EMPIRICAL STUDY ON NETWORK CONFIGURATION AND MONITORING USING MIKROTIK ROUTER AT DAFFODIL ONLINE LTD. (DOL).

BY

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This Report Presented in Partial Fulfillment of the Requirements for the Degree of Bachelor of Science in Electronics and Telecommunication Engineering

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APPROVAL

This Project titled **"Empirical Study on Network Configuration and Monitoring Using MikroTik Router at Daffodil Online Ltd. (DOL).**", submitted by **Rezwan Maruf Sajal**, ID: **142-19-1552** to the Department of Electronics and Telecommunication Engineering, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Electronics and Telecommunication Engineering and approved as to its style and contents. The presentation was held on **October, 2022**.

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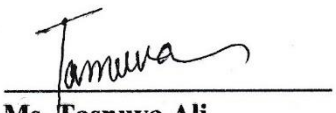
DECLARATION

I hereby declare that, this report has been done under the guidance and supervision of **Ms. Tasnuva Ali, Assistant Professor, Department of ETE, Daffodil International University**. I further certify that this internship file and any related materials have not been submitted elsewhere for award of any diploma or degree. I further declare that I obtained information from my internship in the host company **Daffodil Online Limited (DOL)**, books, online websites and my acquaintances.

Supervised by:



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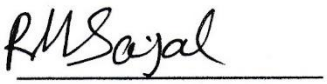

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Finally, I must respectfully appreciate my parents' unwavering assistance and endurance.

ABSTRACT

"Empirical Study on Network Configuration and Monitoring Using MikroTik Router at Daffodil Online Ltd. (DOL)" is the topic of this study. This type of wireless network allows a network administrator to gain control over the entire network by utilizing a security key.

One of the most widely used switches for every ISP network as well as any business company is the MikroTik Router. The main objectives of this internship are to better my understanding of network management and MikroTik router setup as well as to broaden my expertise in these areas. I took advantage of the chance to complete an internship at Daffodil Online Ltd. to act properly for the benefit of my future career. These features include DNS server, DHCP server, Hotspot, IP Addressing, Firewall & Nat, Routing, Bandwidth Limiter, P2P Tunneling Protocol, ARP and many others. Each of them has a distinct function, and without them, a framework would be difficult to maintain. When we need to anchor our information and the framework is connected to the Internet, we employ MikroTik. WinBox Software allows for the completion of all of this configuration. This will undoubtedly help me land a job at an ISP firm. Following the completion of all assistance, this framework is tested at several points and serves as a useful model. In the future, I must enhance the focus setup structure to enhance client execution.

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CHAPTER 01: INTRODUCTION

1.1 Introduction

For students who are seeking to make the transition from university to the working world, the internship program has grown in importance very much. Fortunately I became accustomed to a certified workplace at Daffodil Online Limited. I had the chance to work in this area during my internship and consider how an IT organization creates things like applications that are used by other firms. My previous experiences helped me identify attachment components including social affair work, the workplace, peer support, and completion. As a result, the brief employment phase gave me the chance to learn more, identify my skills and shortcomings, and create plans for improving my self-care for my future job.

1.2 Motivation

I am in my final semester of a four-year bachelor's degree program in Electronics and Telecommunication Engineering at Daffodil International University, and I recognize the value of gathering empirical data to support classroom learning and provides the students a broader viewpoint.

People in Bangladesh are mostly interested in MikroTik systems since they offer a faster and more efficient networking source. I was inspired by the significance of gathering data that will enable a hold to continue learning from the course books while gaining a frequently broad perspective on the practical topics.

I settled on Daffodil Online Limited (DOL) for my internship since I knew that due to their stellar reputation, Daffodil Online Limited has gained their consumer satisfaction and outperformed all other service providers. I have to admit that I was well taught in the basic parts of MikroTik throughout the brief activity at the host company. I've been speaking with people, responding to their requirements, and giving them better communication during my training.

1.3 Objectives of My Internship

The major goal of my internship training is to learn networking with MikroTik in order to position myself as a capable person in the competitive job market. This opportunity is being offered by Daffodil Online Limited. There I learnt how to manage a MikroTik network as an ISP and received a lot of real world experience. Here are some of my objectives:

a. To efficiently control bandwidth to enhance consumer success. The MikroTik operating system is designed to be used as a router smoothly. The software and operating system on a computer is what really enables it to serve as a network router. Numerous IP and wireless network functionalities are built into the PC.

b. To run the Linux-based Router OS system designed for use with routers equipped with MikroTik Router Boards. It can be set up on a computer and used as an access point, firewall, VPN server and router. The system can be utilized as a captive gateway because it is based on a wireless access system.

c. To cooperate with others, develop relationship and managerial skills, and understand professional morals, characteristics, and principles. These are essential skills to thrive in corporate life.

1.4 Report Layout

CHAPTER 01: In this chapter, I have presented the introduction, motivation and objective of my internship.

CHAPTER 02: In this chapter, I have provided information on the company, its target group, products and market situation and organizational structure of the company.

CHAPTER 03: In this chapter, I have provided information on task and activities, events, IP addressing, networking, types of networking etc.

CHAPTER 04: In this chapter, I have provided information on Introduction of MikroTik and MikroTik RouterOS, basic MikroTik configuration of my internship.

CHAPTER 05: In this chapter, I have provided information on all about competencies and my reflections on this internship.

CHAPTER 06: In this chapter, I have delivered my conclusion and future scope of my internship.

CHAPTER 02: ORGANIGATION

2.1 Introduction of the Company

Daffodil Online Ltd. is one of Bangladesh's prominent Internet Service Providers (ISPs). It began offering their services in 2002. They are the most seasoned and earliest ICT Corporation, with basic business values centered on long-term client connections. Based on client preferences and time restrictions, they have increased their operating and service portfolio in recent years. They established a name for themselves by participating on a range of domestic and international initiatives. They use cutting-edge technology and regularly enhance their services. Their Corporate Network Solution division, which has a highly efficient technical expertise group, is able to provide adequate cutting-edge networking and telecommunication solutions.

2.2 Target Group

Daffodil Online Ltd. believes in providing complete satisfaction to customers in terms of ISP solutions in order to establish long-term relationships with them and to adapt to emerging technologies in order to get a sustainable share in the market. Clients and small-to-medium-sized enterprises are counted as new companies in the organization's customer stand. The corporate approach is to think about clients, because these are the principles that focus on our new quick contributions and holding the company's maximum potential growth. According to Web Solutions, these commercial center sections have unique estimation and administration requirements, as well as more loyal and dependable clients.

Learners with prior IT experience are also encouraged to apply because this organization may be able to assist them in expanding their IT skills.

2.3 Product and Market Situation

Daffodil Online Ltd. began operations in 2002. They have expanded their operating and service offering in recent years based on consumer recommendations and considering demands of 21th century. Daffodil Online Ltd. provides a variety of IT services, including professional services. These are listed below:

a) ISP support.
b) Corporate level Internet Solution.
c) Pearson Vue Testing Center.
d) CCNA.
e) MikroTik Routing and Security.
f) Linux System and Administration
g) Cambium Network.

2.4 Organogram of Daffodil online Limited

Organizational Structure of Daffodil online Limited is given below:

Figure 01: Organogram of Daffodil online Limited.

CHAPTER 03: INTERNSHIP TASKS, PROJECTS AND ACTIVITTIES.

3.1 Daily Tasks and Activities

I was familiar with numerous important concepts, such as TCP/IP, a networking protocol that allows two computers to communicate. But I was given many fundamental lessons before I started my internship. I've learned about IP configuration. I discovered several key topics of interest in IP sub-netting. We also recorded a wide range of facts and data. I had no idea about MikroTik switch configuration until I learned a lot about DHCP design, PPPoE setup, data transmission on board, and how to share or choose transfer speed.

1st Month: In the first month of my internship, I gained knowledge and fulfilled several obligations. They are:

a) Recognizing the basics of networking
b) Learning the various IP addressing classes and ranges.
c) MikroTik Overview & First Time Startup.
d) Practical understanding of MikroTik Basic Configuration.
e) Static Routing

f) Dynamic Routing
g) Evidence-based understanding of Network Address Translation (NAT).
h) Basic section of the router.
i) Understanding how to reset a MikroTik router

2nd Month: In the second month of my internship, I gained knowledge and fulfilled several obligations. They are:

a) Studying DHCP management.
b) Experience with routing configuration.
c) Hotspot Fixture.
d) Bandwidth control.
e) Scheduling and scripting.
f) Port forwarding
g) Bridge and STP (Spanning Tree Protocol)
h) Management of VLANs.
i) Firewall and ACL
j) MikroTik Failover
k) How to unblock and block a website.

3rd Month: In the third month of my internship, I gained knowledge and fulfilled several obligations. They are:

a) Wireless management
b) ARP Setup
c) Networking & routing protocol
d) Administration of users.
e) Backup and Recovery
f) Setup for queue and DHCP.
g) Setting up PPPoE
h) MikroTik load balancing.

3.2 Events and Activities

Through this internship training, a variety of perspectives can be changed. I'm gaining experience in a novel way due to my internship. Below is a list of a few:

a) Regarding IP addresses for all IP classes with Subnet
b) Being familiar with networking resources.
c) Monitoring and protecting networks.
d) Generating the client's secret key and client account.
e) LAN, switch, router, and server setups.
f) Identifying and avert network errors.
g) Using WinBox's charts and connections to monitor web speed.
h) Learning and configuring the following: WEB server, DNS server, MAIL server, and Proxy server.
i) Evaluating MikroTik devices, their prices and their power.

3.3 IP Addressing

3.3.1 Introduction to IP Addressing

A device on the internet or a local network can be identified by its IP address, which is a special address. The rules defining the format of data delivered over the internet or a local network are known as "Internet Protocol" or IP. IP addresses, which carry location information and make devices reachable for communication, are essentially the identifier that permits information to be exchanged between devices on a network. There must be a means for computers, routers, and webpages to be distinguished on the internet. A method for achieving this is provided by IP addresses, which are crucial to the operation of the internet. The Internet Assigned Numbers Authority (IANA), a part of the Internet Corporation for Assigned Names and Numbers (ICANN), produces and distributes them mathematically. In order to assist maintain the security of the internet and make it accessible to everyone, ICANN was founded in the United States in 1998. [1]

The internet seeks a method of differentiating among various computers, routers, and webpages. It does this via IP addresses. A series of integers separated by periods makes up

an IP address. Four sets of numbers are used to represent IP addresses; for instance, 192.158.1.38 might be one such address. The range of each number in the set is 0 to 255. Therefore, the complete IP addressing range is 0.0.0.0 to 255.255.255.255.

3.3.2 IPv4: Address Classes and Range

Class A, Class B, Class C, Class D, and Class E are the 05 classes of IPv4 addresses. Here is a summarized table of Addresses, Classes and Ranges: [2]

CLASS	ADDRESS RANGE	NETWORK BITS	HOST BITS	USED FOR
Class A	0.0.0.0-127.255.255.255	8	24	Gigantic network
Class B	128.0.0.0-191.255.255.255	16	16	Medium large network
Class C	192.0.0.0-223.255.255.255	24	8	Small network
Class D	224.0.0.0-239.255.255.255	N/A	N/A	Multicasting
Class E	240.0.0.0-255.255.255.255	N/A	N/A	Experimental

A hypothetical calculation is made to calculate the IP address ranges for a different class in the table. There are certain unusual IP addresses that are kept for a particular purpose.

3.3.3 Private and Public IP Range

IPv4-Private IP Range:

CLASS	CLASS RANGE	ADDRESS RANGE (private)
Class A	0.0.0.0-127.255.255.255	10.0.0.0-10.255.255.255
Class B	128.0.0.0-191.255.255.255	172.16.0.0-172.31.255.255
Class C	192.0.0.0-223.255.255.255	192.168.0.0-192.168.255.255

IPv4–Public IP Range: Except these Private IPs, rest of the IPs are known as Public IP.

3.4 Networking (LAN, MAN, WAN, PAN)

The process of connecting at least two computing devices for information sharing is known as computer networking. PC networks are managed using a combination of tools and software. Computer networking can also be defined as the activity of transmitting and exchanging data amongst nodes through a common medium in a data structure.

Computer networks can be classified in a variety of ways, including LAN, MAN, WAN, and PAN.

3.4.1 Local Area Network (LAN)

Local Area Network is the phrase used to describe a computer network that is spread throughout a building and run by a single administrative system. LAN typically encompasses a company's offices, classrooms, and campuses. Personal computers and workstations can share information, resources, and software thanks to the local area network, or LAN, which links network devices. The TCP/IP protocol uses a private addressing method to connect the collection of devices and computers using a switch or stack of switches. [3] [4]

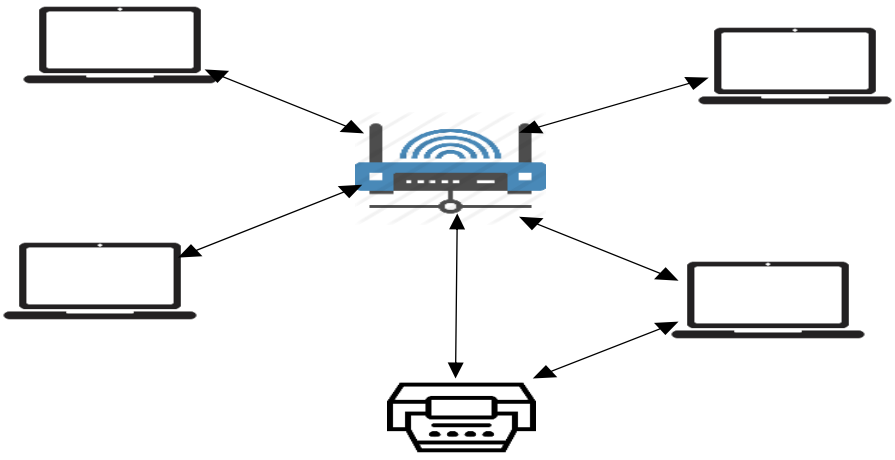


Figure 02: Local Area Network (LAN)

Figure 2 depicts a small office with a printer and four PCs connected via a local area network.

