MIKROTIK ROUTER NETWORK CONFIGURATION

By

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ID: 182-19-2044

The requirements for the Bachelor of Science in Electronics and Telecommunication Engineering degree were partially met by the presentation of this report.

Supervised By

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APPROVAL

The project titled **"MIKROTIK ROUTER NETWORK CONFIGURATION"** submitted by Md Abu Hamza, ID: 182-19-2044 to the Department of Electronics and Telecommunication Engineering(ETE), Daffodil International University has been approved in terms of style and substance and acknowledged as satisfying for the partial fulfilment of the requirements for the degree of B.Sc. Electronics and Telecommunication Engineering. December 2024 was the date of the presentation.

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DECLARATION

Under the direction of Engr. Md Taslim Arefin, Associate Professor and Head, Department of Information and Communication Engineering, Daffodil International University, Dhaka, I therefore certify that this project is entirely my work and effort. It hasn't been submitted for an award anywhere. Other information sources were cited when they were used.

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ACKNOWLEDGEMENT

I am sincerely grateful for the opportunity provided by Atova Technology to complete my internship with such a respectable and forward-thinking company. The main emphasis during the internship was placed on MikroTik router configuration, which significantly enhanced my technical proficiency and understanding of practical networking solutions. Heartfelt appreciation is extended to Ferdosh Epon, the founder and CEO of Atova Technology, for his inspiring leadership and for creating the opportunity to work with this prestigious company. The leadership and the motivational environment established at Atova Technology have been profoundly inspiring. Gratitude is also expressed to Engr. MD Taslim Arefin, Associate Professor and Head of the Department of ICE, for the guidance, encouragement, and unwavering support extended throughout the academic journey and internship period. His mentorship was instrumental in facilitating professional growth and inspiring the pursuit of excellence.

Acknowledgement is further extended to my teachers and academic institution for the constant encouragement and support provided, enabling the successful completion of this internship. The professional development achieved through this internship is deeply appreciated, and the skills and knowledge acquired while working at Atova Technology will always be valued.

Md Abu Hamza

ABSTRACT

An outline of my internship assignment at Atova Technology, which concentrated on MikroTik router configuration, is provided in this report. The internship improved my academic knowledge and practical abilities by giving me hands-on experience with network infrastructure and routing technologies. The main objective was to become acquainted with the features of the MikroTik router, apply different configurations, and solve networking problems so that I could effectively contribute to actual network management situations. The core concepts of MikroTik routers, such as routerOS, firewall filtering, NAT configuration, and bandwidth control, were learned throughout the internship. The dynamic potential of MikroTik hardware and software was examined, as well as the utilisation of tools like Winbox for configuration and monitoring. Routing protocols, such as OSPF, BGP, and VLAN installation, were better understood, and the learning process was aided by the hands-on activities and advice of Atova Technology experts. Additionally, the ability to use networking technology and address practical issues was enhanced. Several network configurations had been successfully established at the project's end, and a comprehensive grasp of the MikroTik router's functionality had been acquired. The usage of MikroTik routers in several contexts will be emphasised, with the aim of mastering network architecture, security, and optimisation. It is also expected that contributions would be made to the creation of innovative technologies that will improve network scalability and reliability, guaranteeing businesses and organisations steady access. Significant advancements in professional growth have been achieved as a result of the internship, during which the technical know-how and self-assurance required to succeed in the fast-paced networking industry were gained.

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CHAPTER 1
INTRODUCTION

1.1 Introduction

A device that links to LOT devices, peripherals, and computers is called a network device. Wireless access points, switches, and routers are the basic parts of a network. My goal in selecting this internship was to get experience. A network-connected device can speak with another computer via these.

1.2 Motivation

1. **Innovation-Driven Solutions**: To innovate cutting-edge technologies that solve real-world problems and improve the quality of life.
2. **Customer-Centric Approach**: To design and deliver technology solutions tailored to the needs of businesses and individuals, fostering growth and efficiency.
3. **Empowering Communities**: To empower businesses and individuals through advanced technological tools, driving societal progress and digital transformation.
4. **Commitment to Sustainability**: To create technologies that are not only effective but also environmentally sustainable, contributing to a greener future.
5. **Global Connectivity**: To bridge gaps in communication and functionality across borders, enabling seamless interaction in an increasingly interconnected world.

1.3 Internship Objective

To assist me become a skilled applicant for the expanding job market is the major objective of my internship. It is imperative to cultivate the skills required for the labour market. This internship's main objective is to create liabilities to set standards for work procedures.

a. To regulate bandwidth to boost user prosperity. The operating system designed for MikroTik is meant to be used as a network router. An operating system and software combination have the power to turn a PC into a reliable network gateway. Numerous features for both wireless and IP networks are built into the machine.

b. To operate the Linux system built on RouterOS that is meant to be installed on MikroTik Router Board routers. It may also be installed on a PC, turning it into a router with an access point,

firewall, VPN server, and client. The system can operate as a captive gateway because it is built upon a wireless access system.

1.4 Introduction of the Company

Atova Technology is a cutting-edge tech solutions company dedicated to empowering businesses and individuals with innovative digital tools. Established with a vision to revolutionize how technology interacts with everyday life, Atova blends creativity, efficiency, and advanced engineering to deliver world-class services.

From developing robust software solutions to creating seamless user experiences, Atova specializes in providing customized, scalable, and sustainable technologies tailored to meet the dynamic demands of the modern world.

Atova Technology thrives on its core values of innovation, reliability, and excellence, driven by a team of skilled professionals who are passionate about transforming ideas into impactful solutions. Whether it's through digital transformation, cloud computing, or AI-driven advancements, Atova is committed to shaping the future of technology with a focus on quality, sustainability, and customer satisfaction.

1.5 Layout of the Report

In this report, an overview of the company is provided, along with its marketing product and organizational structure. Additionally, my motivation, goal, introduction to the firm, and the internship organization are described. Subsequently, an example of the internship is presented by detailing events, project work, and activities undertaken. Finally, the platform MicroTik's future scopes, career prospects, and conclusions are discussed.

In **Chapter 1**, An overview of networking, along with the reasons and goals for undertaking the internship, has been provided.

In **Chapter 2**, The company details, services, and products are also used to describe the organizational structure.

In **Chapter 3**, In addition to in-depth networking knowledge, the fundamentals of networking and MikroTik's function have been covered. For instance, the different kinds of networks are described.

In **Chapter 4**, It will be learned how to configure the MikroTik router, along with static configuration and bandwidth management.

In **Chapter 5**, The conclusion and future career scope after the internship have been discussed.

CHAPTER 2
Organization

2.1 Introduction

A well-known supplier of IT services and solutions, Atova Technology is committed to offering creative and personalized IT solutions. Atova Technology was founded to make complicated IT problems easier to understand. It focuses on software development, networking solutions, cloud-based services, and IT infrastructure management. By providing innovative solutions that are suited to the various demands of businesses, the company has established a reputation for excellence and customer satisfaction. Atova Technology is a reliable partner for businesses looking to improve their operational efficiency because of its services, which span from small-scale corporate solutions to large-scale IT infrastructure deployments.

2.2 Product of Marketing

Being one of Bangladesh's leading national Internet service providers (ISPs), Daffodil Online Ltd. takes pride in its position. Long-term client connections are one of their major business values, and they are the most seasoned and experienced firm in the ICT sector. They are thrilled with what we have accomplished and much more so about our chances for an equally promising future as they reflect on the past ten years since our founding. Additionally, Daffodil Online Ltd provides expert training administrations and distinctive IT services. We are provided with specialised IT Based Professional Training services by Daffodil Online Ltd.

They are listed in the following order:

- Assistance from ISP.
- Protection of IT security.
- Domain name registration and web hosting.
- Internet solutions for businesses.
- Professional courses and training with an IT focus.
- An application solution that is open source.
- Development of websites

2.3 Organizational Structure of Atova Technology

Figure 2.3 Organization of Atova Technology

2.4 Profile of the Company

Name	**Atova Technology**
Address	**Satmasjid Super Market, Mohammadpur, Dhaka**
Cellphone	**01713 615 831**
e-mail	**support@atovatech.com**
Website	**www.atovatech.com**
Type of Company	**IT Company**

CHAPTER 3

Introduction of MikroTik

3.1 Networking

In the modern world, networking is crucial for communication as well. We can't fathom exchanging data across locations without networking. Thanks to networking, data communication between locations is now simple. By distributing data among multiple machines, we may establish a network. Founded in 1996, MikroTik is a Latvian company that specializes in routers and wireless ISP systems. At the moment, MikroTik offers net property hardware and software solutions in the majority of nations worldwide. America created the Router OS computer code in 1997 in response to the impression of victimization caused by industry-standard laptop hardware and complete routing systems. This code offers significant stability, controls for all types of knowledge interfaces, and routing. When we decided to construct our hardware in 2002, the Router BOARD was born.

3.2 Types of Networking

3.2.1 LAN (Local Area Network)

We utilize the local area network daily. Its main objective is to construct small- to medium-sized office spaces and share data and resources between device times, with the possibility of saving on

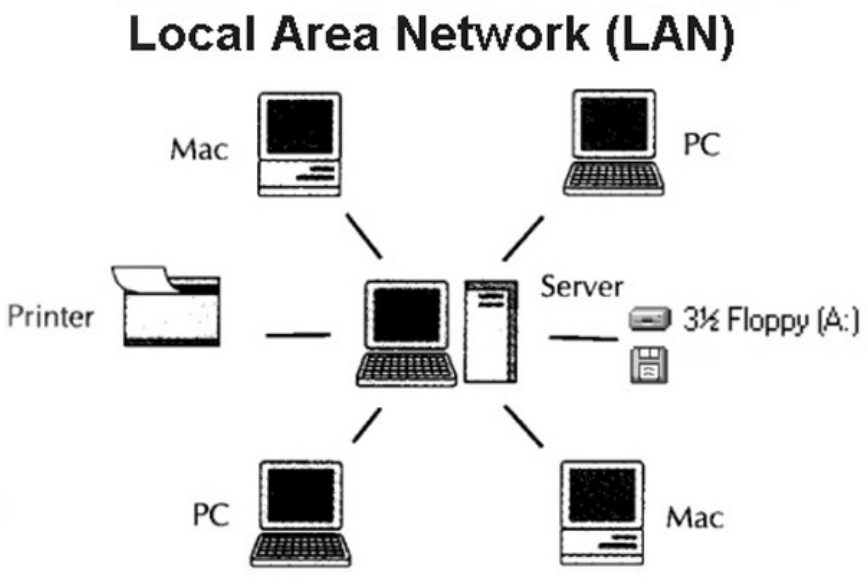


Figure 3.2.1: Local Area Network

printers, electronic equipment, scanners, and other purposes by leveraging company commerce networks and workplace courts. Computers and other network devices can benefit from native space networks by being able to share resources. The computer network is the most concerning because the single connection used here is constrained by the building's maximum distance and backup options.

3.2.2 MAN (Metropolitan Area Network)

The term "metropolitan area" (MAN) is an acronym. One of the several types of networks is networks. One relatively new kind of network is the person. As the name suggests, a global area network (MAN) is a network that is larger than a local area network. MANs are typically less than 100 kilometres long and comprise a variety of hardware and transmission media. It's a single network, similar to a cable TV network, or a way to connect several PC networks into a larger network, allowing resources to be shared across devices as well as between PC networks and LANs.A single network, such as a cable TV network that reaches the entire city or a multitude of local networks, is constructed collaboratively. In this way, the resource is moved from network to network and from laptop to laptop to boot. Large organisations usually own MAN to connect their disparate operations around a city.

