MikroTik Training (Basic) Part- I

Organized by
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Objectives:

- Introduction to MikroTik
- First time start-up
- Basic Configurations
- DHCP Server Configurations
- PPTP Server Configurations
- Mikrotik Wireless/Access Point Configuration
- Bandwidth Control in Different ways
- Q&A Session

Introduction to MikroTik

Mikrotīkls Ltd., known internationally as MikroTik.

- The company was founded in 1995.
- MikroTik is a Linux-based Operating System known as MikroTik RouterOS.
- Router Board is a complete Hardware Operating Platform for RouterOS.
- Headquarter of **Mikrotīkls Ltd.** is in Latvia, Riga.
- Helpline: www.mikrotik.com

 # What is “MikroTik” ?

It is an operating system through which you can distribute the Internet to your subscribers and you can determine the speed of the Internet. The meaning of an operating system means that any software operating system can be installed on any computer, but this system works in a Linux environment. **mikrotik** is the best and easiest internet distribution system.

First time start-up

After you have installed the RouterOS software, or turned on the Router for the first time, there are various ways how to connect to it:

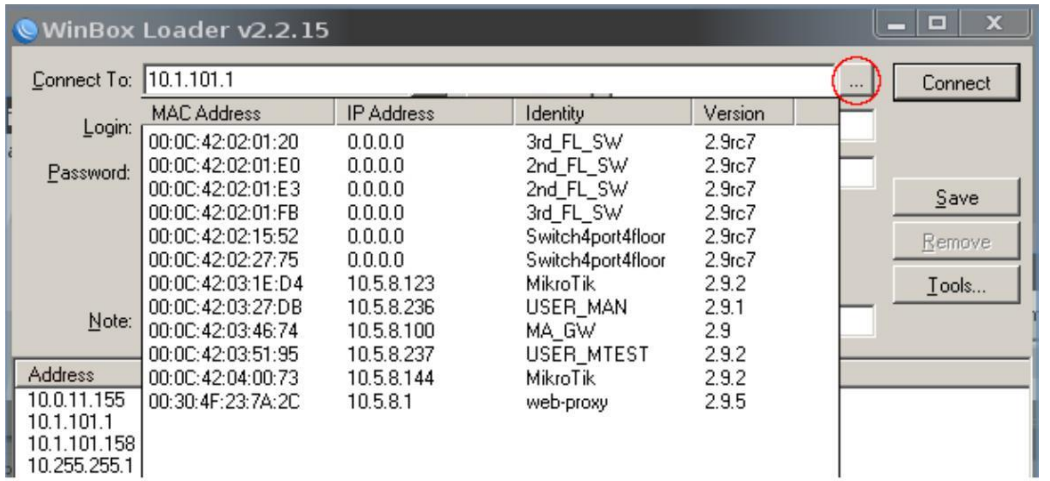
- Accessing Command Line Interface (CLI) via Telnet, SSH, serial cable or even keyboard and monitor if your router has a VGA card.
- Accessing Web based GUI (WebFig)
- Using the WinBox configuration utility (Windows app, compatible with Wine)

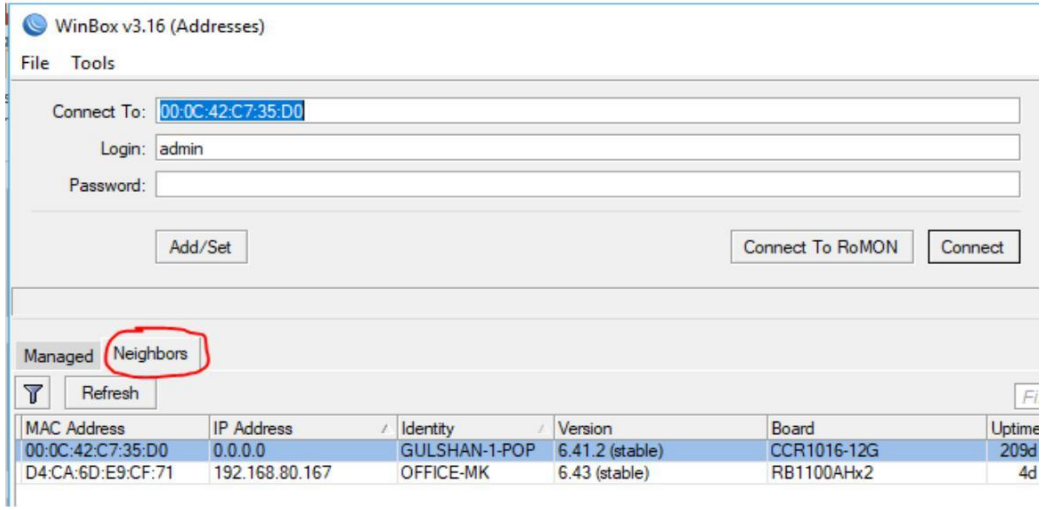
Every router is factory pre-configured with the IP address 192.168.88.1/24 on the ether1 port. The default username is **admin** with no password. After you log in for the first time, please create a new user with a password in the "full" group, re-login and delete the default admin user.