3.4.2 Metropolitan Area Network (MAN)

A metropolitan area network (MAN) is a type of computer network that links computers in an area with many buildings, such as a single large metropolis, several smaller cities, or any other sizeable area. The size of a MAN is more than that of a LAN but less than that of a Wide area network (WAN). The name "metropolitan" emphasizes the scale of the network, not the demographics of the area it covers, hence MANs are not need to be in urban areas. [5]

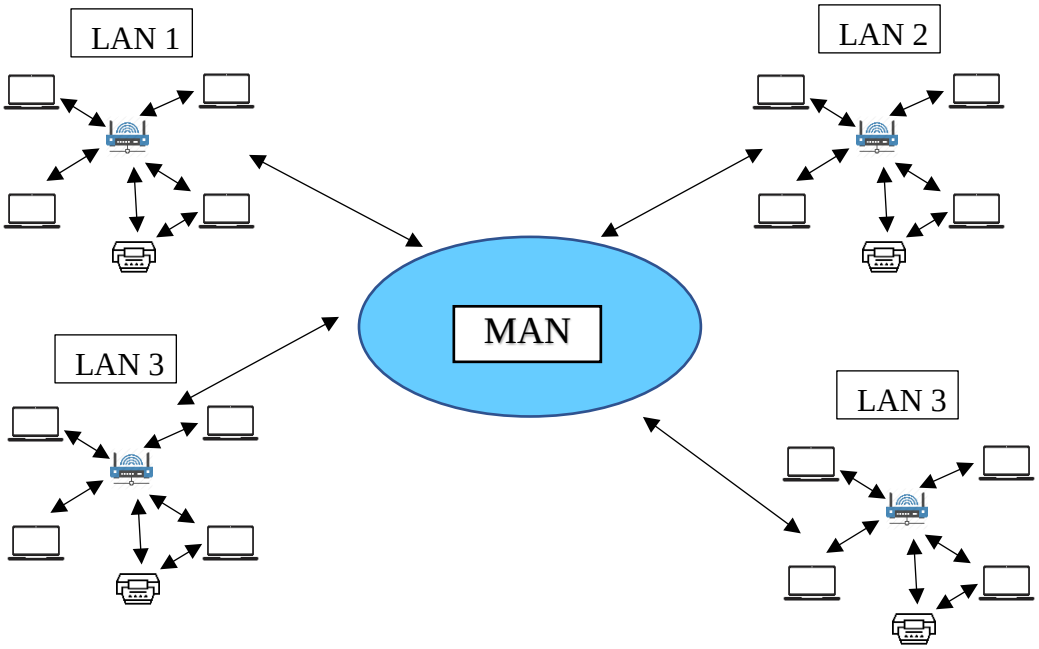


Figure 03: Metropolitan Area Network (MAN)

With Metropolitan Area Network, we can link the client to all of the PC resources in a certain area or location. Figure 3 shows a single MAN connected to four LANs. It can cover an entire city or region.

3.4.3 Wide Area Network (WAN)

A collection of LANs or other networks that connect with one another makes up a wide-area network (WAN). The Internet is the biggest WAN in the world, and a WAN is essentially a network of networks. It is a vast computer network connects collections of computers over considerable distances. Leased lines, VPNs or IP tunnels and other methods are used to establish these long connections. [6]

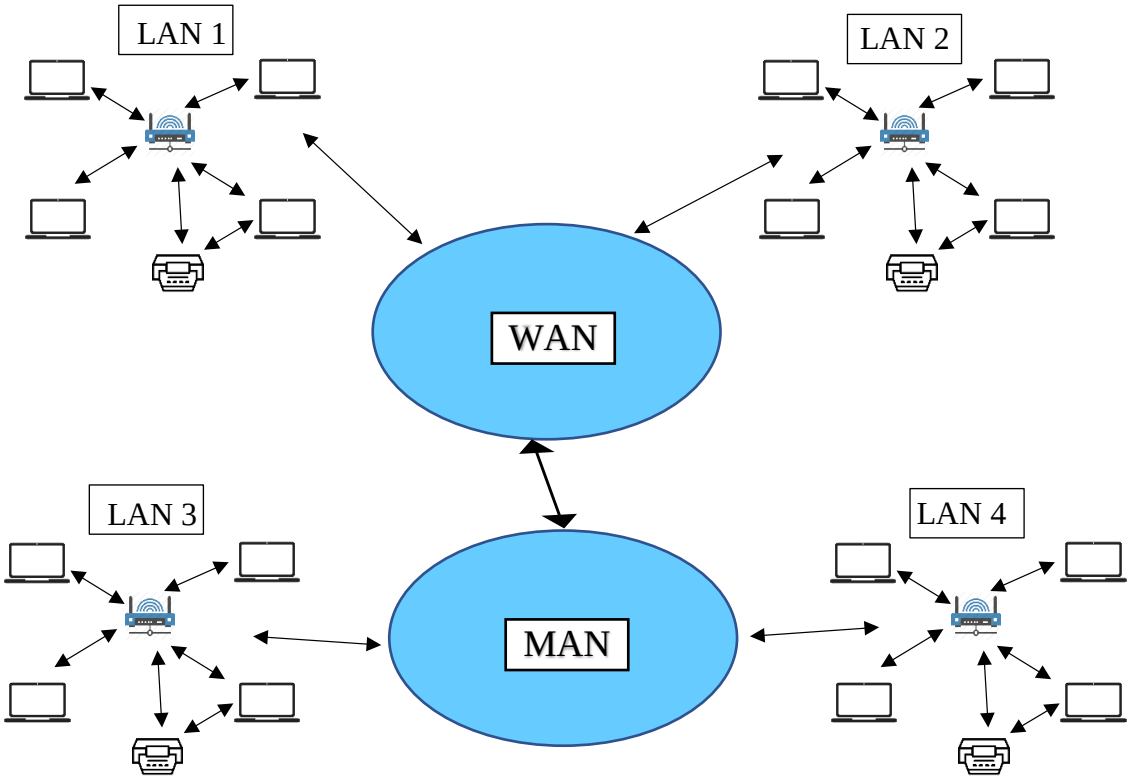


Figure 04: Wide Area Network (WAN) illustrated in comparison with Metropolitan Area Network (MAN)

3.4.4 Personal Area Network (PAN)

A personal area network (PAN) is a type of computer network used to link electronic gadgets in a person's workspace. With the help of a PAN, data may be transmitted between gadgets including PCs, cellphones, tablets, and PDAs. PANs can link to higher level networks including the Internet, with one master device acting as the gateway, or they can be used for communication amongst the individual personal devices themselves. [7]

Figure 05: Personal Area Network (PAN)

CHAPTER 04: BASIC CONFIGURATION OF MIKROTIK

4.1 Introduction of MikroTik

A Latvian firm named MikroTik was established in 1996 with the goal of creating routers and wireless ISP systems. Across most nations throughout the world, MikroTik currently offers hardware and software for Internet access. Since 1997, they have been able to develop the RouterOS software system, which offers substantial stability, controls and flexibility for all types of data interfaces and routing. They have many expertise with complete routing systems and industry standard PC hardware. Their decision to manufacture hardware in 2002 gave rise to the "RouterBOARD" brand. SIA Mikrotīkls has more than 280 workers and is based in Riga, the Latvian capital. [8]

4.2 MikroTik RouterBOARD and RouterOS

4.2.1 RouterOS

The Router Board's operating system is called MikroTik RouterOS that is based on Linux. It is a well-known network device that **SIA Mikrotīkls** provides. It may also be installed on a computer, turning it into a router with all the necessary functionality. It may function as a hotspot, router, firewall, gateway, wireless access point, VPN box, and dedicated traffic shaper.

4.2.2 RouterBOARD

On the other hand Router Board is a full-featured hardware operating platform for Router OS. Routing, Firewall, Bandwidth Management, Wireless Access Point, Backhaul Link, Hotspot, VPN Server, and other key ISP capabilities are all included as they come as a packaged product. The company brands them as RouterOS and RouterBOARD.

4.2.3 Advantages of MikroTik RouterBOARD and RouterOS:

a) Simple and Quick Installation.
b) WinBox GUI through MAC and IP.
c) CLI with Serial Console, Local Console, Telnet, and SSH.

d) API for creating custom devices.

e) Web-based interface

f) Simple to Use & Maintain.

4.2.4 Popular MikroTik Ethernet and Wireless Routers

MikroTik Ethernet routers are reliable, low cost and simple to use. They are perfect for managing companies varies from small to very large. Some of the popular MikroTik routers are: hAP mini, hAp lite, mAP lite, RB951Ui-2HnD, hEX lite, hEX PoE, RB2011UiAS-IN, RB5009UG+S+IN, CCR1036-8G-2S+ etc. [9]

Figure 06: hAP mini

Figure 07: hAp lite

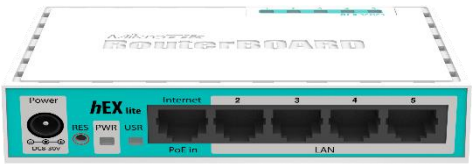


Figure 08: hEX lite

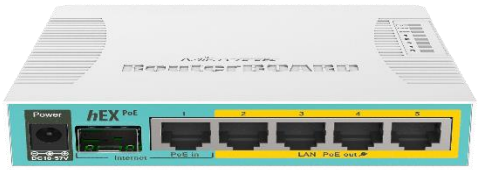


Figure 09: hEX PoE

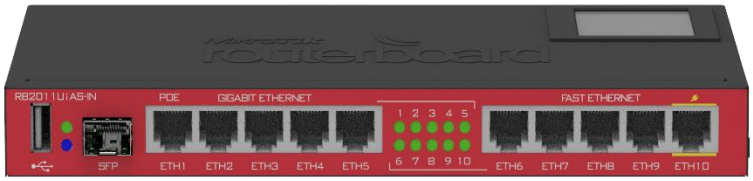


Figure 10: RB2011UiAS-IN

4.3 First Time Configuration and WinBox Installation

4.3.1 Initial Steps to Configure MikroTik RouterBOARD

There are several methods to connect to the router after you have installed the RouterOS software or switched it on for the first time:

a) Using a keyboard and display if your router has a VGA card, Telnet, SSH, serial cable, or any other method to access the Command Line Interface (CLI).

b) Utilizing a web-based GUI (WebFig)

c) Making use of the **WinBox** setup tool (Windows app, compatible with Wine)

The IP address **192.168.88.1/24** is pre-configured at the factory on the ether1 port of every router. "**admin"** is the default username and there is no password. After your initial login, please make a new user in the "full" group with a password, log in again, and remove the default admin account. Connect your PC to ether2 and the router's ether1 port to the WAN cable. We need the WinBox setup tool to allow MikroTik configuration properly.

4.3.2 VMware:

VMware allows us to run multiple application and operating system workloads on the one server – thus enabling better resource management. By creating a virtual machine that behaves exactly like an actual MikroTik – VMware also allows everything running on that virtual machine to run in its own window.

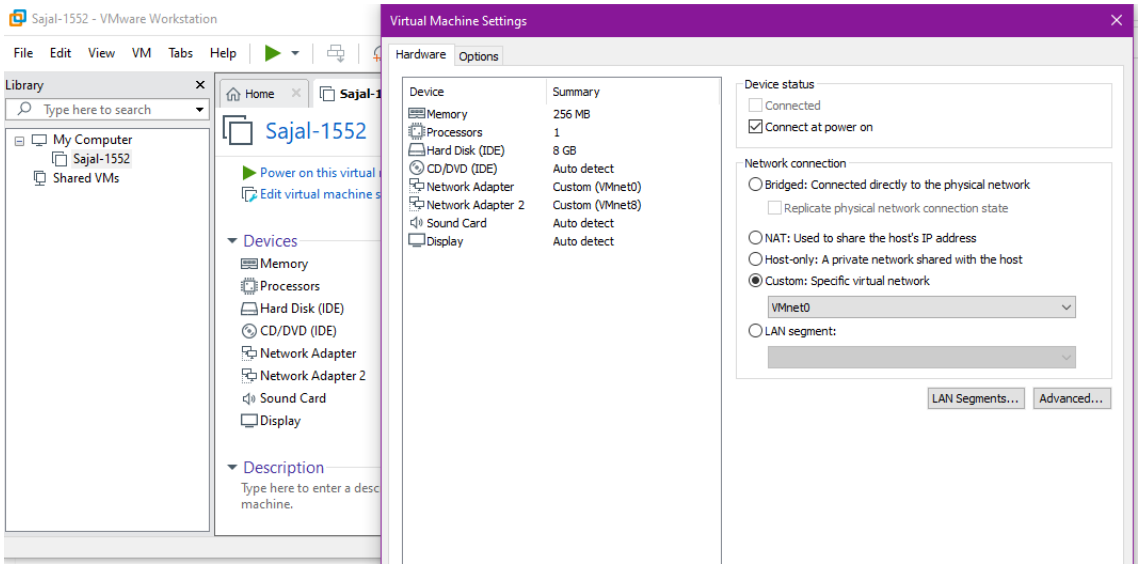


Figure 11: Installing RouterOS to VMware.

Sometimes it is easy to use VMware to virtually work as the RouterBOARD. We need to install RouterOS to VMware first. It is convenient for practicing and learning purposes.

4.3.3 WinBox setup:

WinBox is a small tool that enables MikroTik RouterOS management through a quick and straightforward GUI. It is a local Win32 two-fold, but Wine allows it to operate on Linux and macOS (OS X). There are no regions in the handbook because all interface capabilities are as near to accurately representing console operations as is humanly possible. Some of WinBox's high-level and fundamental framework concepts are unworkable, much like changing the MAC address on an interface changelog.

You must complete the following steps to configure a MikroTik for the first time:

a) Connect MikroTik to your laptop or PC with an Ethernet connection.

b) Any MikroTik port from ether2 to ether5 should be used for the connection (ether1 is a PoE port and should be avoided).

c) Look at the window of WinBox next.

d) To log into MikroTik, choose the "neighbors" page and look up the router's MAC address.