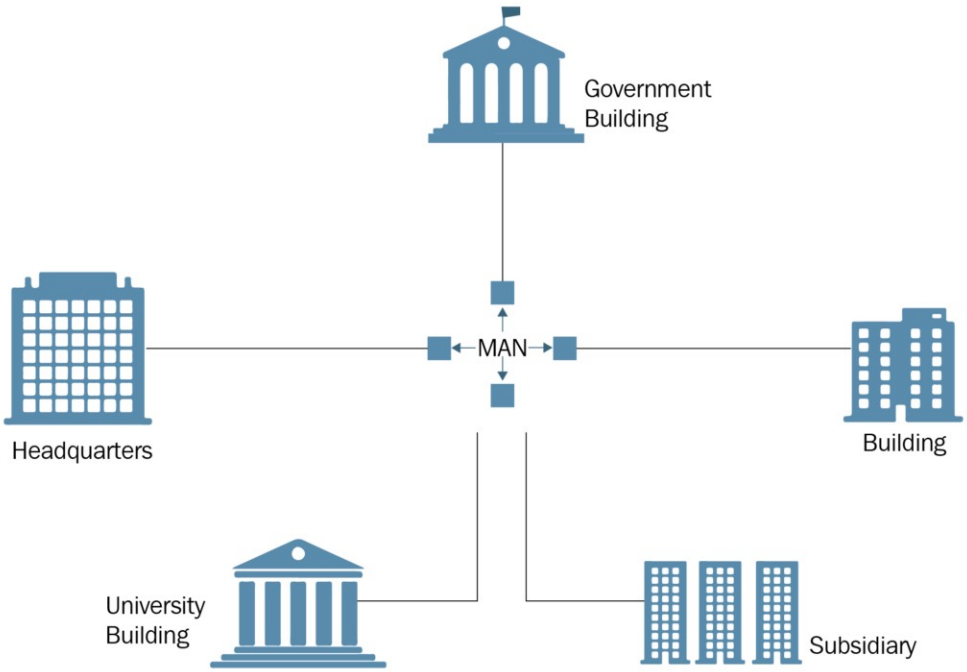


Figure 3.2.2 Metropolitan Area Network

3.2.3 WAN (Wide Area Network)

Wide Area Network is demonstrated over a very wide geographic region using computer networks and MAN. The phone company was used to illustrate this type of network because of its enormous space network, which is challenging to grow, its technology, and its distinctive locations that are used to link to numerous LANs. Because there is a need to develop computer networks worldwide and because satellites are employed in a variety of situations, the WAN of the plans to build over the computer network is genuinely challenging to manage. Most wide area networks run at 56kbps or 1.5444 megabits per second.

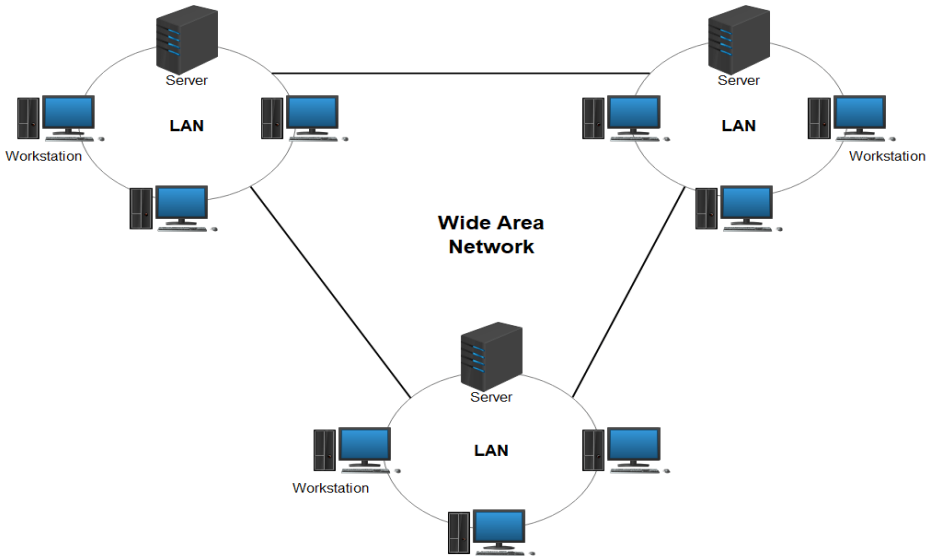


Figure 3.2.3: Wide Area Network

3.3 Training Served

I decided to intern at Atova Technology Ltd. Configuration of a Cisco networking Micro Touch switch Training for MikroTik routers takes four months. Not long after I was admitted, I started taking classes and training. In the beginning, we knew nothing about Cisco networking. We'll go over the IP configuration first. We receive a multitude of data on IP subletting and reconciliation. Next, we started setting up the virtual box's micro-router. We also collect a wide range of data regarding micro-routers. If a MikroTik router is capable of forwarding a new configuration, it must first reset the system. The microcytic router must first scan the IP in the interface, then the DNS and the gateway, in order to establish an Internet connection. In addition to the DHCP setting, we are unaware of the various Mikrotik router configurations. We are familiar with a variety of bandwidth management configurations and how to allocate or share bandwidth thanks to PPPOE. After learning about all the

various settings, we refrained from testing it again. We gained a comprehensive understanding of the MikroTik router after completing a four-month training program.

During the first month, switch configuration, VLAN, switch management, networking, and IP subnetting are all covered.

❖ Gaining knowledge and understanding of network components.

❖ Learn and comprehend the fundamentals of MikroTik.

❖Fundamental Centos Inputs.

The following month, we studied the MikroTik Simple configuration and OS installation in the VMware course offered by Daffodil Online Ltd.

❖MikroTik OS installation

❖Web site filtering

❖IP addressing concept

Third month we learn about MikroTik whole configuration, which is critical for MikroTik router control.

❖Configuration of IP

❖ Subnetting the network

❖ Binding of network

❖ Cisco

❖ VLAN

❖ PPPOE

❖ Static and DHCP

❖ Bridge

❖ Management of bandwidth

❖ Address Resolution Protocol

❖ Wireless configuration

❖ Firewall

3.4 OS of MikroTik

In essence, MikroTik OS is an operating system. It is available at multiple licensing categories (0–6). After around twenty-four hours of experimenting, the variance is zero. You can test the router OS in all its aspects for free with this type of trial. You may compare all of the various license level topographies here. It's not hard to install the operating system on a router. The operating system may be readily burned to a CD and booted from, or we can obtain an ISO image of it.

3.5 MikroTik Ethernet Router

3.5.1 hAp lite

With a 650MHz CPU, 32MB RAM, dual-chain 2.4GHz onboard wifi, four Fast Ethernet ports, and a RouterOS L4 license, the hAP light is a wireless router.

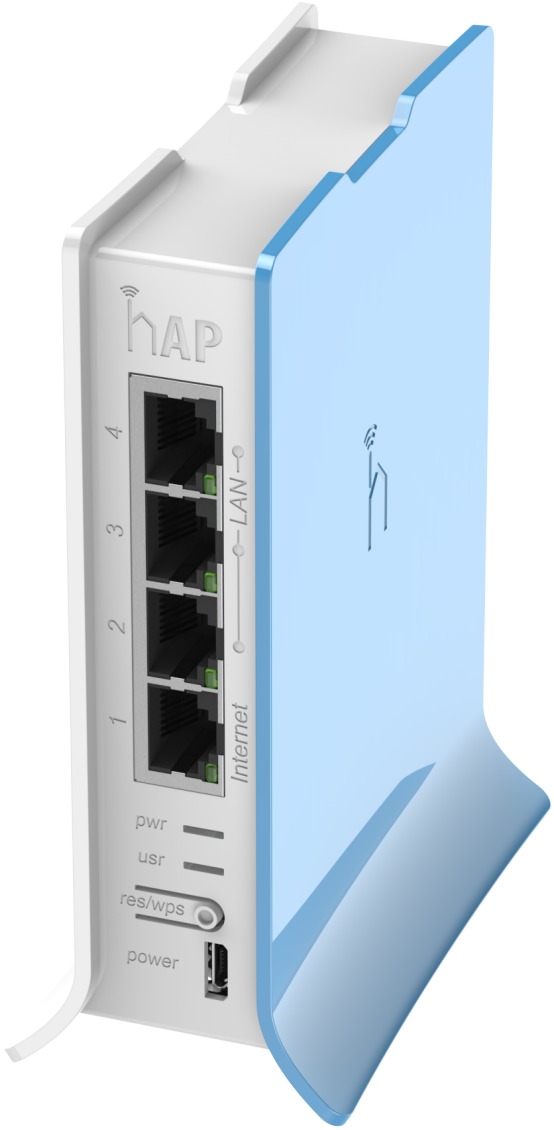


Figure 3.5.1: hAp lite

3.5.2 HEX lite

This is just a five-port LAN router protected by an incredibly strong plastic casing. Since the evaluation is done solely under the switch OS permit, it is clear when the router starts controlling our wired home network. It is easy to use, compact, reasonably priced, and carefully made.

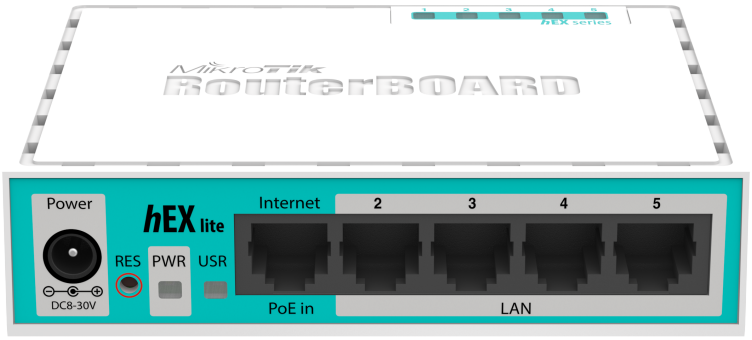


Figure 3.5.2: HEX lite

3.5.3 HEX PoE

A five-port Gigabit Ethernet router called HEX PoE is intended for usage in scenarios where wireless connectivity is not necessary. The device has an SFP port for optical fiber connectivity in addition to a USB 2.0 interface. Other PoE-enabled devices can be powered by ports 2-4 utilizing the unit's voltage. In addition to being affordable and easy to use, it has a powerful 800MHz CPU that can handle all of the complex configurations that Router OS offers. There are less wires and power adapters to be concerned about. The Ethernet ports are insulated, and the maximum current allowed per port is 1A. Along with passive or 802.3af/at PoE output, it also supports passive PoE input and output. Other PoE-enabled devices may be powered at the same voltage as the unit via Ethernet ports 2-4.

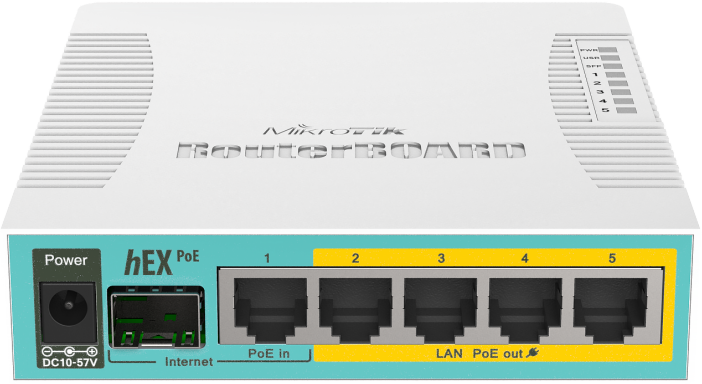


Figure 3.5.3: HEX PoE

3.5.4 RB2011

One affordable multiport device series is the RB2011 series. intended for indoor use and offered in multiple layouts and casing variations. With five Gigabit Ethernet ports, five Fast Ethernet ports, a power connector, and PoE functionality, the RB2011iL-IN is the most basic model. The new Atheros 600MHz 74K MIPS network processor of the upcoming generation powers it. Other PoE Atova Technology requires 10 equipped devices that can be powered with the same voltage as the unit using Port #10's PoE output function. The maximum load on the port is 500mA.