Most popular is WinBox

Winbox

- Winbox is a configuration utility that can connect to the router via MAC or IP protocol.
- Run the Winbox utility, then click the **[...] or [neighbours]** button and see if Winbox finds your Router and it's MAC address. If you see routers on the list, connect to it by clicking on MAC address and pressing **Connect** button.
- If winbox cannot find any routers, make sure that your Windows computer is directly connected to the router with an Ethernet

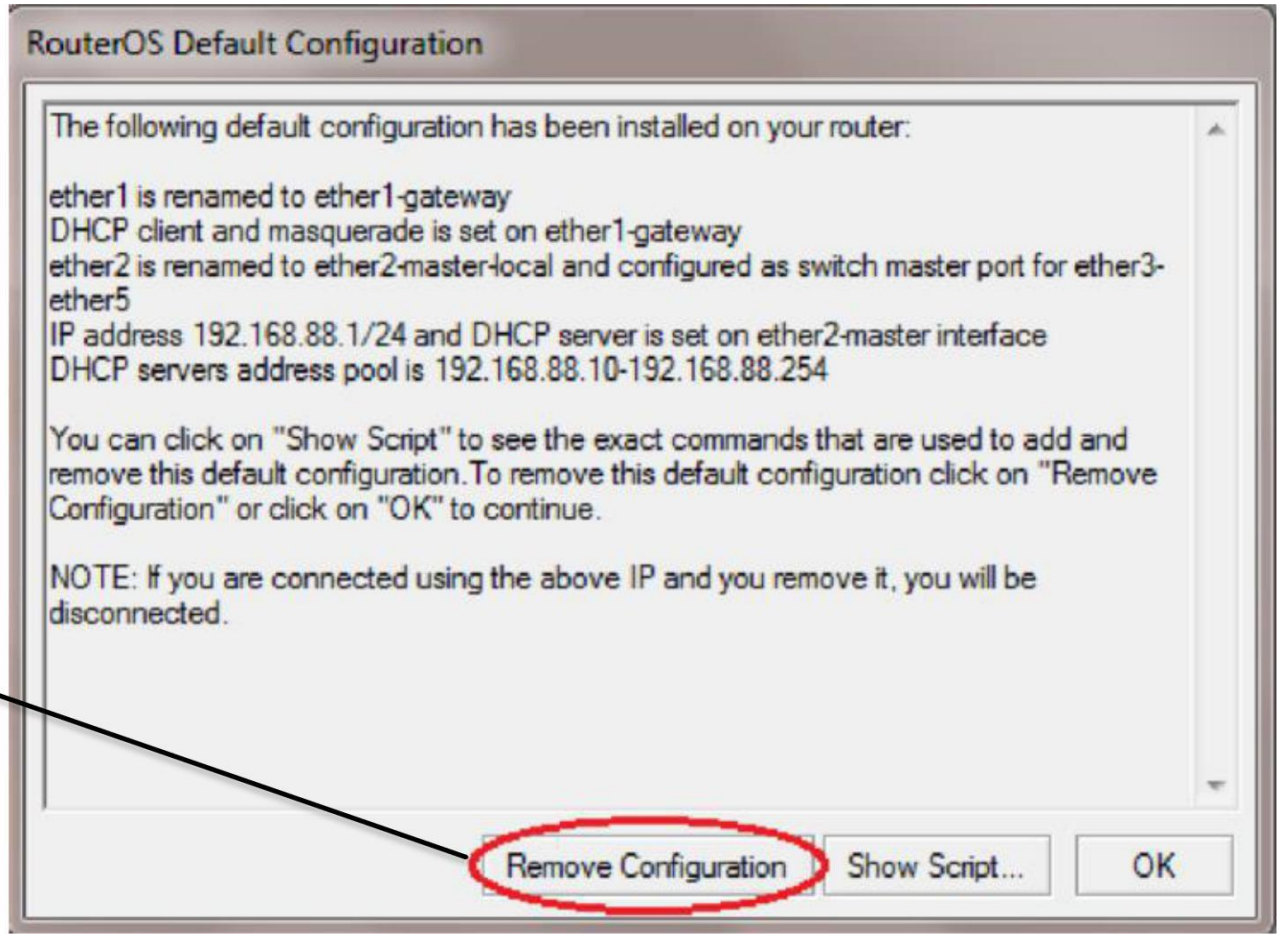




RouterOS Default Configuration

After clicking the Connect button.

