing

```
asha@dollab:~$ sudo apt install nfs-common
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
nfs-common is already the newest version (1:2.6.1-1ubuntu1.1).
0 upgraded, 0 newly installed, 0 to remove and 38 not upgraded.
asha@dollab:~$
```

Figure 4.10.3: Nfs package installing

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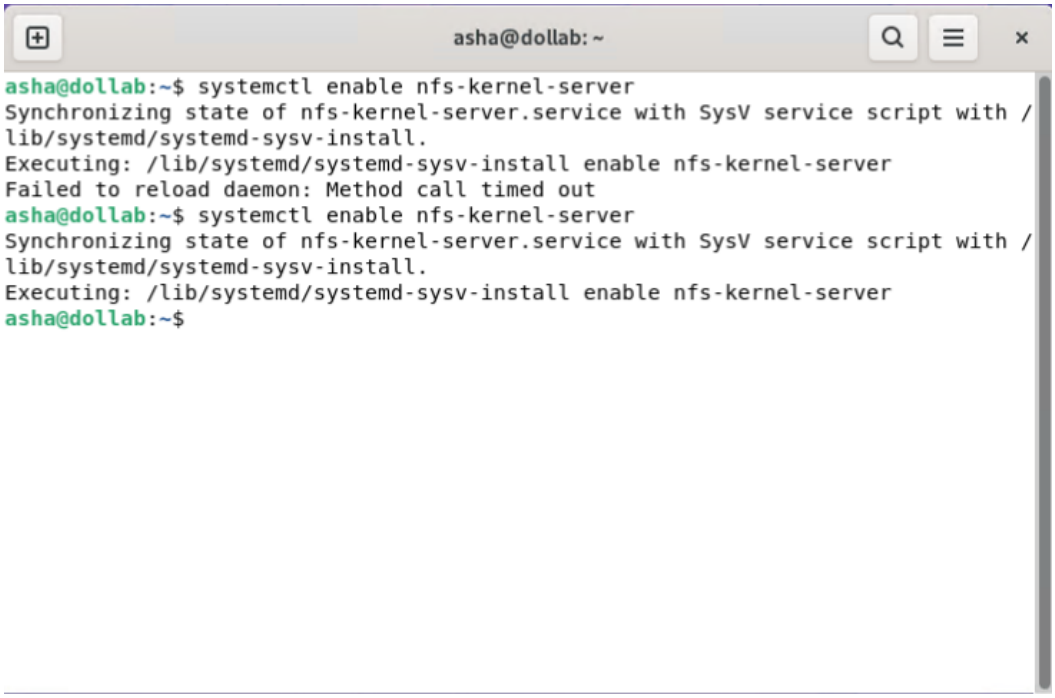

Figure 4.10.4: NFS command

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- **Step 3 for NFS Directory**

mkdir command to create nfs share.