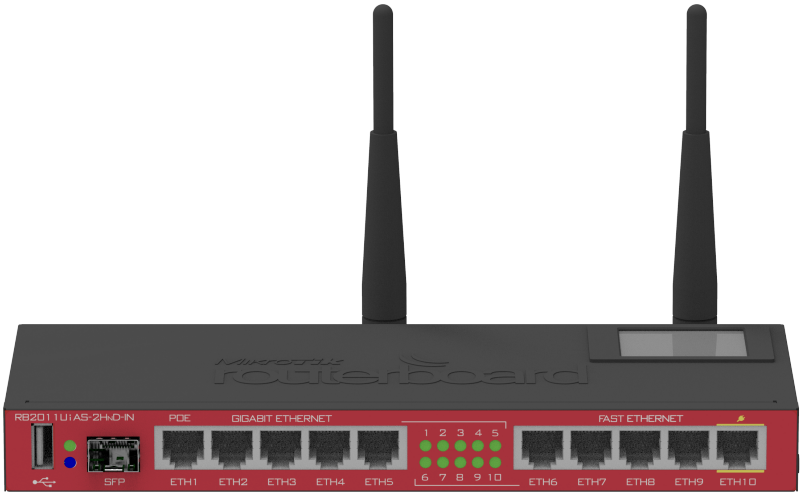


Figure:3.5.4 RB201

3.5.5 CC1036-8G-2S+

With the addition of two SFP+ ports that provide 10G interfaces and the same 36 core Tiller CPU as our previous CCR1036 model—which provides the same speed but allows for 10 gigabit lines—the fastest router on the market has been significantly improved. The new CCR1036-8G-2S+.

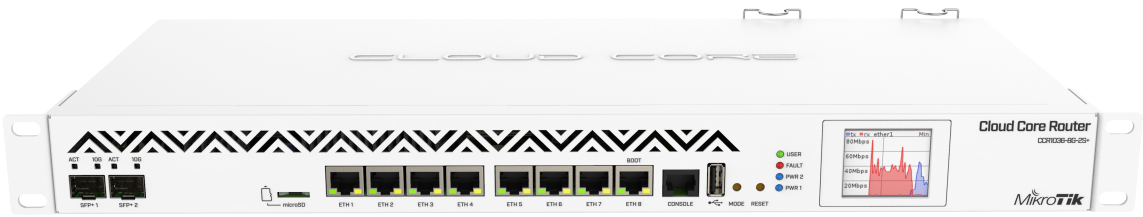


Figure 3.5.5: CC1836_8G_2S

CHAPTER 4

Configuration of MikroTik

4.1 Winbox

Winbox is a little application that makes managing MikroTik RouterOS quick and simple. Although it is a native Win32 binary, Wine may be used to run it on Linux and Mac OS X.

4.2 Win box Interface Menu

Winbox uses the AES128-CBC-SHA encryption technique (needs Winbox version 3.14 or higher).

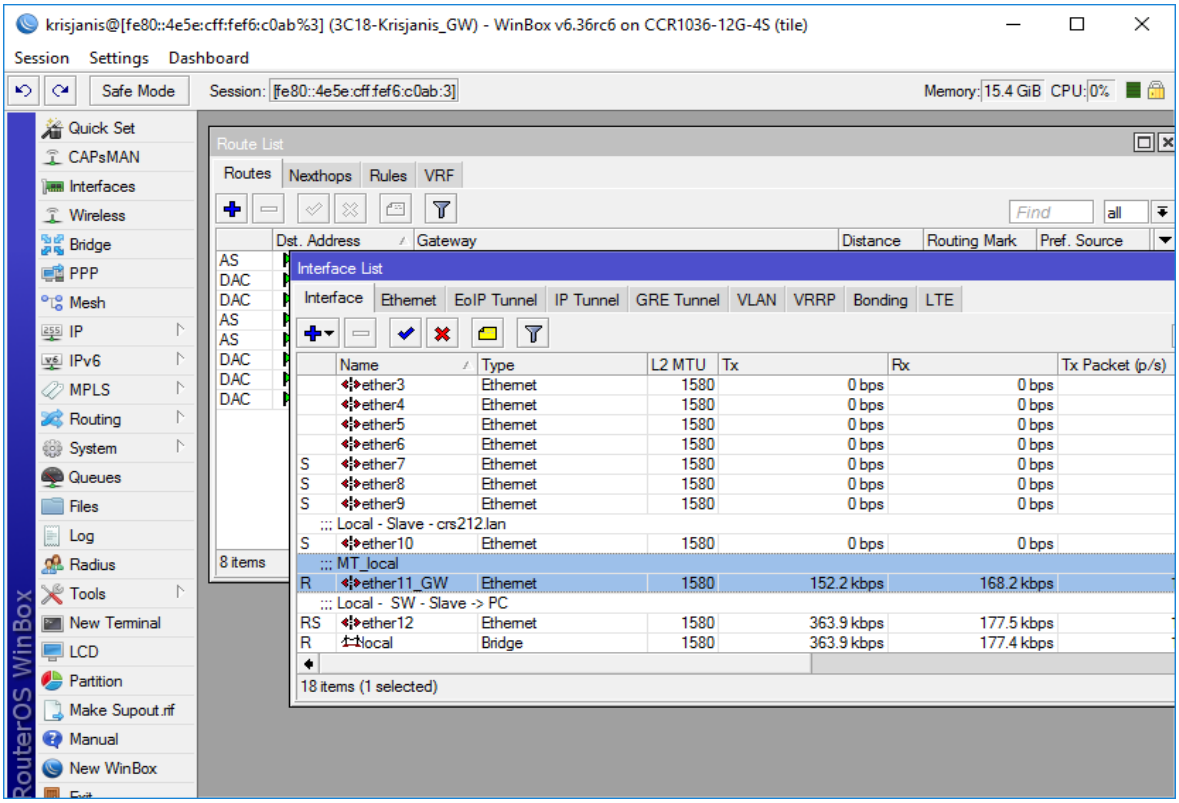


Figure 4.2: Winbox

4.3 Static Configuration

Since the administrator can physically improve this, directing options are required due to the inactive steering inside that directing table. Although she only has a small variety of courses, dormant courses are typically completed because there is just one default course available. If we have the fewest tools for setting up the course and there are no plans to change it in the future, we may also use inactive directing.

Step 1: Winbox open: Ip>> Address 192.168.0.1/24>>Interface_ether1>>
Ip>>Address 172.16.0.1/24>>Interface_ether4>
Apply>>OK

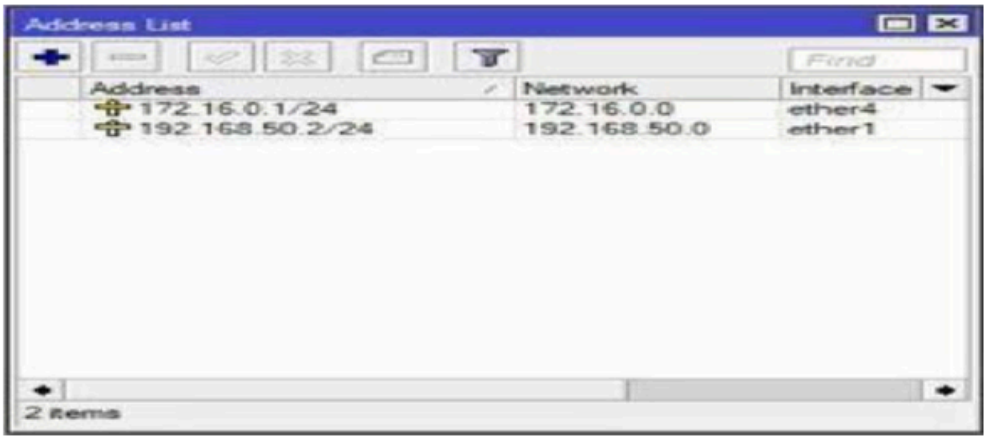


Figure 4.3: Adding Network Address & selecting interface

In Figure 4.3, We have shown the way we can add network address and selecting interface while following the steps described in step 1.

Step2 Ip>Routes>=192.168.50.1)>Apply>OK

Figure 4.4: Adding Route

In Figure 4.4, we have added a route in the router by following the steps in step 2. First, in IP, I went to route, put the IP address and then pressed apply, after that pressed ok.

Step 3: Ip>Firewall>NAT>+action>masquerade>Apply>OK

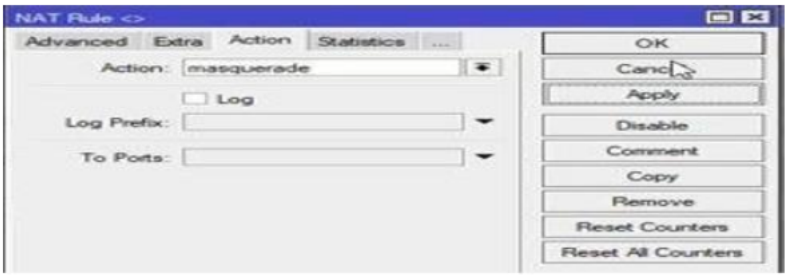


Figure 4.5: Setting up Firewall

In step 3, I have set up firewall and it is shown in the figure 4.5, in the IP section I have select Firewall then NAT and +action then masquerade then applied ok.

Step 4: Ip>DNS>DNS Setting>servers=203.190.10.252=230.190.10.253

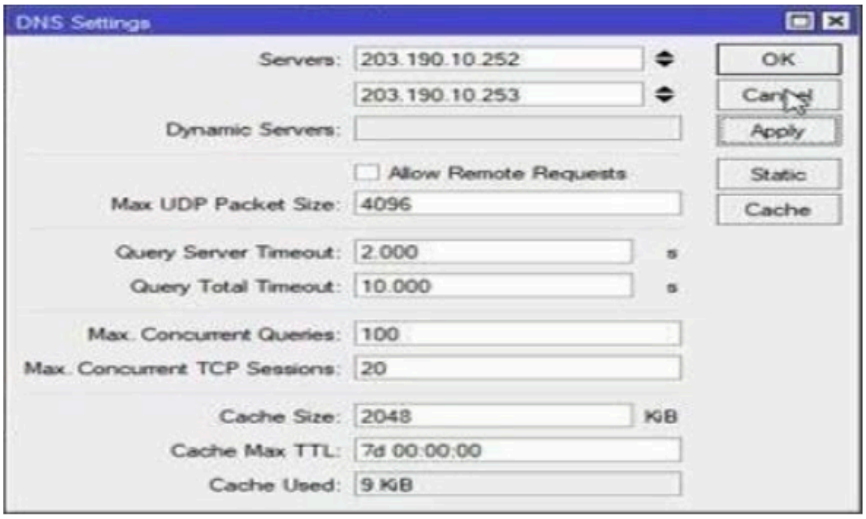


Figure 4.6: Adding DNS

In the figure 4.6, we can see the option of adding DNS. Same as before I have enter the IP section and then DNS then DNS Setteing, after selecting DNS Setting I have put the server ip address 203.190.10.252 and 203.190.10.253

4.4 DHCP Configuration

Its main function is to assign IP addresses to network nodes and devices so they can connect via IP. This is known as the network management protocol.

Step 1: Go to the IP>DHCP server menu first. The window for the DHCP server will then open.

Step 2: After that, simply select ether2 by clicking the DHCP configuration button, and then click the next button.

