EMPIRICAL STUDY ON NETWORK CONFIGURATION USING MIKROTIK ROUTER

By

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This Report introduced in Partial Fulfillment of the Prerequisites for the Degree of Bachelor of Science in Electronics and Telecommunication Engineering.

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APPROVAL

This internship report titled is **"EMPIRICAL STUDY ON NETWORK CONFIGURATION USING MIKROTIK ROUTER"** submitted by **PROBIR KUMAR DATTA**, ID NO: **142-19-1562** to the Department of Electronics and Telecommunication Engineering, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the condition for the degree of BSc (Hon's) in Electronics and Telecommunication Engineering & permitted as to its style and guts.

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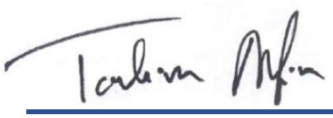

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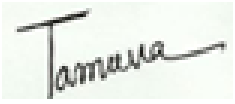

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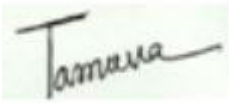
DECLARATION

I thus announce that, this internship report is set up by me **PROBIR KUMAR DATTA**, ID NO: **142-19-1562** to the Department of Electronics and Telecommunication Engineering, Daffodil International University, under my honorable Supervision **MS. TASNUVA ALI**, **Assistant Professor**, Department of ETE, Daffodil International University.

I additionally declare that neither this internship file nor any part of this internship file has been submitted somewhere else for award of any diploma or degree. I additionally declare that; I acquire records from my internship organization Atova Technology, Books, Internet and my friends also.

Supervised By:



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I'm thankful to **Mr. Ferdosh Epon**, the CEO of Atova Technology. I also thanks to **Mahbub Hasan Pavel** (System and Network Trainer) of Atova Technology for their help. Without their assistance of help, I can't complete my internship training in the company. Different individuals from the company additionally my clump mate encouraged me enormously for doing my temporary job program.

I'm truly thankful and wish significant obligation to "**Ms. Tasnuva Ali**, Assistant Professor, Department of ETE, Daffodil International University, Dhaka" [1]. Profound Knowledge and distinct fascination of supervisor in the field of "ISP Set Up and Configuration with MikroTik Router" to do this Internship. Her endless persistence, insightful direction, nonstop consolation, consistent and lively oversight, helpful analysis, important counsel, reading many inferior drafts and correcting them at all stage have made it conceivable to finish my internship.

I might want to offer heartiest thanks to "**Md. Taslim Arefin**, Associate Professor and Head, Department of ETE" [1], for his benevolent assistance to complete my Internship and furthermore to other faculty member and the staff of ETE department of Daffodil International University.

Finally, I must acknowledge with due respect the all support and inspiration of my parents.

ABSTRACT

MikroTik Router is one in everything about chief popular switches to any ISP network additionally as any venture working environment organization. These functions include IP Addressing, Firewall & Nat, Routing, Bandwidth Limiter, Point to Point Tunneling Protocol, DNS server, DHCP server, Hotspot, and many other features. It is very useful for our daily life. In this sector we will know about Cisco, MikroTik, Cabling, Linux. MikroTik Router contains a huge load of organizing administrations that encourage to make a steady and wash network subsequently essentially. it's aforementioned that any ISP Company or Enterprise work environment can't go one day while not MikroTik Router. Along these lines, the framework chiefs UN office aren't exploitation MikroTik Router in any case, they'll presently begin victimization MikroTik Router, I think.

This plan is executed utilizing Winbox. After execution of all help, this framework is tried in various stages and it works effectively as a model. In the future I need to improve concentrate setup framework to improve execution for clients.

My internship objective was picking up systems networking with Mikrotik essentially, I zeroed on ISP networking and Mikrotik router configuration. “Winbox is intended for actualize Mikrotik. Mikrotik is established in 1996 by Arnis Riekstins and John Tully” [2]. Regardless of which router board or working framework you use as a MikroTik router, the salesman will set the fundamental arrangement for you. Discover before you purchase whether the salesman will give you a preferred position in this respect. Mikrotik router is broadly utilized for Its easy bandwidth management. This Router is effectively available and cost cordial. Mikrotik router is well known in light of the fact that It can oversaw large also, little organization framework. Investigate on the web (ISP Company) utilizes this switch in this segment.

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CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

The internship program has become the stage for the people who need to enter to corporate level from the school life, through the brief occupation I got familiar with the certified working environment that was particularly not equivalent to my course study. During my Internship, I got a freedom to work in this area to consider how an IT association develops the thing as applications used by various organization. All my experience helped me with recognizing parts like social affair work, workplace, peering support, finished in the affiliation. As such, the temporary job span gave me the event to extend my understanding, perceive my qualities/weakness that would be more supportive to take care of my career in the future.

To set myself up a gifted individual in the serious job market, networking with MikroTik stage is the fundamental goal of my internship program.

The opportunity is given by Atova Technology. I gather a lot of practical knowledge from there and learn ISP operation and maintenance with MikroTik network.

1.2 MOTIVATION

I am currently pursuing in the final semester of my Bachelor Degree program in Electronics and Telecommunication Engineering at Daffodil International University; I appreciate the significance of acquiring observational information which will back up the course book information and assist an understudy with acquiring a board perspective.

I anticipate that me should experience some new difficulties and that educates me to gain from Atova Technology. This internship or training program gives me a ton of significant data and abilities to create ISP arrangement and MikroTik router setup. Atova Technology temporary job support will give me a reflection/consideration regarding my future life and will be an exceptional reformist for my future guidance and profession.

1.3 OBJECTIVES

- Gain empirical information about computer networking.
- Gain empirical information about Countrywide ISP.

- Learning technical skills.
- Acquiring fundamental foundation information.
- Discusses well with individuals.
- Shows eagerness and energy.
- Cooperates with other people.
- Improve relational abilities.
- Improve regulatory abilities.
- Knowledge on key experts.
- Comprehension of professional morals, qualities and convictions.
- Information on expert affiliations exercises.

1.4 REPORT LAYOUT

The Report is sorted as follows-

CHAPTER 1: In this chapter, I have described about Introduction, Motivation and Objective of my internship.

CHAPTER 2: In this chapter, I have described about Organization introduction, target group, product and service on market situation and Organogram structure of the company.

CHAPTER 3: In this chapter, I have described about events, project, task and activities, challenges and all about of MikroTik configuration.

CHAPTER 4: In this chapter, I have described about competencies earned, reflections of my internship.

CHAPTER 5: In this chapter, I have described about conclusion and future scope of my internship.

CHAPTER 2

ORGANIZATION

2.1 INTRODUCTION TO THE COMPANY

"Atova Technology is established in 2016. Atova Technology is one of the Professional IT service-based company and also a professional training institute in Lalmatia, Mohammadpur, Bangladesh" [3]. where they have fundamental business morals in long haul relationship with their customer. Their accomplishment is very matchless quality; which makes them incredibly pleased. Also, they are exceptionally cautious about their future. Much more breathed life into about their standpoint for a fairly encouraging future. They have 10 to 15 years experienced trainers and developers who have service with a massive work rate.

2.2 PRODUCT AND MARKET SITUATION

There are several categories of IT services and professional services are provided by Atova Technology.

These are given below-

IT Services:

- Software Development
- Website Development
- Ecommerce Solution
- Mobile Apps Development
- Graphics Design
- Complete Server Management
- SEO
- Email marketing
- SMS marketing
- Web, VPS, cloud hosting
- Dedicated server
- Ecommerce, WordPress hosting

Professional Training:

- MikroTik routing and security
- CCNA
- Web development
- WordPress development
- Linux system and administration
- Graphics design
- Android apps development

2.3 TARGET GROUP

The organization's customer stand incorporates all customers and all little-to medium-sized organizations, tallying new companies. The organization procedure to thinks on customers, as these are beliefs focuses for our new speedy contributions and hold the most development feasible for the organization. Web Solutions feels that these commercial center sections have specific estimating and administration needs, and make more committed, reliable clients. IT background students also their targeted people coz they can developed their IT knowledge by this company.

2.4 SWOT ANALYSIS

SWOT investigation is an organized arranging strategy used to assess the Strengths, Weaknesses, Openings, and Threats associated with a Project or in an undertaking. Distinguishing proof of SWOTs is significant on the grounds that they can illuminate later strides in intending to accomplish the target. SWOT represents Strengths, Weaknesses, Opportunity, and Threat. This is a vital device for an organization to examine its interior and outside climate.

Strengths:

Atova Technology is a made sure about the association which offers numerous advantages and an assortment of circulation dependent on your requirements:

- ✓ Highly Expert teams.
- ✓ Solid capital support.
- ✓ Low-priced facilities.
- ✓ Own property and hardware.
- ✓ Quality help services.
- ✓ We have low overheads, so we can offer great incentive to clients.
- ✓ Simple sending of new administrations.
- ✓ Swift response to client demand.

Weaknesses:

- ✓ Website is not updated properly.
- ✓ No suitable advertising plans.
- ✓ Technical team member is enough but others stuff is not enough to support properly.
- ✓ More double requires extra effort and amenities.

Opportunities:

- ✓ Financial expansion.

- ✓ Increased Socialization.
- ✓ Launch of new facilities.
- ✓ Build up the ability of individuals.
- ✓ Improve the quality and inventiveness.
- ✓ In the know regarding the world.

Threats:

At any work spot or undertaking there are some savagery and dangers which makes it hard to do appropriately. On the off chance that we need to accomplish the work appropriately or effectively, at that point we should to overlook their dangers and concentrate to the work, keep on doing completely.

- ✓ Manpower whipping.
- ✓ Competition from another private sectors.
- ✓ Decreasing per line revenues due to competitive pricing.
- ✓ Developments in innovation may modification this marketplace past our volume to adjust.

2.5 ORGANOGRAM STRUCTURE OF ATOVA TECHNOLOGY

I show below the organogram structure of Atova technology: -

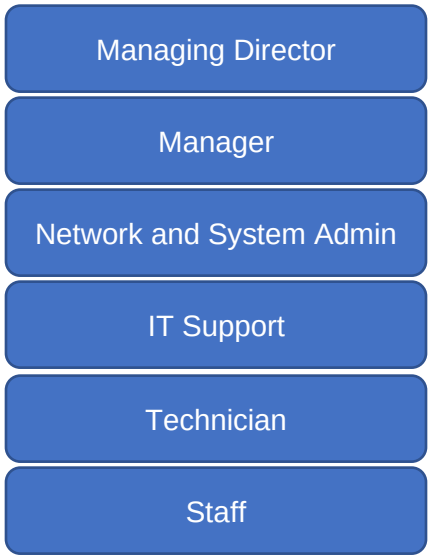


Figure 1: Organogram structure

CHAPTER 3

INTERNSHIP TASKS, PROJECTS AND ACTIVITTIES

3.1 DAILY TASK & ACTIVITIES

To start with, I have found out about IP setup. I got different significant points of interest in IP sub-netting. Also, we recorded a wide range of information and data. We had no clue about MikroTik switch arrangement then we become familiar with a ton of about DHCP design, PPPoE setup, data transmission the board and how to share or choose transfer speed. Subsequent to knowing a wide range of arrangement that was simple for me to design any switch. Subsequent to completing an awe-inspiring four-month significant reason, we know all the idea and design of Learning about organization parts.

1st Month: In this 1st month of my Internship period, I learned and achieved some responsibilities -

- Understanding fundamental networking.
- Understanding IP addressing and types of classes and range.
- Introduction to MikroTik & Fist time startup.
- Empirical knowledge about MikroTik Basic Configuration.
- Empirical knowledge about Network Address Translation (NAT).
- Fundamental segment of Router.
- Empirical knowledge about routing setup.
- Knowing how Resetting MikroTik.

2nd Month: I have gathered knowledge and gain practical experience those the following topics at second month of my internship period –

- Learning about DHCP management.
- Hotspot Solution.
- Bandwidth management.
- Scripting & Scheduling.
- Port Forwarding.
- Bridge & STP.
- VLAN Management.
- Firewall & ACL.
- MikroTik Failover.
- How to block & unblock a Site.

3rd Month: I have gathered knowledge and gain practical experience those the following topics at second month of my internship period –

- MikroTik Load Balancing.
- Wireless Management.
- Networking & Routing protocol.
- User Administration.
- Backup & Recovery.
- Queue & DHCP setup.
- PPPoE setup.

3.2 EVENTS & ACTIVITIES

This internship training can be fixed several types of perceptions. My internship program is a new way of gaining my knowledge. Some are given below –

- I distinguish the Internet protocol range, classes and addresses, all things considered.
- I think about Mikrotik gadgets, cost and ability.
- I have well information on networking materials.
- Notice and ensuring networks.
- Make the clients account, client secret key.
- Server, LAN, switch and router arrangements.
- Recognize network blunders.
- Notice web speed by means of charts on winbox or connections.
- Learning, understanding and configuring: WEB server, DNS server, MAIL server, Proxy server.

3.3 PROJECT TASK & ACTIVITIES

3.3.1 IP ADDRESSING & CLASSES RANGE

IP address: "IP (Internet Protocol) Address is a location of your network equipment. It helps in associating your PC to different gadgets on your network and everywhere on the world. An IP Address is comprised of numbers or characters. The internet wants a way to distinguish between different computers, routers, and websites. IP addresses is how it does so" [4]. All gadgets that are associated with an internet connection have a special IP address which implies there's a need of billions of IP addresses. This prerequisite is satisfied by the new IP variant IPv6. There are two types of IP addresses: Public, Private. Public IP address two types: Static & Dynamic IP address There are two version of IP address: IPv4 & IPv6. IPv4 protocol only acceptable for 2^{32} addresses and It's actually 32-bit binary numbers. IPv4

address is consists with two parts (Network & Host). IPv6 protocol acceptable for 2^{128} addresses. IP Address is an identifier for devices on a TCP/IP network.
Example: 172.15.254.2

IPv4: Address Classes and Range:

There are 05 Classes of IPv4 Addresses: class A, class B, class C, class D and class E

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

The IP address ranges for an alternate class in the table are theoretically determined. There is some uncommon IP address to that are held for a specific reason.

Assume, IP addresses having all zero's or one's either in the network id or host id are precluded from all the IP address classes. These IP addresses are utilized for a particular reason. In class A, 127 is reserved for the loopback or local host [5].

Private & Public IP Range:

IPv4-Private IP Range

CLASSES	CLASS RANGE	ADDRESS RANGE
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 Private IP**,** rest all the IPs are known as Public IP.

3.3.2 NETWORKING (LAN, MAN, WAN)

"Computer networking is the act of interfacing at least two computing gadgets with one another to share information. PC networks are worked with a blend of equipment and programming. Another way to say computer networking is the exercise of conveying and swapping data between nodes over a shared medium in a data structure" [6].

Computer networks can be characterized in numerous different ways- LAN, MAN, WAN, PAN.

Local Area Network (LAN):

"A Local Area Network (LAN) is a private network that links PCs and devices inside a restricted area like a house, a workplace, a building or a campus. On a minor scale, LANs are used to join individual computers to printers" [7]. However, LANs can also encompass to a few kilometers when used by firms, where a huge number of computers share a variability of resources like hardware (e.g., Printers, scanners, audiovisual devices etc.), software (e.g., application programs) and information (Figure 2). The extensive diversities of LAN topologies are used at the data link layer and physical layer.

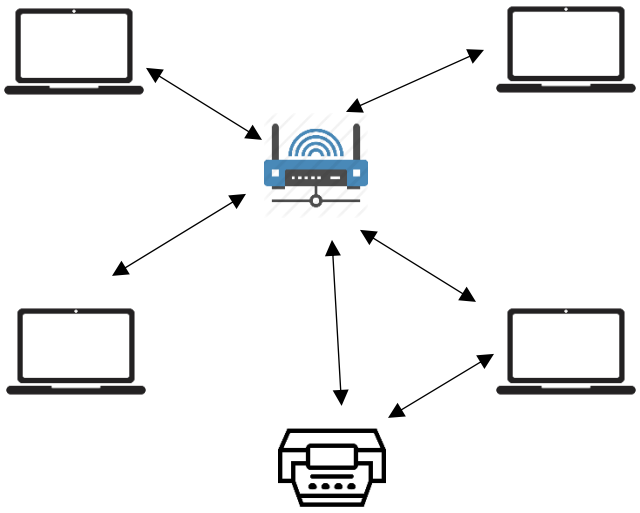


Figure 2: Local Area Network

In figure 2, We see a printer & 4 PCs are connected with a router in a small office.

Metropolitan Area Network (MAN):

The Metropolitan Area Network is a PC network which is like the Local Area network yet ranges a whole city or grounds (Figure 3).
In Metropolitan Area Network, we interconnect the client with PC assets in an entire geographic region or locale. This Network is bigger or more extensive that the Local Area Network [7].

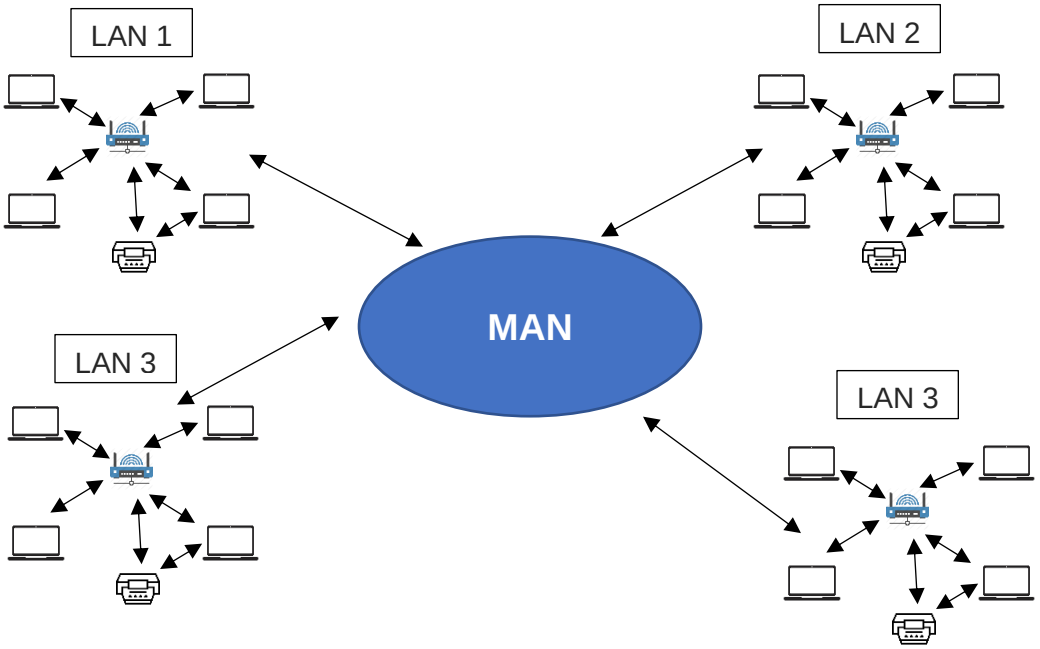


Figure 3: Metropolitan Area Network

In figure 3, We see one MAN connected with 4 LANs. Its ranges can up to city or area.

Wide Area Network (WAN):

"The Wide Area Network is the telecom network which stretches out over the huge geological zone for the basic role of computer networking. These networks are frequently settled with rented telecommunication circuits" [7]. The WAN interfaces distinctive more modest networks, including the Local Area Network (Figure 4). The PCs associated with the Wide Area Network are frequently associated through open networks, for example, telephony system. This Network can associate through the rented lines or satellites.