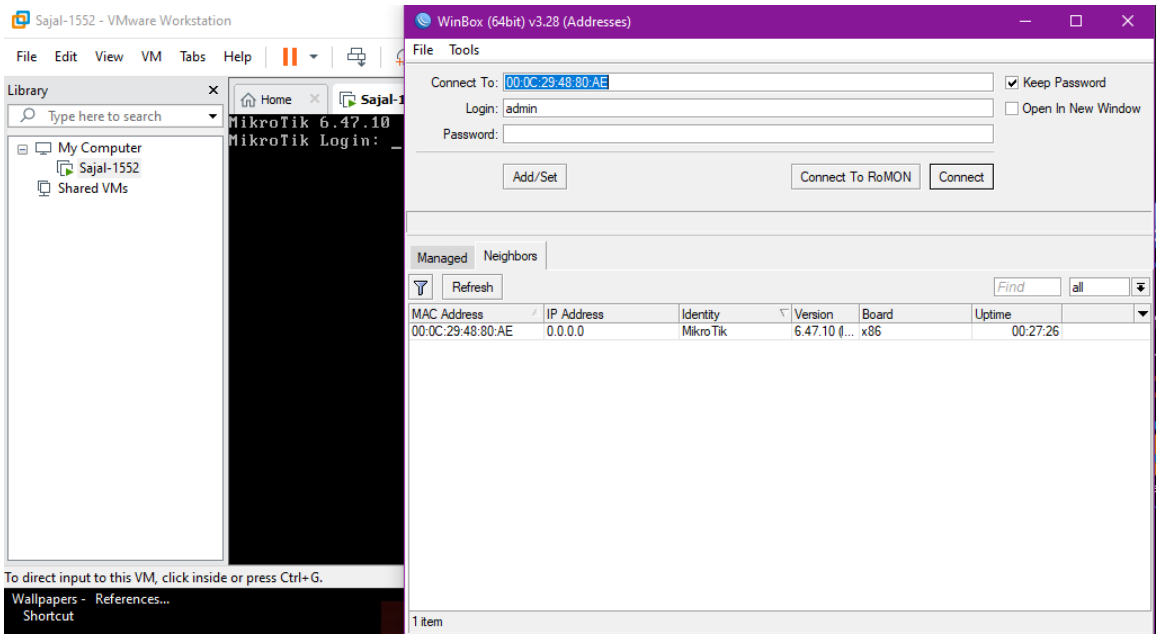


Figure 12: Setting up WinBox to log into MikroTik.

e) Then navigate to MAC address and log in with admin. After that, click the Connect button to log in.

f) The plugins will then start to load, allowing you to access MikroTik.

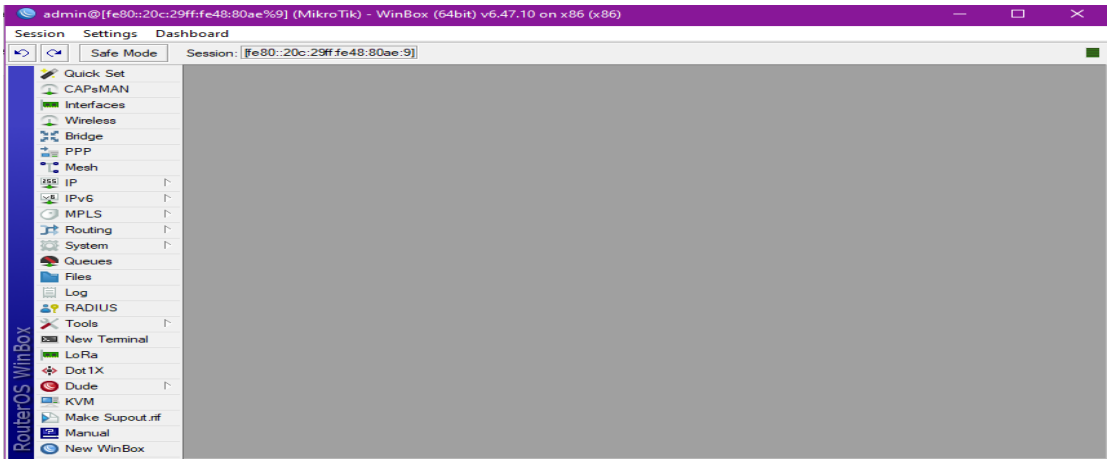


Figure 13: WinBox interface at start up

4.4 Static Configuration of MikroTik

Simply said, a static IP address is an address that never changes unless you deactivate the device or your network architecture alters. Servers and other significant equipment typically utilize static IP addresses. Internet Service Providers are responsible for assigning static IP addresses. First we have to set up the device name. It is the identification of the device also known as hostname.

System>>Identity>>Identity=MikroTik>>Apply>>OK

Figure 14: Setting up hostname

Step 1: First open WinBox

IP>> Addresses>> **Add [+]>>**Address= **192.168.0.200/24**>>Interface_ether1>>

Comment=WAN>>Apply>>OK

IP>>Addresses>> **Add [+]>>**Address**= 192.168.10.10/24**>>Interface_ether2>>

Comment=LAN>>Apply>>OK

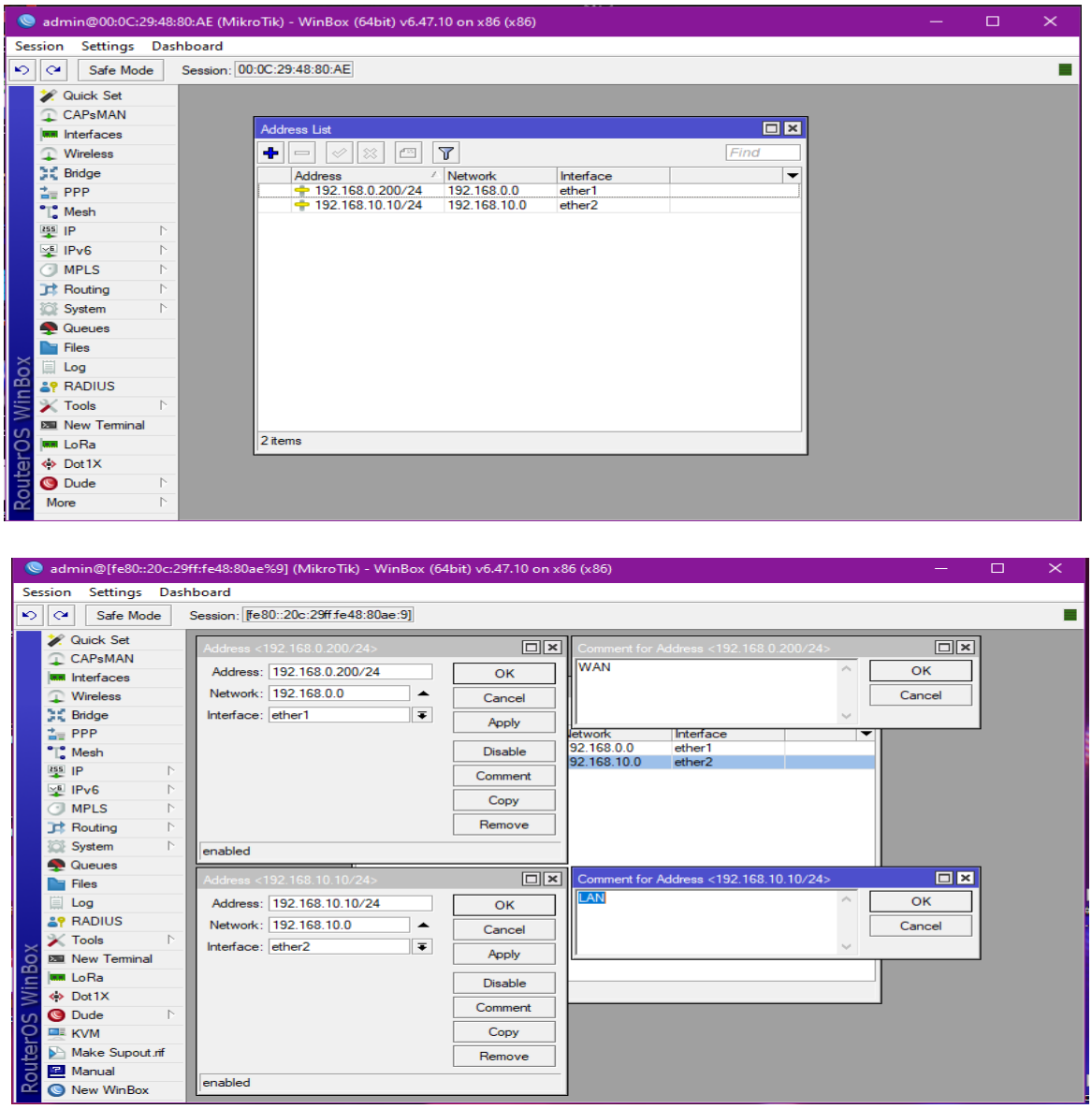


Figure 15: Static WAN & LAN configuration using WinBox

Step 2: Configuration for Default Gateway:

IP>>Routes>> **Add [+]** New Routes

Dst Address=**0.0.0.0/0**>>

Gateway=**192.168.0.1**>>

Apply>>OK

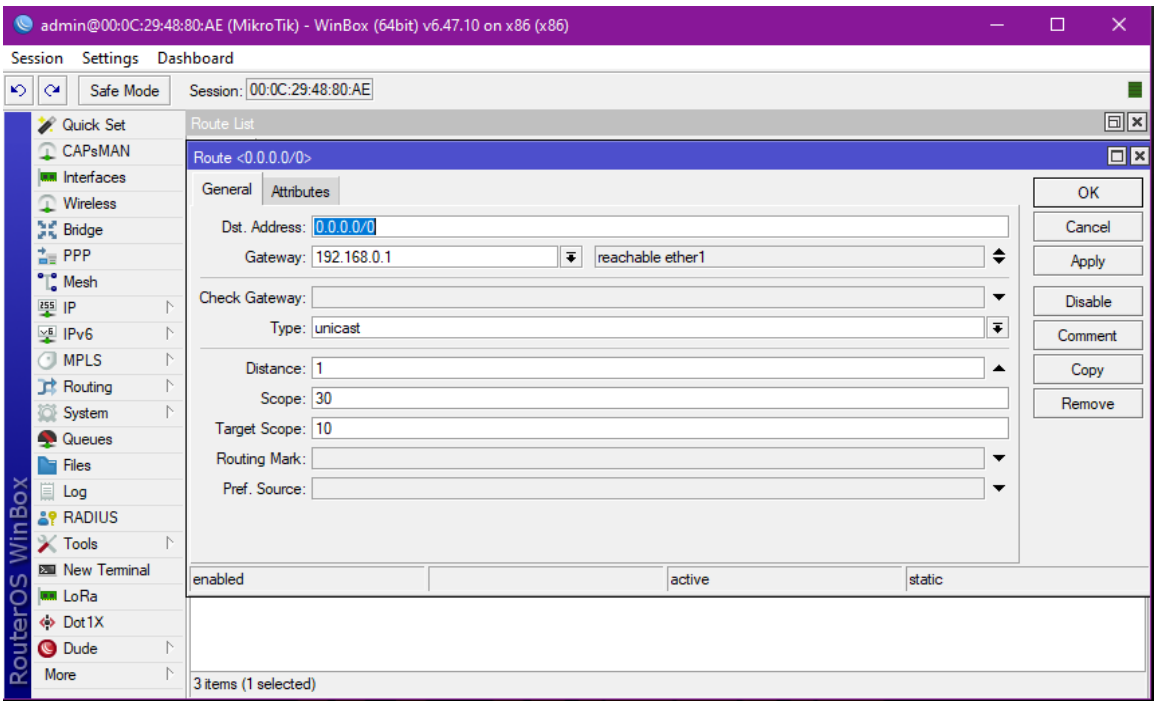


Figure 16: Default Gateway Configuration

Step 3: DNS server configuration

The hierarchical and decentralized naming scheme used to identify machines available over the Internet or other Internet Protocol (IP) networks is called the Domain Name System (DNS). [10] ISP will give required DNS server addresses. If the DNS address from the ISP is not available, we may utilize public DNS like 8.8.8.8 or 8.8.4.4

IP>>DNS>>DNS Setting>>servers=**8.8.8.8** + servers=**8.8.4.4**>>Apply>>OK

Note: We will not enable the "**Allow Remote Requests**" option.

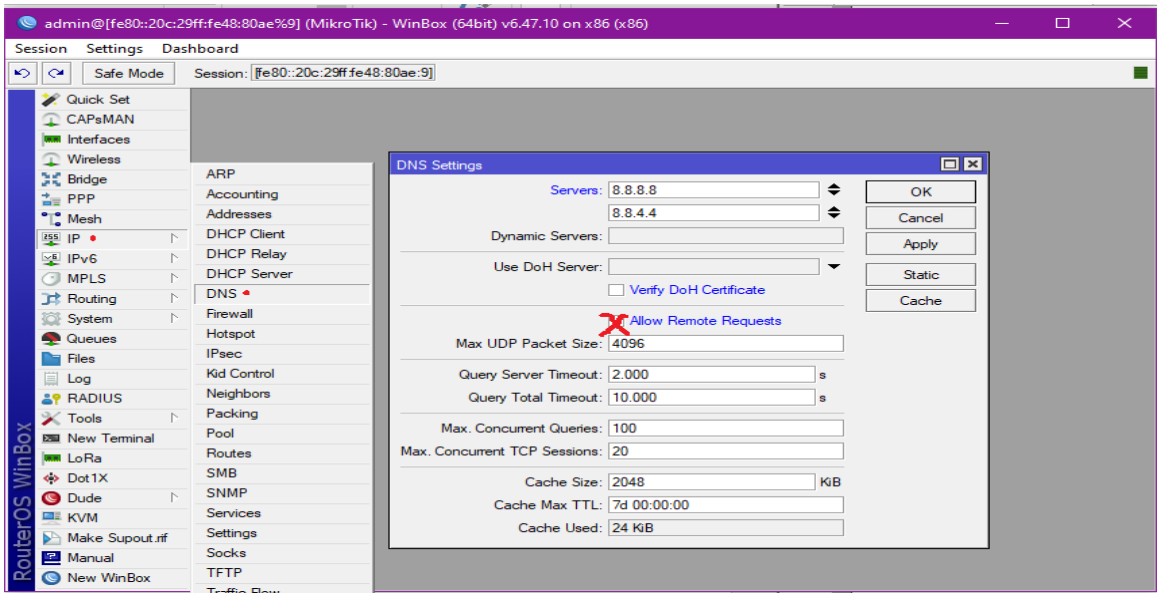


Figure 17: Configuration of Domain Name System (DNS)