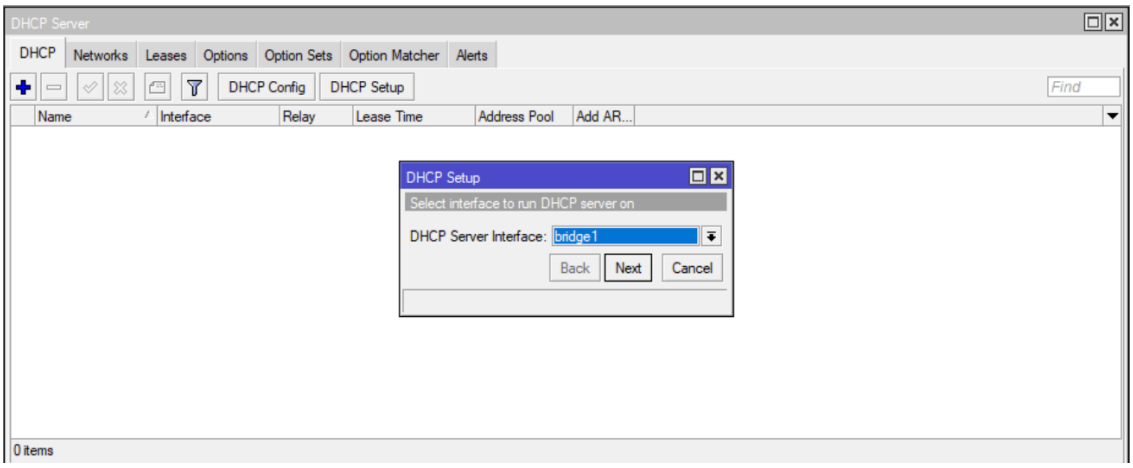


Figure 4.7: Selecting DHCP Server

Step 3: Next, type the address of the designated LAN network block (172.16.0.1) in the DHCP address area input field and click next. Every end-user on this network will now have an IP address issued to them.

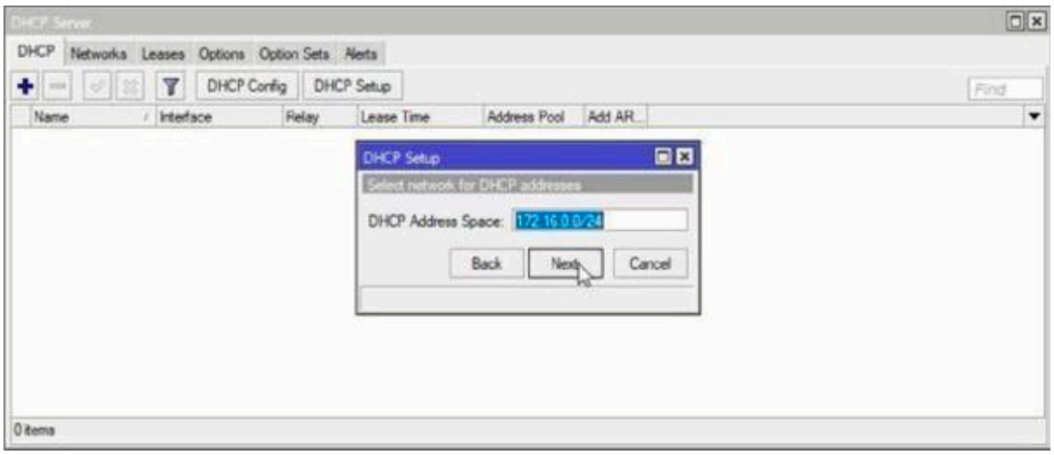


Figure 4.8: Selecting Network Block

After selecting DHCP Server Interface in Figure 4.7, press next we can see the DHCP address space where we can select the total network block. The total number of IPs will be 24, and every end-user will now get a different IP

Step 4: Click next after choosing a gateway in the DHCP network input box that is provided.

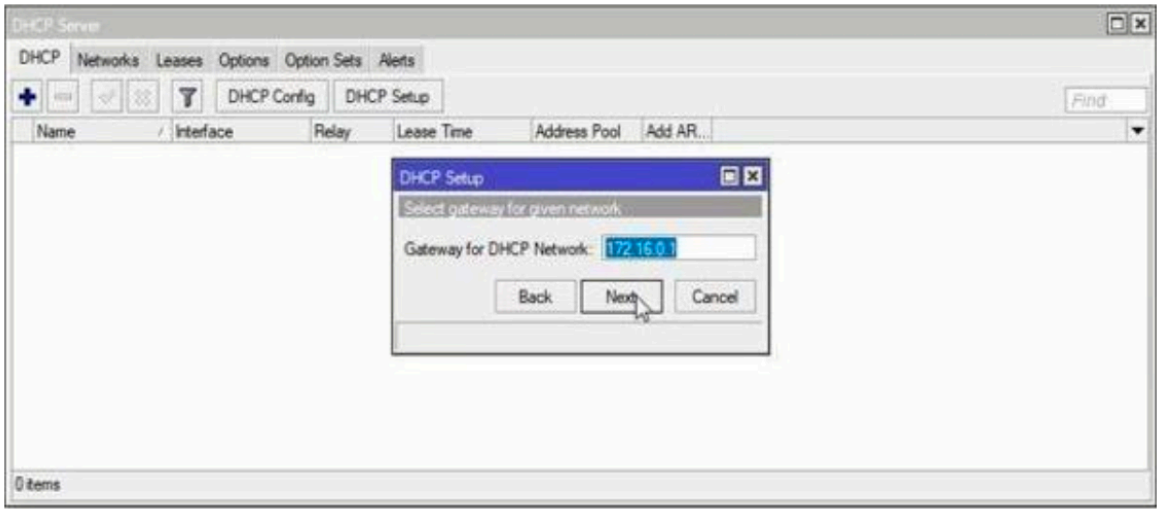


Figure 4.9: Selecting Gateway

Now In Figure 4.9, we can see selecting the gateway as it was provided earlier DHCP input. After completing the configuration now we can setup DHCP gateway by selecting DHCP>DHCP Setup, A box will pop up and there will be shown an IP and we have to press Next.

Step 5: Enter the IP range and the DHCP client user's IP address before pressing the next button.

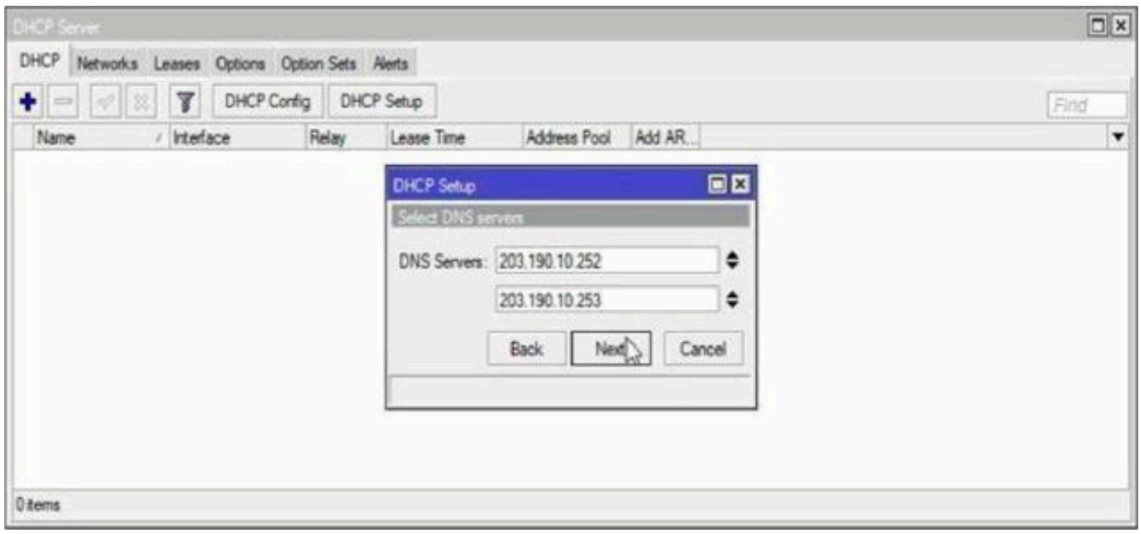


Figure 4.10: Selecting DNS Server

After selecting the gateway, we have to select the DNS server, we have the DNS server, which will be visible in the DNS Server option. As shown in the figure 4.10

Step 6: Click Next after entering the DNS server's IP address

Step 7: Now we have to enter the IP lease time, after entering the lease time, we press the Next button.

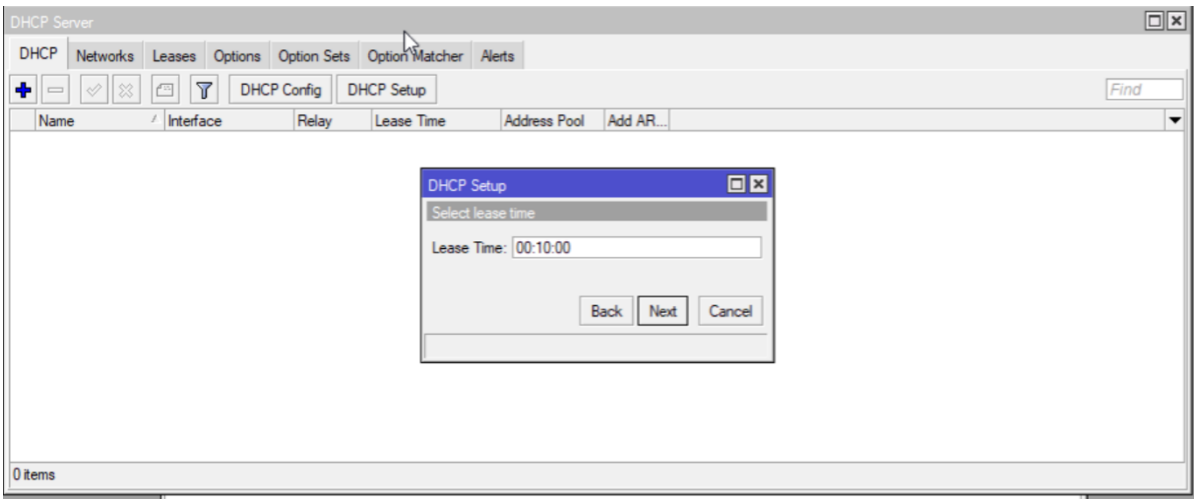


Figure 4.11: Selecting the Lease time of DHCP Server

After entering the DNS server's IP we click next, and then we will see the lease tine, We have to set up the lease time, once the lease time is set for the ip then we click next again

Step 8: After completing lease time, The DHCP configuration is complete and we will see a successful signal appear on the screen.

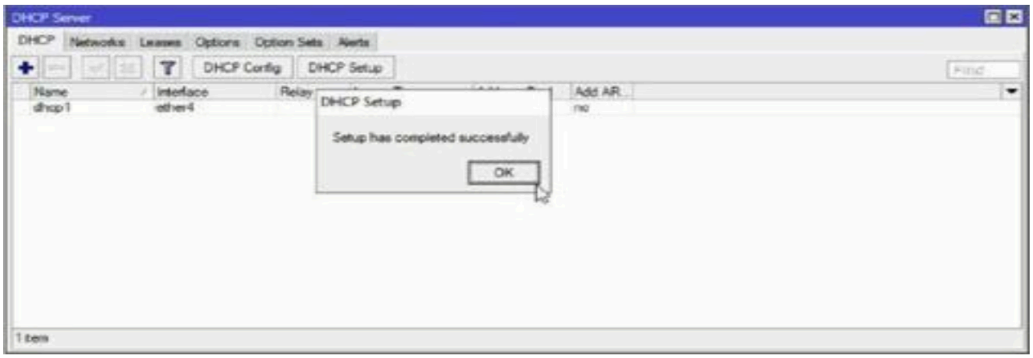


Figure 4.12: DHCP Setup successful

Every device that uses an IP address, such as a cellphone, router, personal computer etc will be connected to the new network that we have just configured. A MicroTik DHCP server IP address is assigned randomly and we can check the IP status by clicking leases.