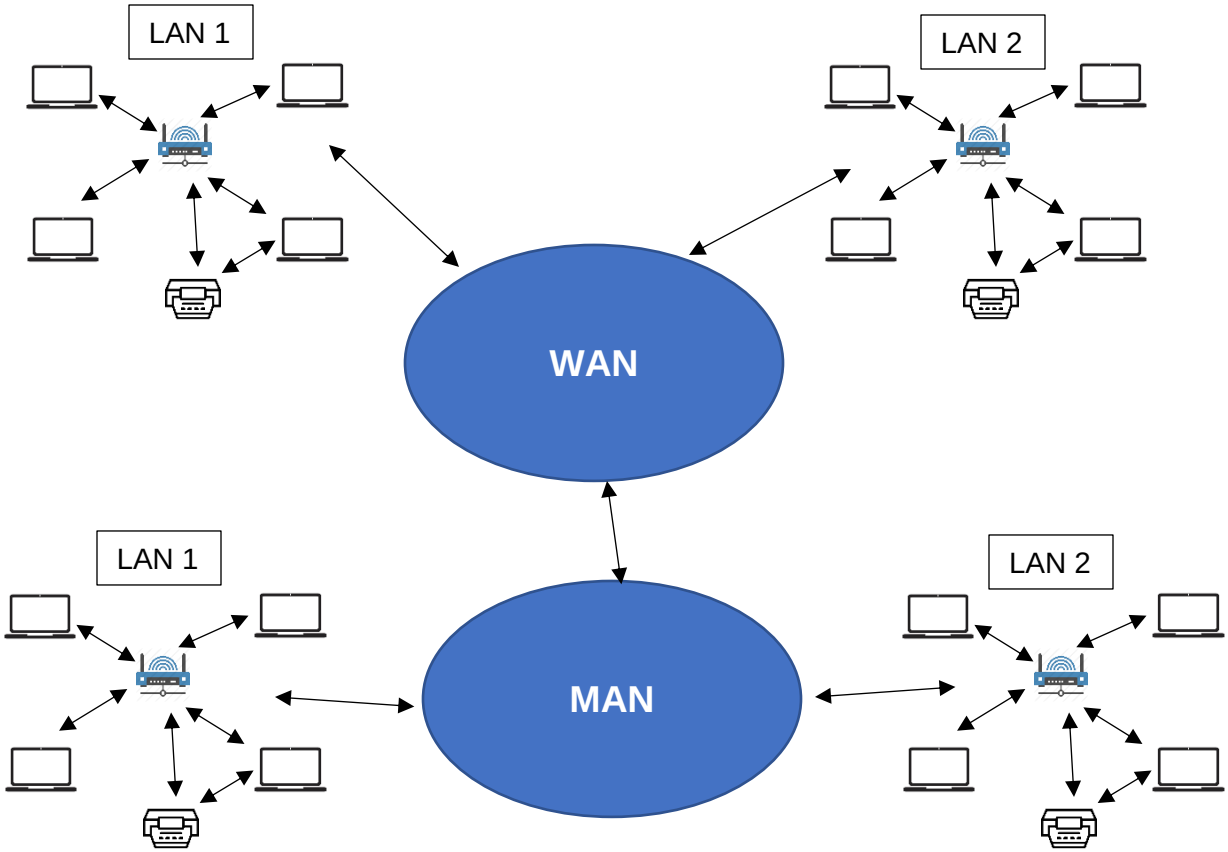


Figure 4: Wide Area Network

In figure 4, A WAN connected with 2 LANs & 1 MAN. It is basically long-distance network.

Personal Area Network (PAN):

"The Personal Area Network is utilized for interconnecting the gadgets which are focused on an individual's workspace" [7]. This Network gives information transmission among gadgets, for example, PCs, cell phones, tablets, and individual digital assistants (Figure 5).

Figure 5: Personal Area Network

In figure 5, We see a private network. Here It consists of a pc, a laptop & a printer. It is a private home network.

3.3.3 INTRODUCTION TO MIKROTIK

MikroTik is a well-known Network Device delivered by Mikrotīkls Ltd. It is a Linux-based Operating System known as MikroTik RouterOS. It can likewise be introduced on a PC and will transform it into a router with all the important features. It can be used as- a Router, Firewall, Gateway, Wireless AP, VPN Box, dedicated Traffic Shaper or Hotspot. Mikrotīkls Ltd. is a Latvian company which was originated in 1996 to develop routers and wireless ISP systems. MikroTik now offers hardware and software for Internet connectivity in most of the nations around the world [2].

Router OS:

Router OS is the operating system of Router Board. It has all the essential features for an ISP - Routing, Firewall, Bandwidth Managing, Wireless Access Point, Backhaul Link, Hotspot, VPN Server and more.

- Swift and Modest Installation.
- Winbox GUI over IP and MAC.
- CLI with Telnet, SSH, Local Console and Serial Console.
- API for Programming your own Apparatuses.
- Web Interface.
- Easy to Activate & Preserve.

Router Board:

Router Board is a complete hardware operating platform for Router OS.

Figure 6: MikroTik Router Board (HEX lite)

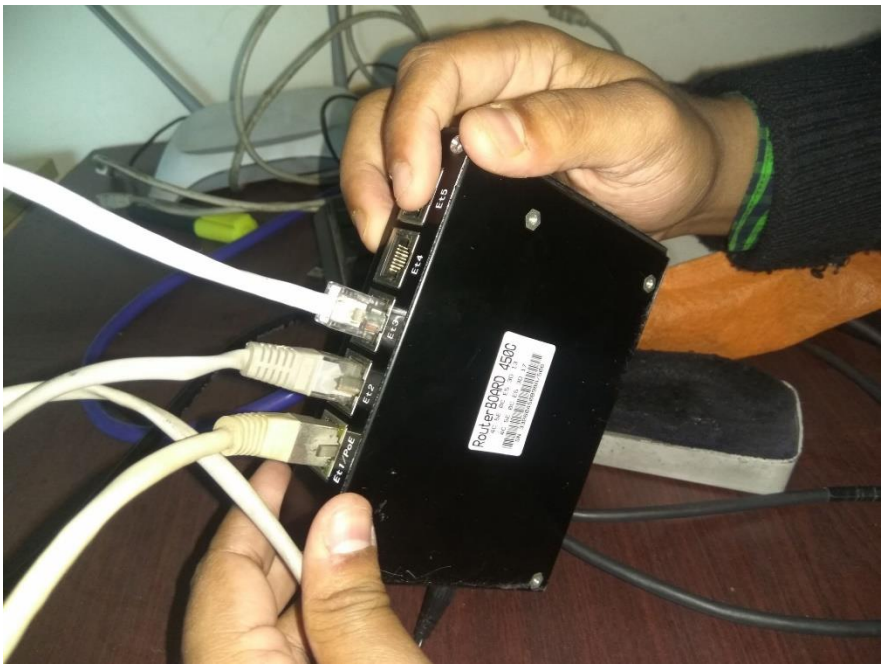


Figure 7: MikroTik Router Board (450c)

3.3.4 FIRST TIME CONFIGURATION & WINBOX INSTALLATION

Every Router is default pre-configured by the Factory with the IP Address **192.168.88.1/24** on port ether2. Default Username is **admin** with **no** Password that means **blank** password. To admittance MikroTik we need Winbox configuration utility and we can download it from **"**www.mikrotik.com/download**".**

Winbox:

"Winbox is a little utility that permits the administration of MikroTik RouterOS utilizing a quick and basic GUI. It is a local Win32 twofold yet can be run on Linux and macOS (OSX) utilizing Wine. All interface capacities are pretty much as close as conceivable reflecting the console functions, that is the reason there are no areas in the manual" [8]. A portion of the high level and framework basic designs are impractical from WinBox, similar to MAC address change on an interface changelog.

To Configure a MikroTik first time you have to assemble the below steps:

- Connect your Laptop/PC with MikroTik via Ethernet Cable (Figure 8).
- It should be linked to any one port of MikroTik from ether2 to ether5 (ether1 is PoE port, so must be avoid it).

Figure 8: Connect pc to MikroTik with Ethernet cable

- Then discover Winbox.
- To Login into MikroTik you have to click on “neighbors” button for searching Router’s MAC Address (Figure 9).
- Then click MAC address and add login Username is **admin.** Then click Connect Button to Login.
- Then Plugins will load and you able to access into MikroTik.

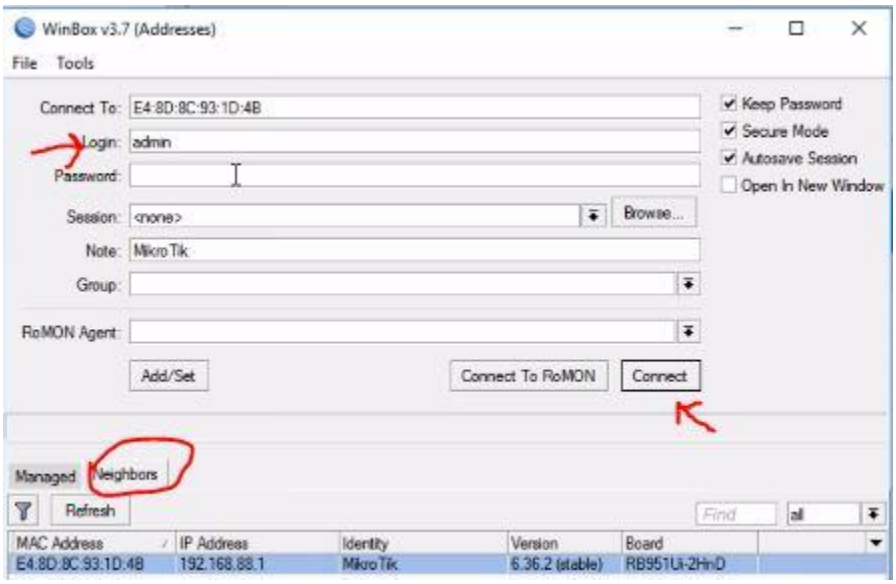


Figure 9: MikroTik router login

- After Logged into MikroTik you will be familiarized with the subsequent Dialog Box in which details are defined about the Default-Configuration of MikroTik. Then click “**Remove Configuration**” which will remove its Default-Configuration (Figure 10). Then Login once again into MikroTik via MAC Address like earlier. You must click “Remove Configuration” key because there is a DHCP Server configured with 192.168.88.0/24 in ether2 which might reasons numerous problems in future such as malfunction or DHCP Broadcast to LAN, etc.

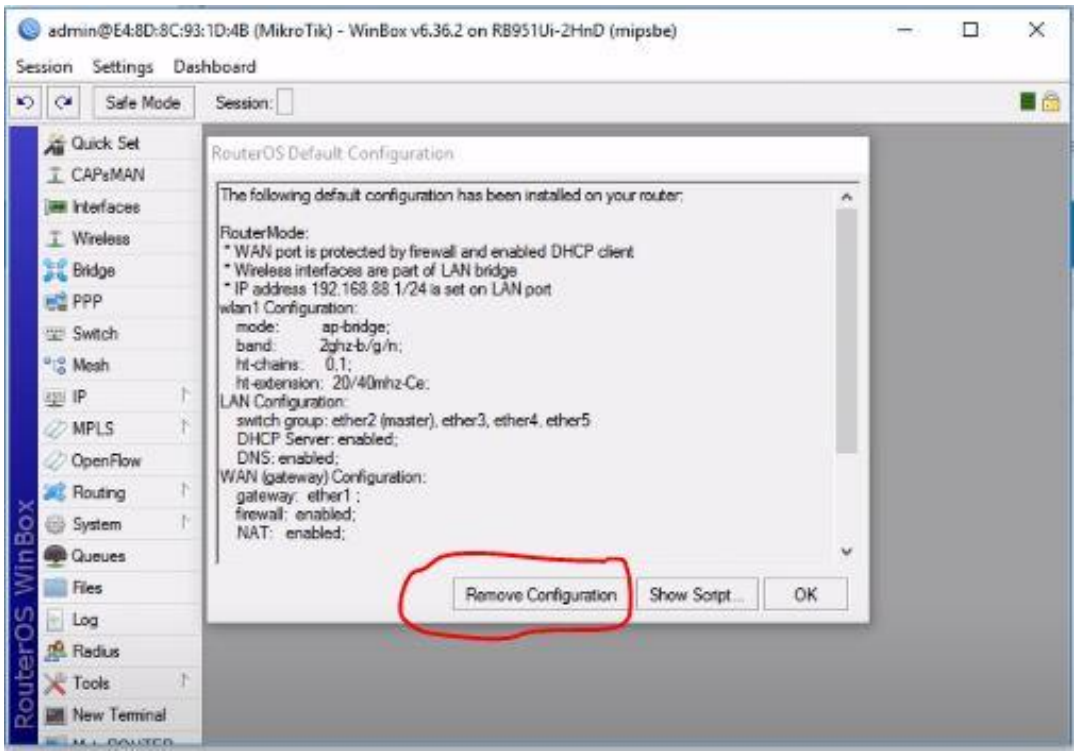


Figure 10: Reset default configuration of MikroTik

Winbox Dashboard:

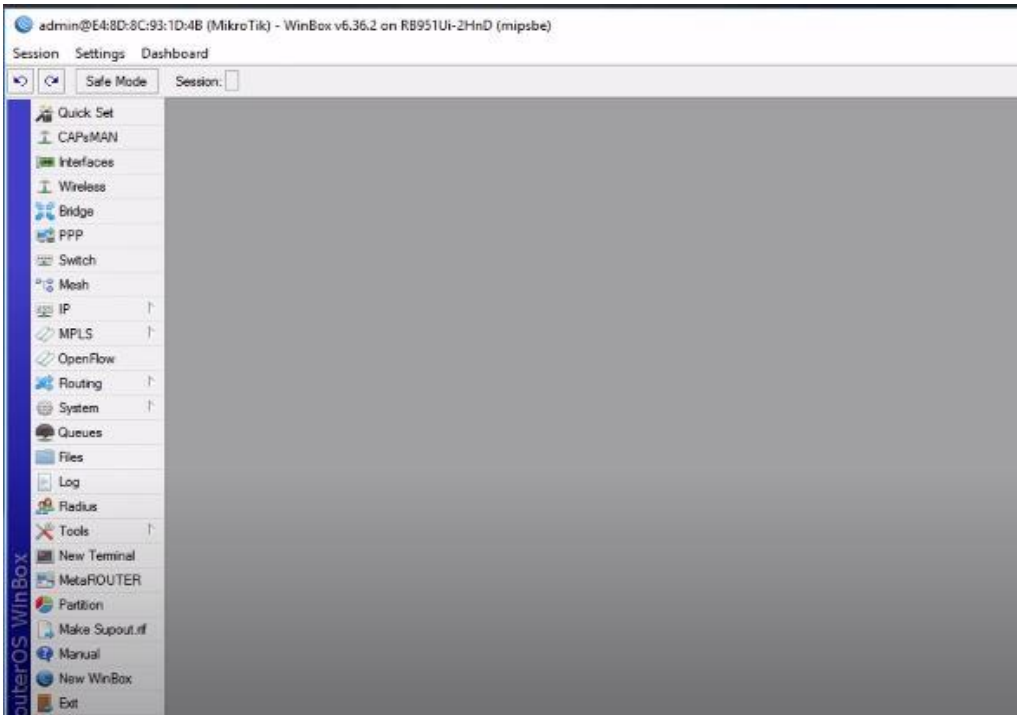


Figure 11: Winbox Dashboard

When previous all steps are completed then this dashboard will show (Figure 11).

3.3.5 BASIC CONFIGURATION OF MIKROTIK

Hostname:

Hostname of a gadget is its Identification. A Router or Switch should have its Identity to be open on the Network to other gadgets. The Hostname will say you in which Router or Switch you are chipping away at. The default Hostname of MikroTik is “MikroTik”

To Configure the Hostname of MikroTik the steps are-

- Click System Menu
- Then Identity
- Then set the Hostname as you want.

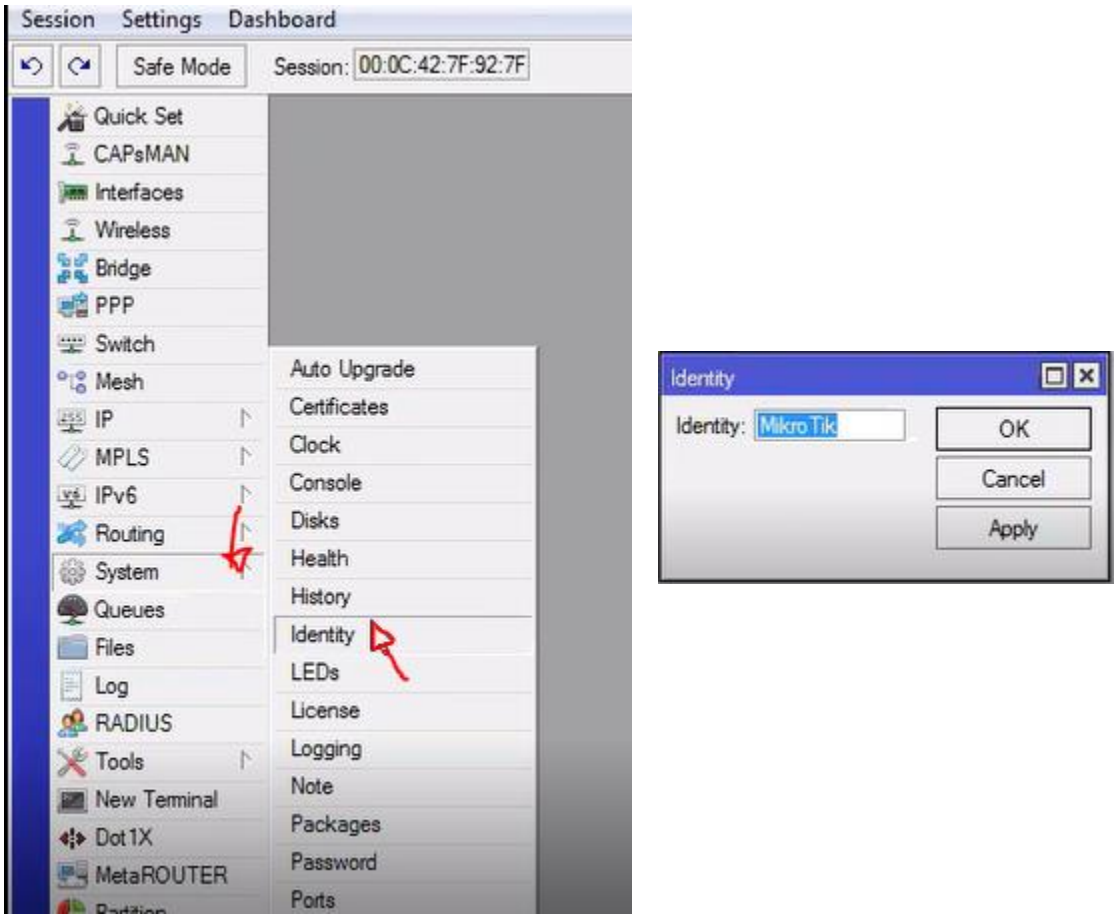


Figure 12: Hostname configuration

LAN & WAN configuration:

To Configure an IP Address the steps are:

- Click to IP Menu
- Then Addresses
- Then add the IP Address with Mask
- Select an Interface
- Write LAN or WAN or something in comment section.