Then you will find a screen just like this. You have to start your configuration from Left most Menu Bar.



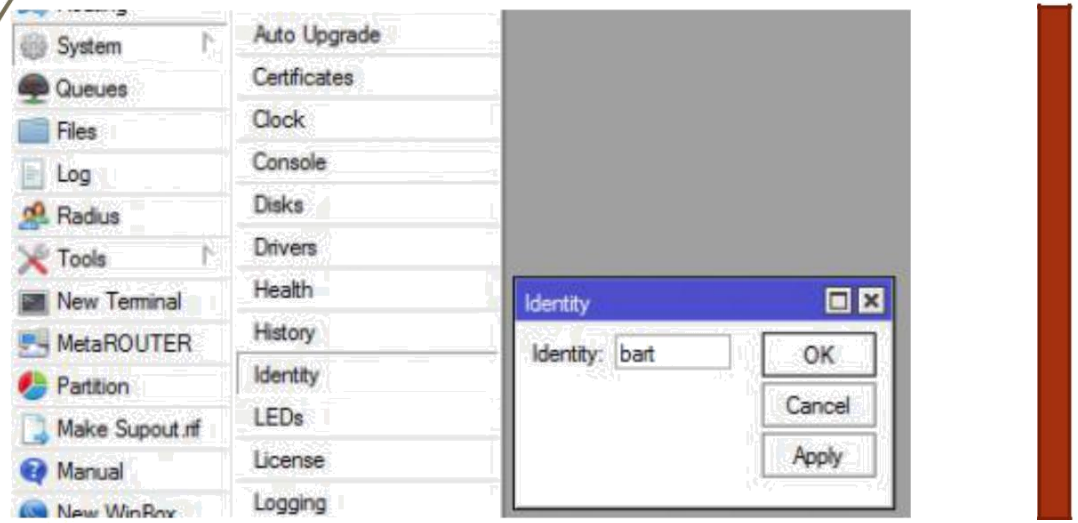
Basic Configurations

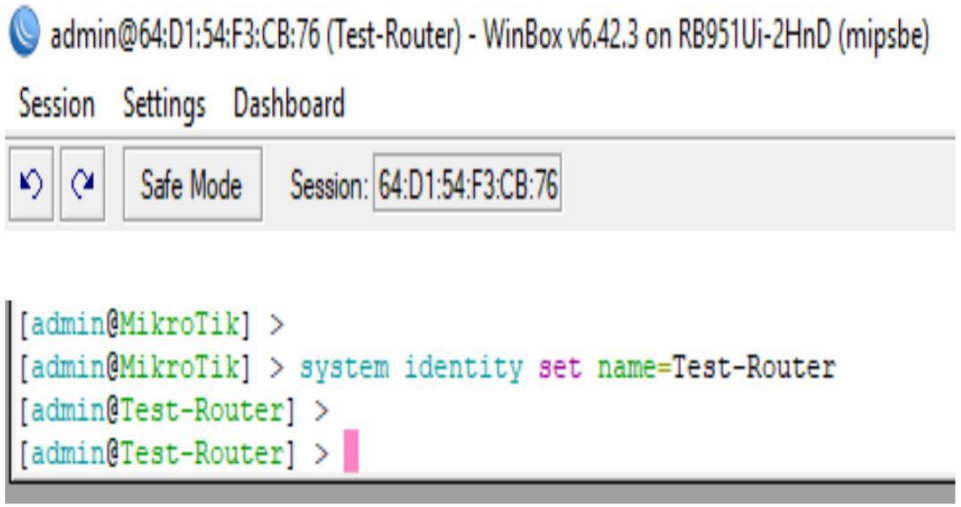
This configuration will usually act as NAT Router (Gateway Server). For basic MikroTik Router configuration we have to do the following three steps:

- a) Hostname of Router
- b) IP Addressing
  - -WAN
  - -LAN
- c) Default Route
  - -Test Gateway is Reachable or NOT !!!
  - -Router can resolve Name !!!
- NAT (Network Address Translation)
- d) DNS Settings
- e) NTP/SNTPClient

Hostname

- Setting the System's Identity provides a unique identifying name for when the system identifies itself to other routers in the network and when accessing services such as DHCP, Neighbour Discovery and default wireless SSID. The default system Identity is set to 'MikroTik'.





IP Addressing

Here we have to determine two IP Addresses which will indicate the Outside Global (WAN) and Inside Local (LAN).