Step 4: Setting up NAT on Firewall

IP>Firewall>>NAT>>**Add [+]** >>general>>chain= **srcnat**>>Apply>OK

IP>Firewall>>NAT>> **Add [+]** >>action>> action=**masquerade**>>Apply>>OK

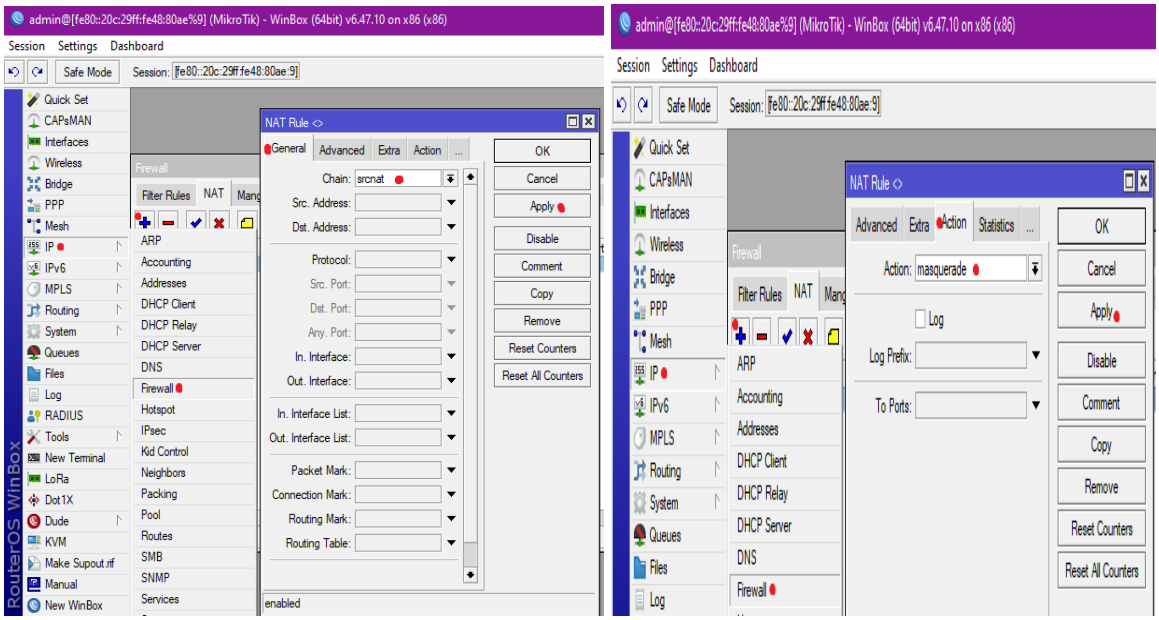


Figure 18: Setting up NAT on Firewall

Step 5: Time Setup

System >> Clock >> Time >> Time Zone Name=**Asia/Dhaka**

GMT Offset= **+06:00**>>Apply>>OK

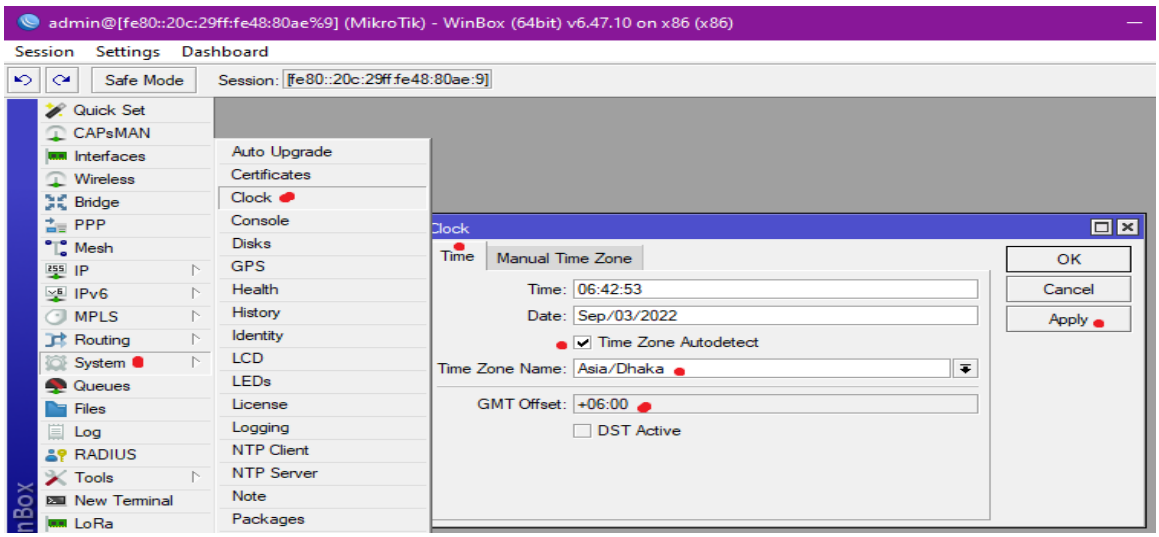


Figure 19: Time and zone setup of RouterOS

Step 6: Password setup for Admin

System >> Users >> Double Click on **admin**

Admin >> Set the Password>>New Password>>Confirm Password>>Apply>>OK

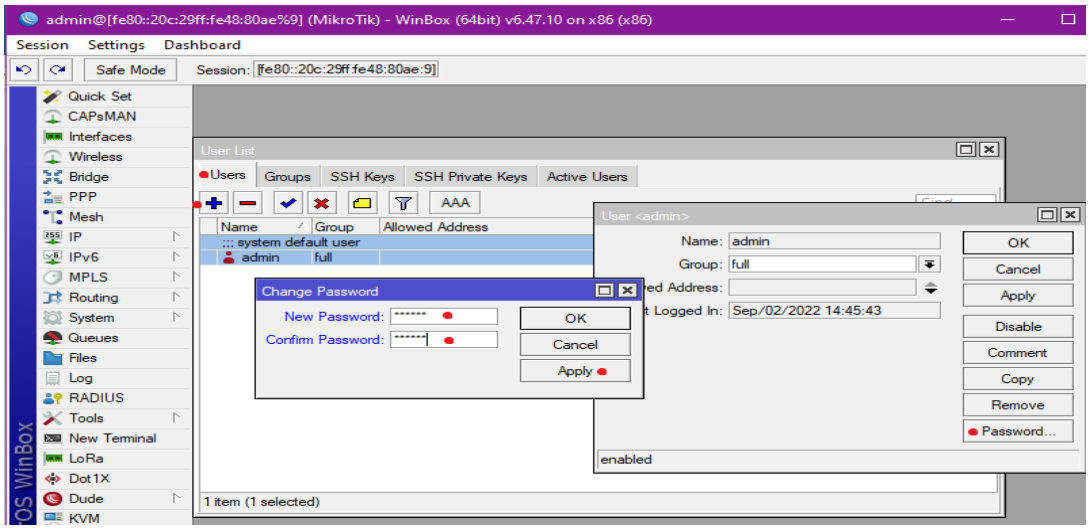


Figure 20: Setting Up New Password for Admin.

4.5 DHCP Server Configuration

Step 1: IP >> DHCP Server >> DHCP > **Add [+]** > Generic >>

Name=**dhcp1552** >> Interface=ether2 >>Apply>> OK

DHCP Server >>Networks>>address= **192.168.10.0/24**>>gateway=**192.168.10.10**>>

Select "**no DNS**">> Apply >>OK

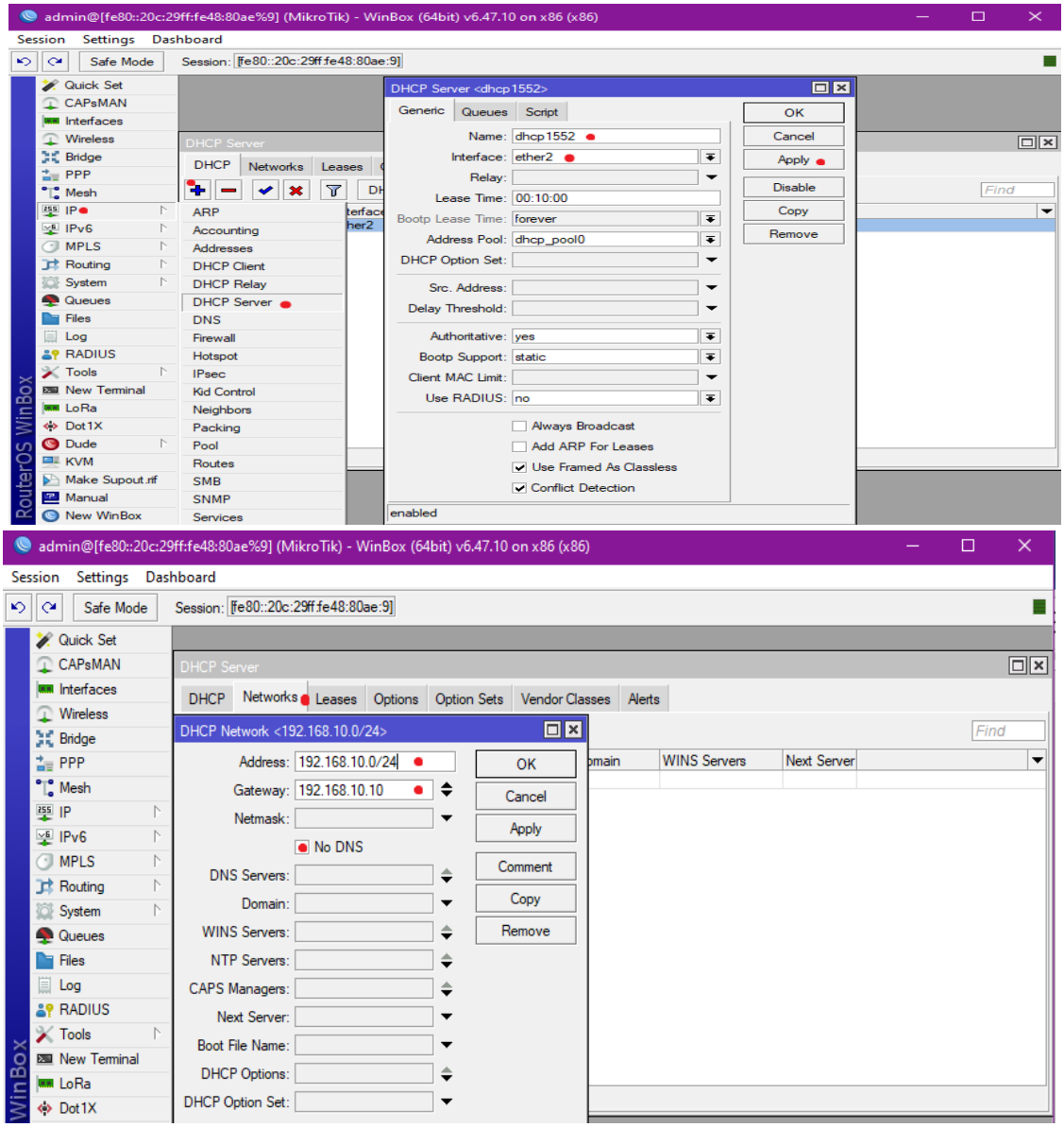


Figure 21: DHCP Server and Network configuration.

Step 3: Configuring a PC/Laptop as DHCP client

PC Control Panel>> Network and Internet>> Network and Sharing Center

>> Change adapter settings>> Internet Protocol Version 4 (TCP/IPv4)>>Properties

>> Select "**Obtain an IP address automatically**"

>> Select "**Obtain DNS server address automatically**"

>>OK

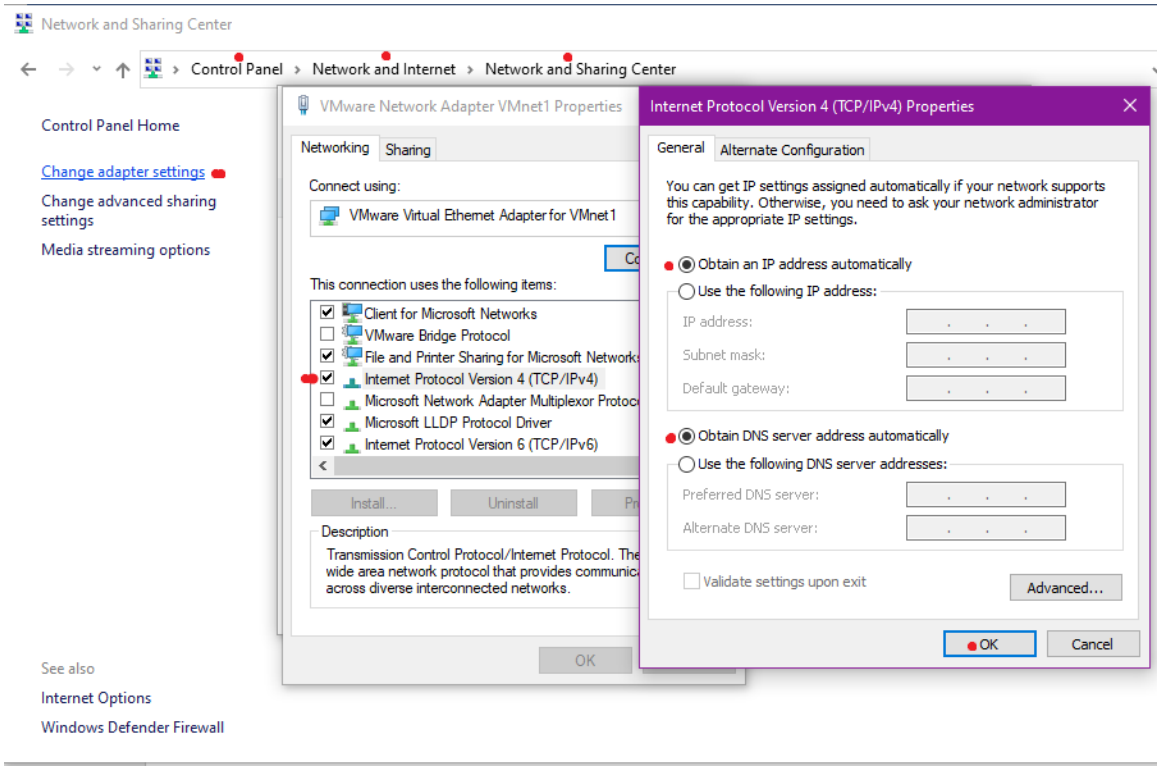


Figure 22: Configuring a PC/Laptop as a DHCP client.

4.6 PPPoE Configuration:

PPPoE means Point-to-Point Protocol over Ethernet. Service providers may manage several client systems, authenticate their access to its services, and monitor client data use via PPPoE. Additionally, PPPoE includes functions like data compression and encryption.