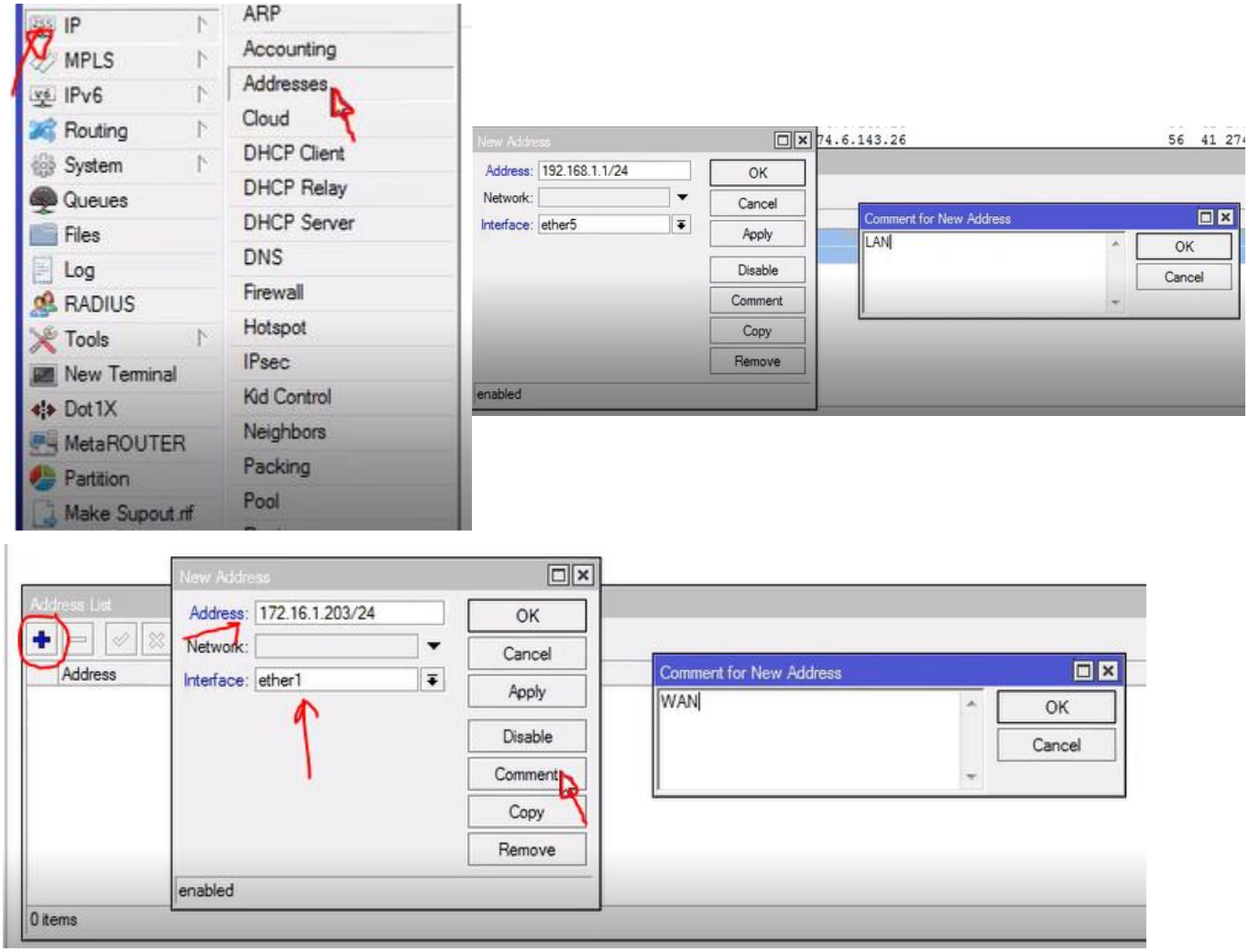


Figure 13: LAN & WAN configuration

Default Gateway configuration:

All packets for destinations not in the Routing Table are sent via Default Route. We need to add a Default Route to ISP so that all Untrusted Traffic will passes through ISP Gateway. Default Route is (0.0.0.0/0)

To add a Default Gateway in MikroTik the steps are:

Go to **IP** Menu > **Routes** > **New Route** > add a **Default Route** (0.0.0.0/0) to ISP **Gateway.**

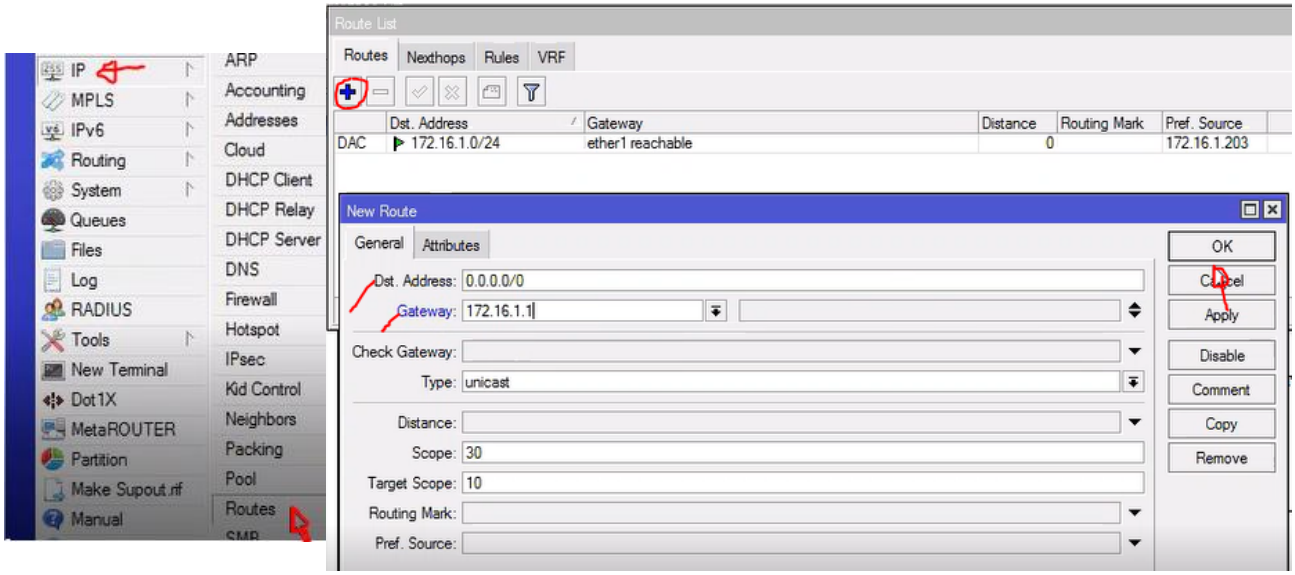


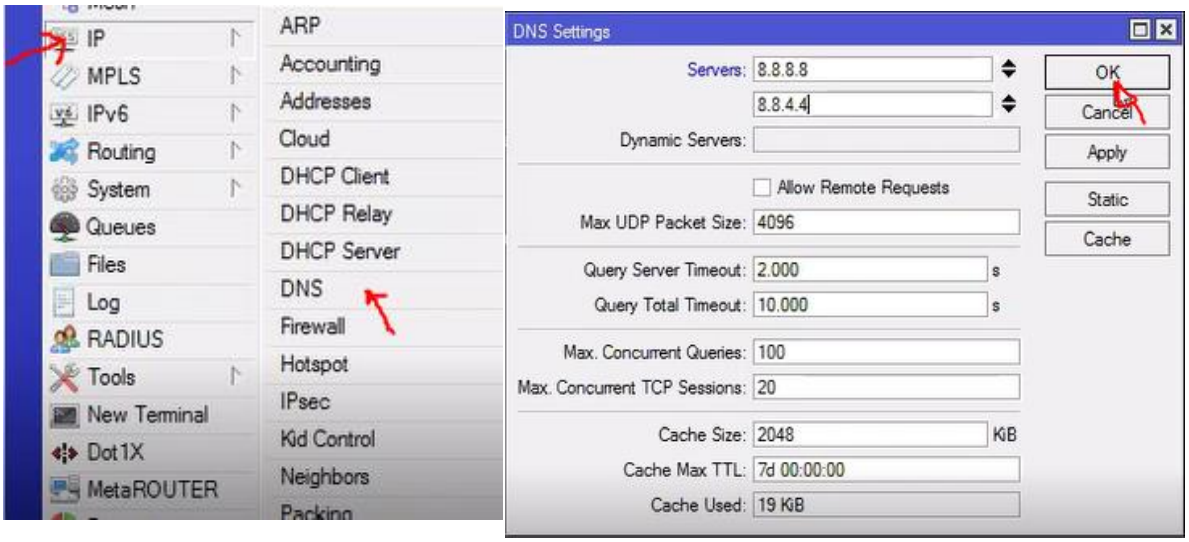
Figure 14: Gateway configuration

DNS server configuration:

DNS stands for Domain Name System or Domain Name Service which acts as a translator. It converts web addresses into their IP addresses. DNS server addresses provided by ISP. If ISP can't be provided DNS address, then we can use public DNS like 8.8.8.8 or 8.8.4.4 etc.

DNS setup steps are: Go to **IP** Menu > **DNS** > set the **Primary & Secondary DNS.**

Note: Be careful, don't enable the "**Allow Remote Requests**". If you enable this then your Router will act as an Open Resolver as well Caching DNS.



Now ping to yahoo.com in terminal

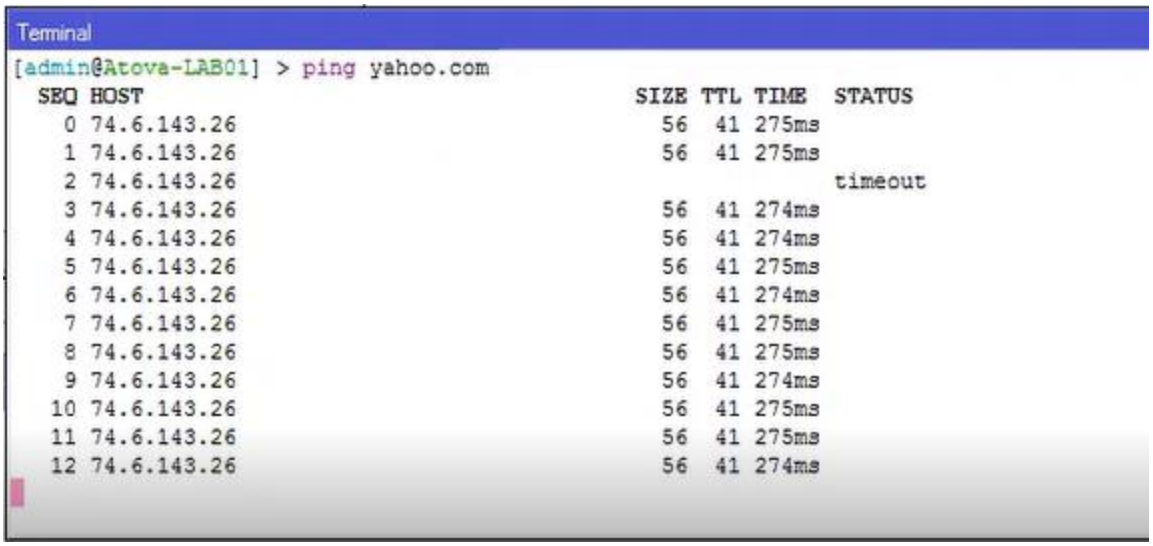


Figure 15: DNS Server configuration

SNTP Configuration:

SNTP means Simple Network Time Protocol. It is used for clock synchronization. It is updated the system time for that Script & Scheduler works perfectly. Otherwise, it's not works properly.

Step 1: Go to **System** Menu > **SNTP Client** > set **Enable** the SNTP Client > set the Primary & Secondary NTP Server.

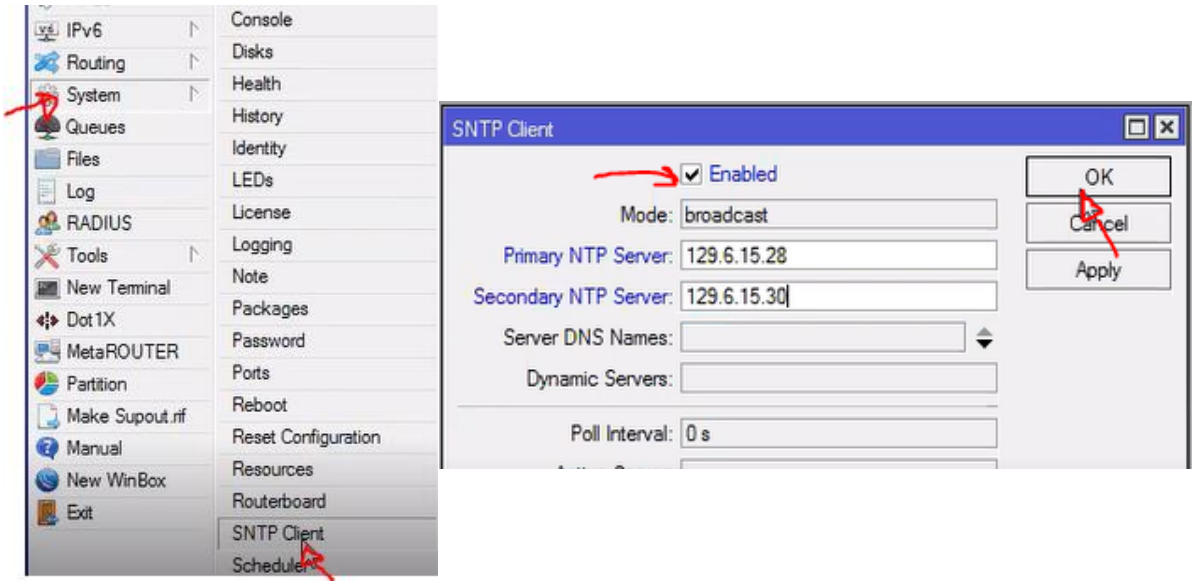


Figure 16: SNTP configuration (Step1)

Step 2: **System Menu** > **Clock** > Select the Time Zone as **Asia/Dhaka**

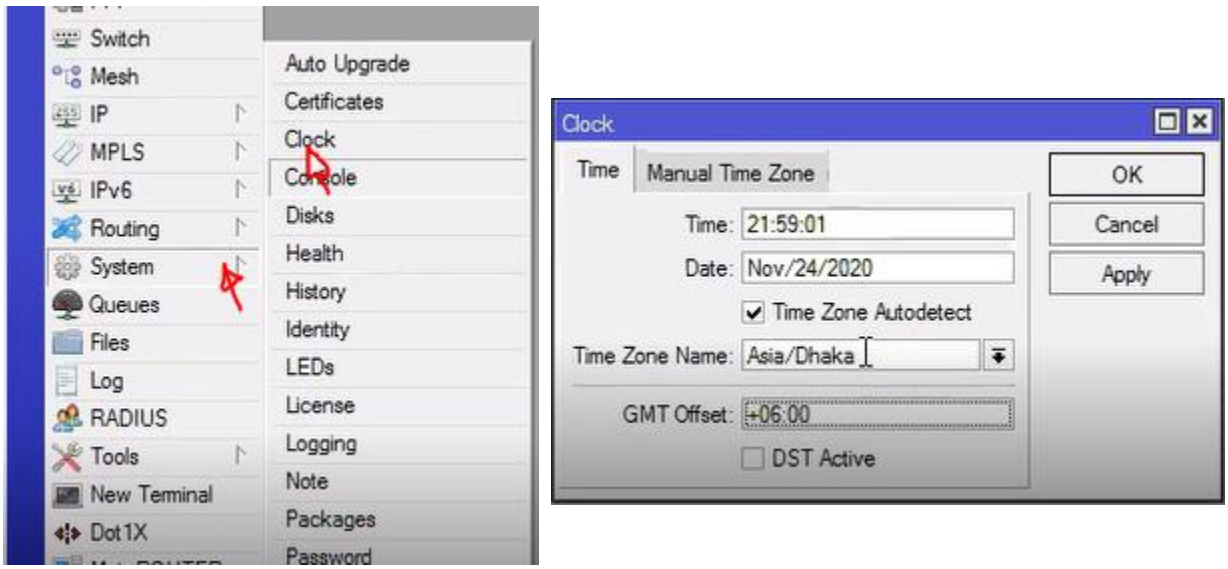


Figure 17: SNTP configuration (Step2)

Admin Password setup:

To set the “admin” Password steps are: **System** Menu > **Users** > Double Click on User **admin** > Set the **Password**.

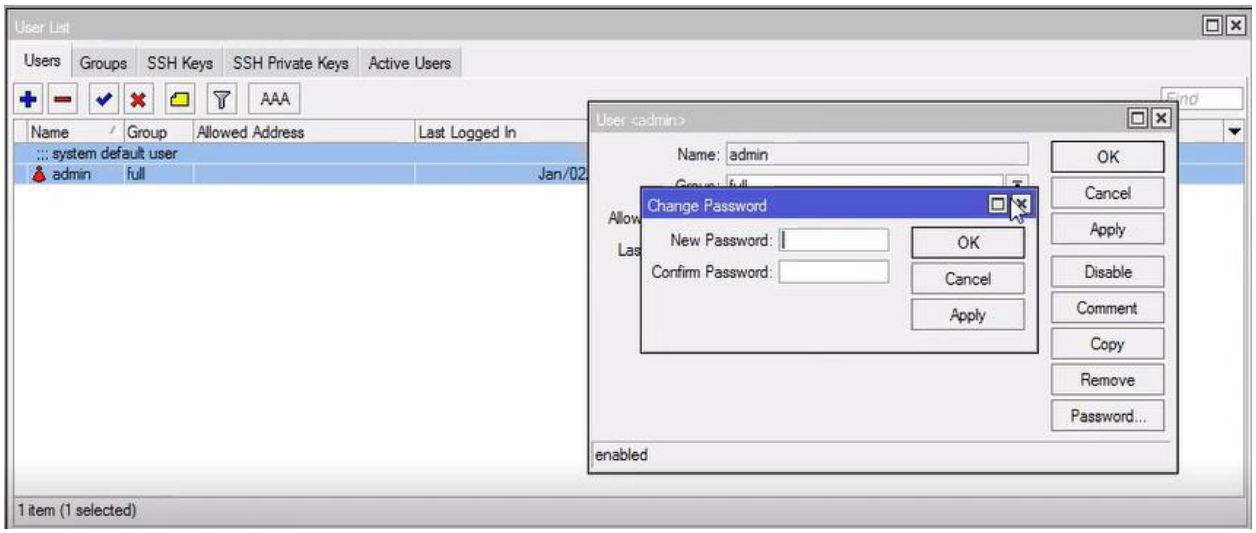


Figure 18:"Admin" Password setup

3.3.6 NETWORK ADDRESS TRANSLATION (NAT) CONFIGURATION

"Network Address Translation (NAT) is a cycle of shifting the source and objective IP locations and ports. Address translation diminishes the requirement for IPv4 public locations and conceals private network address ranges" [9]. Basically, we can say that NAT converts that local (private) IP address to a global (public) IP address This interaction is normally done by routers or firewalls. NAT permits a single device, such as a Router.

There are three types of address translation:

- Static NAT
- Dynamic NAT
- Port Address Translation (PAT)

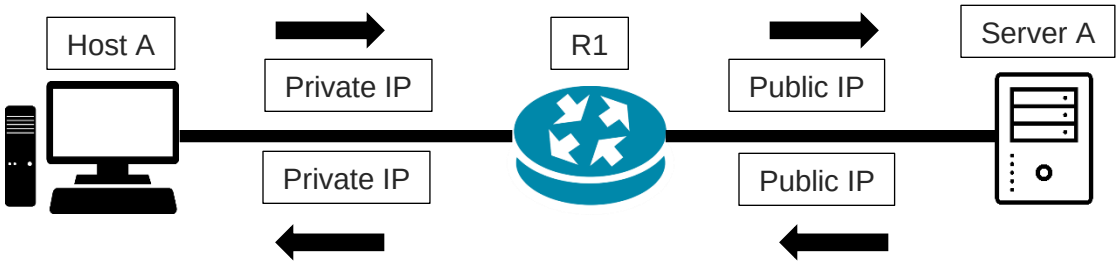


Figure 19: How NAT works

In figure 19, I showed how NAT works. Here Host A has private IP when it connected to international network, when It passed away from R1, it acts as a Public IP.