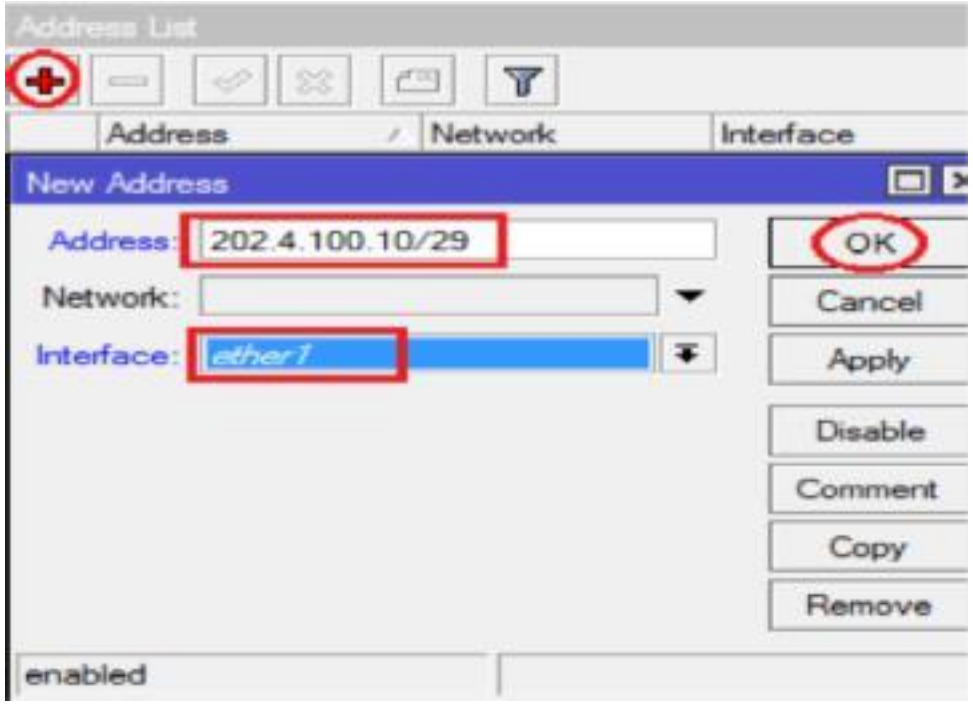
1. Outside Global (WAN) - Public IP provided by ISP.
2. Inside Local (LAN) - Private IP assigned by the Administrator which will act as Local Gateway.

IP Addressing for Outside Global (WAN)

- We have to setup WAN IP Address from Left most **Menu Bar** which is shown in below.

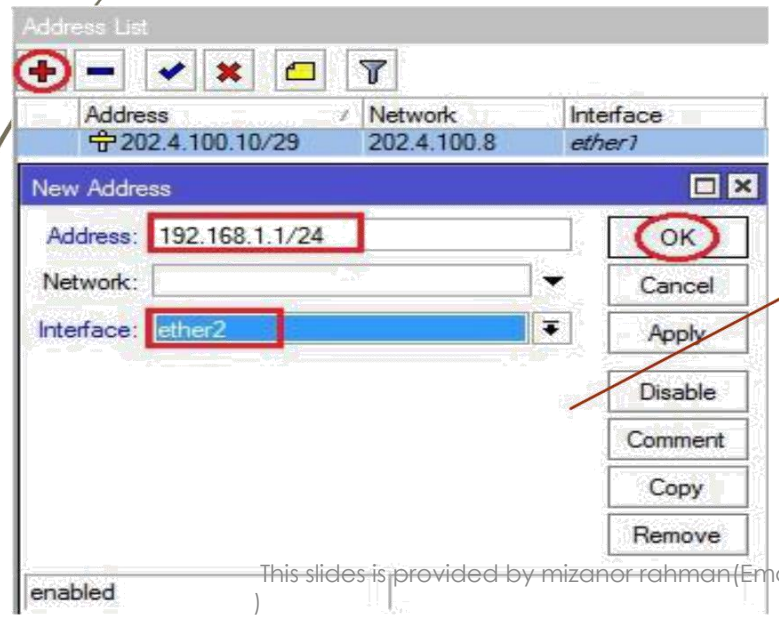
If you want to configure it in **CLI** mode:

[admin@MikroTik] > ip address
add address=202.4.100.10
netmask=255.255.255.248
interface=ether1

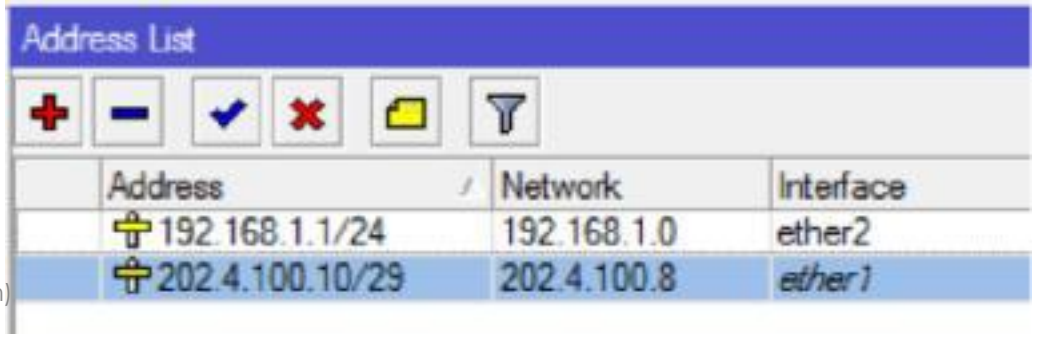


IP Addressing for Inside Local (LAN)