chmod 777 -R command to allow permission

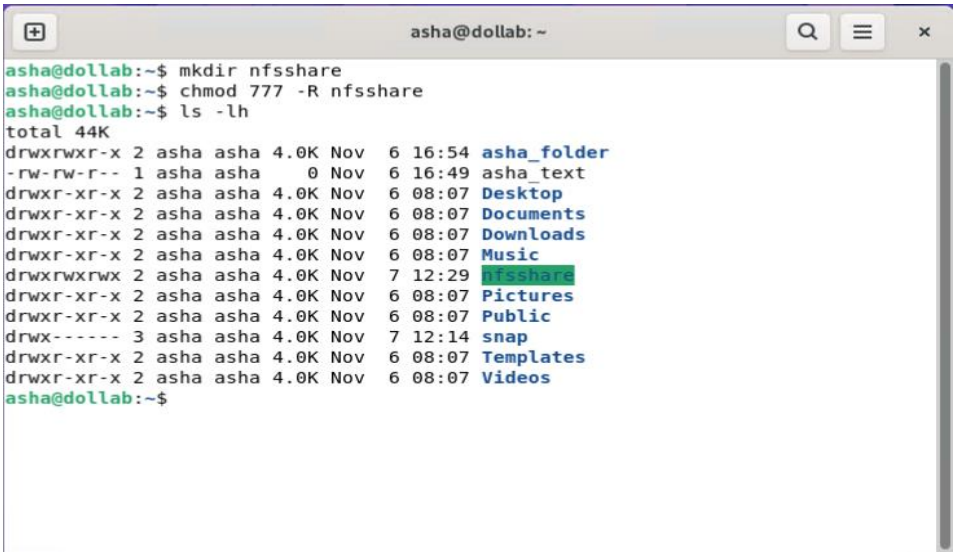

Figure 4.10.4: NFS directory created

- **Step 4 for NFS Directory**

Command vim > add ip address

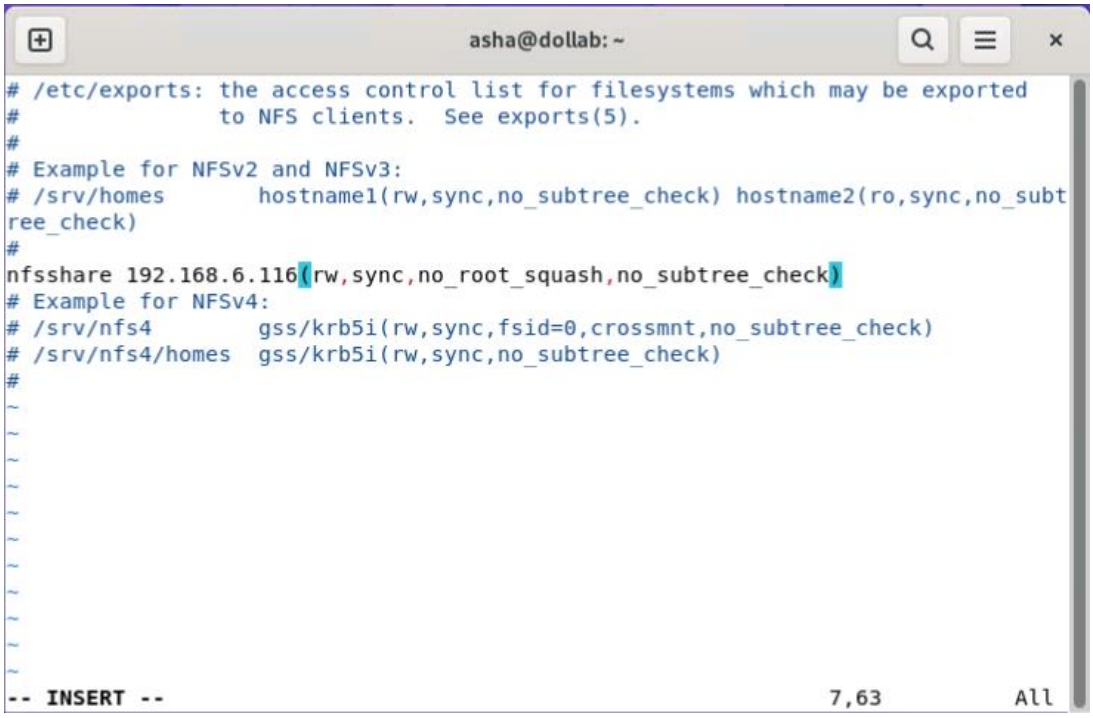

Figure 4.10.5: NFS client ip address

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- **Step 5 for NFS Server Restart**

Command systemically restart nfs-kernel-server to restart NFS server.