4.5 Bandwidth Management

Two methods exist for bandwidth management.

i. Make multiple queues (one for each IP). (Which does not sound like a good idea in our opinion.)

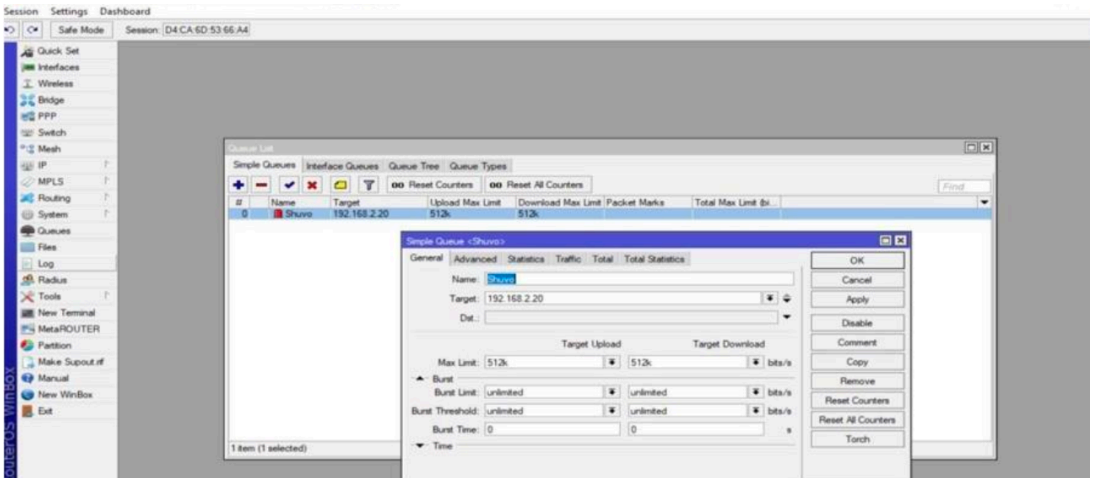


Figure: 4.13 Bandwidth Management

In the figure 4.13, we have shown the way we can manage the bandwidth, making multiple queues for each ip is now a good idea, that why we make two new queues for PCQs

ii. Make two new queues for PCQs. (One to be uploaded, and one to be downloaded)

4.6 PPPoE Configuration

Point-to-point protocol over Ethernet, or PPOE, is the full name of this network protocol that encapsulates point-to-point protocol packets into Ethernet frames. It is frequently employed in DSL administrations. It makes use of a DSL scenario where a DSL modem is connected to an isolated user interface via Ethernet.

Step 1: When establishing a PPPoE client, assume that the WAN port is ether 1. WAN cable attached to Ethernet 1: select PPP, then the plus sign. Put a Plus in it. Select the PPPoE client next. Select an ether1 after inspecting an interface by selecting the general tab. After entering the User and Password on the Dial Out page, click Apply. Lastly, the window will show the connection status.

Step 2: Setting DNS: Choose IP, then DNS, and fill in the DNS IP address field with the necessary IP address.

Step 3: Navigate to the Ports tab, select Interface Add into Bridge, click Add + Add Port into Bridge, choose the previously generated bridge, and click OK.

Step 4: Enter an IP address to configure a LAN; select IP, then click Address. To add a new IP address, click add+, enter the address, and choose the bridge name that was previously generated.

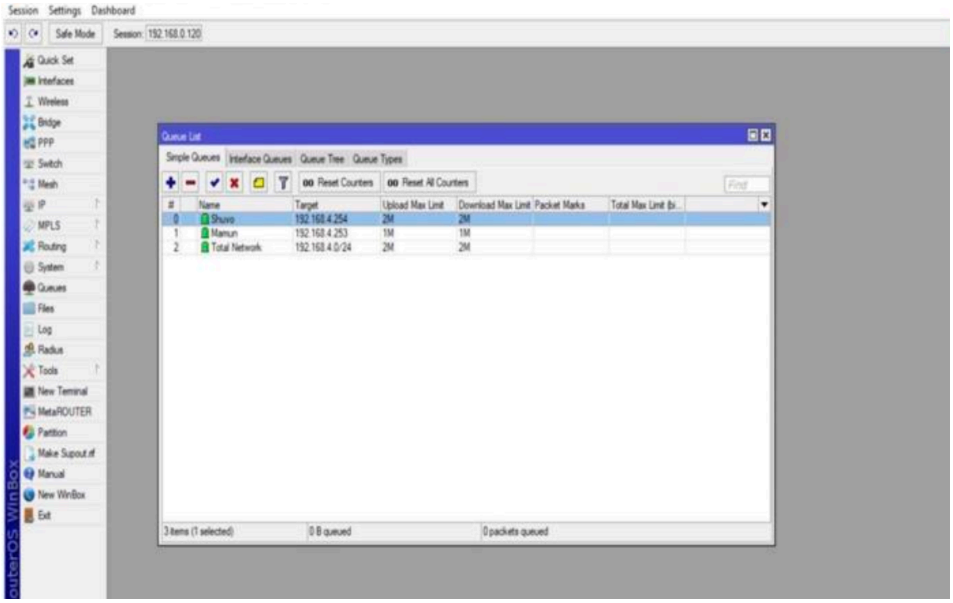
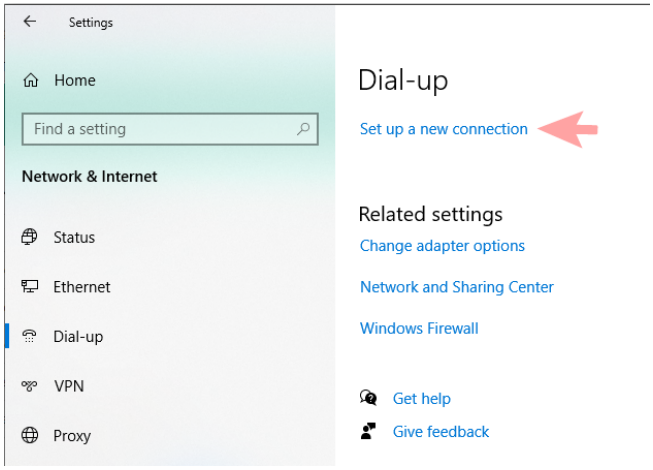


Figure: 4.14 PPPoE Configuration

In that figure 4.14, we show the PPPoE configuration,

Step 5: Select the bridge and click the next button after setting up the DHCP server.



Step 6: Select Firewall by clicking IP on the NAT LAN network, then select PPPoE out1 by clicking scant. Select Masquerade, then Proceed.

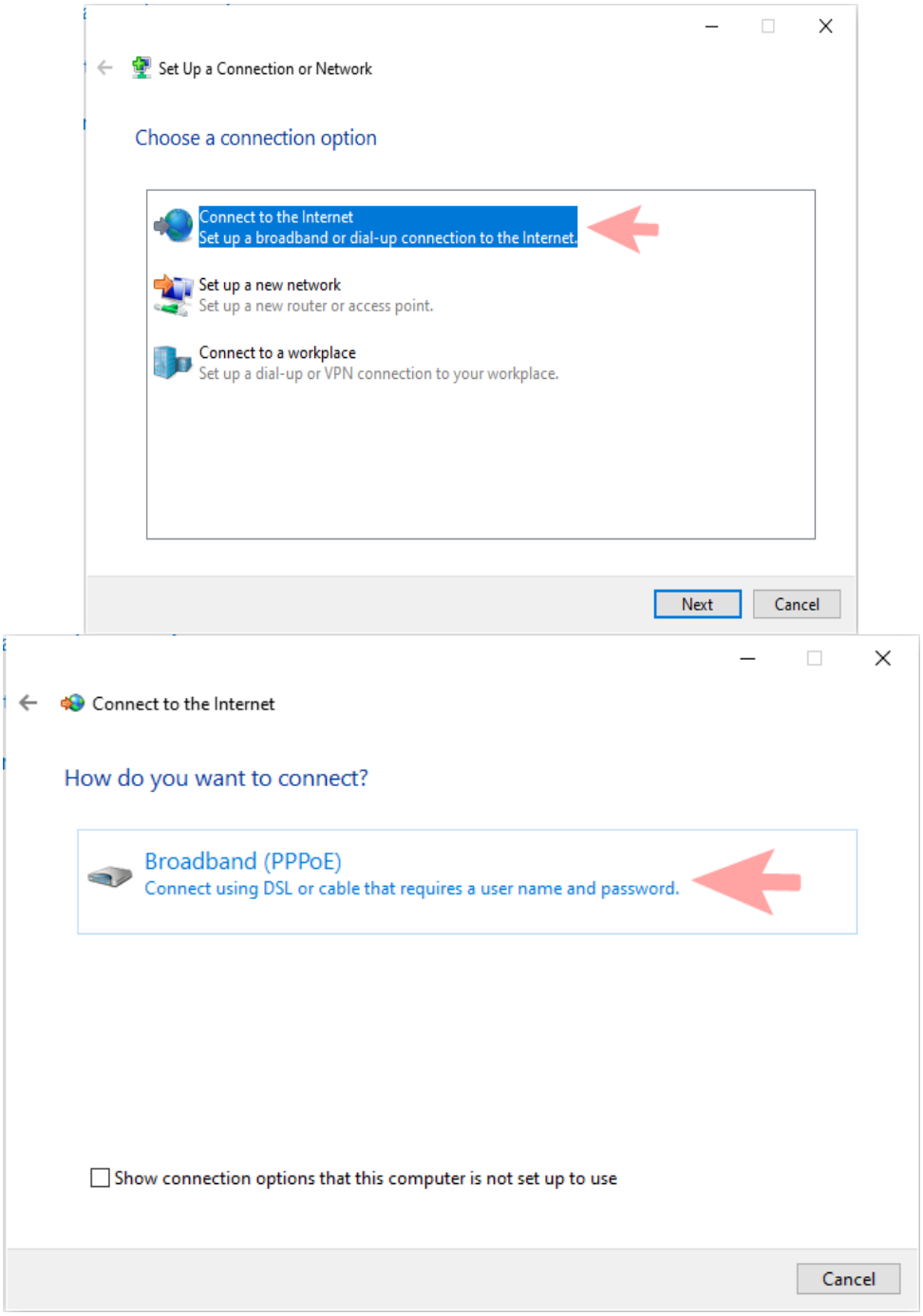


Figure: 4.15: PPPoE Configuration

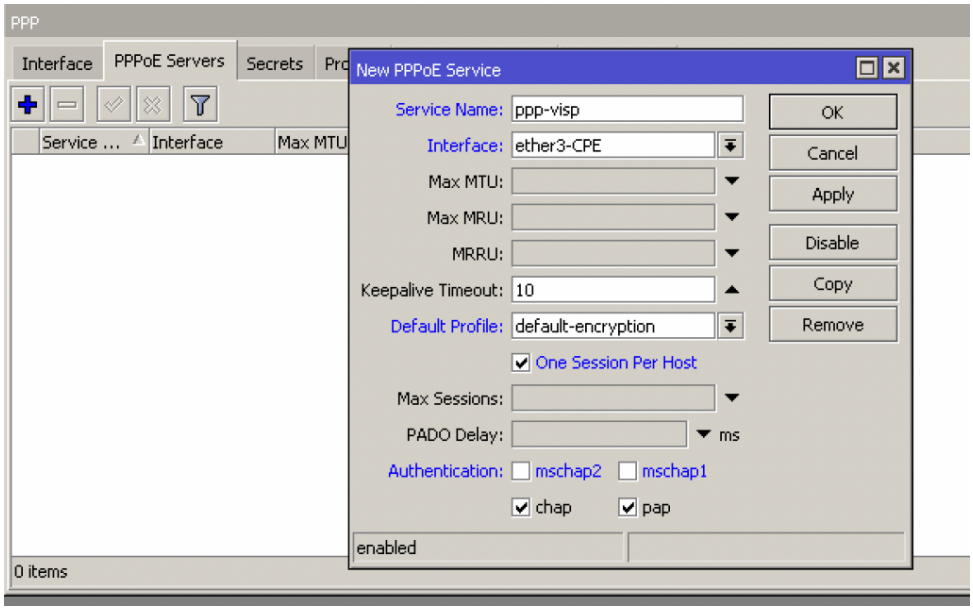


Figure:4.16 PPPoE Dail Up configuration

This image shows the configuration interface for setting up a new PPPoE (Point-to-Point Protocol over Ethernet) service on a MikroTik router. Here's a step-by-step explanation of the configuration options visible in the dialog box

4.7 Wireless Connection

A wireless local-area network (LAN) uses radio waves to link gadgets like laptops and cell phones to your company's network and its apps, as well as the Internet. You are linked to the wireless network of the establishment when you use a Wi-Fi hotspot at a café, hotel, airport lounge, or another open space.