Step 1: PPP>>Interface>>**Add [+]**>>PPPoE Server Binding>>OK

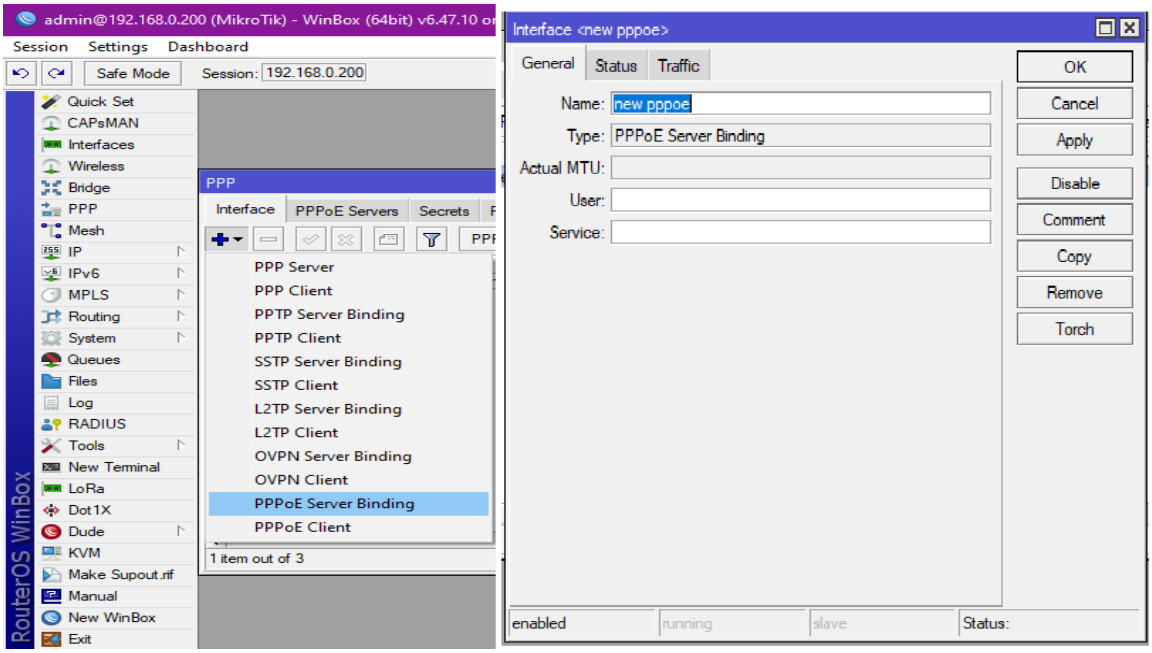


Figure 23: PPPoE Server Binding

Step 2: PPPoE Server:

PPP >> PPPoE Servers >>Add [+] >>Service Name=service1 >> Interface >>ether2 >>Select One Session per Host >> Set the Authentication Parameters.

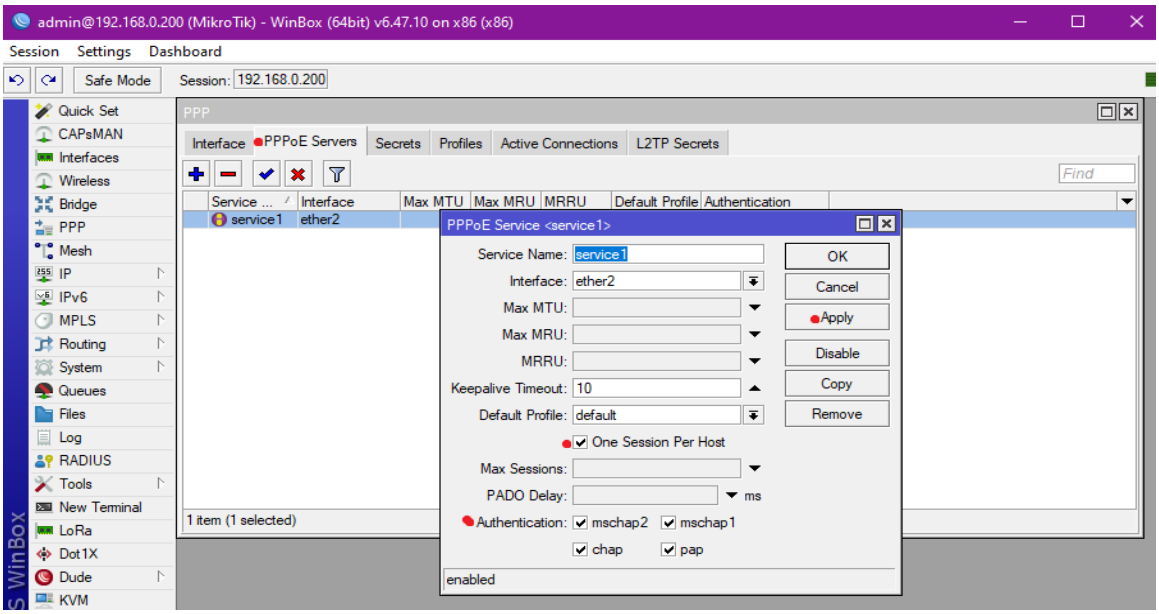


Figure 24: PPPoE Server setting

Step 3: PPPoE Profiling for different packages:

Package 1:

PPP >> Profiles >>General >>name=default>>DNS=8.8.8.8, 8.8.4.4>>apply

Limits>>Rate Limit (rx/tx) =1024000/1024000 (Bandwidth Control)

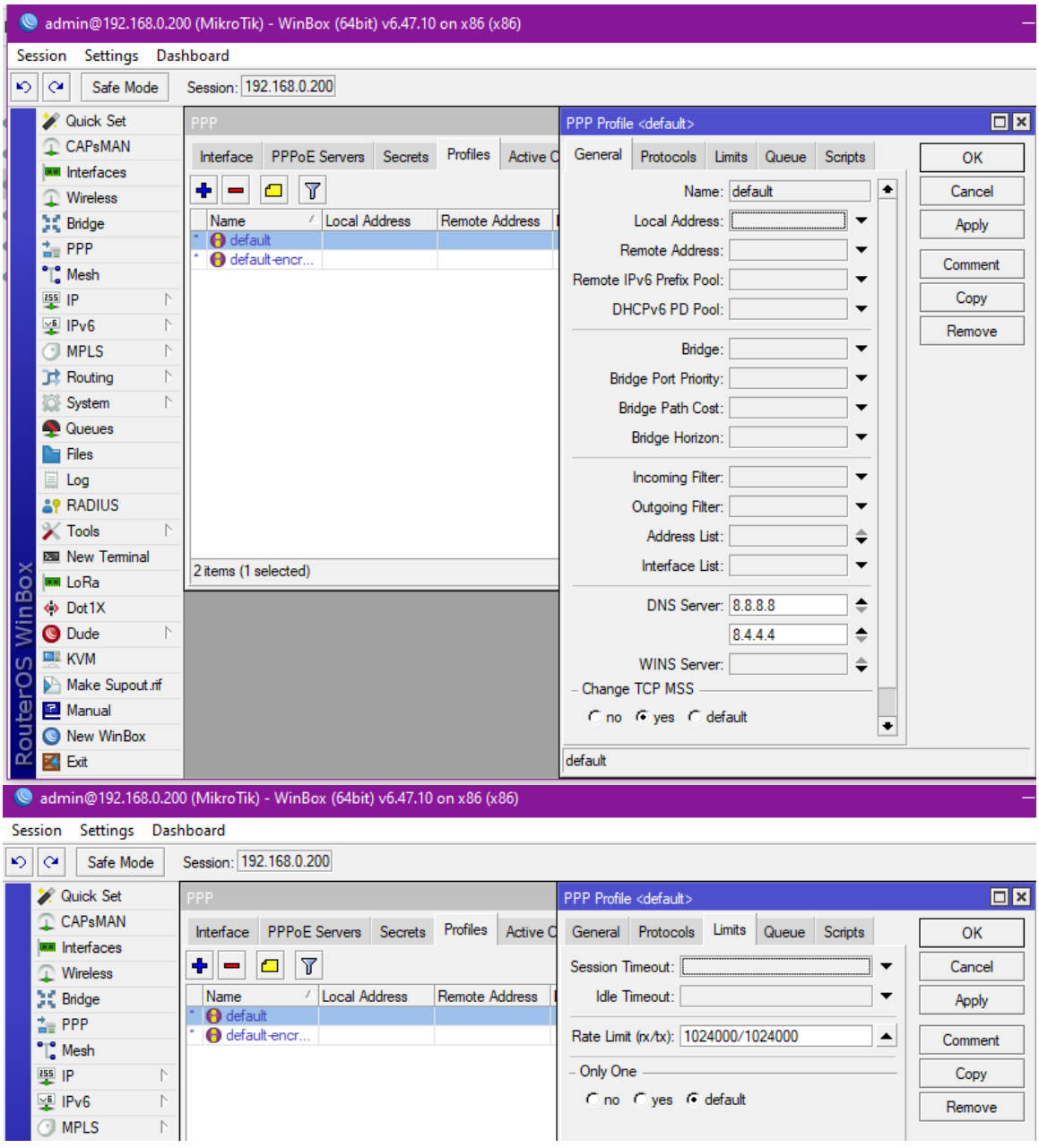


Figure 25: PPPoE Profiling for package 1. (With 1 Mbps limit)

Package 2:

PPP >> Profiles >>General >>name=default>>DNS=none>>apply

Limits>>Rate Limit (rx/tx) =2048000/2048000 (Bandwidth Control)

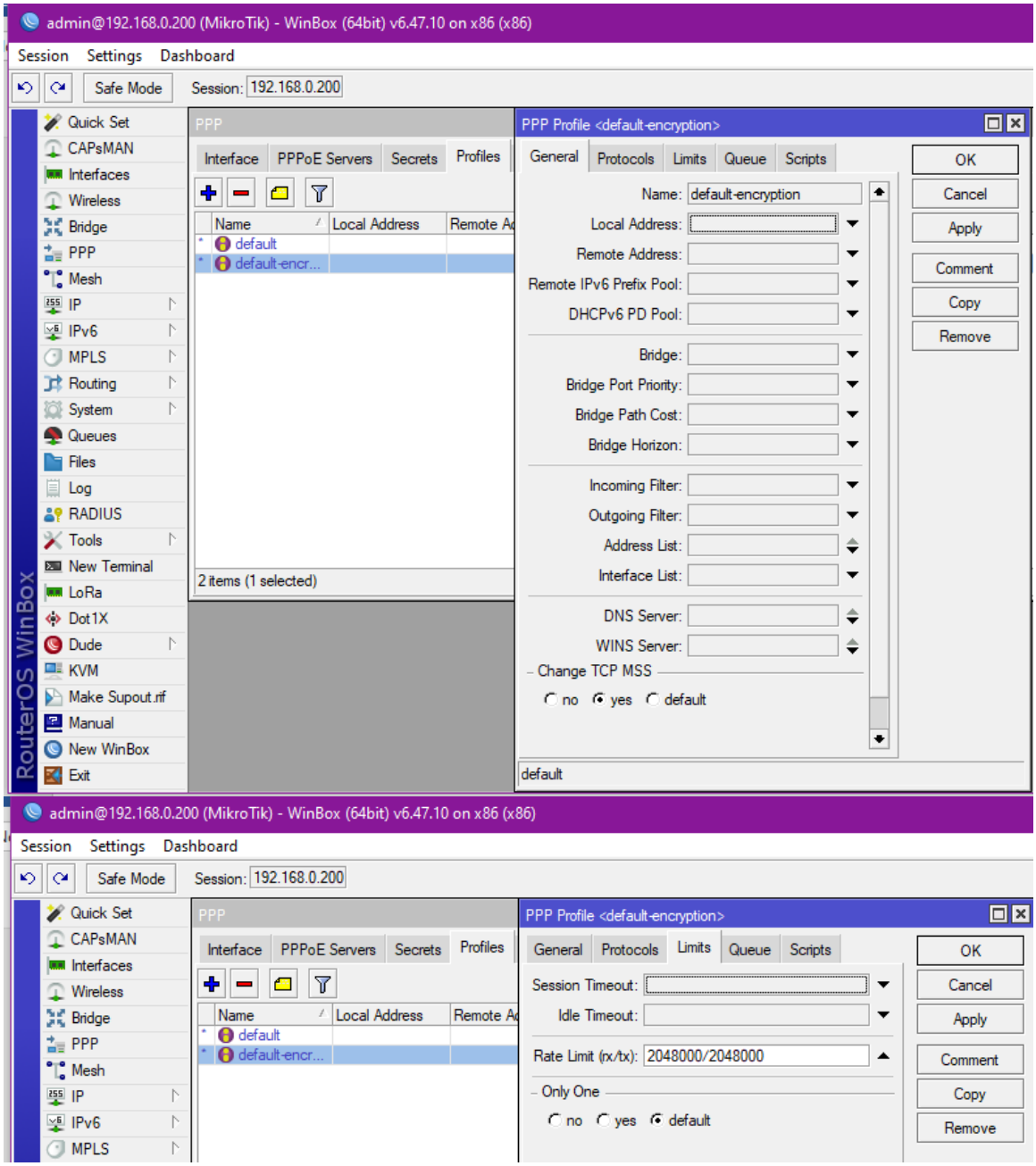


Figure 26: PPPoE Profiling for package 2 (with 2 Mbps limit).