NAT (specific subnet) configuration steps are: **IP** > **Firewall** > **NAT** > Click **[+]** to add a NAT Rule > In **General** section, Chain=srcnat, Src. Address=192.168.1.0/24 > In Action section, Action=masquerade > OK
For normal NAT configuration, don't input anything in **Src. Address** box.

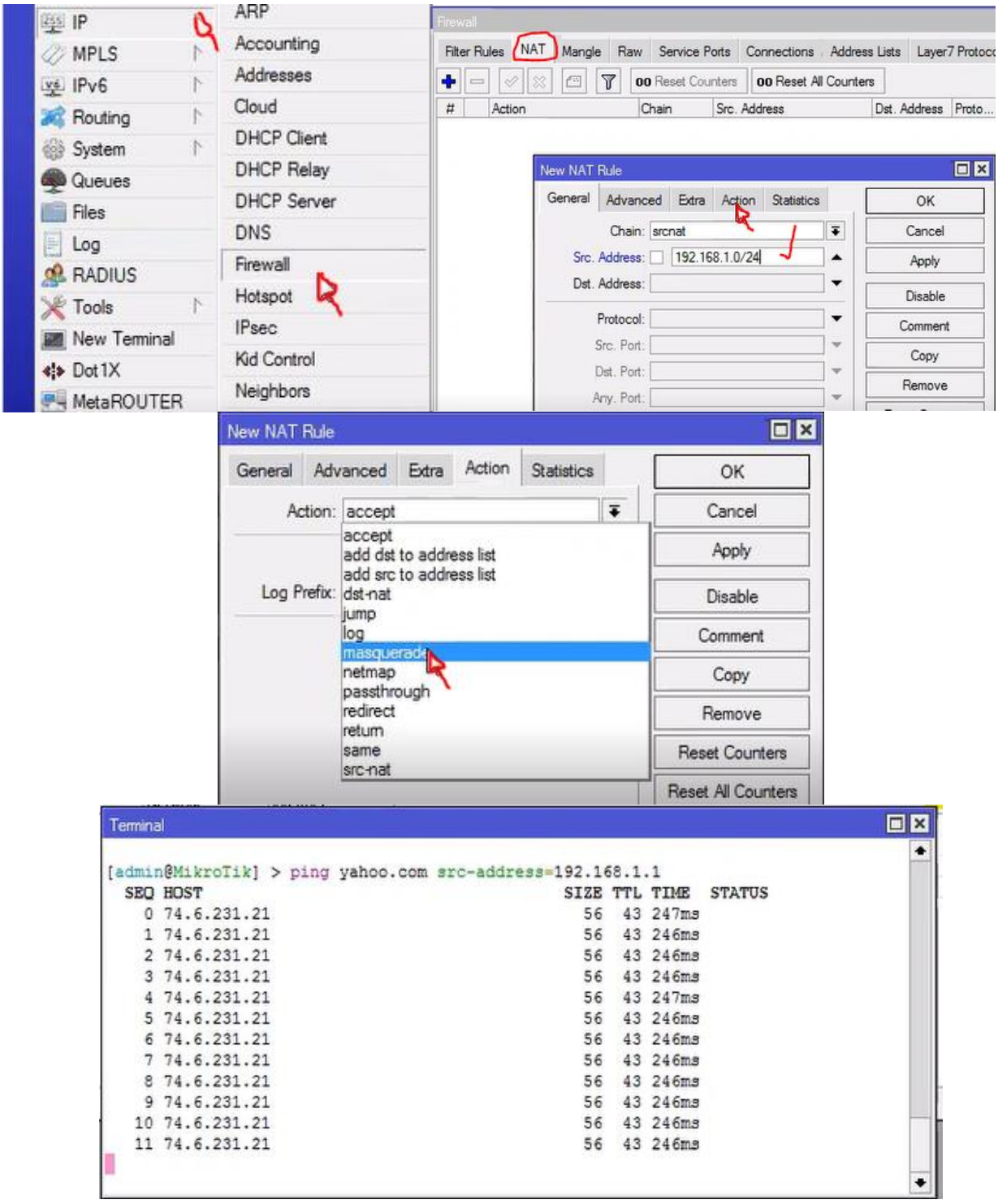


Figure 20: NAT configuration

3.3.7 DHCP SERVER CONFIGURATION

"Dynamic Host Configuration Protocol (DHCP) is a network management protocol used to progressively allot an Internet Protocol (IP) address to any gadget, or hub, on a network so they can interconnect utilizing IP" [10]. Basically, it is a client/server protocol. DHCP permits hosts to get essential TCP/IP Configuration data from a DHCP Server.

IP pool:

DHCP Pool is a Range of IP from which a DHCP Server can allocate an IP for a DHCP Client. IP pool configuration steps are- **IP** Menu > **Pool** > Add an **IP Pool** with specifying the **IP Range** > press **OK**.

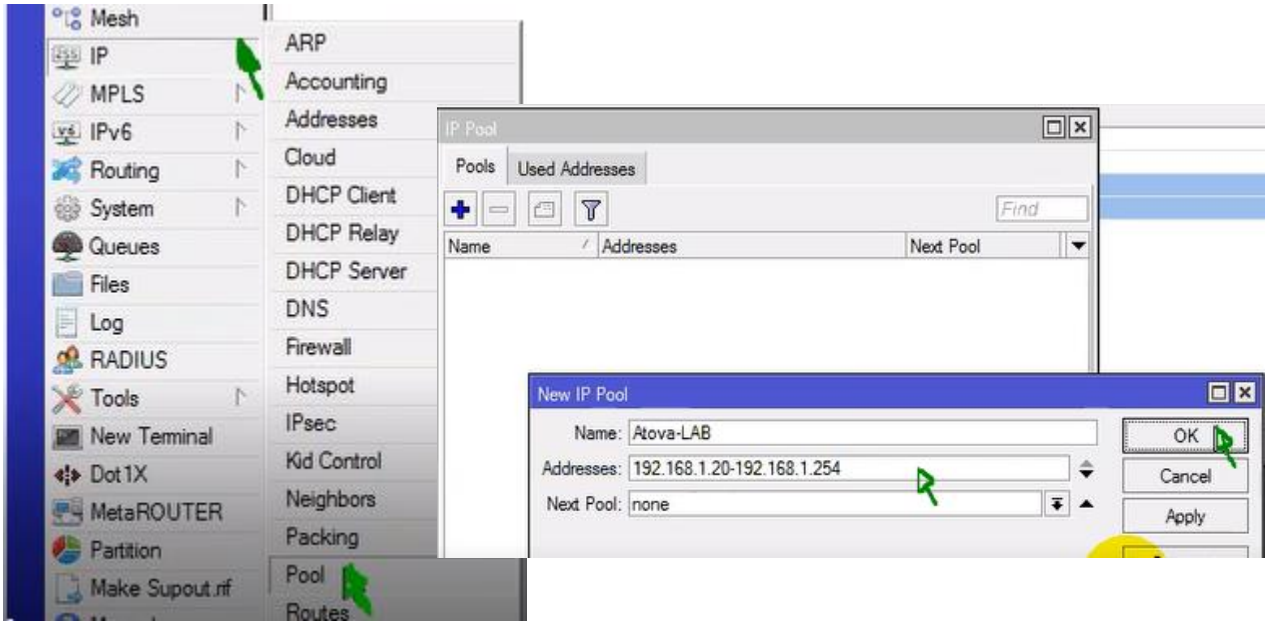


Figure 21: IP pool setup

DHCP server configuration:

To Configure DHCP Server the steps are: **IP** Menu > **DHCP Server** > **DHCP** > Add [+] > Set a **Name** of Server > Select the **DHCP Interface** > Introduce **DHCP Pool**.

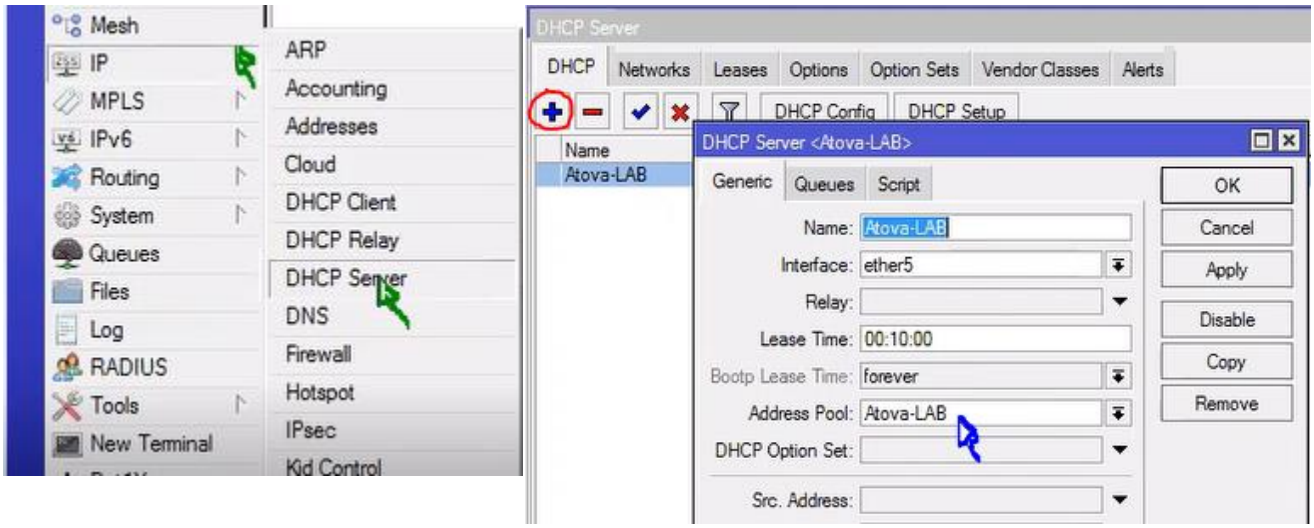


Figure 22: DHCP server configuration (Step1)

DHCP network configuration:

steps are: **IP** Menu > **DHCP Server** > Click **Networks** Option and Click **[+]** >Set the **Parameters** > Press **OK**.

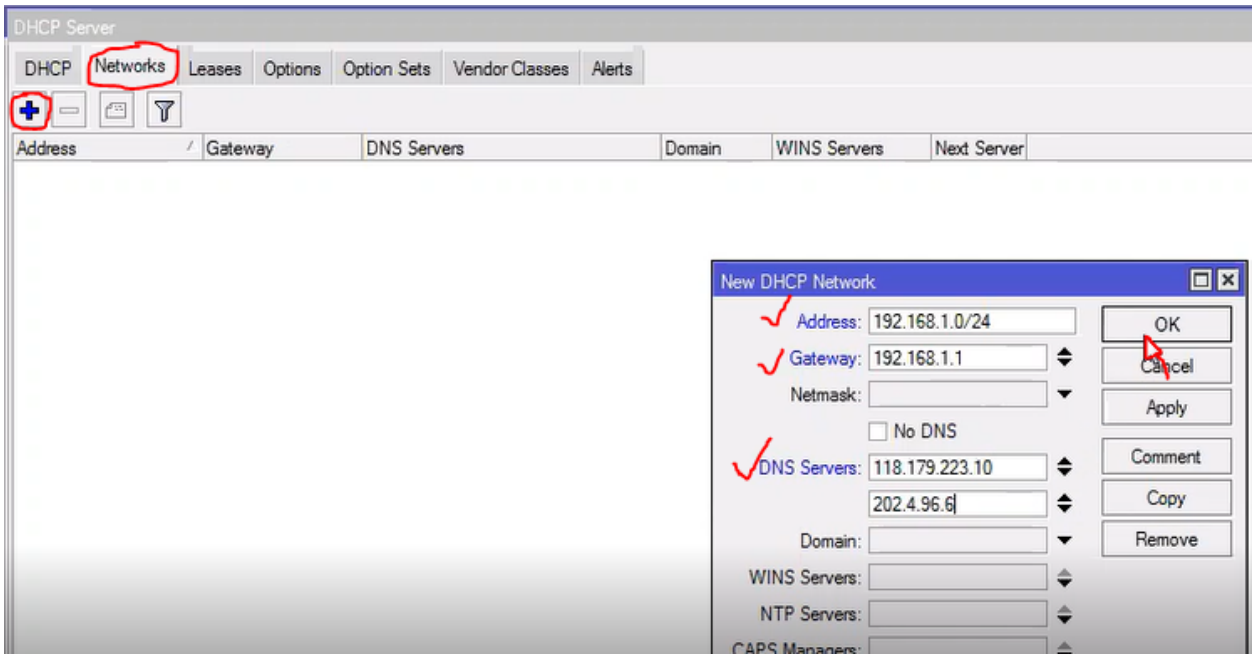


Figure 23: DHCP Network configuration (Step2)

Configuring a PC as a DHCP client:

The steps are:

- Open Control Panel.
- Select on Network and Internet.
- Select on Network and Sharing Center.
- Select the Change adapter settings
- Select the Internet Protocol Version 4 (TCP/IPv4) option.
- Click the Properties button.
- Then select: Obtain an IP address automatically and Obtain DNS server address automatically.

I attached all DHCP client configuring step by step in below Figure 24.

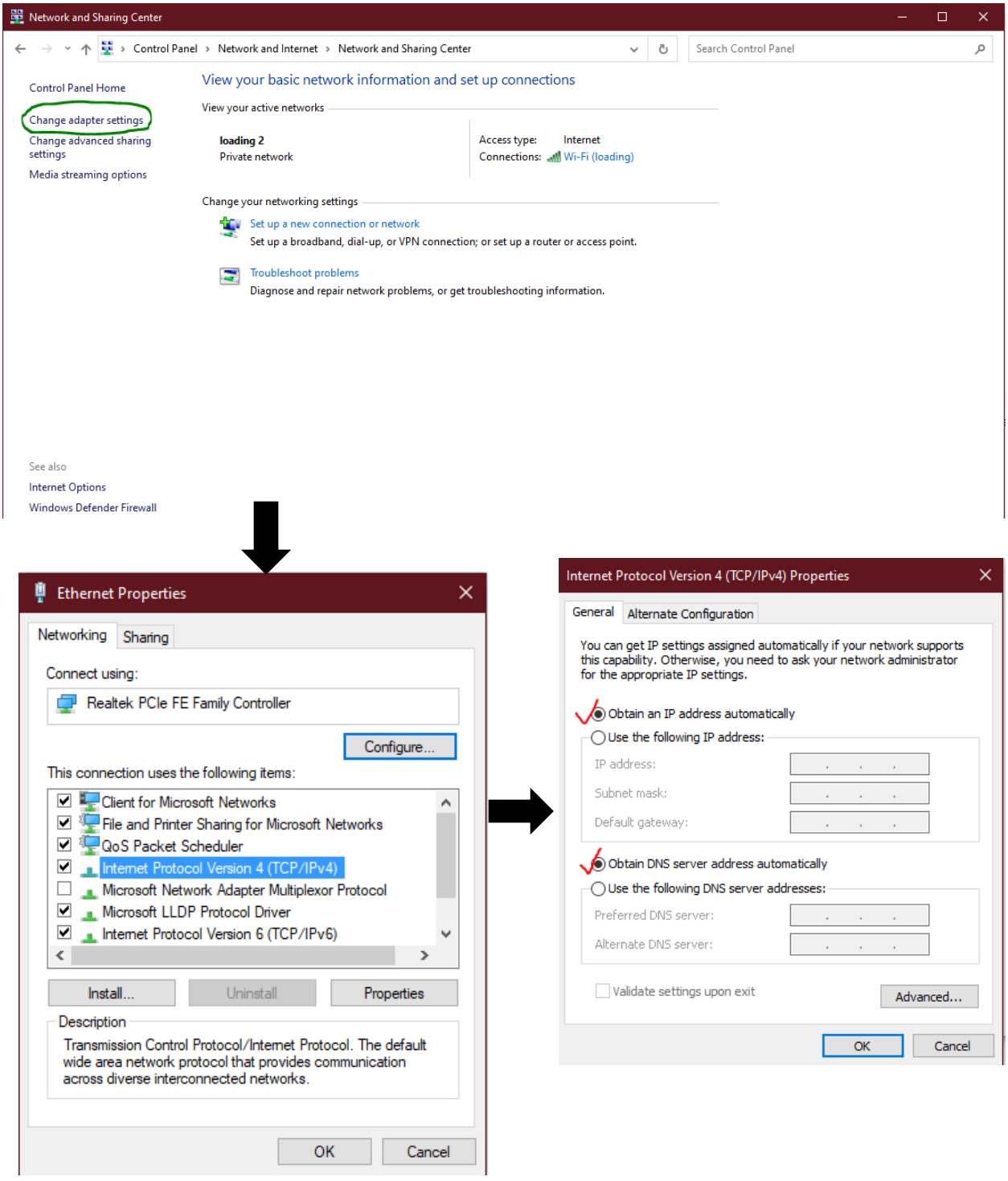


Figure 24: Configuring a PC as a DHCP client

Lease management:

Right Click on IPs then Click "**Make Static**" Then DHCP Server will assign the same IP to DHCP Client while connecting to the Network.

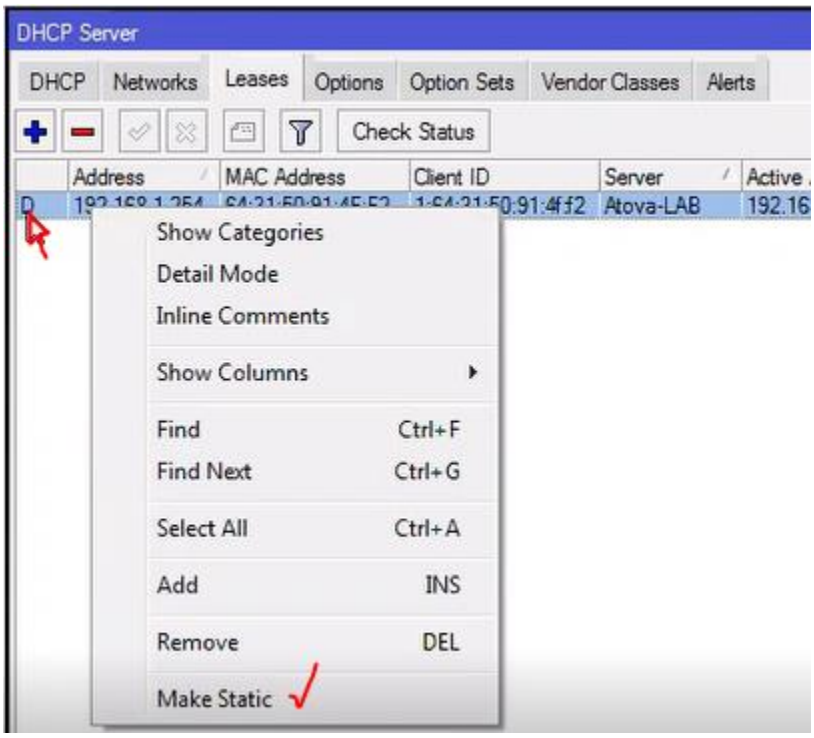


Figure 25: Lease management

3.3.8 PPPoE CONFIGURATION

PPPoE means Point-to-Point Protocol over Ethernet. PPPoE is the superlative approach for ISPs to serve Internet to the Customer's over IP based Network.