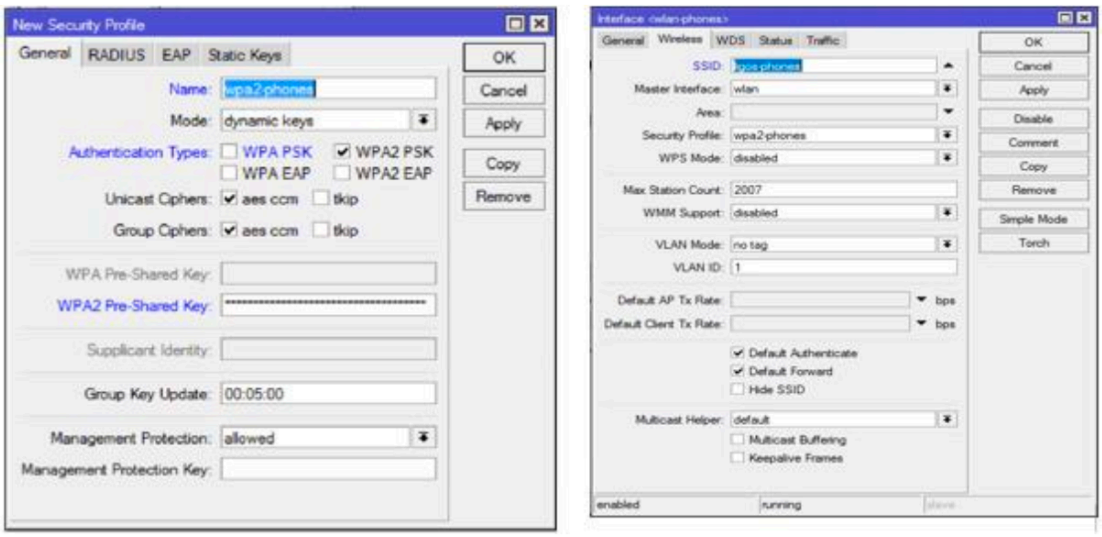


Figure: 4.17 Wireless Connection

Step1: Select Wireless>Security Profiles and add a new profile to start a new security profile. Go to Wireless>Interfaces and add a virtual access point to create a virtual access point.

Step 2: IP>Address; type a new address there. To establish a new pool, select IP >Pool.

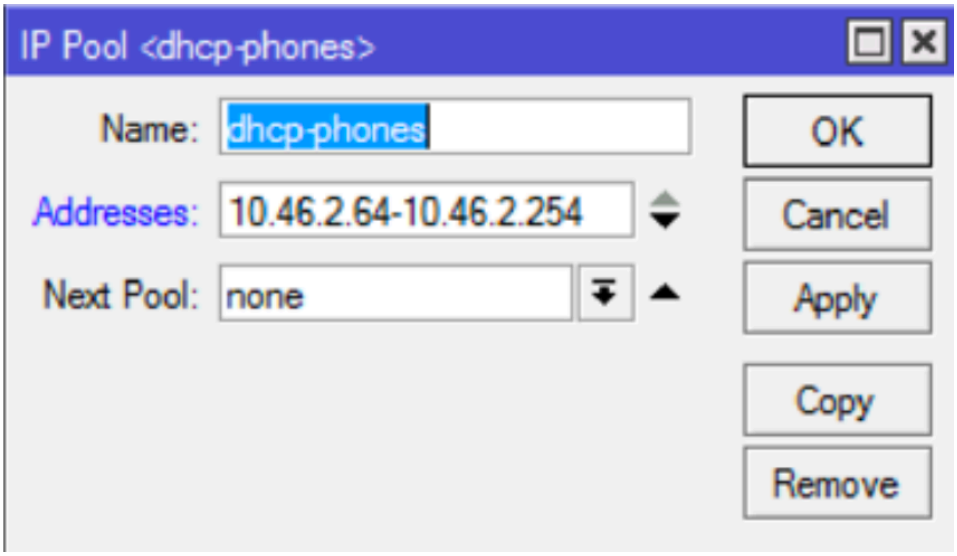


Figure: 4.18 Wireless Connection Configuration

In Figure 4.18, We have configured the wireless connection via IP Pool DHCP, Once the Name and addresses are inputted, and kept the next pool on the None option and then pressed apply.

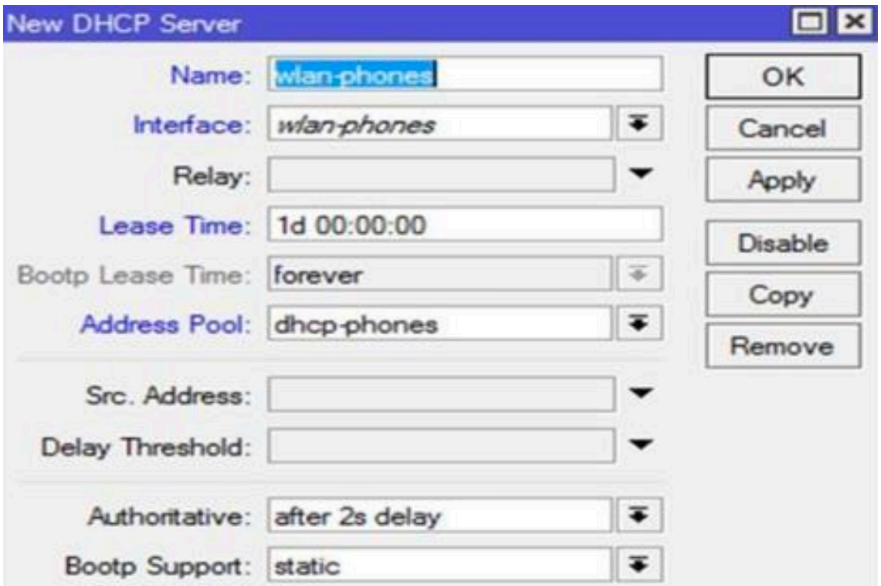


Figure: 4.19 Wireless Connection

Step 3: Devices can connect to a Wi-Fi network by using addresses that are assigned to them by DHCP. Click IP>>DHCP Server>>. Tab DHCP>> DHCP Provider

4.8 ARP Configuration

For MAC address access, ARP binding adds a static IP address to a device's ARP database. When making DHCP requests, DHCP conservations connect a device (end-user) to the internet to acquire the same IP assignment.

Select ARP IP first, followed by the plus sign, data entry, and OK. Choose a static IP address and MAC address after that. If the interface is ether2, the identical LAN procedures need to be carried out on the DHCP server. Lastly, input the required data for the MAC address, static IP address (static IP must be used), and DHCP server by clicking the Plus sign.

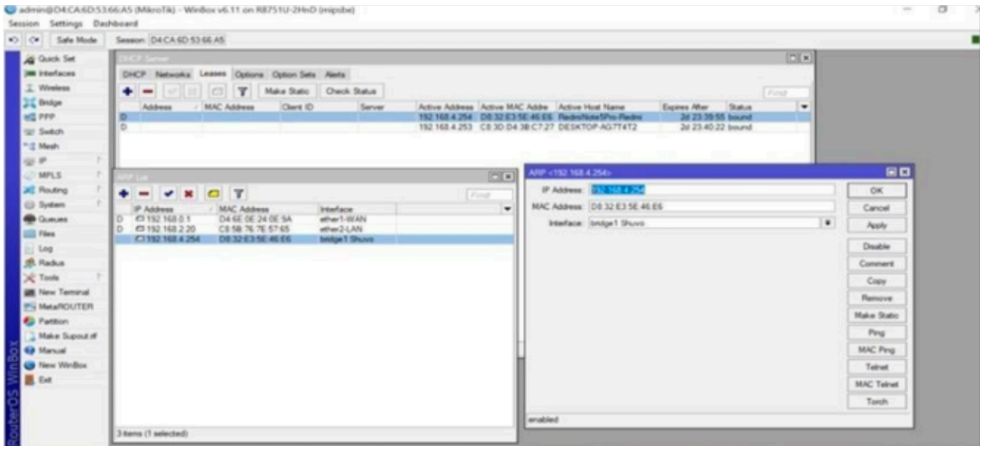


Figure: 4.20 ARP Configuration

Depending on your network needs, you can configure ARP (Address Resolution Protocol) on a MikroTik router. Devices can communicate within a local network by using ARP to translate IP addresses to MAC addresses. We can configure multiple ARP options for interfaces with MikroTik.

- Go to **IP** > **ARP** (for ARP table) or **Interfaces** (for enabling/disabling ARP on interfaces).

In figure 4.20, we have configured ARP(Address Resolution Protocol) by going to IP and then ARP.

4.9 Bridge Configuration

When connecting several interfaces (such as Ethernet ports, wireless interfaces, and VLANs) at Layer 2, a MikroTik router must have a bridge configuration in order for them to function as a single network. This is helpful in situations when devices that are connected to various physical ports or wireless interfaces need to share the same IP subnet and interact directly without the requirement for routing (Layer 3).

Step 1: To Start, We have to select the Bridge menu from the left side

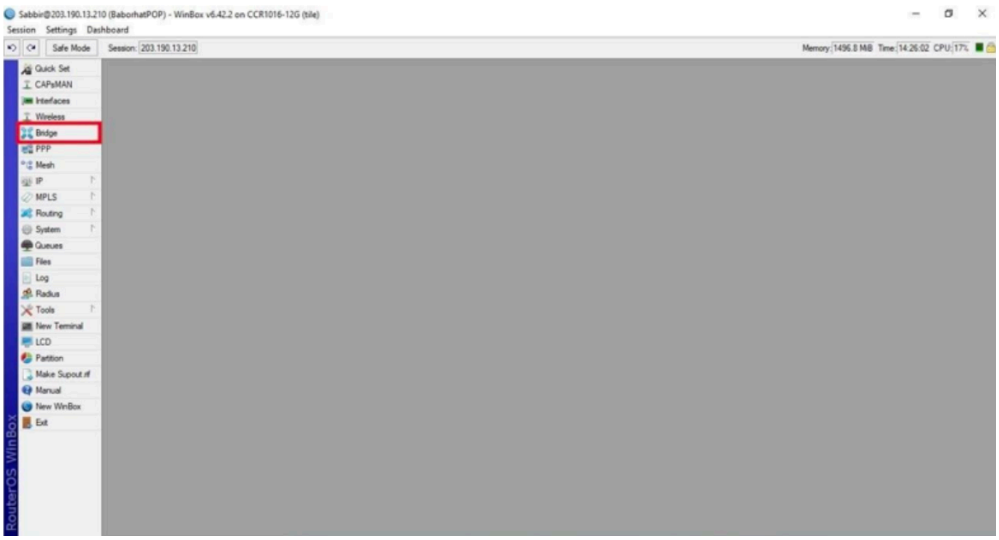


Figure: 4.21: Bridge Selecting

In Figure 4.21, I have selected the Bridge option from the menu.