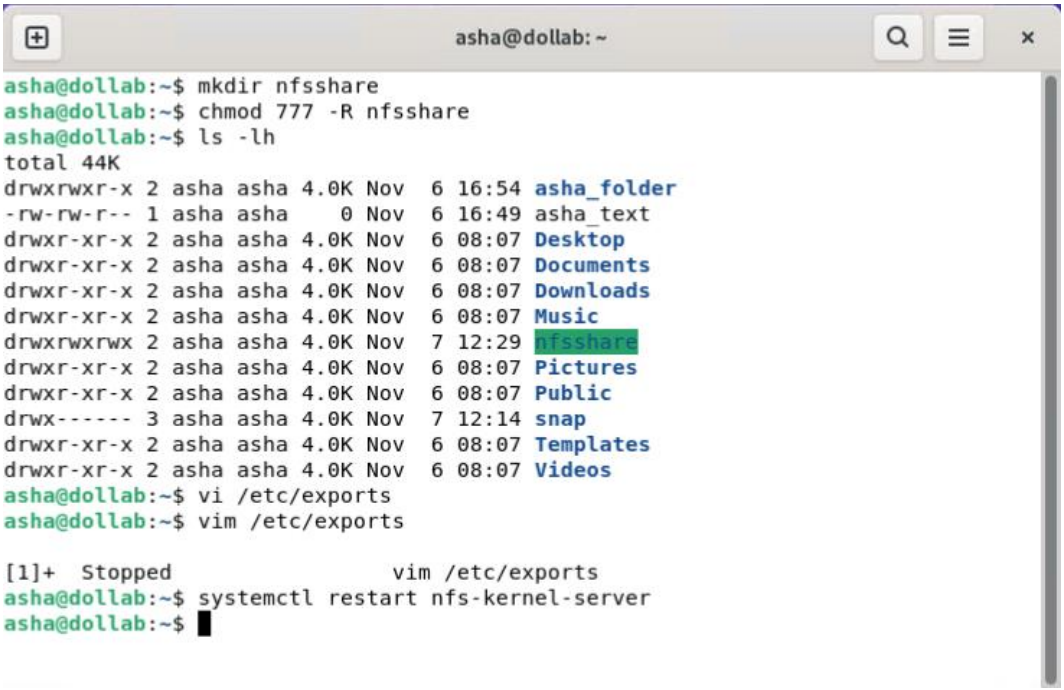

Figure 4.10.6: NFS server restarted

- **Step 6 for NFS Server File**

Command touch nfs/file to create a random file and ls to view file.

Figure 4.10.8: List directory of nfs shared folder

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4.11 Linux FTP Server Configurations

- **Step 1 for FTP Address**

Command vim > add ip address of FTP and hostname.

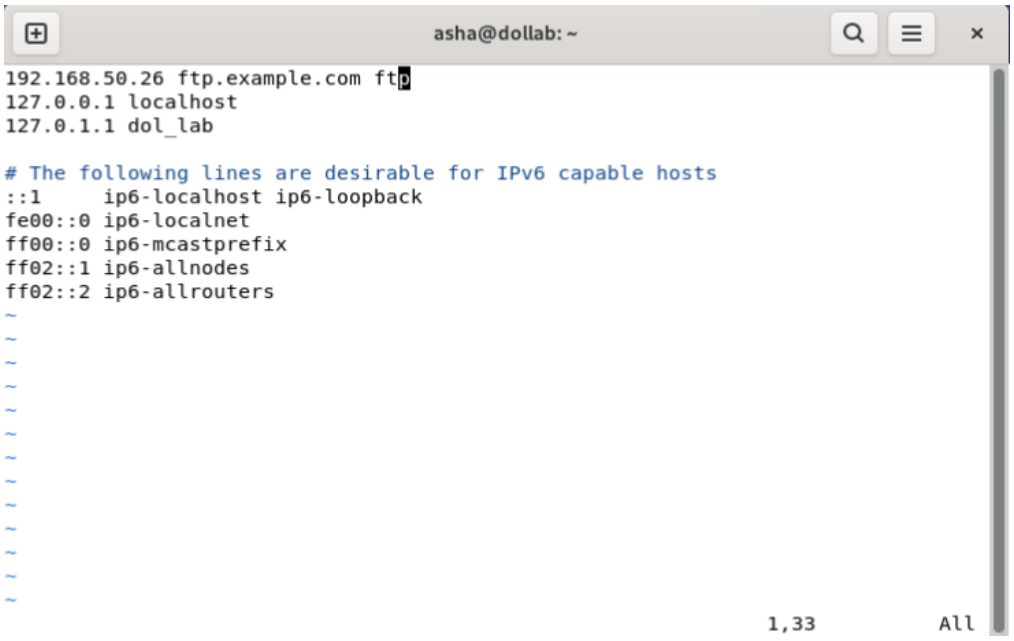

Figure 4.11.1: Hostname, ip address set

- **Step 2 for FTP Package**

Command sudor apt install vsftpd to install ftp packages.