Step 4: **PPPoE Secret:**

PPP >> Secrets >> Add [+] >>Name=test 1>>Password=123456>>Service=pppoe>>

Profile=default>>Local Address=192.168.1.1>>Remote

Address=192.168.1.2>>apply>>OK

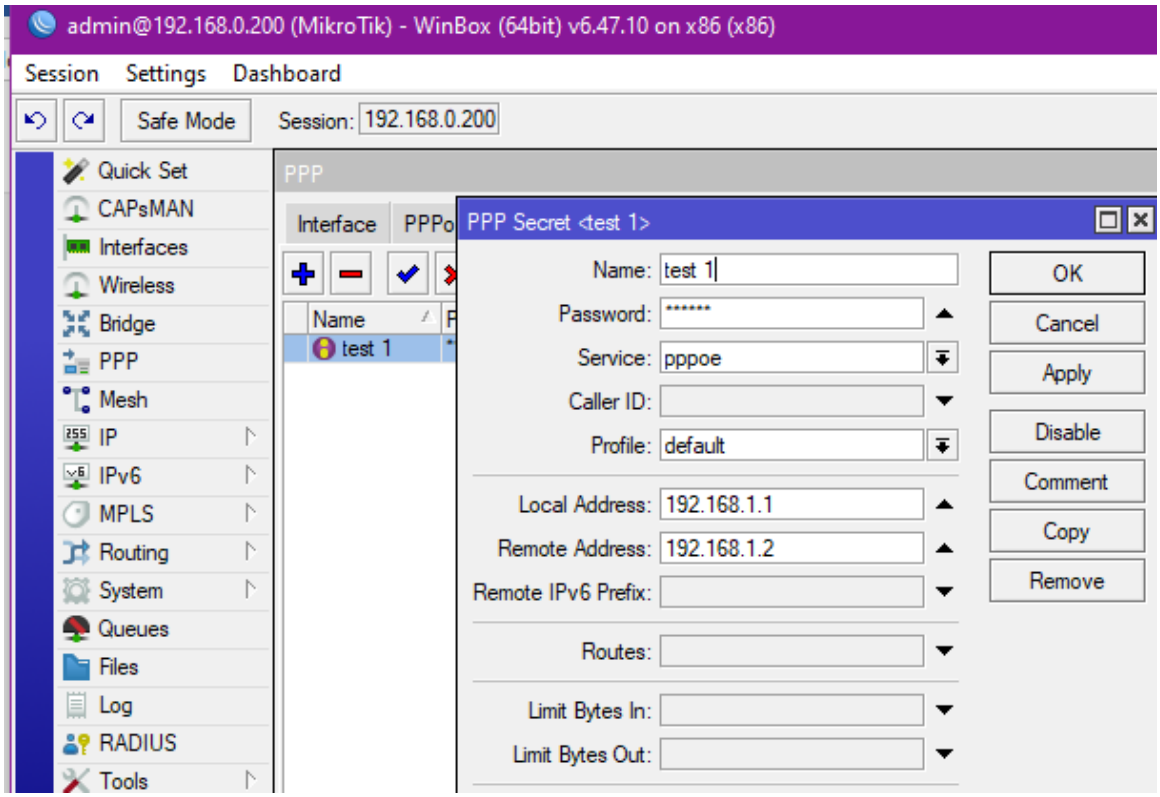


Figure 27: PPPoE Username & Password setup

Step 5: Connecting PC via Dial-up

We need to test the PPPoE connection by simply set up a dial-up connection to the PC. We have to disable the current internet connection for better understanding.

PC Settings>>Network & Internet>>Dial-up>>

Set up a new connection>>connect to the internet>>Broadband (PPPoE)

>>user name=test 1

>>password=123456

>>Connect

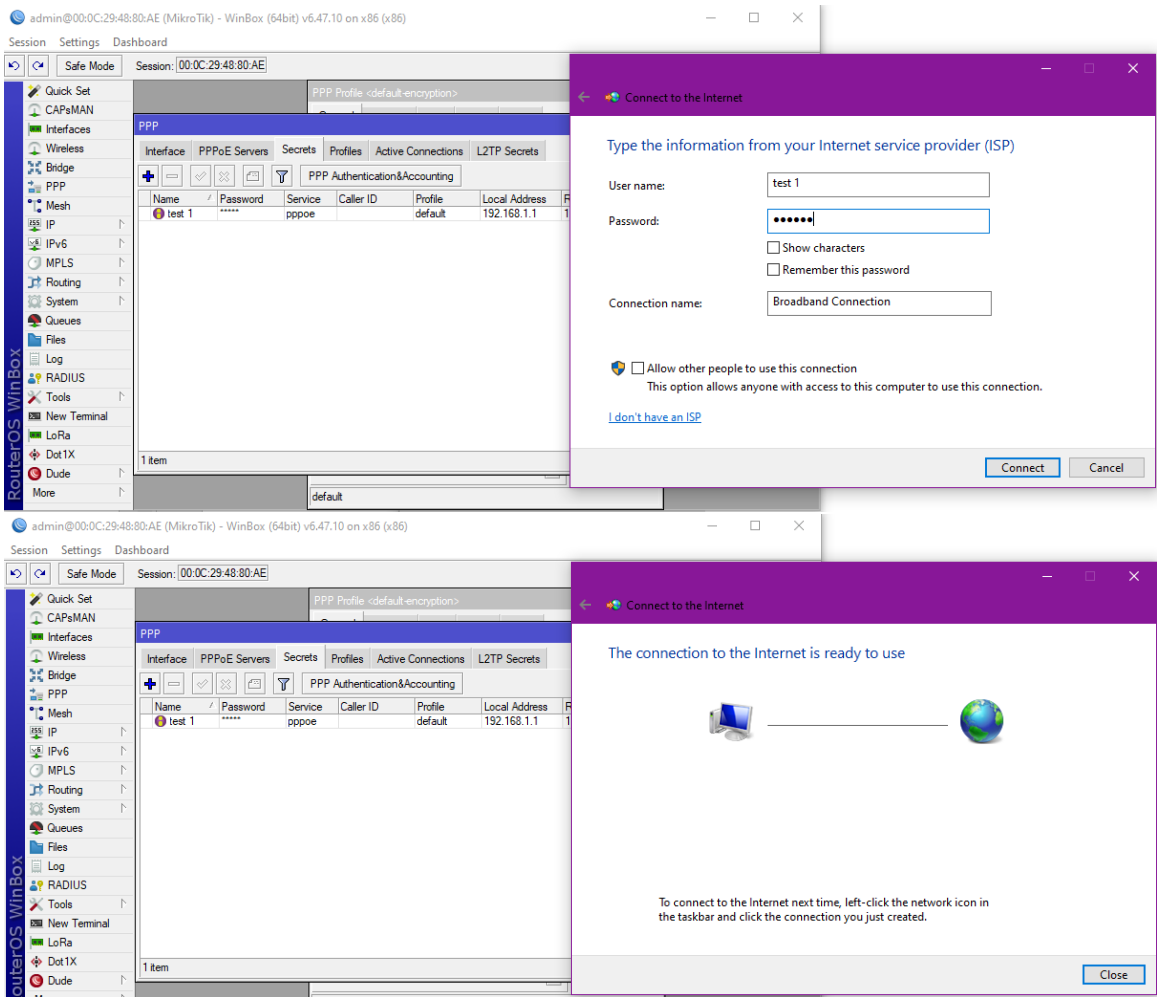


Figure 28: PPPoE Configuration testing via dial-up connection.

4.7 Bridge Configuration

A bridge allows you to connect two or more network segments together allowing devices to join the network if it's not possible to connect them directly. First I add an IP address to my PC for testing purposes.

PC Control Panel>> Network and Internet>> Network and Sharing Center

>> Change adapter settings>> Internet Protocol Version 4 (TCP/IPv4)>>Properties

>> Select “use the following IP address”

>> Select “use the following DNS server addresses”

>>OK

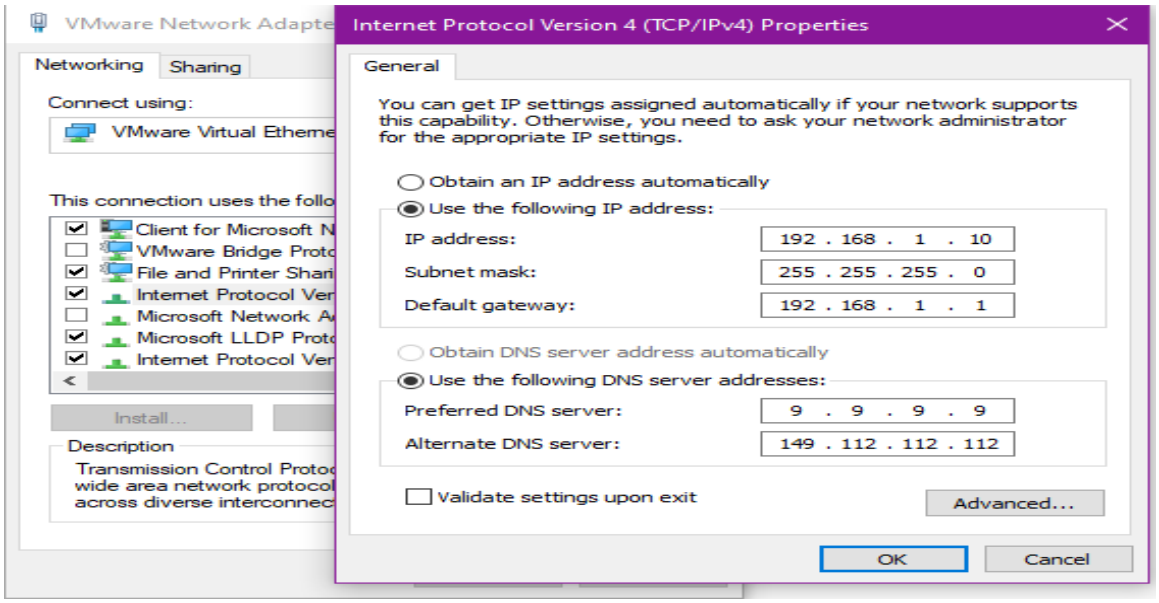


Figure 29: IP setup in PC for Bridge configuration.

Step 1: Creating Bridge on RouterOS

Bridge >> **Add [+]** >> Name=**bridge1552** >>Apply>>OK

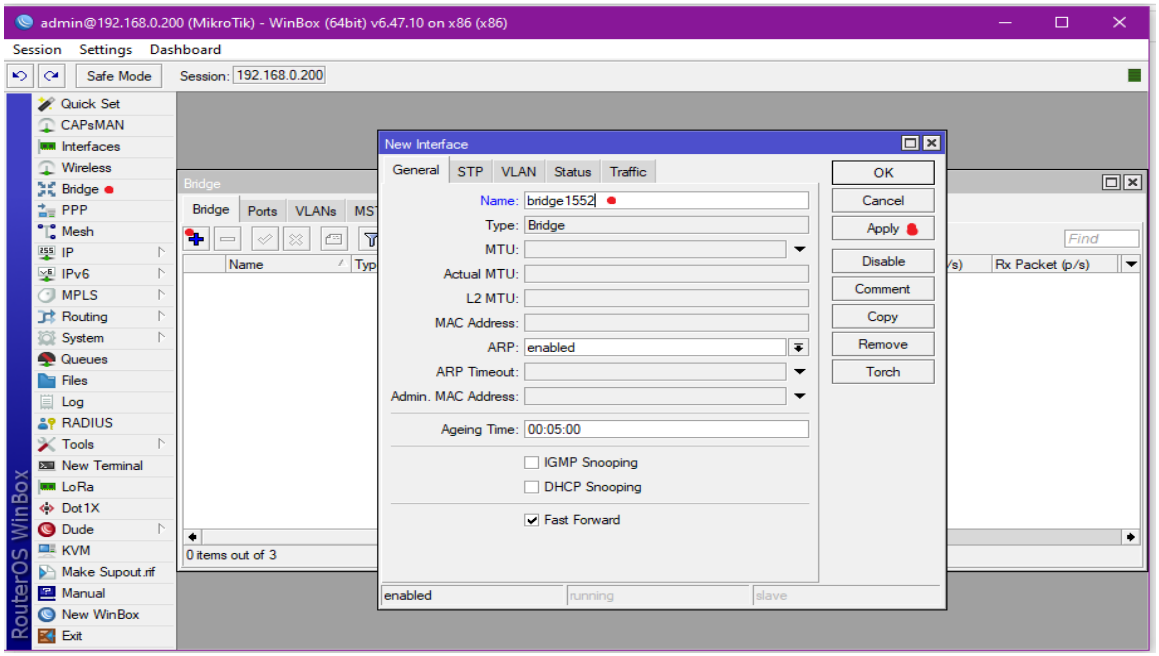


Figure 30: Creating and naming Bridge

Step 2: Bridge port adding:

Bridge>> Ports >> **Add [+]** >> Interface=**ether1**>>bridge=**bridge1552**>>Apply>>OK

Bridge>> Ports >> **Add [+]** >> Interface=**ether2**>> bridge=**bridge1552**>>Apply>>OK

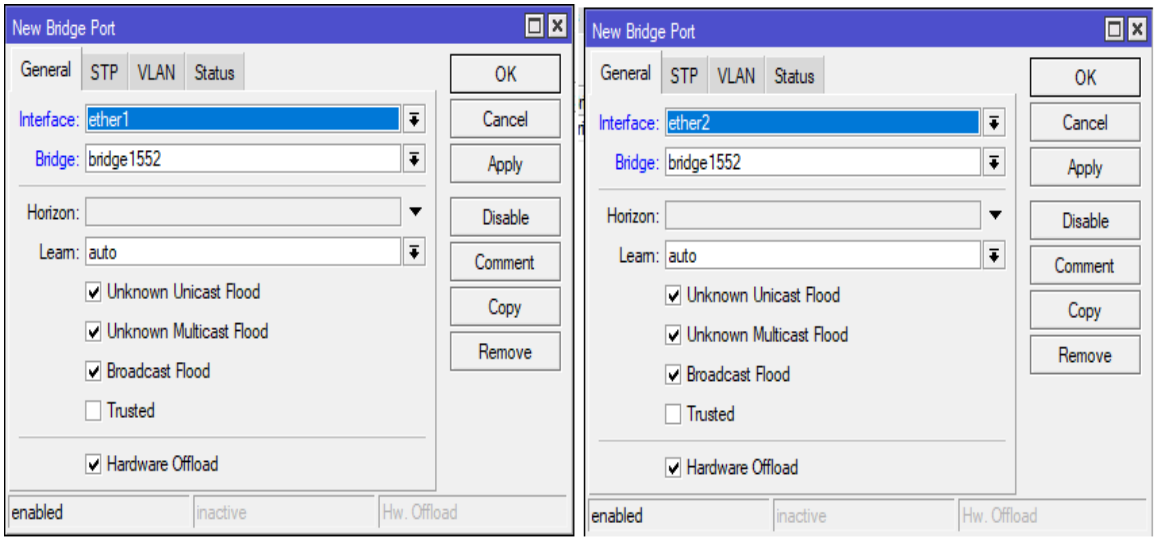


Figure 31: Members port adding in Bridge configuration

Step 3: IP address assigning in Bridge configuration:

IP>>Addresses >>**Add [+]** >>Address=**192.168.1.10/24**>>Interface=**bridge1552**

>>Apply>>OK.