STEP-1: **PPPoE Interface: PPP** > **Interface** > Click **[+]** > Select **PPPoE Server Binding** > Press OK

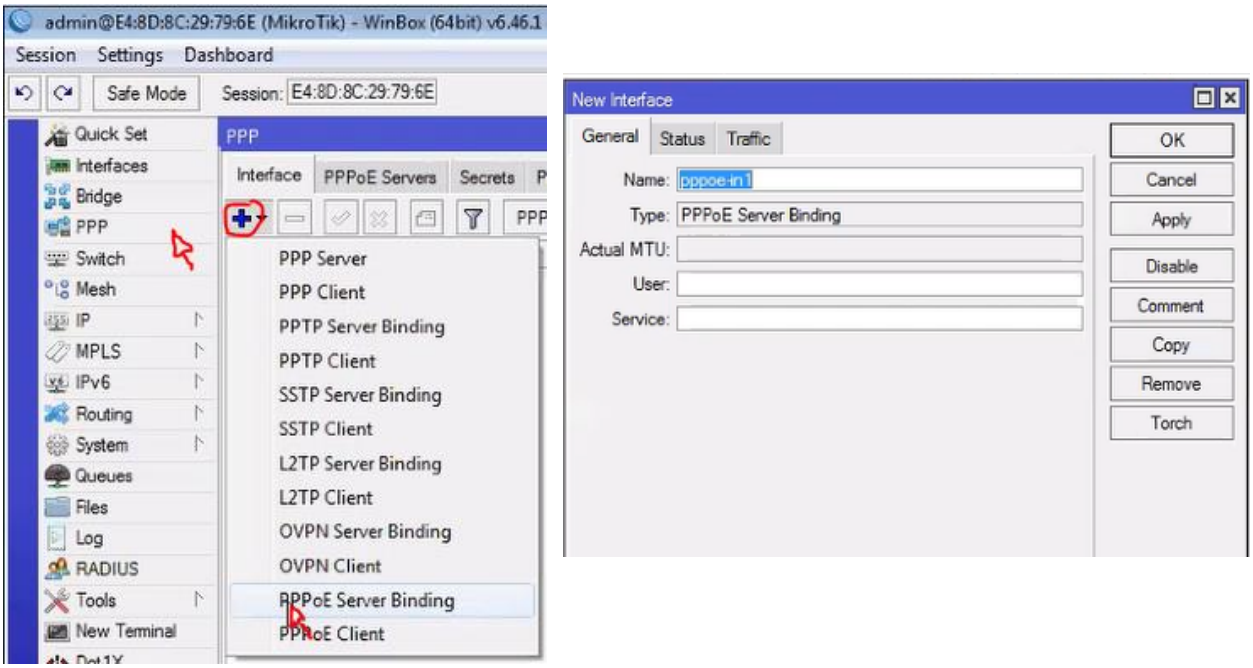


Figure 26: PPPoE interface setup

STEP-2: **PPPoE Server: PPP** > **PPPoE Servers** > click **[+]** > Add **Service Name** > Select **Interface** >Tick **One Session Per Host** > Set the Authentication **Parameters.**

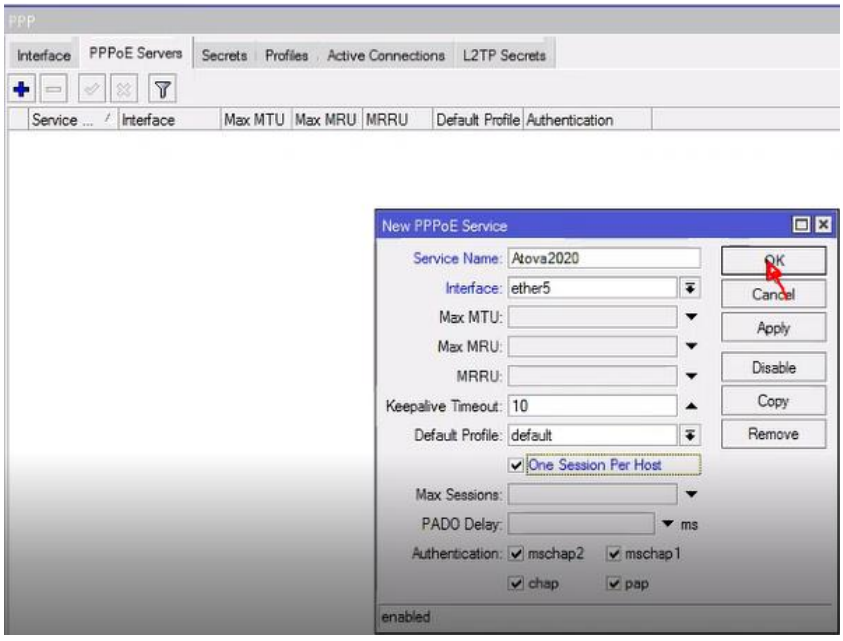


Figure 27: PPPoE Server setup

STEP-3: **PPPoE Profile: PPP** > go to **Profiles** > complete the following Parameters - **General** (name, Gateway, DNS) > **Limits** (Bandwidth Control).

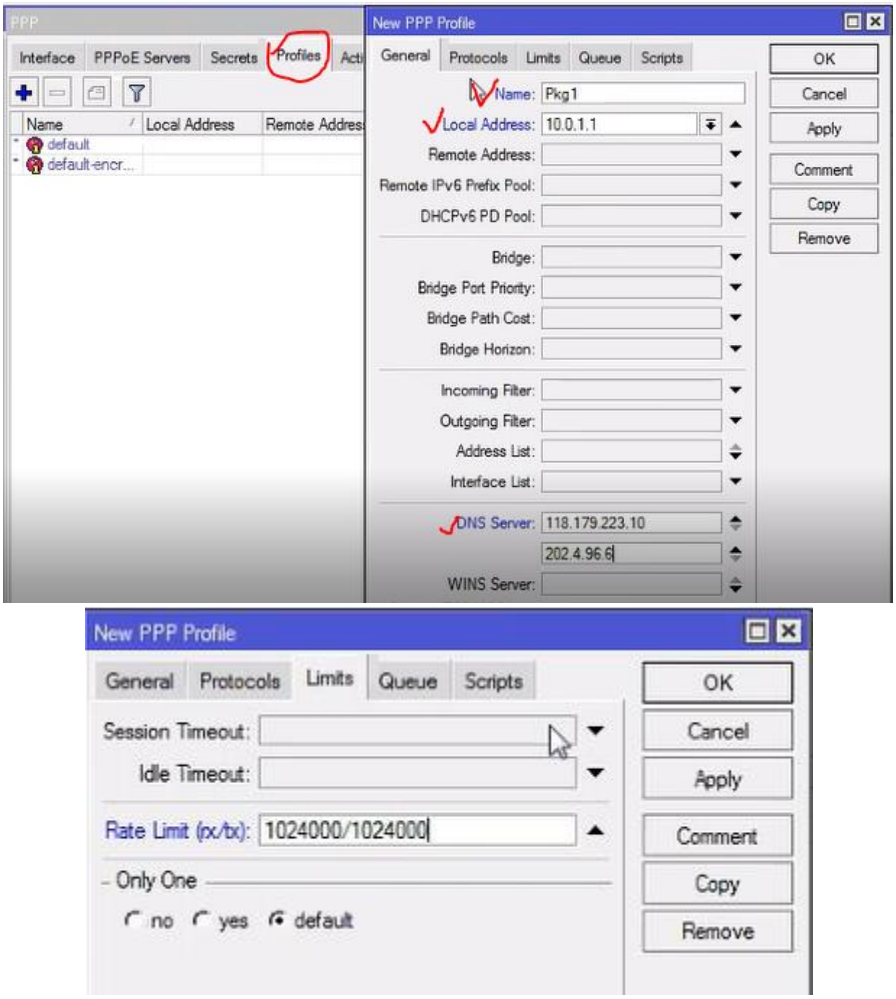


Figure 28: PPPoE Profile (pkg1)

In Figure 28, I showed package-1 PPPoE profile which limit 1 Mbps.

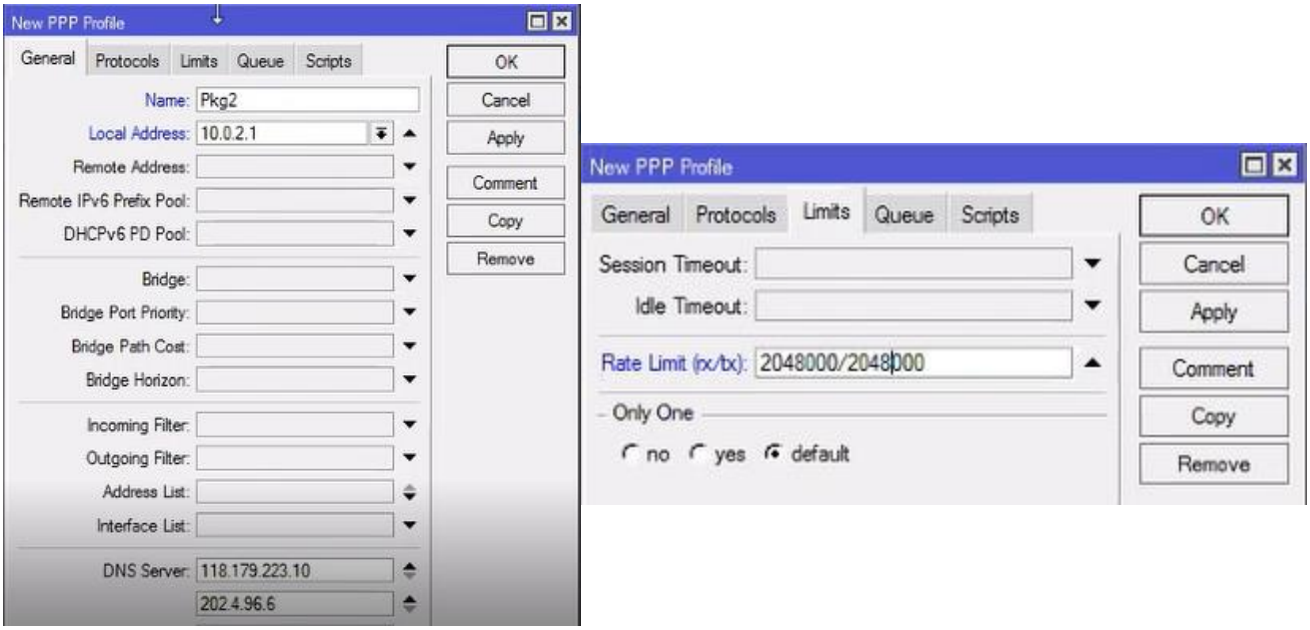


Figure 29: PPPoE Profile (pkg2)

In Figure 29, I showed package-2 PPPoE profile which limit 2 Mbps.

STEP-4: **PPPoE Secret: PPP** > **Secrets** > Click **[+]** >- Set **Name**, **Password**, **Service**, **Profile**, **Local Address**, **Remote Address**.

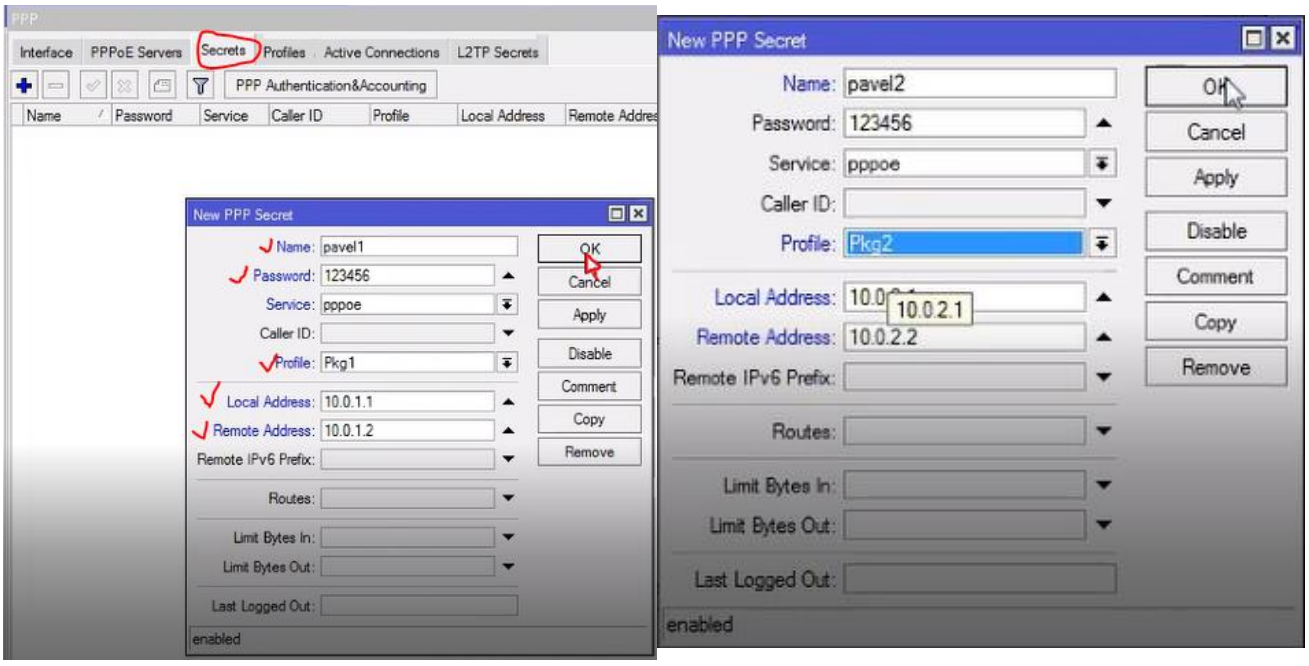


Figure 30: PPPoE Username & Password

3.3.9 BRIDGE CONFIGURATION

Network Bridge connects Multiple Network segments. For test purpose I add an IP in my PC.

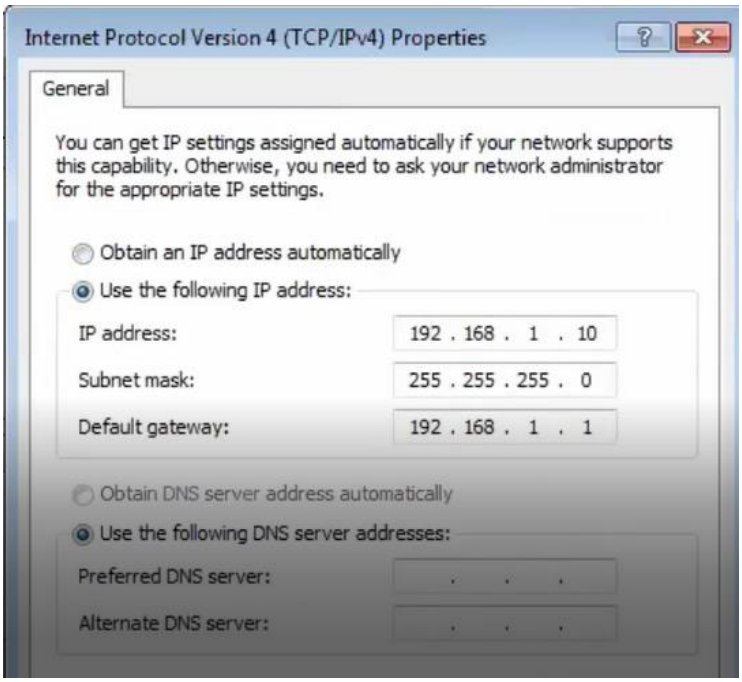


Figure 31: IP setup in PC for Bridge configuration

Now Creating a Bridge which will aggregate two or more Interface together.

Create Bridge: the steps are: **Bridge** > Click **[+]** > Name the **Bridge** > Press **OK**

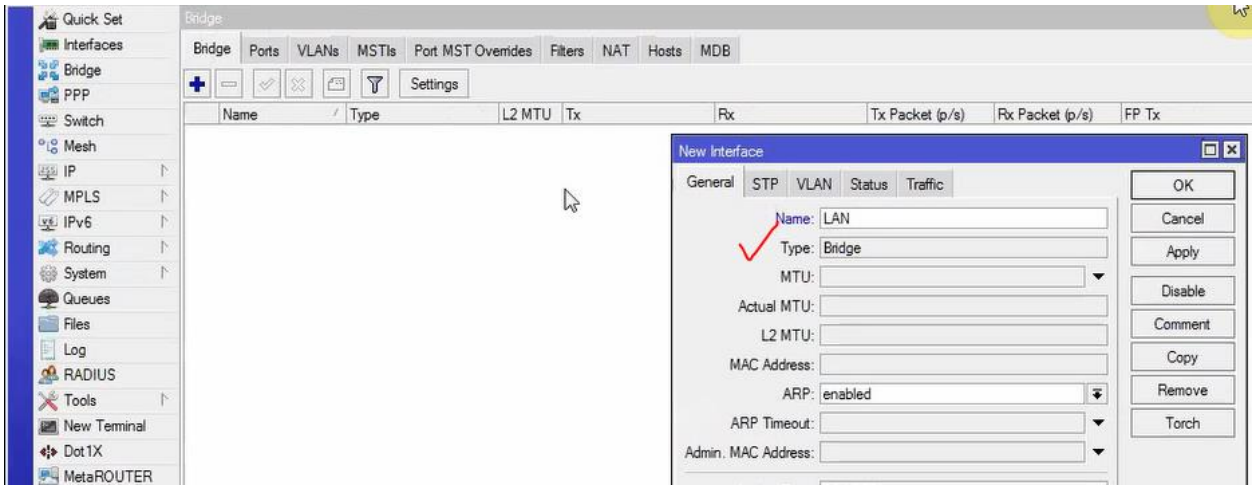


Figure 32: Bridge creating

Members port adding: steps are: **Bridge** > Click **Ports** > Click **[+]** > Select the **Interfaces >** select **Bridge >** press **OK**

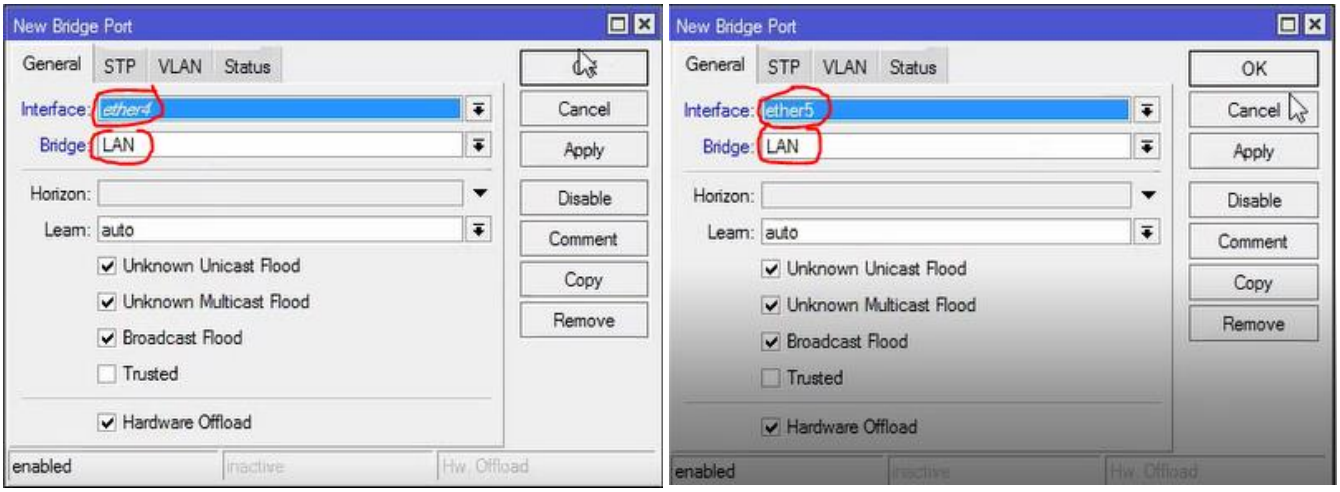


Figure 33: Members port adding in Bridge configuration

IP address assigning in Bridge: Steps are: **IP** Menu > **Address >** Click **[+]** > to add an **IP Address >** Select the **Interface >** press **OK.**

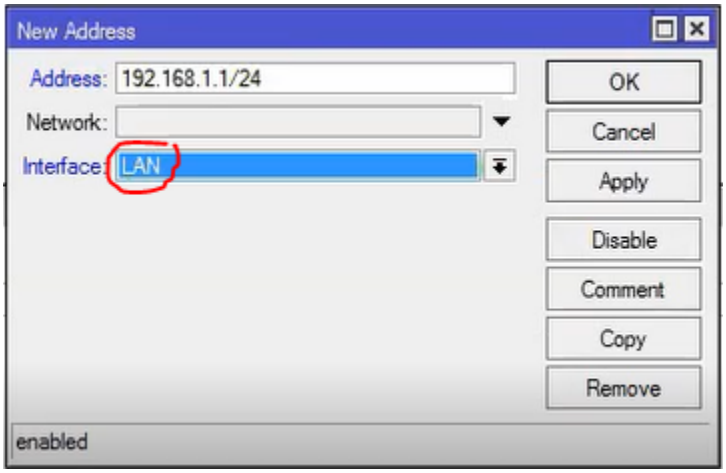


Figure 34: IP address assigning in Bridge

Now this network can connect by ether 4 & 5.