Command cd /etc/vsftpd > ls -lh to view package files.

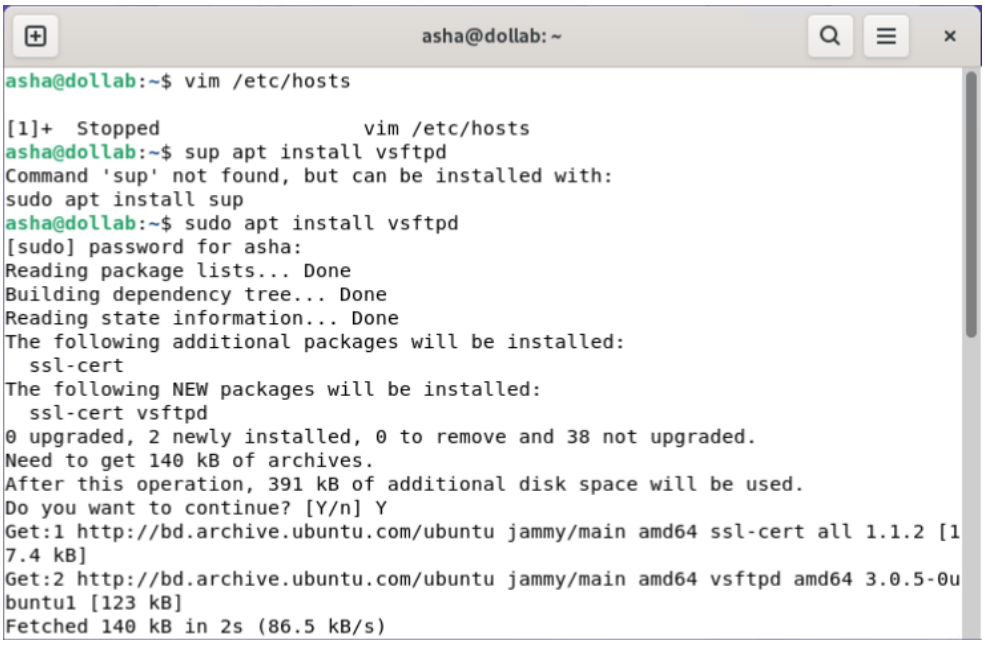

Figure 4.11.2: FTP server vsftpd package installing

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```
asha@dollab: ~
asha@dollab:~$ cd /etc/vsftpd
asha@dollab:~$ ls -lh
total 48K
-rw-rw-r-- 1 asha asha    0 Nov  7 16:36 vsftpd.conf
-rwxrwxrwx 1 asha asha    0 Nov  7 16:37 vsftpd_conf_migrate.sh
-rw-rw-r-- 1 asha asha    0 Nov  7 16:37 vsftpd.conf.org
asha@dollab:~$
```

Figure 4.11.3: Vsftpd package files

- **Step 3 for FTP Configurations**

Command vim > add FTP information's