We have to assign an IP Address with appropriate Netmask in any other Interface of our Router which will act as a Gateway for our Local Network. Say, we have a Network with Prefix 192.168.1.0/24. Then we have to determine a single IP from our Prefix for Gateway and every PC of our Network should use that IP as Gateway. To add this IP the procedure is: Go to **IP Address** Menu then do the followings accordingly.

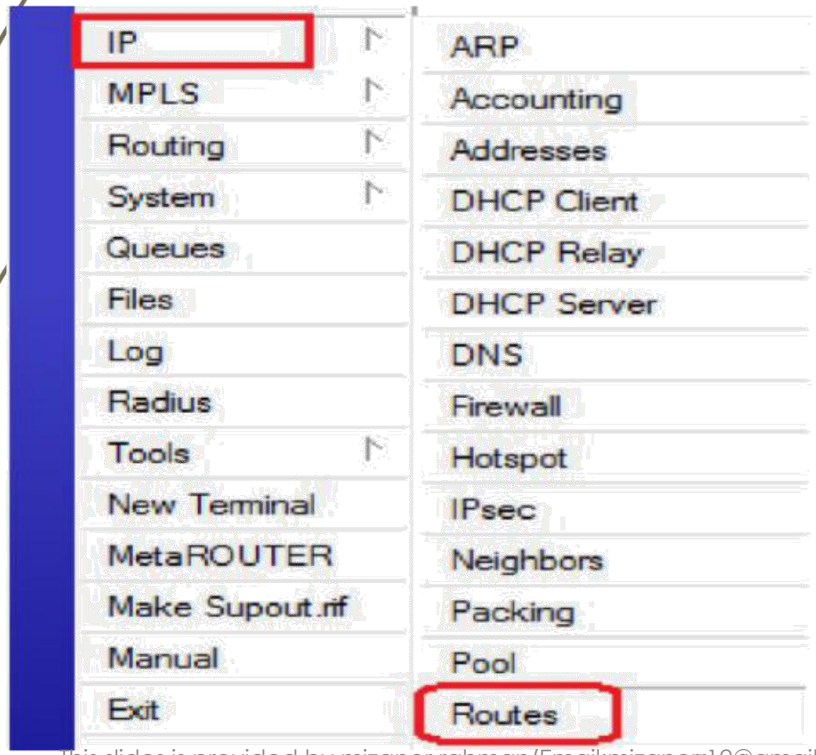


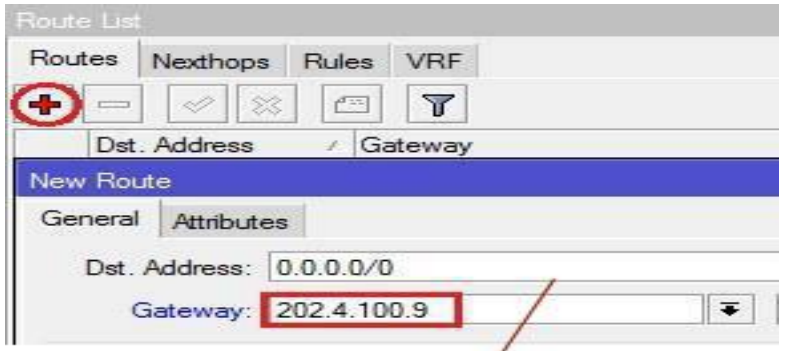
CLI mode:
[admin@MikroTik] > ip address add address=192.168.1.1 netmask=255.255.255.0 interface=ether 2



Default Gateway/Route

Route with **dst-address** *0.0.0.0/0* applies to every destination address. Such route is called the *default route*. If routing table contains an active default route, then routing table lookup in this table will never fail.