Step 2: After Selecting the bridge option from the left we have to press the "+" button.

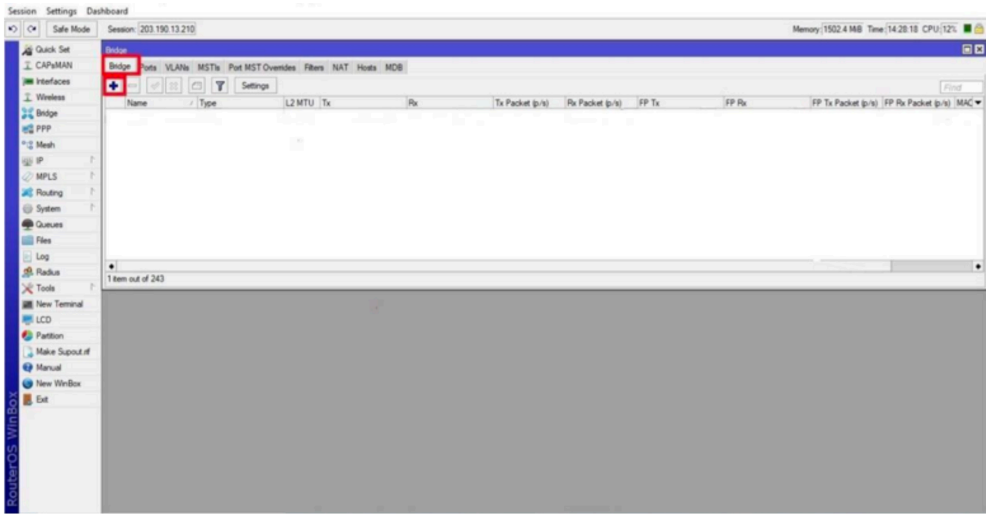


Figure: 4.22: Bridge "+" Selection

In Figure 4.22, we can see there is an “+” option under the Bridge section, once the Bridge option is selected then we need to press on the “+” option as shown in the picture of Figure 4.22

Step 3: After that, the interface needs a distinctive name. After applying the setting, click OK.

Step 4: Click the "+" button after finding the Ports tab.

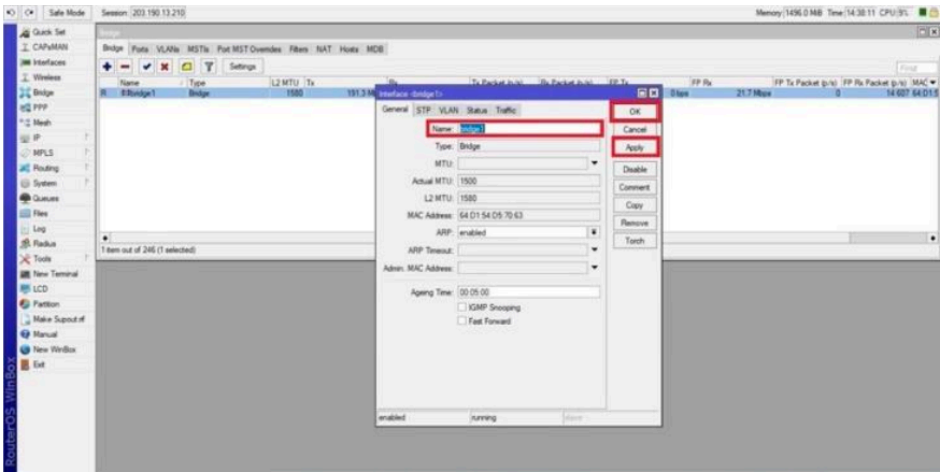


Figure 4.23: Adding Bridge Name

In the above picture of Figure 4.23, we have added a Bridge name, Once the name is added we select the apply option as marked in the figure, then press ok.

Step 5: In the drop-down menu, pick the physical interface option.

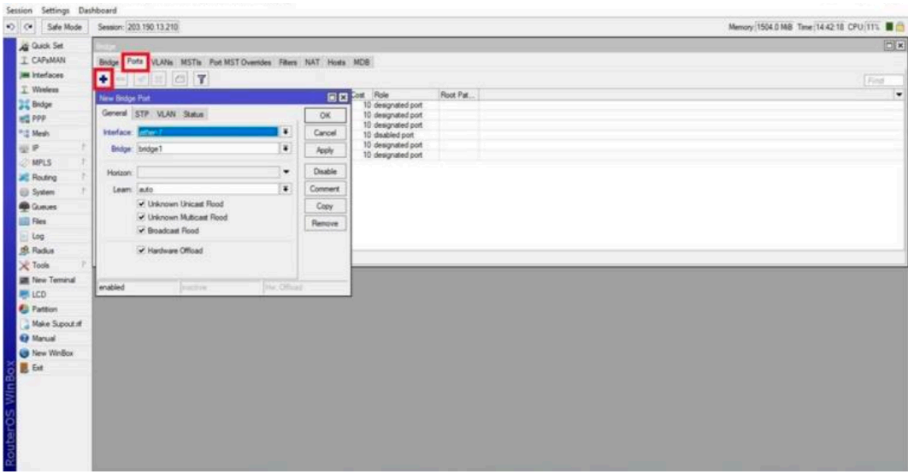


Figure 4.24: Adding Port

In Figure 4.24, We are now adding a port after completing the bridge name, we can see in the picture made in red squire there is an option called Ports, once press that tab we have to press “+” button to proceed.

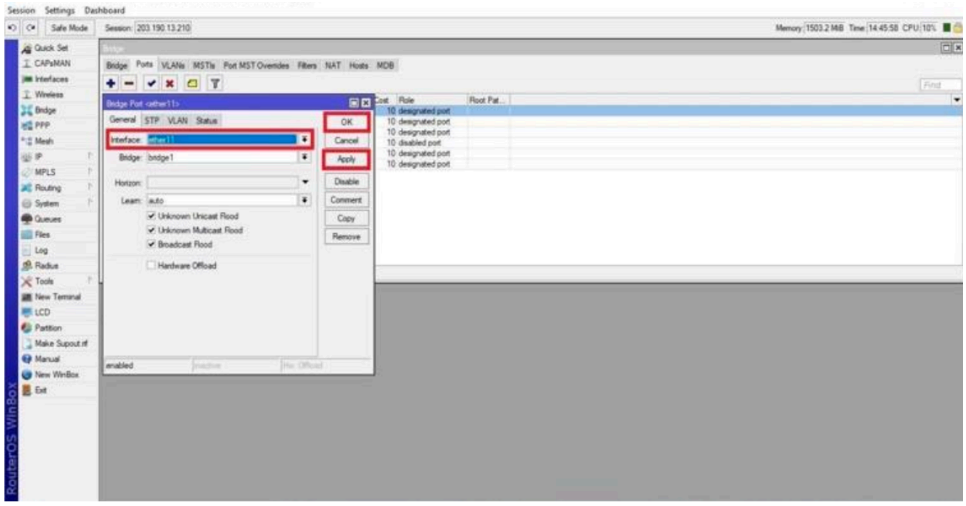


Figure 4.25: Selecting Interface and Bridge

In Figure 4.25 we can see the next step of Figure 4.24, once 4.24 is completed then we will see the interface as shown in the picture of Figure 4.25 then selecting the general interface we will find the surface and select the option and press apply, once applied then press ok

4.10: IP SERVER

In MikroTik, an IP server is a service that lets users control router access using Winbox, API, or CLI using IP addresses. Setting up how devices can access the router's administrative interfaces is a crucial aspect of the IP Services configuration.

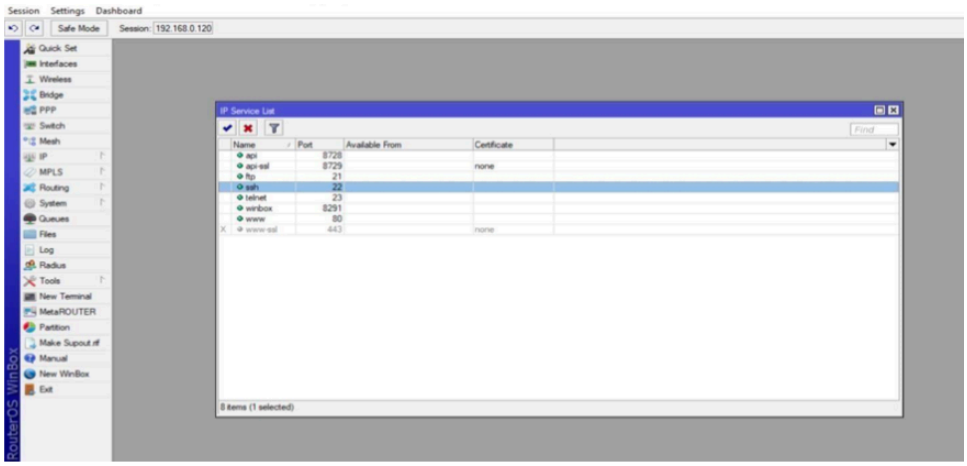


Figure 4.26: IP Server

In figure 4.26, We have the list of IP Server that are created and will be visible to the IP Server list. To access the IP services we have to use Winbox or the web interface then Navigate to IP, then Services.

4.11: User ID

In MikroTik routers, the **User ID** refers to the username assigned to a user account for accessing and managing the router's configuration via interfaces such as Winbox, the web interface, or SSH.

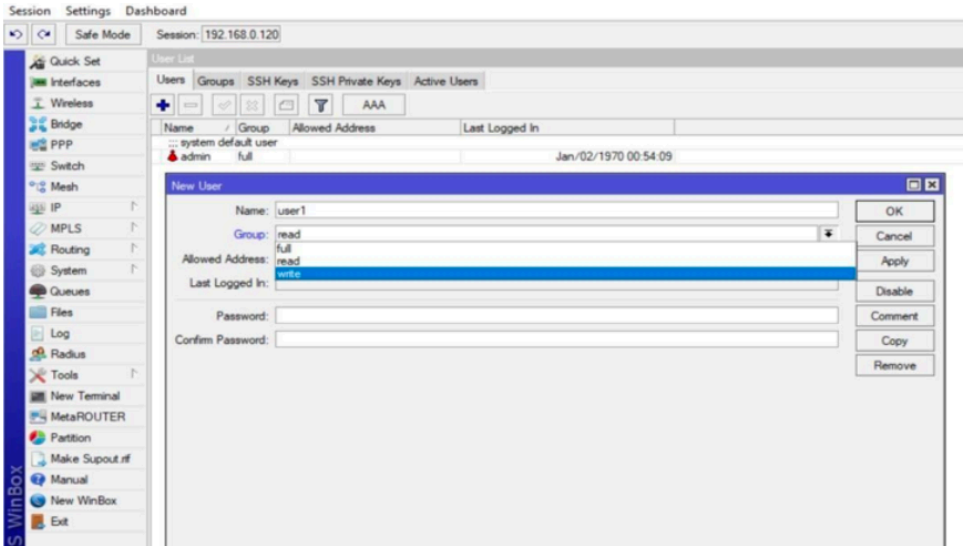


Figure: 4.27: User ID

In understanding User roles in MikroTik router configuration, we need to understand that there are User Names also known as User IDs. Each user has a unique username and they can use this name to log in to the router, also they need a password and it is recommended to use a strong password.