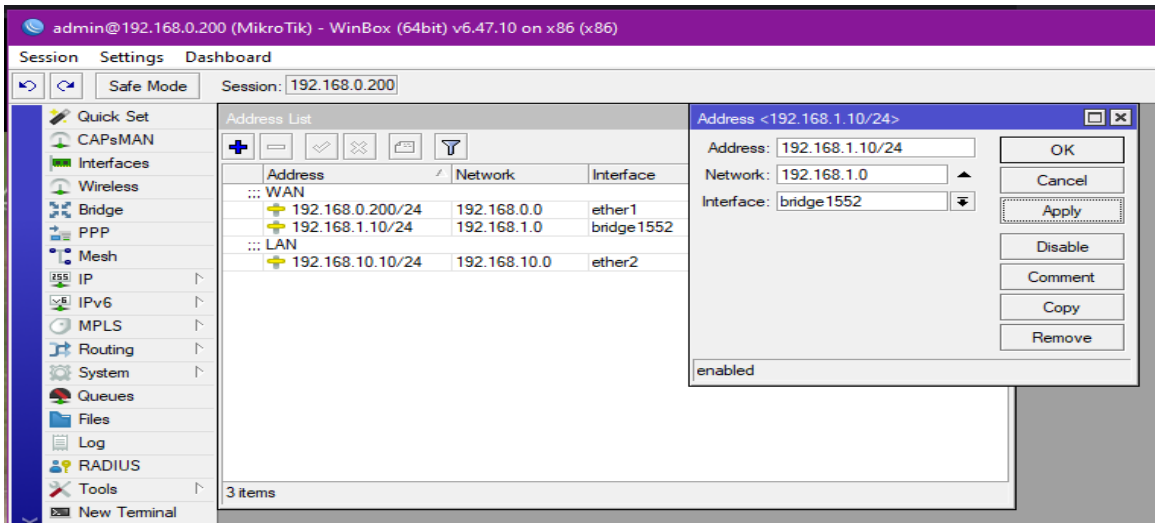


Figure 32: IP address assigning in Bridge configuration

4.8 ARP / AP Configuration

If the ARP of an IP is set to reply only, the router would not be able to connect to the internet because the router only replies to ARP requests. It is done for the security reason of clients. We need to manually bind the IP and Mac address.

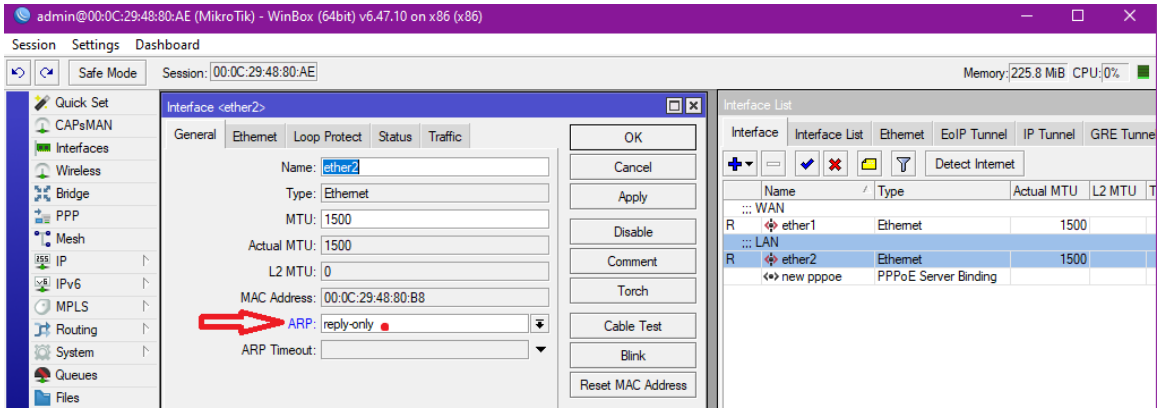


Figure 33: ARP set to reply-only.

IP>>ARP>> **Add [+]**>>ip address=192.168.0.105>>MAC address= **00:D8:61:36:DF:16** >>interface=bridge1552>>Apply>>OK

To perform the same procedures on the DHCP Server, click IP and then DHCP Server next.

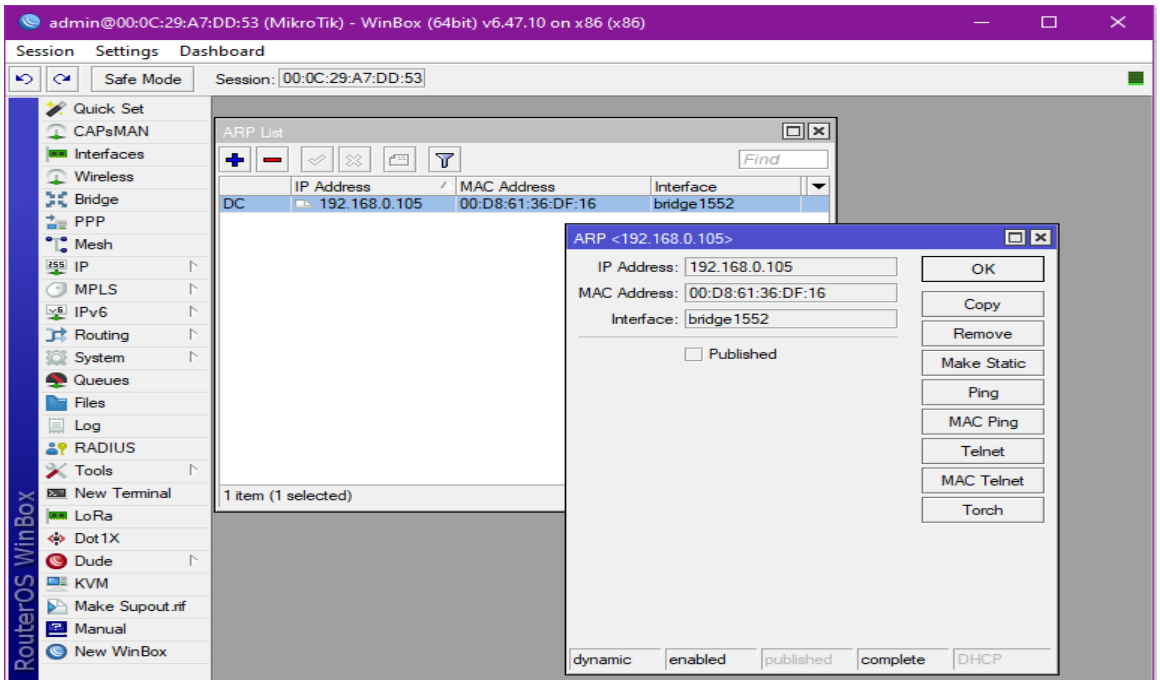


Figure 34: ARP / AP Configuration.

4.9 Bandwidth Management & Queue Setup

Bandwidth management is the act of monitoring and managing the communications (traffic, packets) over a network link in order to prevent the link from being overloaded or filled to its maximum capacity, which would cause network congestion and subpar performance. We use bandwidth management for the benefit of overall experience of clients. In MikroTik we use a technique called Queue Setup. Queue setup is used to limit and prioritize traffics. We also use it to limit data rate to certain IPs.

We will create multiple queues for each client and a total usage queue where it shows the total bandwidth. For testing purpose lets create a queue to which we will give a better bandwidth.

Step 1:

Queues>> Simple Queues >> **Add [+]** >> General >> Name=VIP user >> Target=192.168.1.20>>Max Limit=Upload 5M & Download 5M>>Apply>> OK

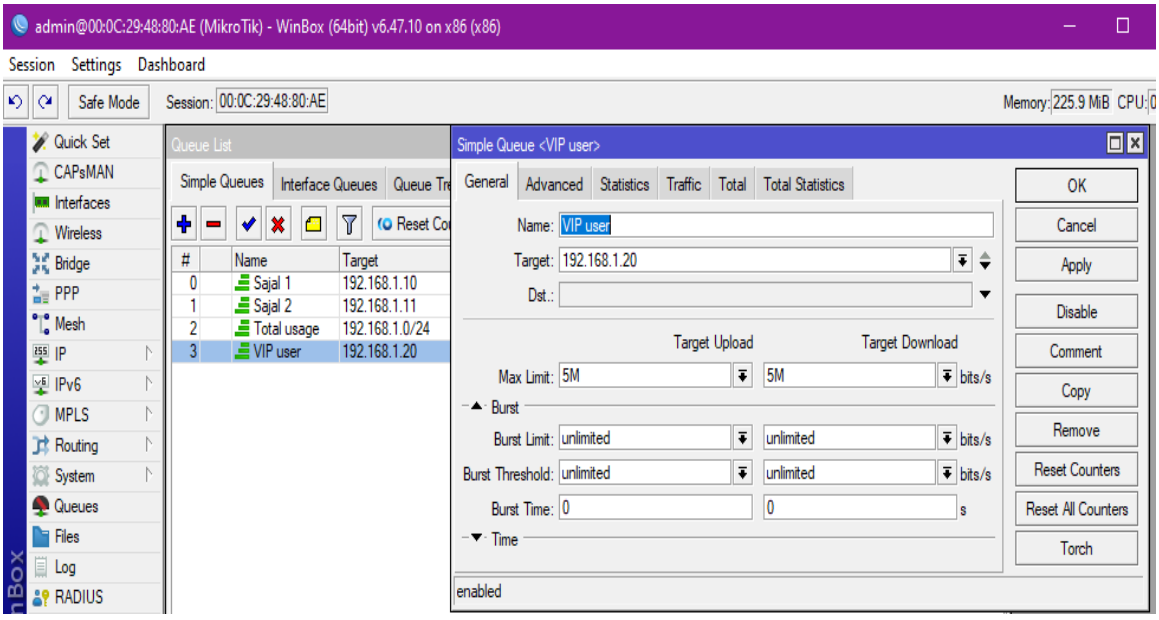


Figure 35: General Queue setup in Bandwidth management.

By the setup for **"VIP user"** will create slow bandwidth problem for other users in the queue like **"Sajal 1"** and **"Sajal 2".** We will also notice dropdown at download speed.

Step 2:

Queues>>simple queue>> double click **"VIP user"**>>Advanced>>Priority=1 & 1>>bucket size=0.100 & 0.100>>apply>>OK

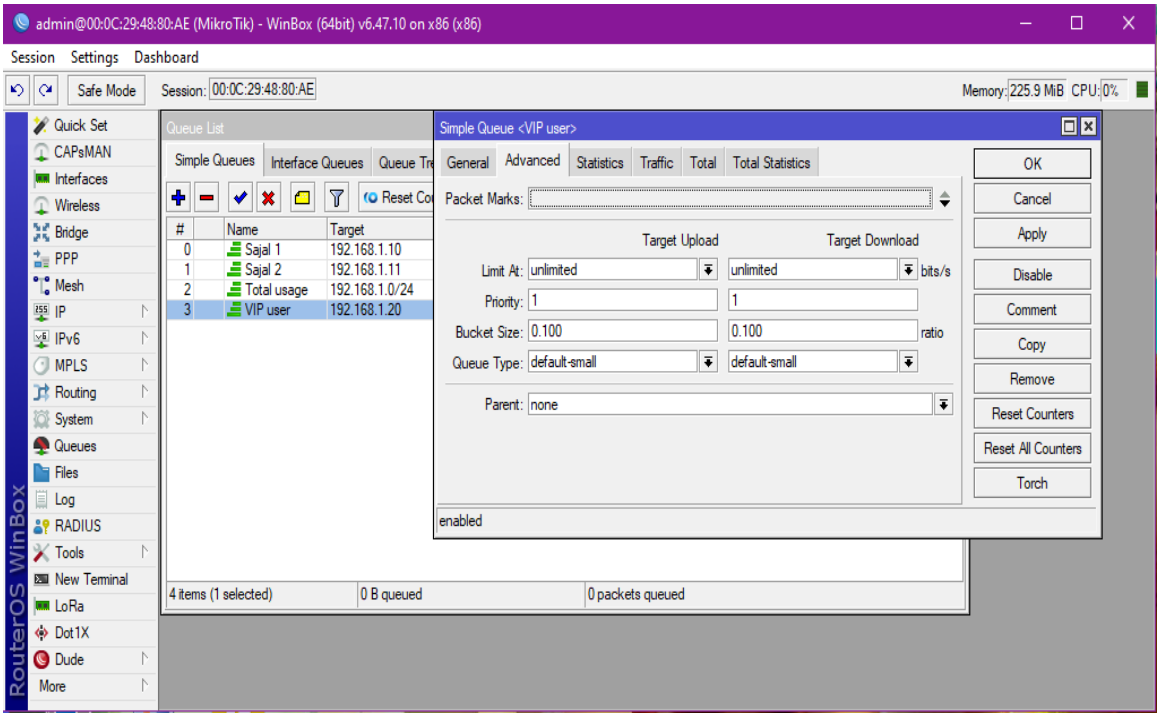


Figure 36: Advanced Queue setup in Bandwidth management.

4.10 MikroTik Firewall

A firewall is a type of network security device that keeps track of incoming and outgoing network traffic and makes decisions about which traffic to allow or deny in accordance with a set of security rules. The first line of defense for network security is a firewall. They provide a barrier between trustworthy internal protected and regulated networks from shady external networks like the Internet. Firewall gives very good stealth scan defenses and it blocks more DoS attacks [11]

Port Filtering Firewall:

IP>>Firewall>>Filter rules>>**Add[+]**>>General>>Chain=forward>>Src. Address=192.168.1.0/24>>Protocol=6(tcp)>>Dst. Port=80 >>Apply>>OK

Action>>Action=**drop**>>Apply>>Ok

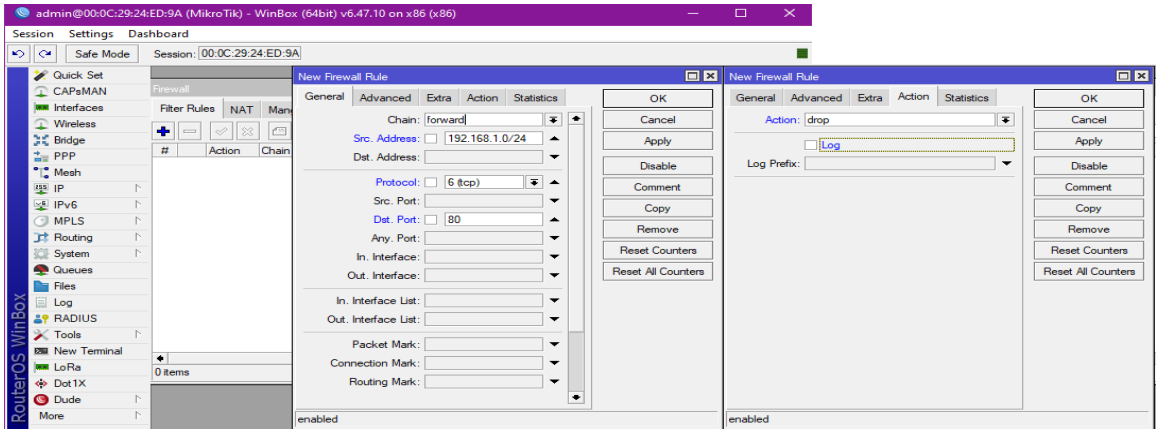


Figure 37: Firewall Port dropping in a determined network

To accept port we need to follow the exact rules.