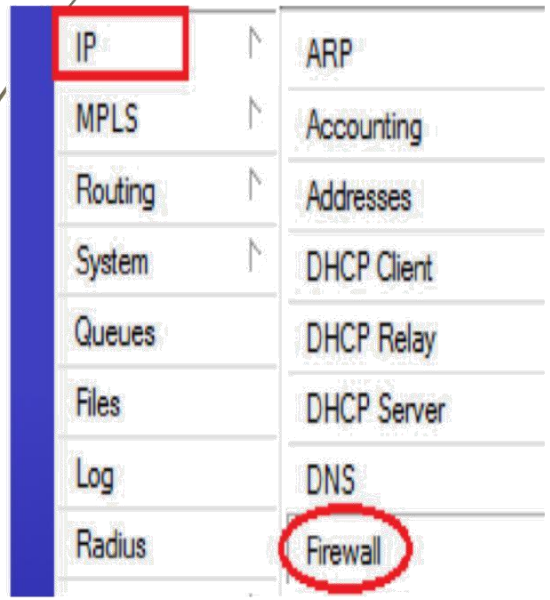
CLI mode:

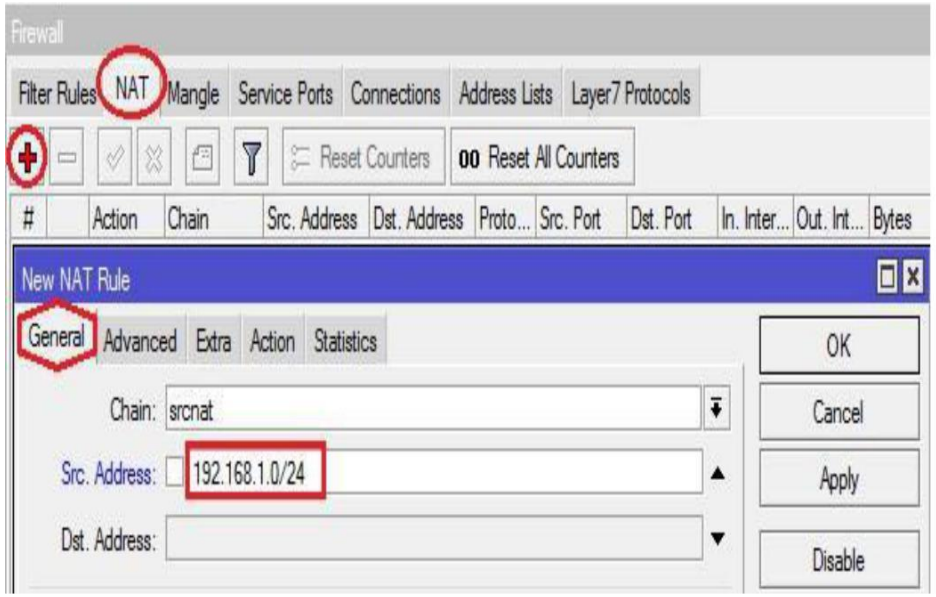
[admin@MikroTik] > ip route add dst-address=0.0.0.0/0 gateway=202.4.100.9

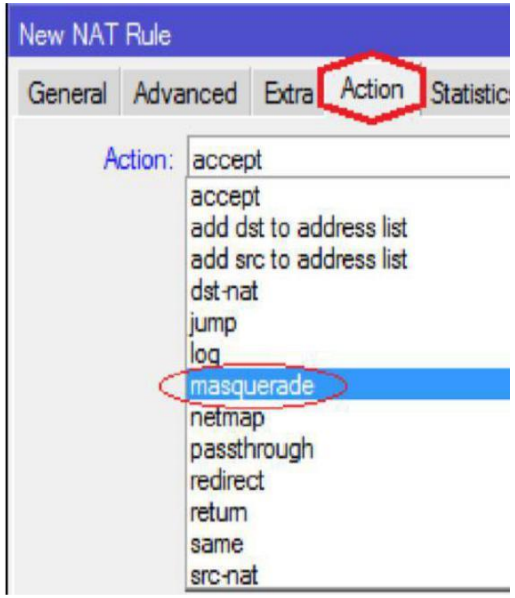
NAT (masquerade)

NAT is the process of modifying IP address information in IP packet headers while in transit across Traffic in a routing device. In **MikroTik**, we have to masquerade our Local Prefix over Public IP (WAN) so that Internet will accessible from Local Network with reference to Public IP.

Procedure of **NAT:** Go **IP** → **Firewall** → **NAT** then add a NAT Rule as follows:

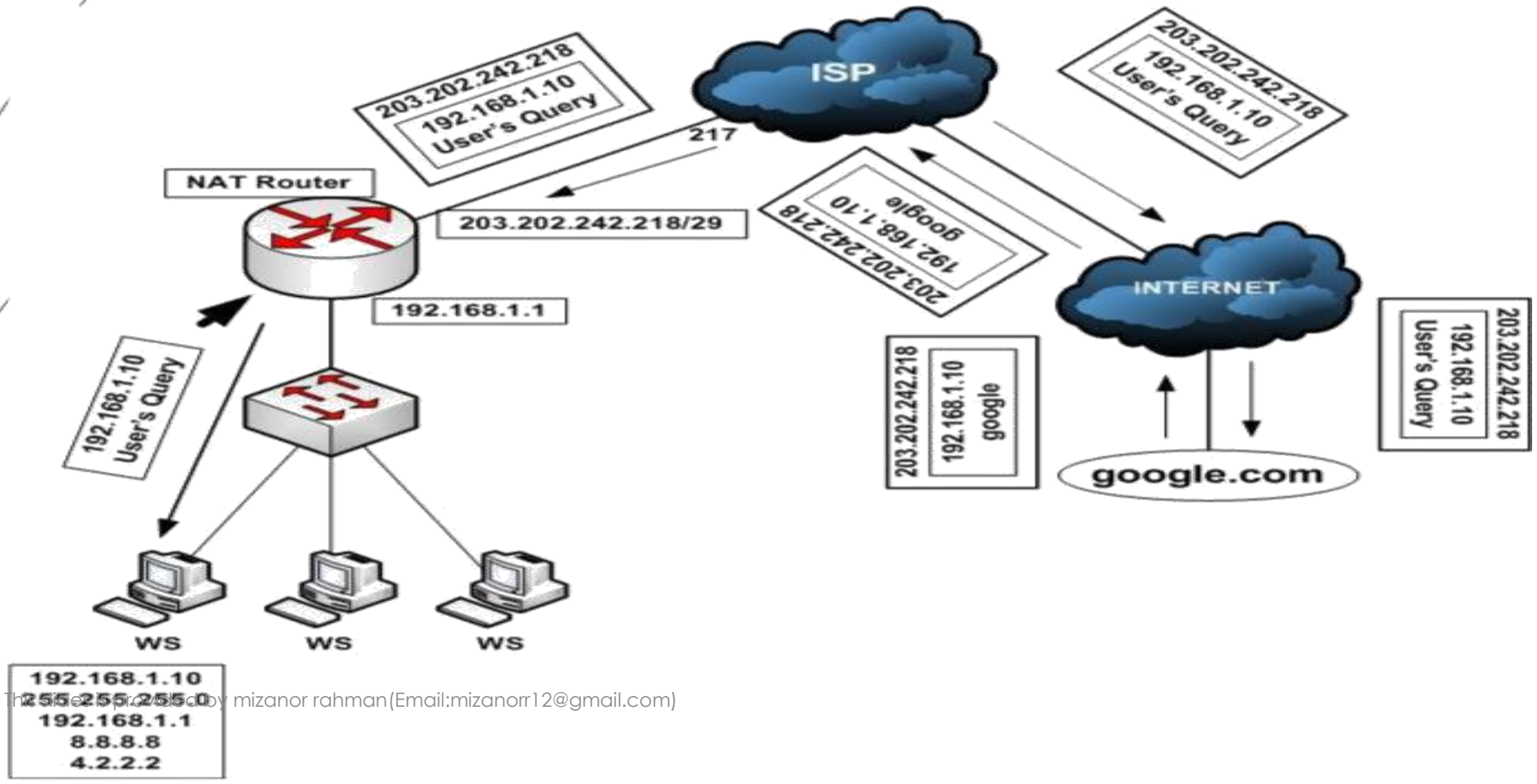






Packet Flow of NAT

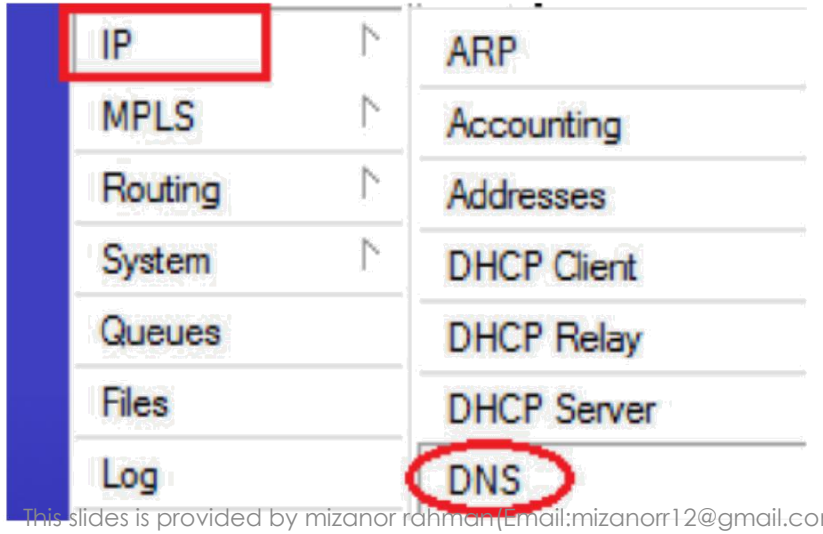
Try to Understand !!!