In the figure 4.27, we can see there are few option on there, such as Name, Group, Allowed address, Last log in, and password option which are described above.

Chapter 5
MikroTik Router Bandwidth Management

5.1 Introduction

The practice of managing and maximising internet traffic distribution throughout a network to guarantee equitable use, avoid network congestion, and enhance overall performance is known as MikroTik router bandwidth management. The well-known networking gear and software manufacturer MikroTik provides powerful features in its routerOS operating system to put effective bandwidth management techniques into practice. Network managers can use a variety of methods to control bandwidth with MikroTik routers, including traffic shaping, limiting user bandwidth, prioritising some types of traffic over others, and establishing Quality of Service (QoS) policies. Businesses, educational institutions, and service providers who want to preserve a dependable network experience, prevent individual user misuse, and guarantee that vital applications have the bandwidth they require must have these features.

Administrators can enforce restrictions based on IP address, user, protocol, or even time of day thanks to MikroTik's flexible bandwidth control features, which can be customised to meet the unique requirements of the network. The tools from MikroTik offer complete solutions to effectively manage and optimise bandwidth utilisation, regardless of the size of your ISP infrastructure or small office network.

5.2 Types of Bandwidth Management

There are a few different methods of managing the bandwidth of Mikrotik router, In short, they are described under the section of the point that is mentioned below.

I. Simple Queues
II. Bandwidth Limiting
III. Traffic Shaping
IV. Using Dynamic Bandwidth
V. Bandwidth Monitoring

5.2.1 Simple Queues

A Simple Queue is a fundamental element in MikroTik's bandwidth management system that is used to regulate and control traffic flowing through a router. It enables you to set bandwidth restrictions for particular users, IP addresses, or subnets, guaranteeing the efficient and equitable distribution of network resources.

5.2.1(a)

Essential Elements of a Simple Queue:

i. Traffic Shaping: Individual or group users' upload and download rates can be limited.
ii. Types of Queues: The maximum upload (TX) and download (RX) speeds can be restricted using simple queues.
iii. IP Filtering: To impose bandwidth restrictions, Simple Queue can target particular IP addresses or subnets.
iv. Queue Rules: To guarantee that particular traffic is given priority or is restricted, rules are defined based on IP addresses, subnets, or other factors.

5.2.1(b)

Basic Configuration:

i. Make a Queue: From the Queues section under Queue Types in the MikroTik RouterOS, you can make a Simple Queue.

ii. Establish Target and Limits: Choose which IP addresses or subnets you wish to use the rules on, and then establish the fastest possible upload and download speeds.

iii. Modify Priorities: By assigning a greater priority to specific traffic, you may make sure that more crucial apps operate more efficiently.

5.2.1(c)

Example Use Case:

To restrict a particular user (let's say IP 192.168.1.100) to 10 Mbps download and 2 Mbps upload speeds with a 100 Mbps internet connection, you would set up a Simple Queue with the following

parameters:

The address is 192.168.1.100.

Maximum Download Speed: 10 Mbps

Maximum Upload Speed: 2 Mbps

Even if the rest of the network has more available bandwidth, this guarantees that the particular user can only utilise up to 10 Mbps for downloading and 2 Mbps for uploading.

5.2.2 Bandwidth Limiting

Distributing bandwidth to each user comes next after the NAT Rule setting is finished. You can accomplish this by visiting the menu queues. Click the queues button on the toolbar, and then click the plus sign (+) to add it.

In Simple Queue the General section fills as below:

Name: PC1

Target Address: 10.10.20.2
10.10.20.3
10.10.20.4
10.10.20.5

Target Upload: Max limit 384 kbps

Target Download: Max limit 384 kbps

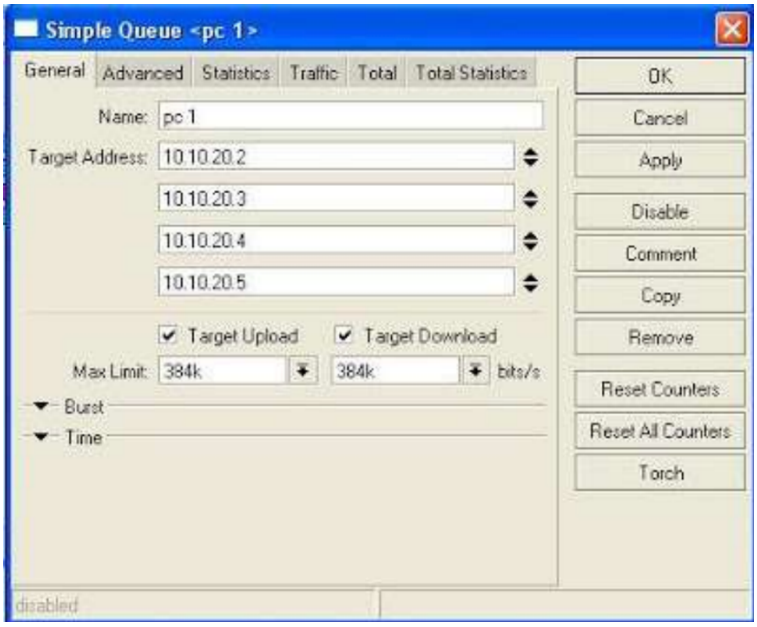


Figure 5.1: Simple Queue Bandwidth Limit(PC1)

Name : PC2

Target Address: 10.10.20.6

10.10.20.7

10.10.20.8

10.10.20.9

10.10.20.10

Target Upload : Max limit128 kbps

Target Download : Max Limit128 kbps

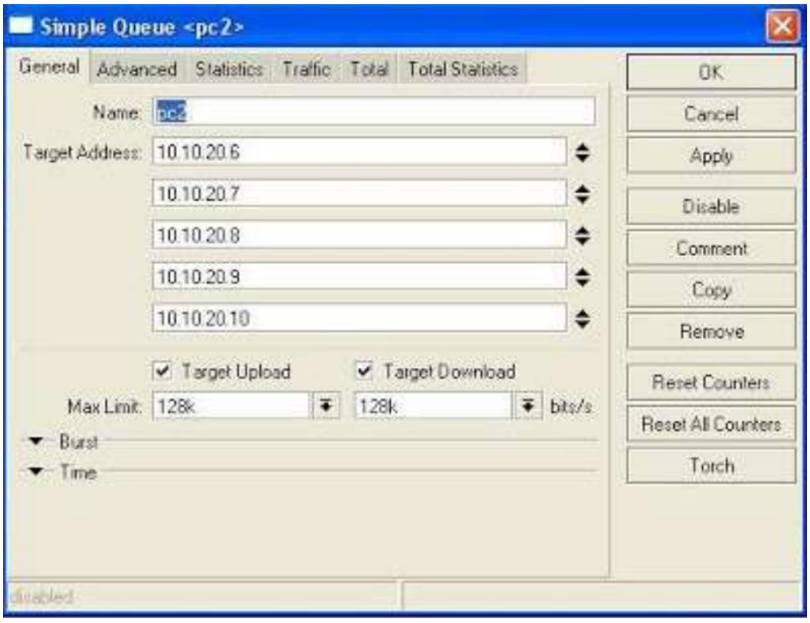


Figure 5.2: Simple Queue Bandwidth Limit(PC2)

Figure 5.1 and 5.2 show The bandwidth of IP address 10.10.20.5 will increase to 384 kbps. The combined bandwidth of IP addresses 10.10.20.6 to 10.10.20.10 will increase to 128 kbps. With this setup, the designated IP addresses are guaranteed to receive their appropriate bandwidth capacity.

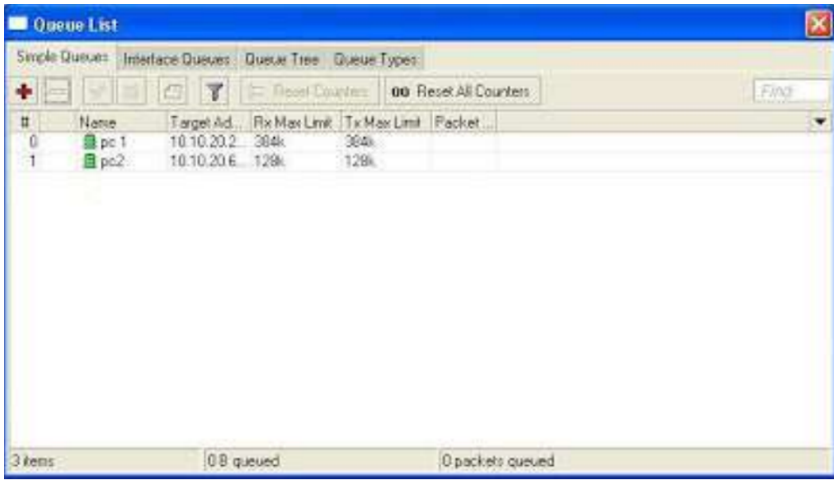


Figure 5.3: Queue List

It can surf websites to see if the bandwidth limit is effective. Use the Torch tool, as seen in Figure 5.3, to keep an eye on each user's activity. You may monitor traffic on particular networks in real-time using the Torch program. Red while browsing means that all of the available bandwidth has been used. Half of the allotted bandwidth is being used, as indicated by the colour yellow. The colour green denotes idle or free bandwidth.

5.3 Resolution

Users gain a great deal from utilising MikroTik to control network traffic. Every user can use their allotted quotas properly and efficiently. Comparatively speaking, installing the MikroTik application requires less hardware than setting up a separate computer for network administration. A more fair allocation of bandwidth among customers can be guaranteed via MikroTik's bandwidth management. As a result, even when all computers are online at once, they may all access the internet steadily and smoothly. The bandwidth is allocated to each computer unit based on its specific requirements. Using MikroTik makes it easier for the administrator to control bandwidth than not using it.

Chapter 6

Conclusion and Prospects for the Future of Careers

6.1 Conclusion

Setting up a MikroTik router is a crucial first step in creating a safe, dependable, and effective network. Administrators can fully utilise MikroTik's robust features to satisfy a variety of networking requirements by adhering to methodical methods. Setting up IP services, protecting access with appropriate user management, and adjusting firewalls, routing, and bandwidth control are the first steps in customising the router to meet the needs of small and large businesses. Important procedures that greatly improve router security include changing default credentials, limiting access by IP, and turning down unwanted services. Furthermore, role-based access and user authorisation adjustments provide efficient management while lowering risks. Among other things, network security and services are set up at the sector level. After completing the internship, it can be said that someone trained by Atove Technology will be able to fully operate the MikroTik and maintain the various tasks that can be performed regularly with all the necessary preparations. After the completion of the internship, the MikroTik router can now be operated with great proficiency. Thanks to the correct setup of every kind of microcontroller router, the MikroTik can now be operated independently. During this conference, the use of an ISP to establish a network institution was also learned. Internal experience has been used to prepare for leadership, international society, and service life, which is the gift provided.

6.2 Prospects for the Future of Careers

It may be challenging for anyone in our country to find employment, particularly if experience is lacking. An internship was decided upon as it would enable the transformation of an employment opportunity into valuable experience. Networking professionals, such as network administrators and engineers, are in high demand. As more small and medium-sized businesses (SMBs), Internet service providers (ISPs), and organisations rely on MikroTik devices, the need for qualified experts to set up, manage, and optimise these networks has increased. Opportunities for experts in wireless networks have arisen, as professionals with expertise in wireless network setup and troubleshooting benefit from the widespread use of MikroTik's routerOS and hardware in wireless networking solutions. Consequently, this internship enables me to investigate my future options:

Use a platform that is based on an ISP.

- Serve as a company's IT manager.
- Serve as a network engineer at work.
- Serve as a manager of security and technical support

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