3.3.10 SITE BLOCKING & UNBLOCKING CONFIGURATION

Site Blocking: IP Menu > **Webproxy** >go to **Access** >Add **[+]** > Ad **Src. Address** > Add **Dst. Host= *content*** > Action=**deny.**

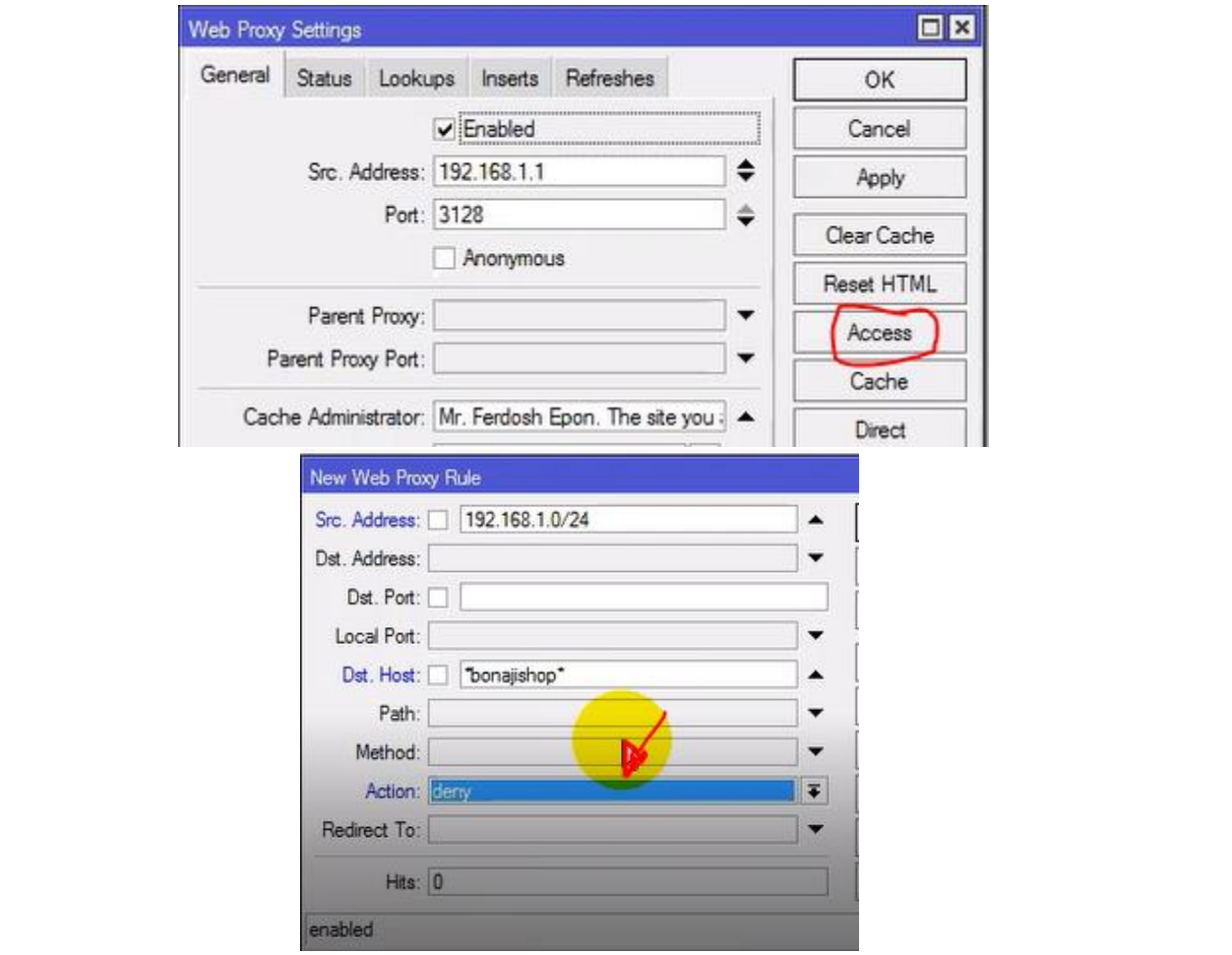


Figure 35: Site Blocking configuration

In figure 35, I showed step by step site blocking configuration. Here I stopped "bonajishop.com" access by 192.168.1.0/24 network. For that when I try to access this site then it shown ERROR.

Site unblocking: All steps are same to Site blocking configuration, just set Action = **allow.**

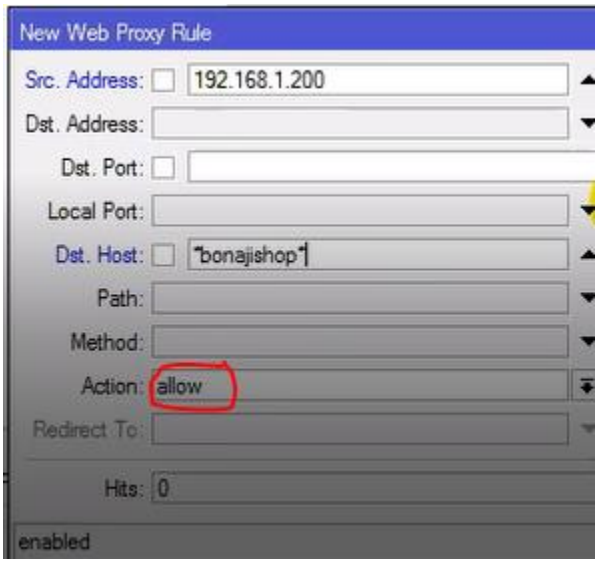


Figure 36: Site Unblocking configuration

In figure 36, I showed site unblocking configuration step by step. Here I enable to access to bonajishop.com by 192.168.1.200 address.

3.3.11 BANDWIDTH MANAGEMENT & QUEUE SETUP

Bandwidth Management:

Bandwidth Management is the way toward estimating and controlling the interchanges on a Network Link, to try not to completely fill the Link or Overfilling the Link, which would bring about Network Congestion and Poor Performance of the Network.

Queue setup:

Queues is used for restrictive the bandwidth for certain IP addresses, protocols or ports. It is essential for monitoring lots of data package or lots of client's data. In mikroTik, we see two types of Queue- Parent Queue & Child Queue.

Parent Queue:

Steps are- **Queues** Menu > **Simple Queues** > Add **[+]** > **General** Option > Name > Target Address > Max Limit=Upload/Download > press **OK.**

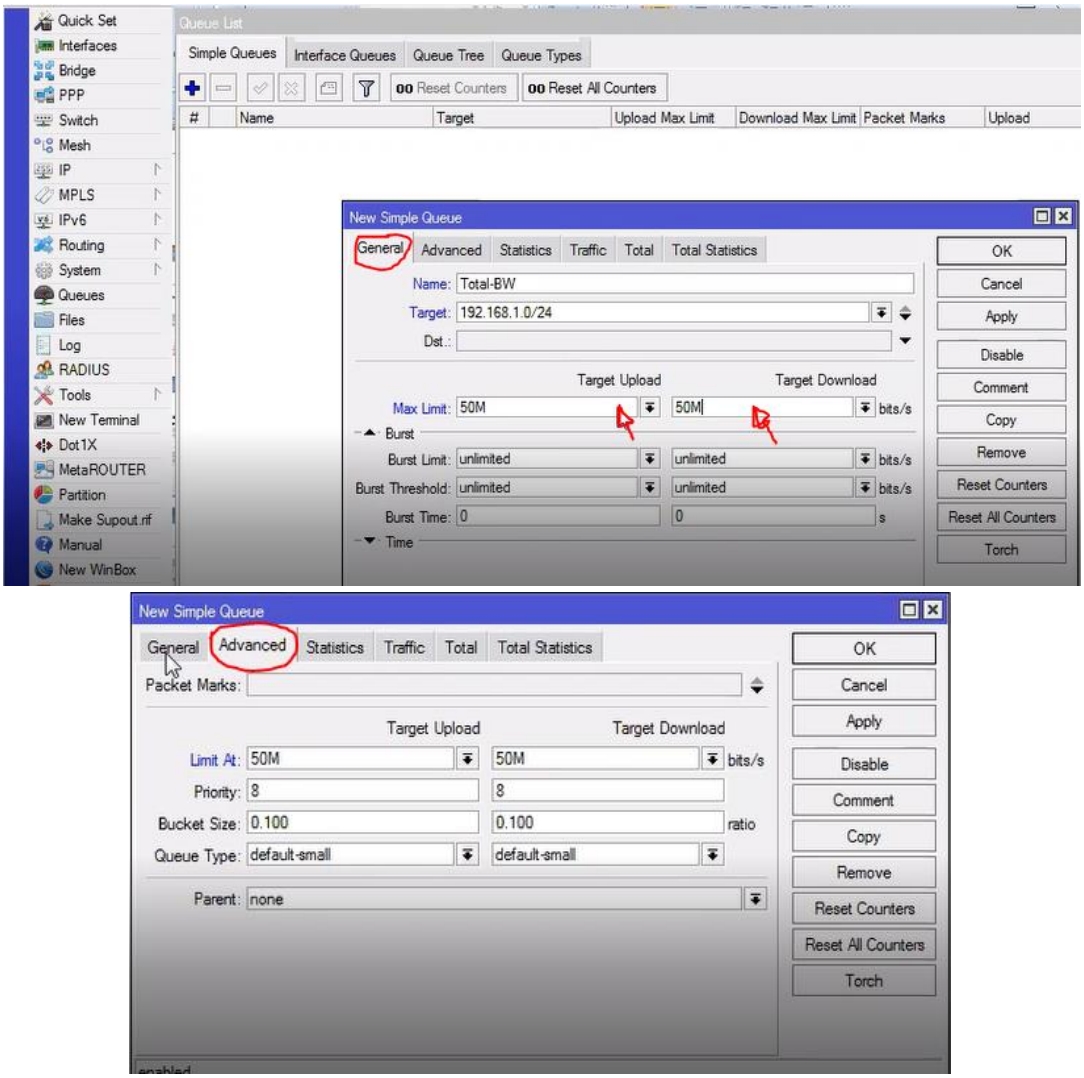


Figure 37: Parent Queue Setup

Child Queue: Queues Menu > **Simple Queues >** Add **[+]** > **General** Option (Add Name, Target Address, Max Limit) > In **Advanced** Option (Add Parent) > Press **OK**.

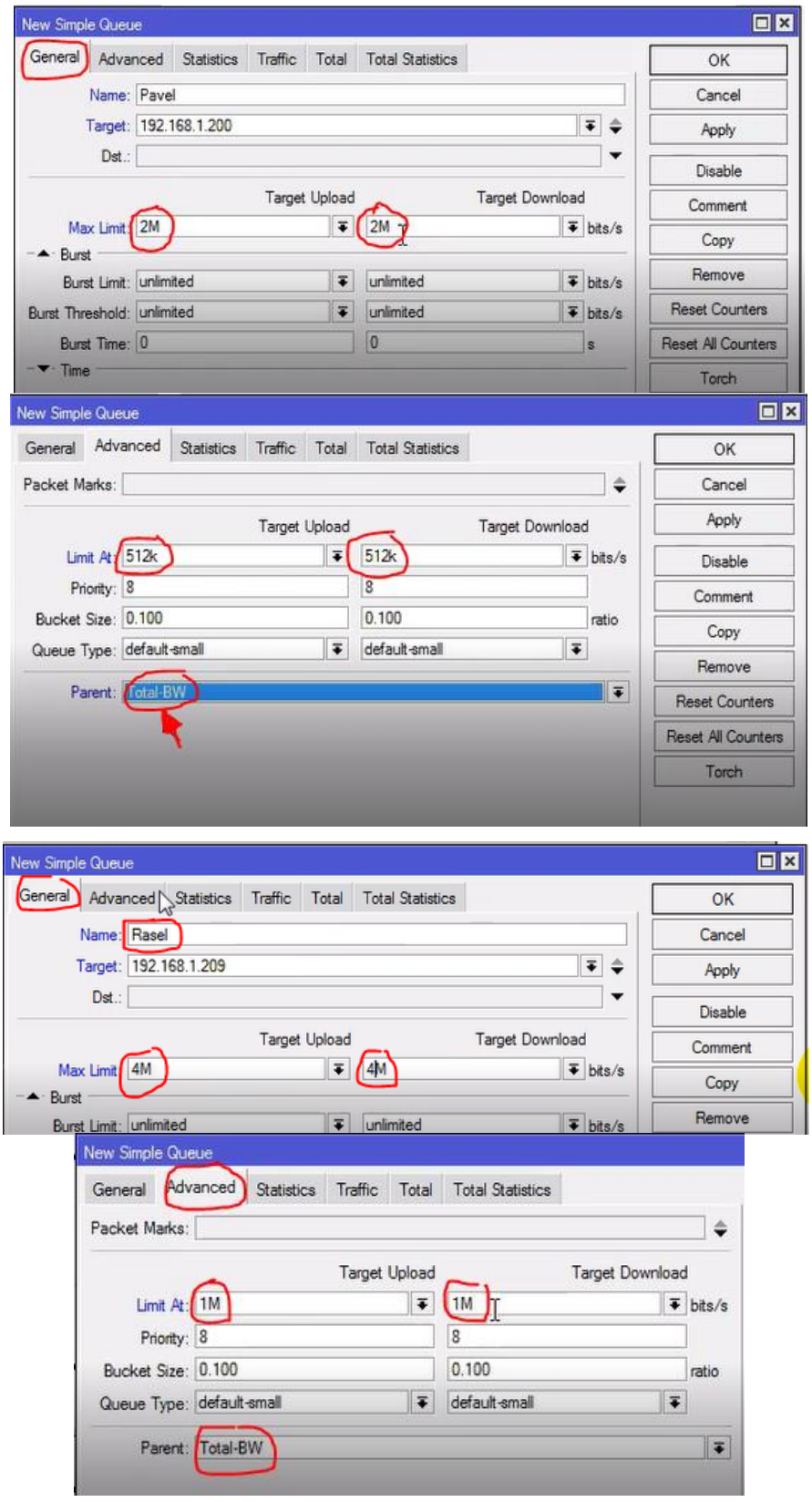


Figure 38: Child Queue Setup

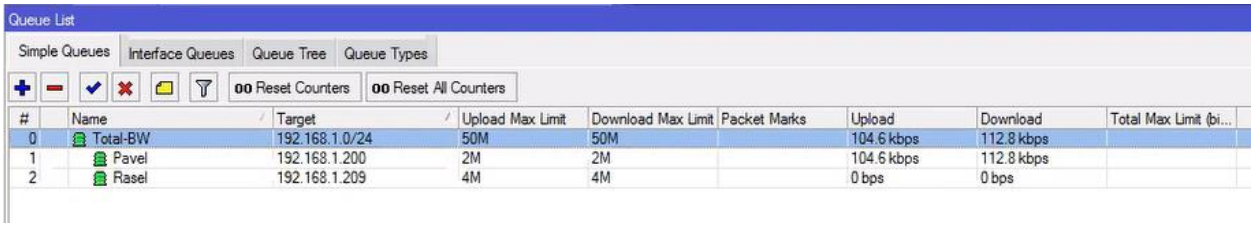


Figure 39: Queue List

MRTG Setup:

Interface Rules: Tools >Graphing > Interface Rules > Add [+] >Press OK

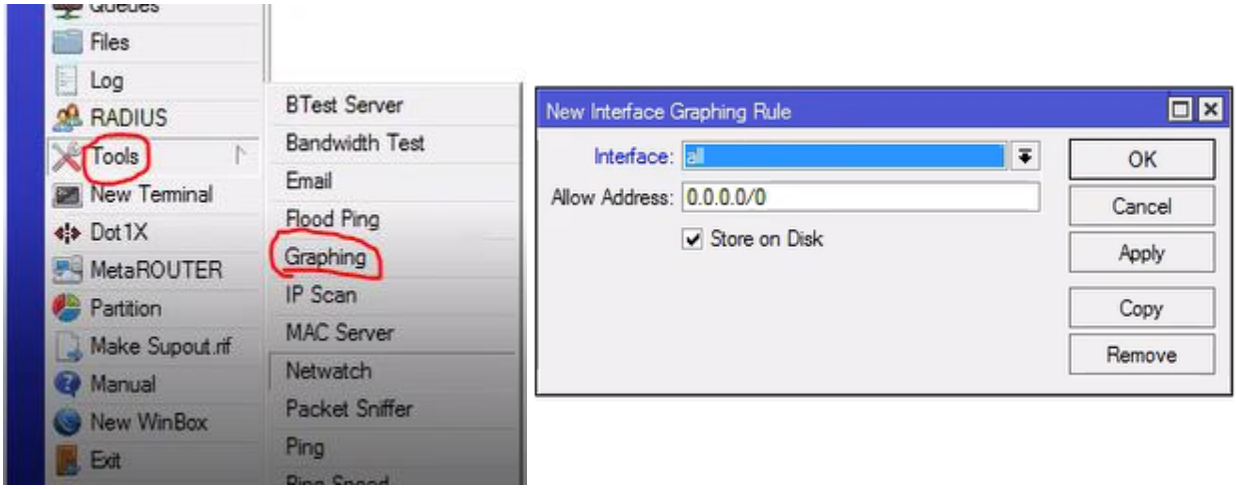


Figure 40: MRTG Interface rules setup

Queue Rules: Tools > Graphing > Queue Rules > Add [+] > OK

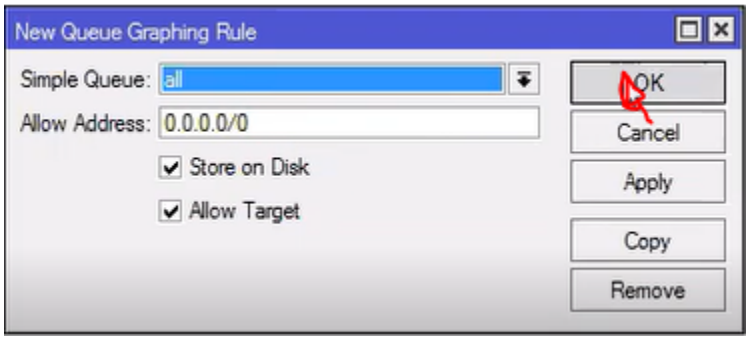


Figure 41: MRTG Queue Rules setup

Resource Rules: Tools > Graphing > Resource Rules > Add [+] > OK

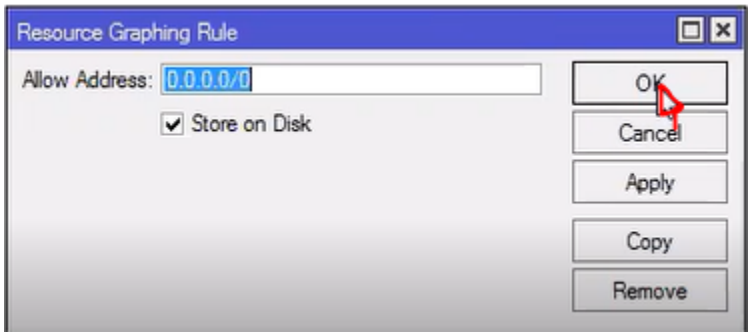


Figure 42: MRTG Resource Rules setup

To view MRTG, open the **Link:** http://a.b.c.d/graphs (i.e., http://210.7.50.35/graphs).