```
asha@dollab: ~
# Enable this and ther server will recognise asynchronous ABOR requests. Not
# recommended for security (the code is non-trival). Not enalbing it.
# however, may confuse older FTP clients.
#async_abor_enable=YES
#
# By default the server will pretend to allow ASCII mode but in fact ignore
# the request. Turn on the below options to have the server actually do ASCII
# mangling on files when in ASCII mode.
# Beware that on some FTP servers, ASCII support allows a denial of service
# attack (DoS) via the command "SIZE /big/file" in ASCII mode. vsftpd
# predicted this attack and has always been safe, reporting the size of the
# raw file.
# ASCII mangling is a horrible feature of the protocol.
#ascii_upload_enable=YES
#ascii_download_enable=YES
#
# You may fully customise the login banner string:
ftpd_banner=welcome to blah FTP service.
#
# You may specify a file of disallowed anonymous e-mail addresses. Apparently
# useful for combatting certain DoS attacks.
#deny_email_enable=YES
# (default follows)
~
-- INSERT --                                          23,20         All
```

Figure 4.11.4: Vsftpd editor configurations steps

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```
asha@dollab: ~
# (default follows)
#chroot_list_file=/etc/vsftpd/chroot_list
#
# you may activate the "-R" option to the builtin ls. This is disabled by
# default to avoid remote users being able to cause excessive I/O on large
# sites. However, some broken FTP clients such as "ncftp" and "mirror" assume
# the presence of the "-R" option, so there is a strong case for enabling it.
#ls_recurse_enable=YES
#
# When "listen" directive is enabled, vsftpd runs in standalone mode and
# listens on IPv4 sockets. This directive cannot be used in conjuction
# with the listen_ipv6 directive.
listen=YES
#
# This directive enables listening on IPv6 sockets. To listen on IPv4 and IPv6
# sockets, you must run two copies of vsftpd with two configuration files.
# Make sure, that one of the listen options is commented !!

pam_service_name=vsftpd
userlist_enable=YES
tcp_wrappers=YES
use_localtimee=YES
~
~
~
~
-- INSERT --                                          22,19         All
```

Figure 4.11.5: Vsftpd editor configurations steps

- **Step 4 for FTP Server Start**

Command service vsftpd start and service vsftpd restart.

```
asha@dollab: ~
asha@dollab:~$ cd /etc/vsftpd
asha@dollab:~$ ls -lh
total 48K
-rw-rw-r-- 1 asha asha    0 Nov  7 16:36 vsftpd.conf
-rwxrwxrwx 1 asha asha    0 Nov  7 16:37 vsftpd_conf_migrate.sh
-rw-rw-r-- 1 asha asha    0 Nov  7 16:37 vsftpd.conf.org
asha@dollab:~$ service vsftpd start
Starting vsftpd for vsftpd: se                          [FAILED]
vsftpd (pid 1742) is running...
asha@dollab:~$ service vsftpd restart
Shutting down vsftpd:                                   [  OK  ]
Starting vsftpd for vsftpd:                             [  OK  ]
asha@dollab:~$
```

Figure 4.11.6: Vsftpd starting and restarting

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```
asha@dollab: ~

          inet addr:127.0.0.1 Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING MTU:16436 Metric:1
          RX packets:20 errors:0 dropped:0 overruns:0 frame:0
          TX packets:20 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:1392 (1.3 KiB) TX bytes:1392 (1.3 KiB)

asha@dollab:~$ service iptables stop
iptables: Flushing firewall rules:                         [  OK  ]
iptables: Setting chains to policy ACCEPT: filter          [  OK  ]
iptables: Unloading modules:                               [  OK  ]
asha@dollab:~$ cat /etc/passwd | grep ftp
ftp:x:14:50:FTP User:/var/ftp:/sbin/nologin
asha@dollab:~$ service iptables restart
iptables: Applying firewall rules:                         [  OK  ]
iptable: Loading additional modules: ip_conntrack_ftp      [  OK  ]
asha@dollab:~$ service iptables restart
iptables: Flushing firewall rules:                         [  OK  ]
iptables: Setting chains to policy ACCEPT: filter          [  OK  ]
iptables: Unloading modules:                               [  OK  ]
iptables: Applying firewall rules:                         [  OK  ]
iptables: Loading additional modules: ip_conntrack_ftp     [  OK  ]
asha@dollab:~$
```

Figure 4.11.7: Iptables restarting

- **Step 5 for FTP IP Tables**

Command vim > add relatable ip tables and information.