IP>>Firewall>>Filter rules>>**Add[+]** >>General>>Chain=forward>>**Src.** Address=192.168.1.139>>Protocol=6(tcp)>>Dst. Port=80 >>Apply>>OK

Action>>Action=**accept**>>Apply>>Ok

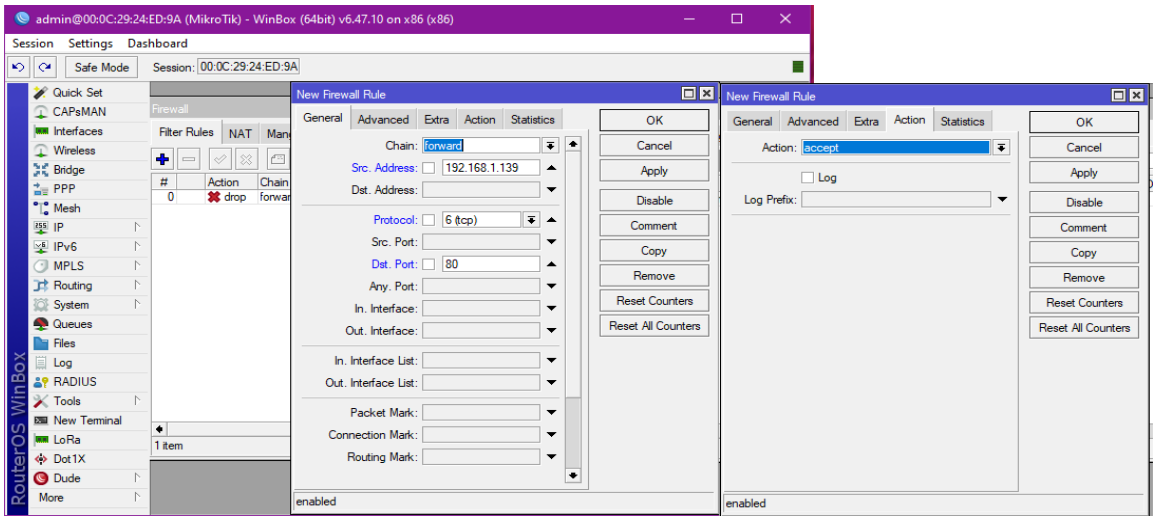


Figure 38: Firewall Port accepting in a determined network

Note: We need to place the accept queue to #0 otherwise firewall will not work properly. First click on # then drag the accept queue to the top. Now the accept queue is on #0 queue.

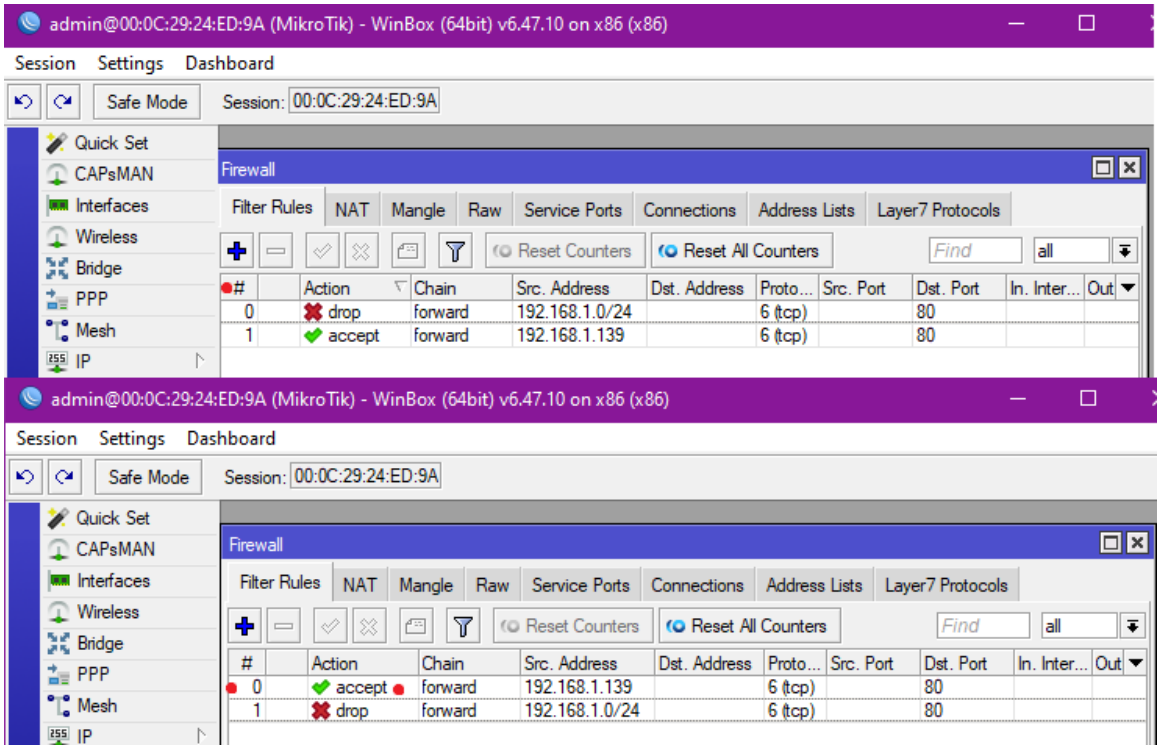


Figure 39: Firewall filter rules priority queue for specific rule.

4.12 Difficulties and Challenges

There were several problematic situation I would encounter during my internship. Then I'd make an effort to overcome every obstacle. My internship's main difficulties are: temporary, unpaid and competitive internship in a leading IT company. So I felt the pressure to work with talented senior employees. But I did not hesitate to ask for help from them. More difficulties and challenges are listed below:

a) Some organizational strength was not enough.
b) Password management issues
c) Dealing with unsatisfied clients and their complains
d) Security issues with both network and cable management.

e) Building relationships with authorities and fellow colleagues in the region.
f) Solutions for Hotspots
g) Bandwidth management issues
h) Time management problems in bad weather condition or traffic jam.

CHAPTER 05: ASSESSMENTS AND COMPETENCIES

5.1 Competencies Acquired

After completing an internship at Daffodil Online Ltd., I gained knowledge of the various difficulties or problems that can arise during practical working. I evaluated and achieved several competencies during the course of my internship. I used to work hard to achieve such goals in an effective manner.

These acquired competencies are listed below:

a) Troubleshoot, monitor, and supervise MikroTik routers.
b) Look for answers to moderate problems.
c) Develop my practical knowledge for real-world issues.
d) Real-world exposure to a workstation.
e) Install the MikroTik router OS.
f) Comprehend bandwidth control.
g) Maintain the MikroTik router.
h) Utilize a hotspot.

5.2 Assessments of the Internship

In the current situation of Bangladesh, getting a job is a real challenge without prior experience on that field. The post-covid19 condition of job market is at its worse. A productive internship can help me prepare for a career. I consider completing my internship to prepare for my impending reflection a success. DOL serves as a link between my personal lives and my work. This company gives me a lot of knowledge that will help me focus more effectively at work.

CHAPTER 06: CONCLUSION & FUTURE CAREER SCOPE

6.1 Scope for Future Career

In real life, finding a job may be quite difficult for all of us in our nation, especially if we lack experience. That is why I choose an internship—it will help me to increase my career prospects and gain experience. Therefore, this internship allows me to explore my options for future living. As a consequence, this internship will help me in the future to discover my scope in the corporate world. They are:

a) Work on any ISP platform
b) To work as an engineer in the security industry.
c) Possibility of employment as a network engineer.
d) Possibility of employment as an IT security engineer.
e) Any IT-related position in corporate office or bank.

6.2 Discussion & Conclusion

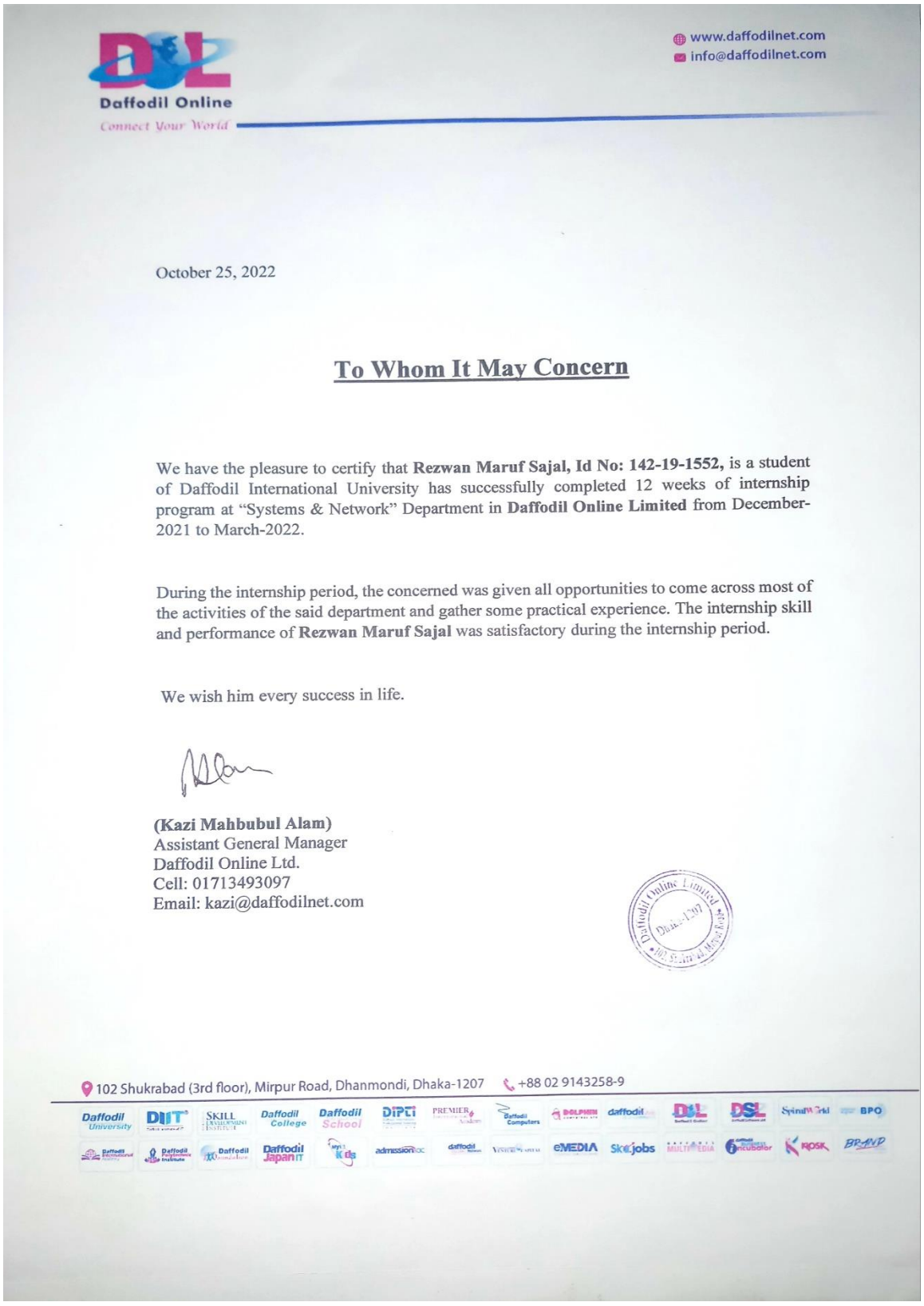
I have been thinking of constructing a MikroTik network during my internship. I've got a lot of thoughts on IP class and how to use the network to gain a lot of IP. I thought this internship would be a great way for me to learn modern skills. I learned a lot about the firm throughout my brief job. The method and diagram of computer organizations, information association, organization security, interface, and maintenance are the biggest openings in a wide range of applications. The most significant lessons I took away from my internship were how to set up an ISP link, how to manage bandwidth in various ways, how to establish bridge mode, how to set up a firewall and NAT and how to protect a network. My trainer and counselor were excellent, and I learnt a lot from them. They also gave me a lot of fresh ideas that I will use in the future. A variety of swaps that I was able to make will be useful in the future.

I've never used a reality networking system before, but doing so now provides me the chance to do so in the future. I can now manage a wide range of routers, which will be useful in the future. It enables me to connect with actual networking contacts that will be useful to me in the future.

APPENDICES

Name	**Daffodil Online Limited**
Address	102, Shukrabad (3rd floor), Mirpur Road, Dhanmondi, Dhaka - 1207, Bangladesh
Telephone	+8802-48119586 , 9143258, 9143259
Email	info@daffodilnet.com , noc@daffodilnet.com
Website	http://www.daffodilnet.com/
Types of Organization	Leading Internet Service Provider (ISP) in Bangladesh

INTERNSHIP CERTIFICATE



Daffodil Online
Connect Your World

www.daffodilnet.com
info@daffodilnet.com

October 25, 2022

To Whom It May Concern

We have the pleasure to certify that **Rezwan Maruf Sajal, Id No: 142-19-1552,** is a student of Daffodil International University has successfully completed 12 weeks of internship program at "Systems & Network" Department in **Daffodil Online Limited** from December-2021 to March-2022.

During the internship period, the concerned was given all opportunities to come across most of the activities of the said department and gather some practical experience. The internship skill and performance of **Rezwan Maruf Sajal** was satisfactory during the internship period.

We wish him every success in life.

(Kazi Mahbubul Alam)
Assistant General Manager
Daffodil Online Ltd.
Cell: 01713493097
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