Pavel MRTG:

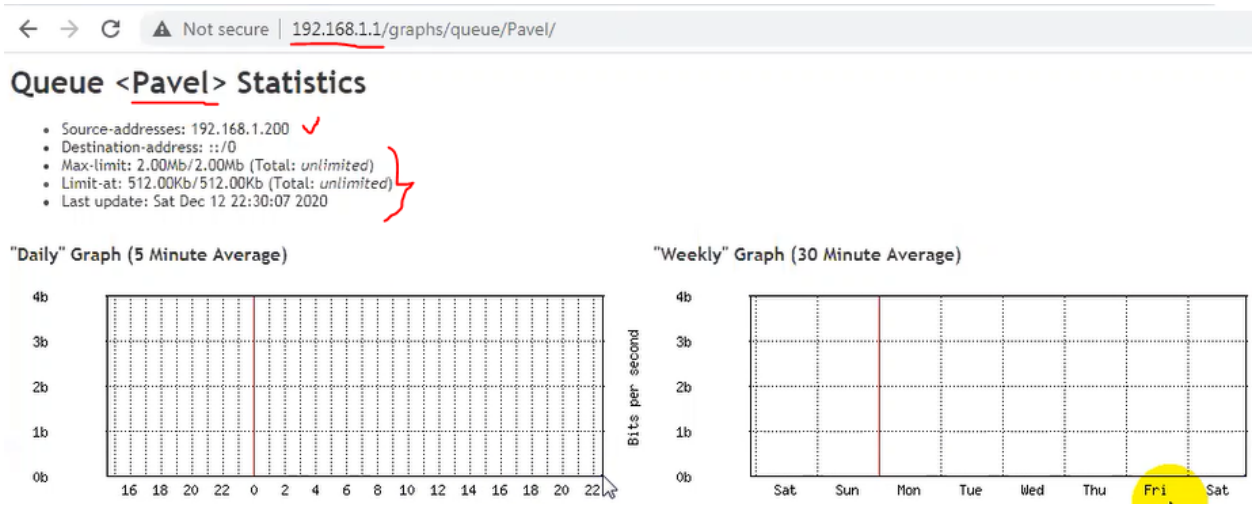


Figure 43: MRTG Graph

In figure 43, I showed MRTG graph for 192.168.1.200 address which name is Pavel. I see almost a blank graph because of when I set up a new id then I collected this information. This graph starting showed difference thing when this address holder access difference site or internet.

3.3.12 DAY-NIGHT SCHEDULING BANDWIDTH

Scripting

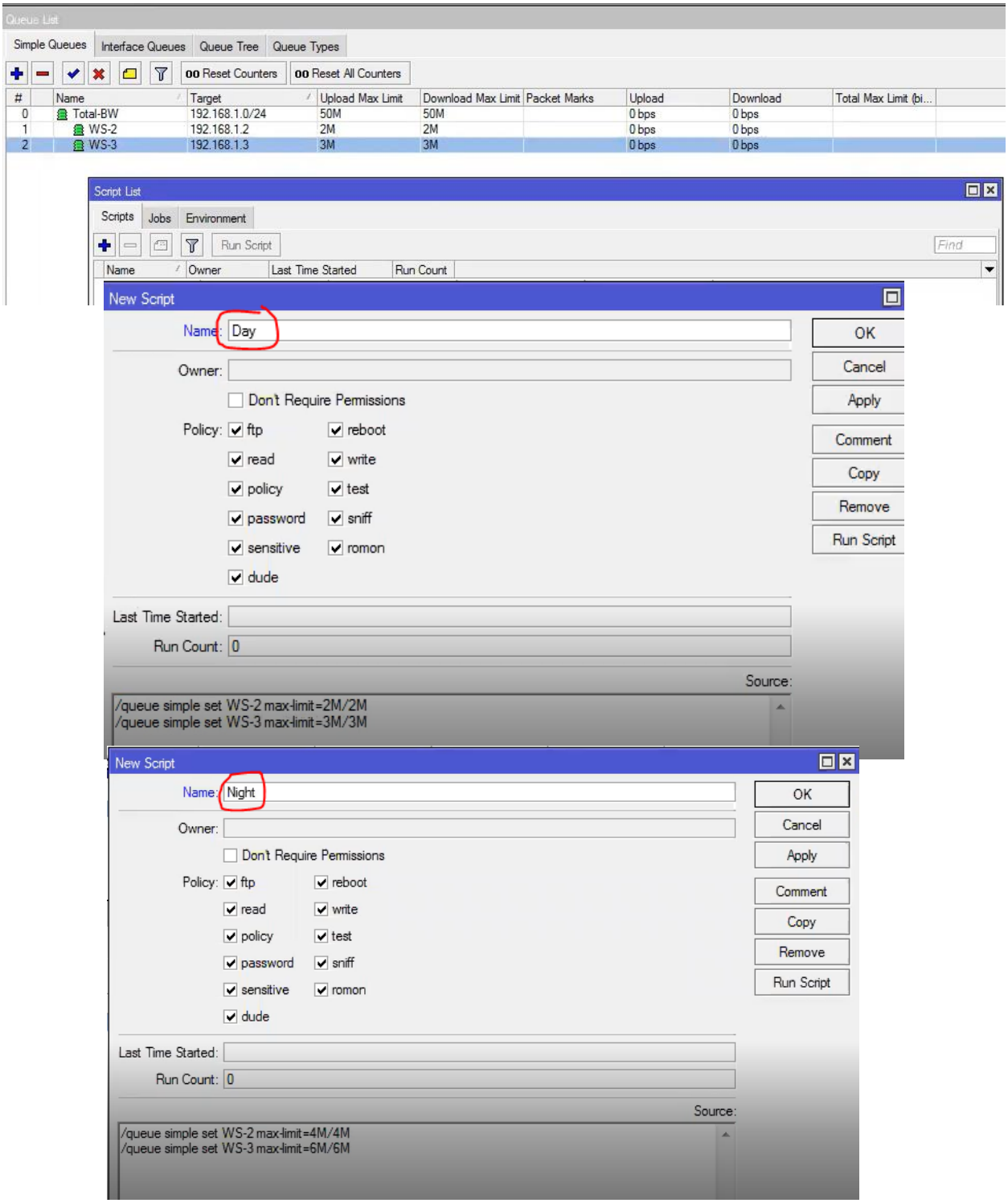


Figure 44:Scripting for Day & Night Bandwidth Offer

Scheduling: System Menu > **Scheduler** > Add **[+]** a Schedule

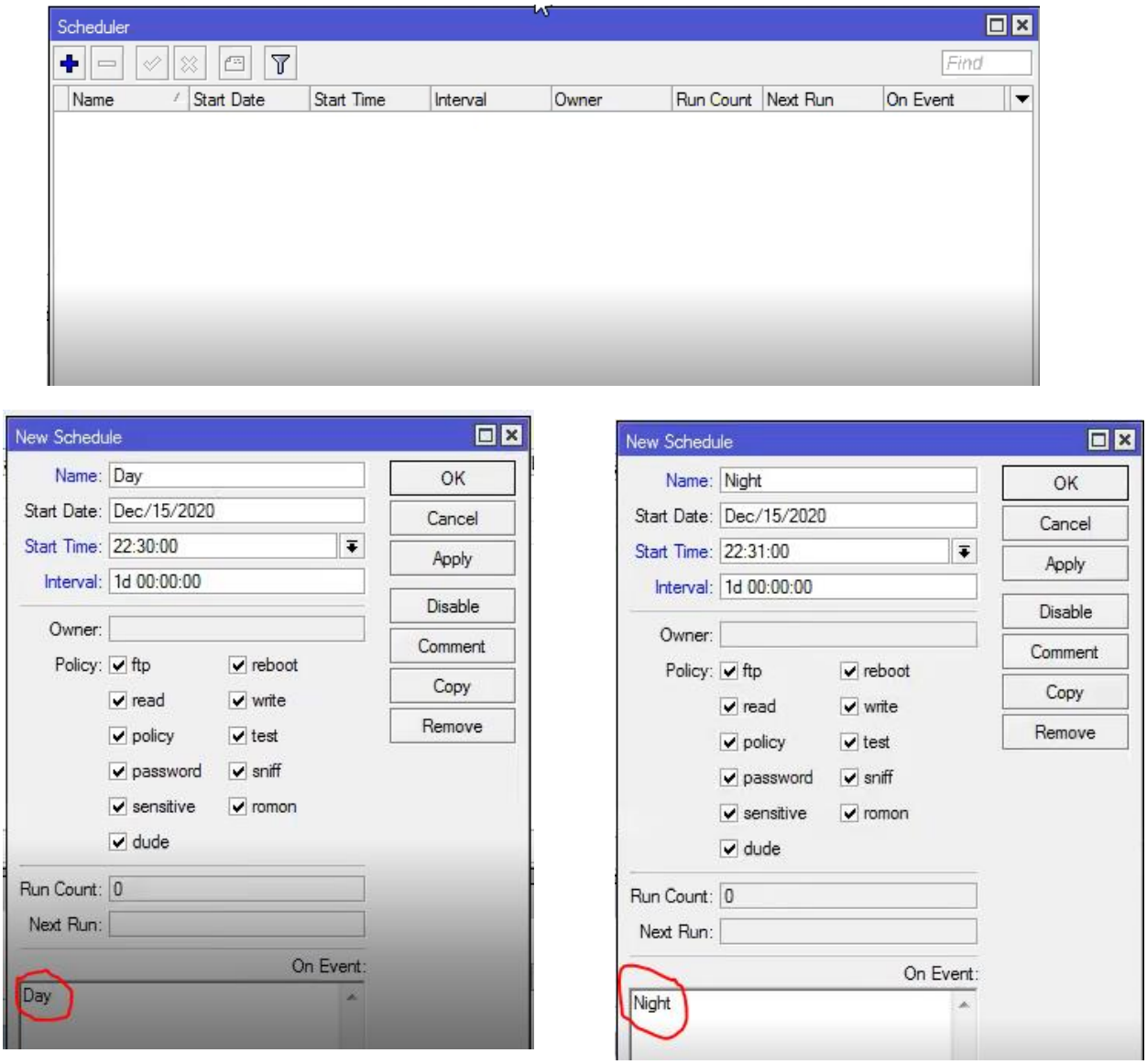


Figure 45: Run a Script by Scheduler

In figure 45, I showed scheduler for two scripts (Day & night). Day script start at 22:30:00 pm & Night script start at 22:31:00. I checking this configuration at night in 15th December 2020. For checking purpose, I set both scripts time interval at night.

3.3.13 FAILOVER SETTING

Failover refers to the constant capability to proximately and seamlessly switch over to a backup if something goes wrong. Most of the time Failover system is used by Highly corporate & emergency organization or company. It is good because If **Primary** Link goes **down** then Traffic will passes through **Backup** Link automatically and when primary link became up then traffic will passes through primary link again.

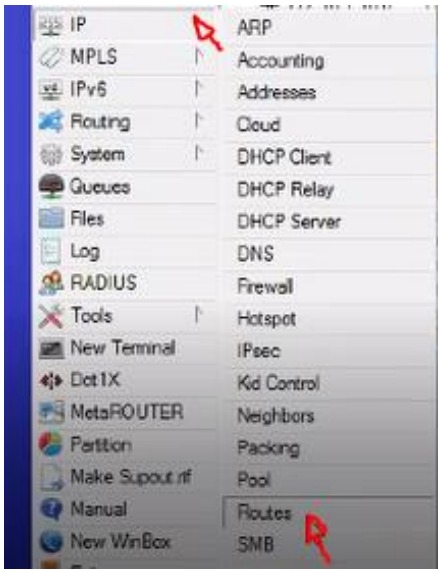
We should maintain some protocol for Failover setup on MikroTik router like that-

- We need minimum 2 **WAN** connection & 1 **LAN** connection. We can set WAN-1 is the primary connection & WAN-2 is backup connection.
- Must be Administrative Distance (**AD**) of WAN-1 is **less** than WAN-2.
- If both the Links (primary & secondary) are from same ISP then we can use ISP provided DNS.
- But If both the Links (primary & secondary) are from different ISP then we must be use public DNS.

Configuration scenario:

- IP Addressing – (WAN-1, WAN-2 & LAN)
- Default Route (0.0.0.0/0) – (for WAN-1 & WAN-2)
- DNS Settings
- NAT (masquerade)

We already know how to add IP addressing, DNS setting & NAT configuration. In Failover setting we just show default route & AD setting.



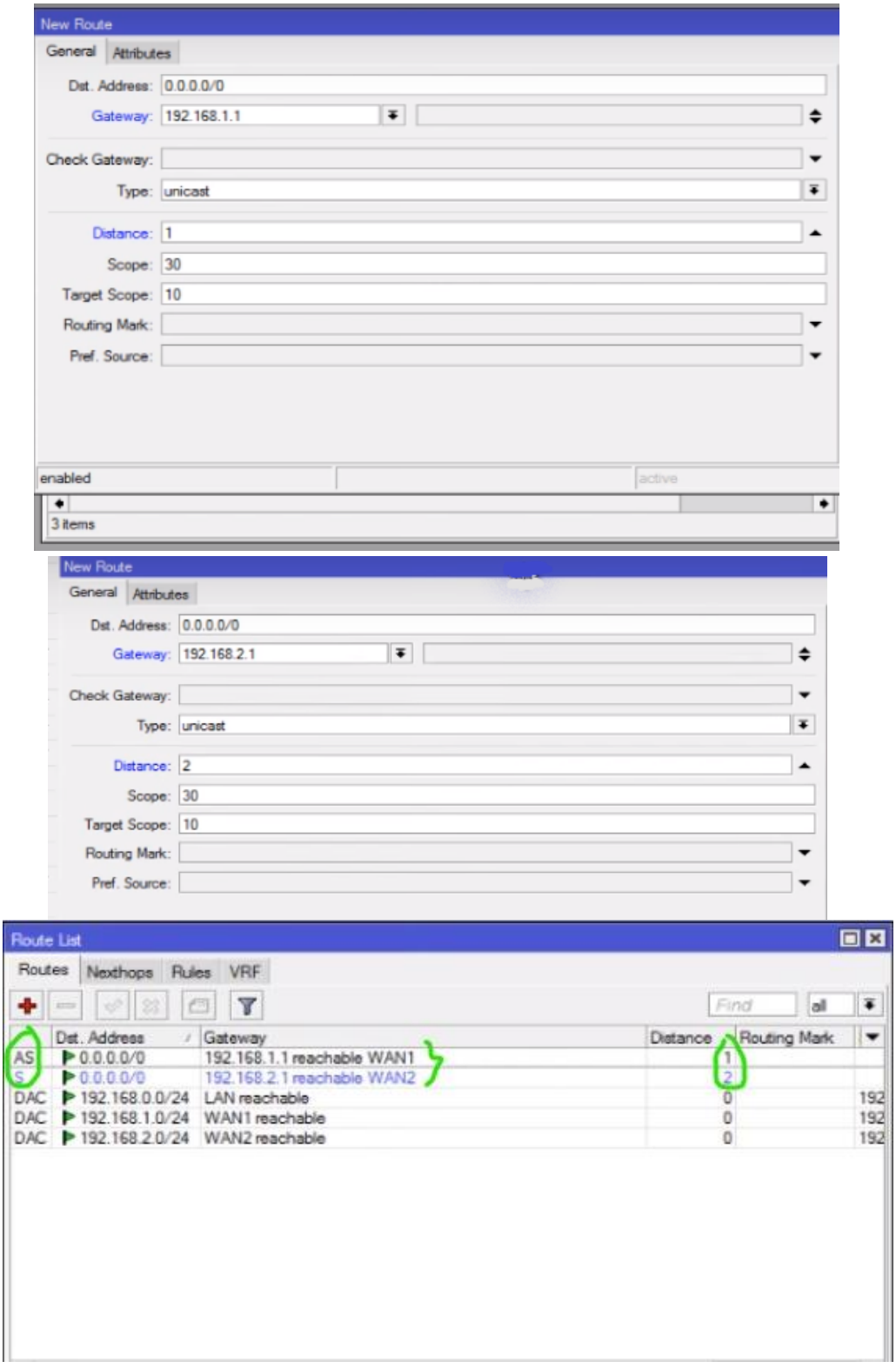


Figure 46: MikroTik Failover Setting

In figure 46, We see 192.168.1.1 has lowest AD & 192.168.2.1 has higher than WAN-1. Because of that lowest AD get first priority.It is the primary link. When it disconnected then

WAN-2 will active.

3.3.14 MIKROTIK FIREWALL

Firewall:

"A firewall is a security gadget (PC equipment or software) that can help ensure your network by sifting traffic and blocking outcasts from acquiring unapproved admittance to the private information on your PC" [11]. Not exclusively does a firewall block undesirable traffic, it can likewise help block malevolent software from contaminating your PC.

Port Filtering Firewall:

We have applied Firewall over HTTP (port 80) when we want to control Browsing for a specific IP/Subnet.

Steps are: **IP** Menu > **Firewall > Filter Rules >** Click **[+]** > **General:** [Chain=**forward**, Src. Address=x.x.x.x or, x.x.x.x/x, Protocol=**tcp**, Dst. Port=**80**] > **Action:** Action= **drop/reject**.