```
asha@dollab: ~

# Load additional iptables modules (nat helpers)
#    Default: -none-
# Space separated list of nat helpers (e.g. 'ip_nat_ftp ip_nat_irc'), which
# are loaded after the firewall rules are applied. Options for the helpers are
# stored in /etc/modprobe.conf.
IPTABLES_MODULES="ip_conntrack_ftp"

# Unload modules on restart and stop
#    Value: yes|no, default: yes
# This option has to be 'yes' to get to a sane state for a firewall
# restart or stop. Only set to 'no' if there are problems unloading netfilter
# modules.
IPTABLES_MODULES_UNLOAD="yes"

# Save current firewall rules on stop.
#    Value: yes|no, default: no
# Saves all firewall rules to /etc/sysconfig/iptables if fireawll gets stopped
# (e.g. on system shutdown).
IPTABLES_SAVE_ON_STOP="no"

# Save current firewall rules on restart
#    Value: yes|no, default: no
# Saves all firewall rules to /etc/sysconfig/iptables if firewall gets
"/etc/sysconfig/iptables-config" 54L, 1990C                    1,1           Top
```

Figure 4.11.9: Iptables editor configurations

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- **Step 6 for FTP Browser Access**

Open Firefox browser > type address to access FTP Server.

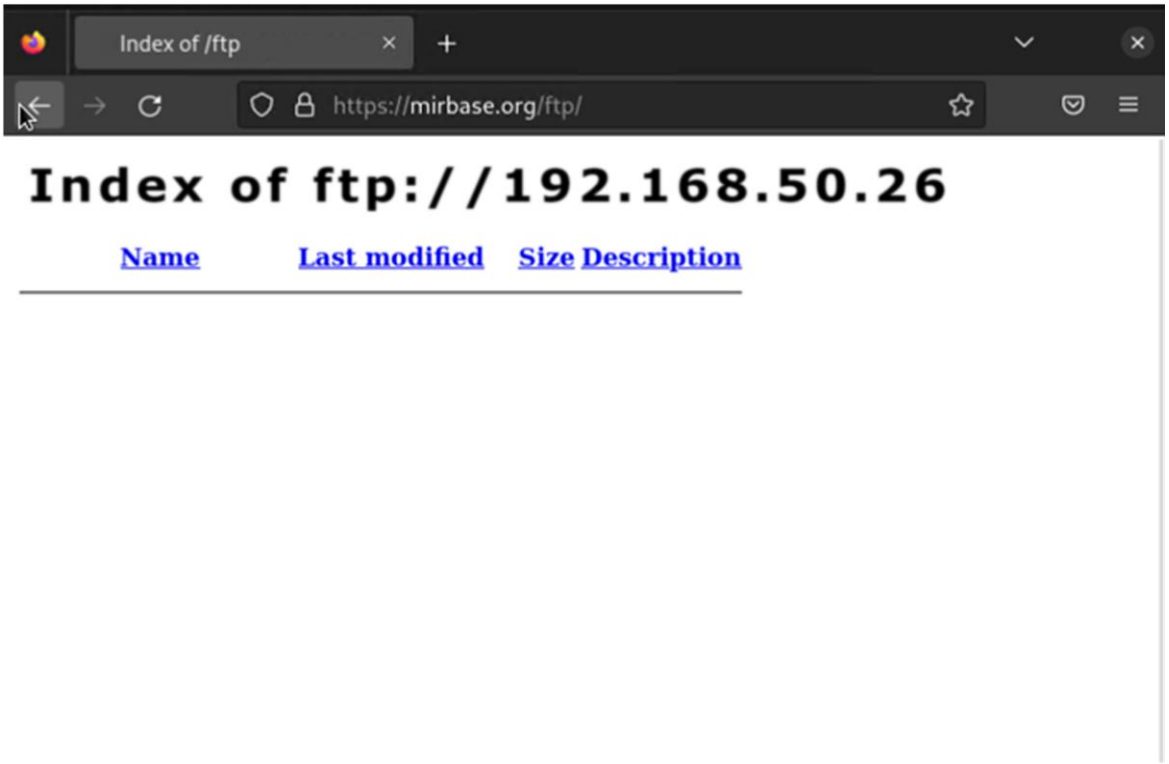

Figure 4.11.10: FTP server access by browser

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CHAPTER 5

CONCLUSION AND SCOPE

5.1 Discussion and Conclusions

This internship is a tremendous huge possibility for me to use the knowledge I have acquired throughout my academic career. As a surgical intern, Daffodil Online Limited I have developed my commitment to the work. The key to working in an is being committed and having the right attitude.

sophisticated setting It goes beyond simple formalities. The engineers must get involved in the process of the performance monitoring service, or technical engineering firm, for the majority. Working 24 hours a day, seven days a week has given me effective ways to communicate with technical employees and work gaps. due to the fact that there aren't many prospects for internet services. Over the course of my internship, I gained a lot of experience working with (Daffodil Online Limited) ISP.

Throughout the course of my internship, I performed numerous tasks at regular intervals and learned numerous important procedures from my peers and supervisors. I eventually gained the confidence to handle the task myself. This