Port Dropping in specific network:

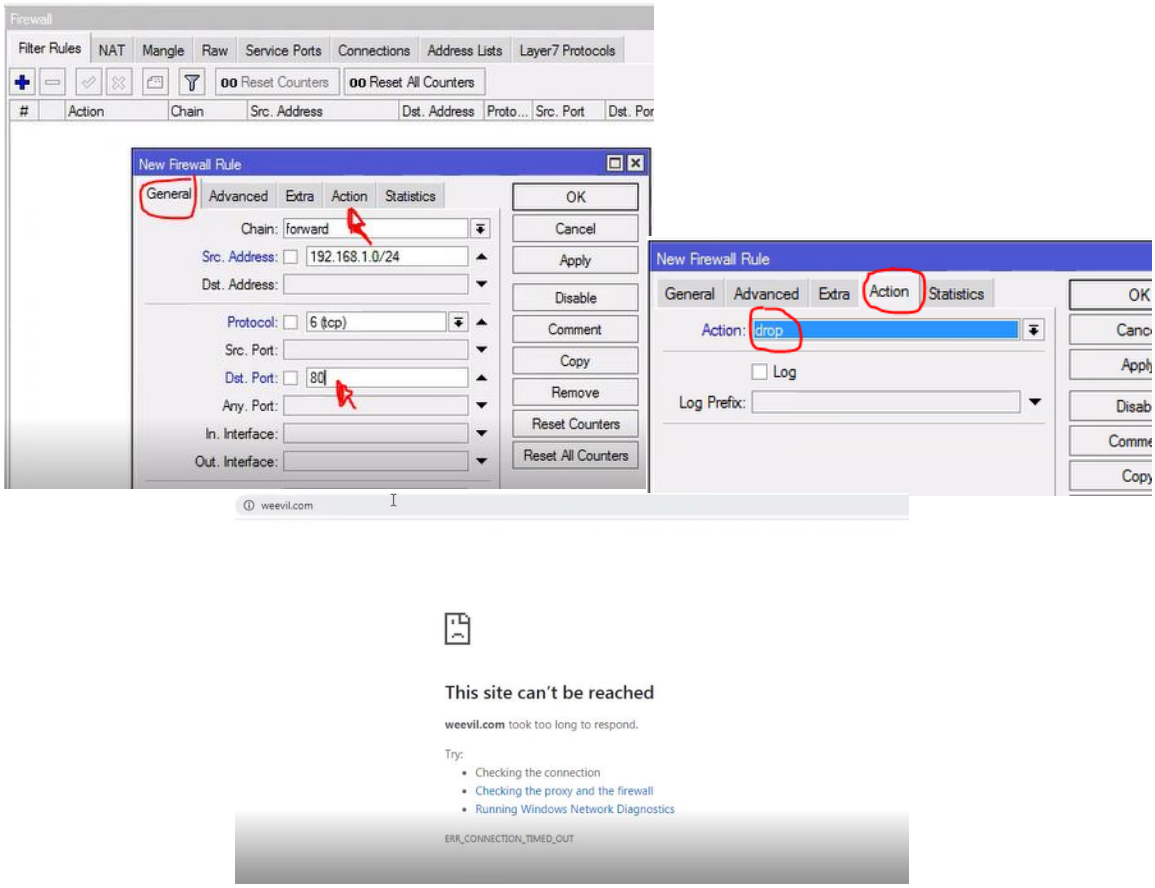


Figure 47: Port dropping in specific network (192.168.1.0/24)

Port accept in specific IP:

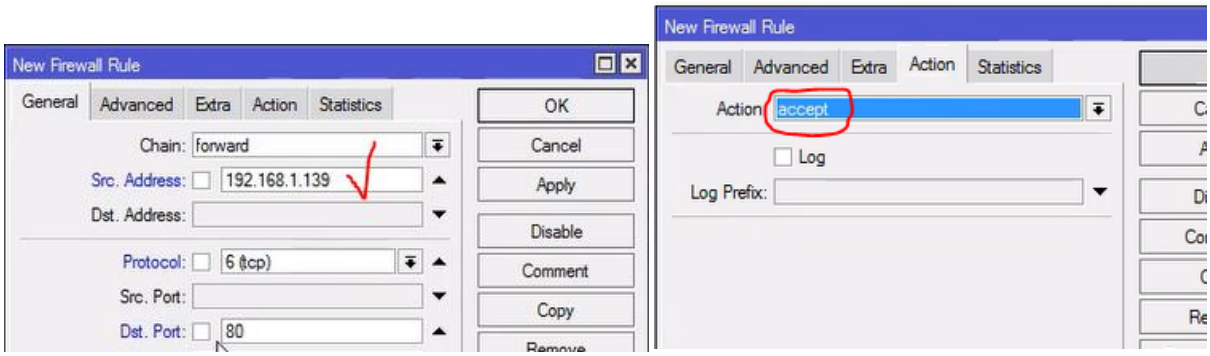


Figure 48: Port accepting in specific IP (192.168.1.139)

Now, we should drag the accept part from bottom to top. Otherwise, it's not working coz Firewall works with sequentially rules.

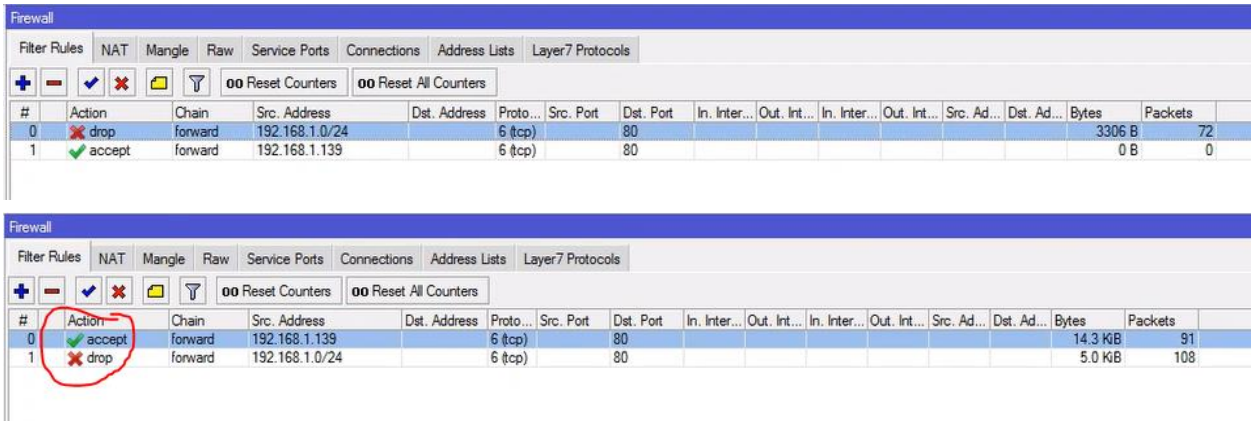


Figure 49: Port Filtering action list

In figure 49, I dragged the accept option from bottom to top. Because We set two protocol. One is "drop" & another is "accept". I set 192.168.1.0/24 network should be dropped without 192.168.1.139 address. So, we should be set the accept part to the top & drop part to the bottom. Because Failure must be given first priority to topper protocol then bottom protocol.

Destination Filtering Firewall:

We can block traffic for any specific Destination in MikroTik. We can do it for a single IP of our LAN or LAN Subnet.

Steps are: **IP** > **Firewall** > **Filter Rules** > add **[+]** > **General** [Chain=**forward**, Dst. Address=x.x.x.x] > **Action**: Action=**reject/drop.**

Destination IP block for full network:

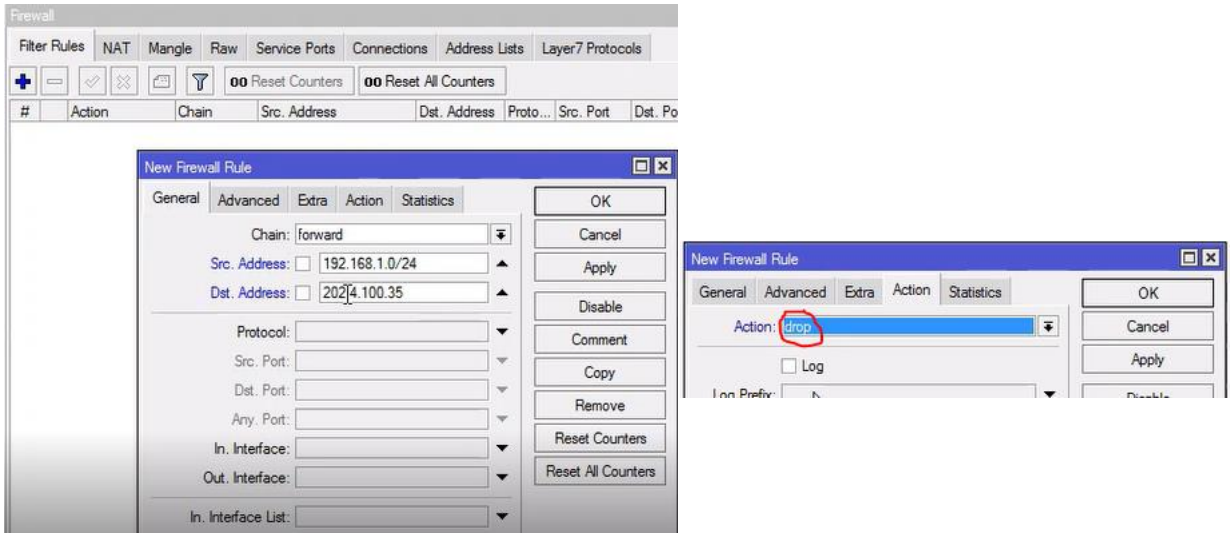


Figure 50: Destination IP block for full network

Destination IP allow for specific IP:

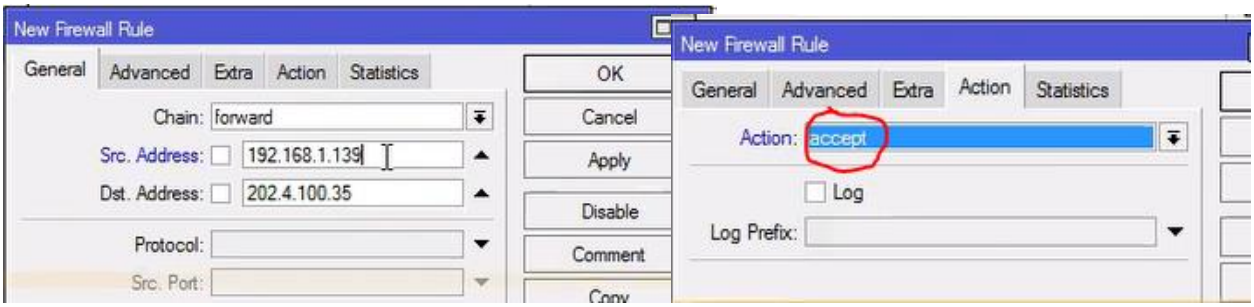


Figure 51: Destination IP allow for specific IP

MAC Filtering Firewall:

Steps are: **IP** > **Firewall >Filter Rules >** Click **[+] > Advanced** (to add a **Src. Mac address**) **> Action** (Action**: drop/reject**).

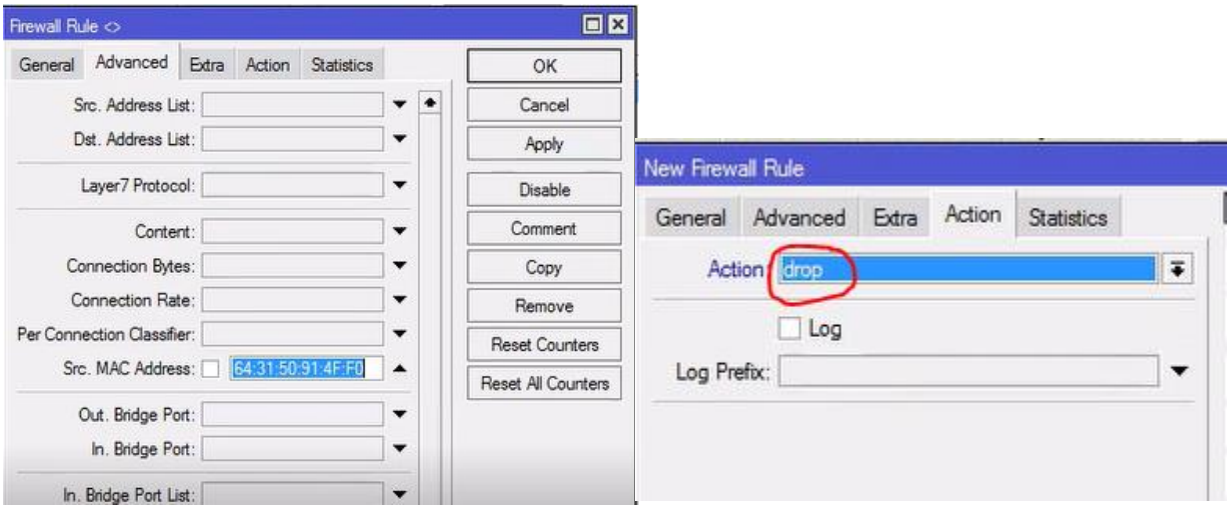


Figure 52: Mac Filtering Firewall

3.4 CHALLENGES

The key challenges of my internship are given below: Provisional, Unpaid, Competition.

During my internship, there were numerous kinds of threats I would face. And I would try to resolve all the difficulties.

- Increased some organized strength.
- Generating community relationships with colleague and officials.
- Hotspot solution
- Bandwidth managing problem
- problems of password management
- Security

CHAPTER 4

COMPETENCIES AND REFLECTIONS

4.1 COMPETENCIES EARNED

After executed internship in Atova Technology. I have acquired know how of different hassle or troubleshooting faces the many performance of sensible working. During my internship length I had assigned some Competencies earned. Those earned I used to be strived to accomplished efficaciously.

Those Competencies Earned are given bellow:

- Router Supervision, Monitoring and troubleshooting.
- Find resolutions for mid-level difficulties.
- Progress my hands-on knowledge for real problem faces.
- Increase my public personality together.
- Real experience of working station.
- Install MikroTik router OS.
- Understanding bandwidth management.
- Maintenance mikrotik router.
- MikroTik Security.
- Hotspot solution.

4.2 INTERNSIP REFLECTIONS

A job is an actual venture for the workplace, especially if I have no experience. A successful internship can assist me construct ride for a profession. So, doing my imminent reflection preparation internship as a success. Think of a top concept that will be like a future job or a right job. I hope these internships in positions are reachable complete a range of and many profession paths Atova Technology restricted consults work lifestyles balance. Atova works like a bridge between my own lifestyles and work. This enterprise offers me a lot of understanding to enhance my job concentration.

CHAPTER 5

CONCLUSION & FUTURE CAREER

5.1 SCOPE FOR FUTURE CAREER

In actual lifestyles discovering a job can be a huge project of all of us of our country, especially if we have no experience. That's why I pick out internship, due to the fact it can assist me to improve my profession probability into an experience. So, this internship affords me to find scope in future lifestyles.

After finishing an outstanding internship my future scope will desire:

- To work in any ISP platform.
- To be an engineer at security sector.
- Prospect to join as a Network Engineer.
- Prospect to join as an IT Security Engineer.
- Bank job in IT sector.
- To be able technical support.

5.2 DISCUSSION & CONCLUSION

In my internship transitory I think about arranging a network by Mikrotik. I have a great deal of thoughts regarding IP class, how to make a great deal of IP by breaking the network. Subsequent to finishing my scholarly life, this temporary job assumed a vital part. It has really shown me a part. This internship appeared to be an extraordinary chance for me to acquire abilities in the current life. During my temporary job acquired a great deal of abilities about the organization. The methodology and diagram of PC organizations, information association, security of organization, interface and keeps up of the best open doors in an assortment of uses. My counselor and trainer are great and I got a ton of innovative thoughts from them which will prove to be useful later. I've been capable to make various types of switches, which is exceptionally useful for my future. This is my reality networking system experience which offers me the chance to meet viably in what's to come. Now, I am able to maintain different types of routers, which is very cooperative for my future. It gives me the chance to meet the real-life networking system which is actual effective for me in future.

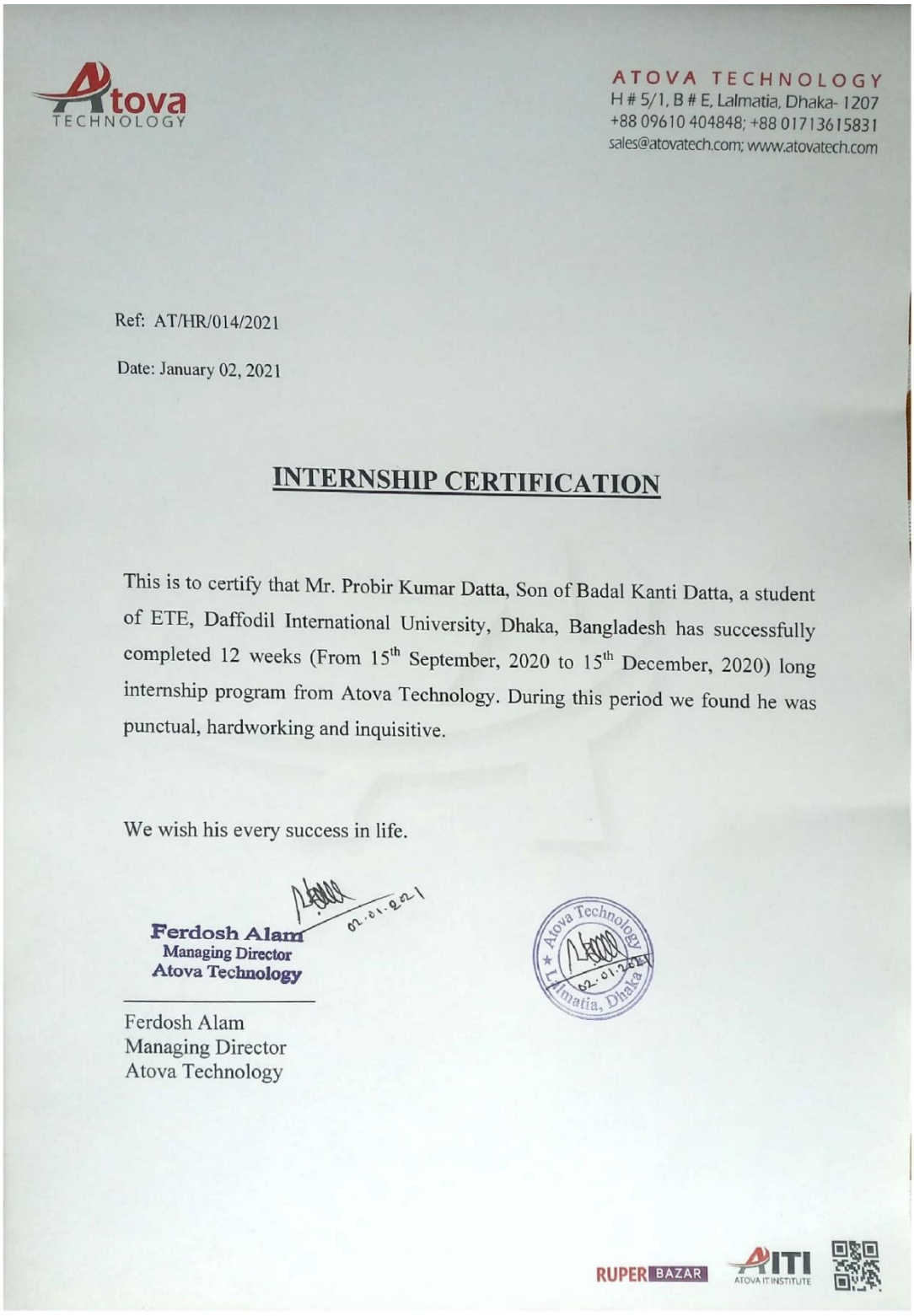
APPENDICES

Appendix: Information of Company

HEAD OFFICE

Name	Atova Technology
Address	3rd Floor, Satmasjid Super Market Mohammadpur Bus Stand Dhaka- 1207
Telephone	+880 1713615831
E-mail	sales@atovatech.com
Website	www.atovatech.com
Type	IT based company & professional training institute

INTERNSHIP CERTIFICATE



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sales@atovatech.com; www.atovatech.com

Ref: AT/HR/014/2021

Date: January 02, 2021

INTERNSHIP CERTIFICATION

This is to certify that Mr. Probir Kumar Datta, Son of Badal Kanti Datta, a student of ETE, Daffodil International University, Dhaka, Bangladesh has successfully completed 12 weeks (From 15th September, 2020 to 15th December, 2020) long internship program from Atova Technology. During this period we found he was punctual, hardworking and inquisitive.

We wish his every success in life.

02.01.2021

Ferdosh Alam
Managing Director
Atova Technology

Atova Technology
Lalmatia, Dhaka
02.01.2021

Ferdosh Alam
Managing Director
Atova Technology

RUPER BAZAR ITI ATOVA IT INSTITUTE

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