is a fantastic chance for me to put my knowledge and skills to use. Additionally, I developed fresh concepts and learnt how to manage important failures. Since doing this sort of job is so beneficial to my career, I no longer want to do it.

5.2 Scope for Further Career

Career requirements Under the Linux operating system, square size was achieved in some locations. The professional chances in the Linux system square size described are not limited to the platform, but instead encompass a wide range of industries, including desktop applications.

Device drivers, Kernel, and Development Open supply software and network engineers are now in high demand from creators of open source software. Currently, several businesses are switching to Linux and open-source software. Companies like Google, Yahoo, Boeing, Lufthansa, wiki.org, and some others go to affordable open supply solutions. Professional networking in Linux, Mikrotik, etc. is in high demand.

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Chapter 6

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CHAPTER 7

APPENDICES

Actual learning occurs at the end of the working period when I have the chance to reflect on what I have seen and experienced through experimental teaching and internships. I use the right business.

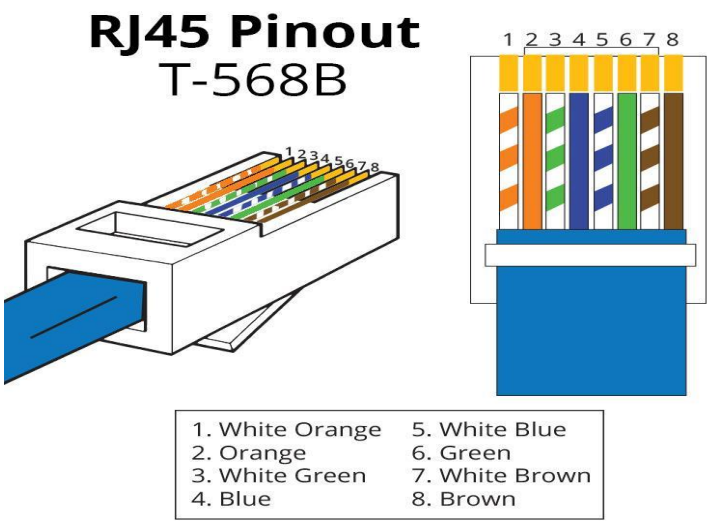
etiquette to observe clients and professional etiquette while learning how to interact with knowledgeable caretakers, another set of employees, as well as a subject matter expert. I'm imposing a company's strategic goal, ways to interact with coworkers, ways to share resources, ways to plan, ways to make decisions, some technical knowledge of the commercial enterprise's environment, and the organization's accountability and response.

The opportunity to seek an expert opinion is provided by the internship experience I had under the supervision of my internship manager, which included an evaluation and one-on-one sessions.

At DOL, I gained a lot of practical knowledge regarding RJ45 cabling. a combination of 8 color codes that are serially patched together and prepared for LAN cable connection.

Appendix A: RJ45 Cabling

At DOL, I gained a lot of practical knowledge regarding RJ45 cabling. a combination of 8 color codes that are serially patched together and prepared for LAN cable connection.



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