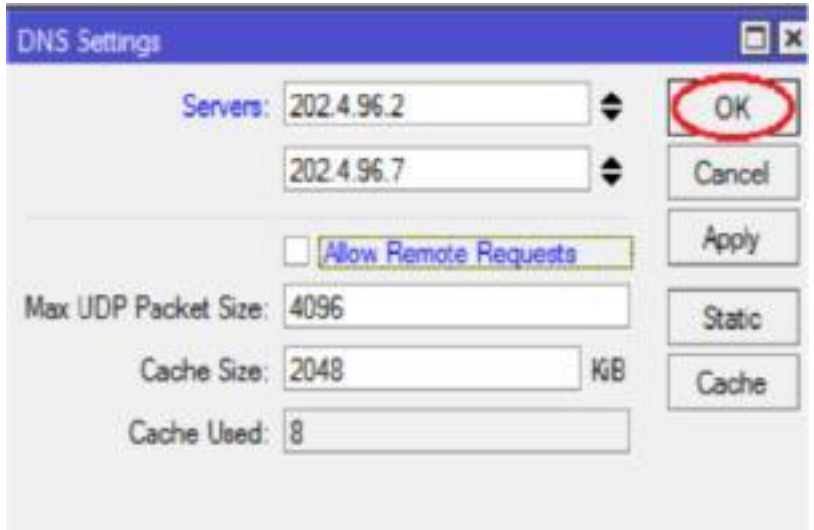


DNS Settings

A DNS server is a computer server that contains a database of public IP addresses and their associated hostnames, and in most cases, serves to resolve, or translate, those common names to IP addresses as requested.

To setup DNS in **MikroTik** the procedure is: Go to **IP** **DNS** Menu then Add the DNS Servers so that Internet comes to Your **MikroTik**.

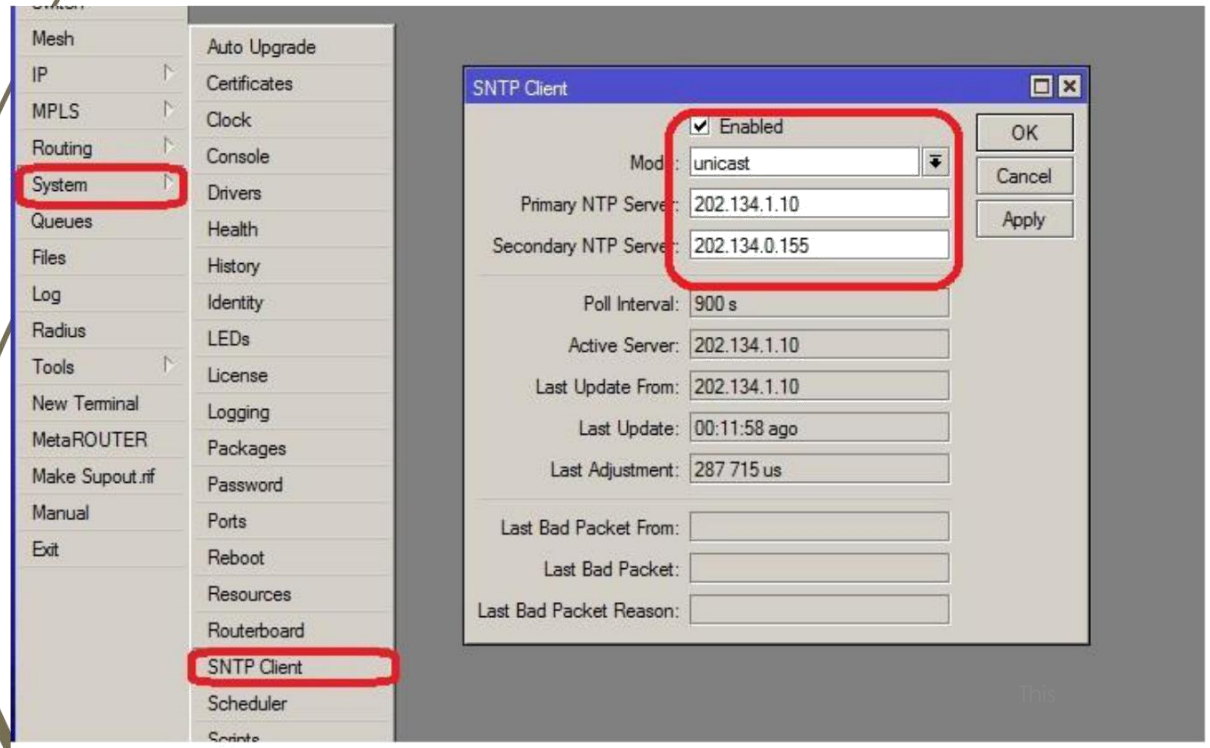


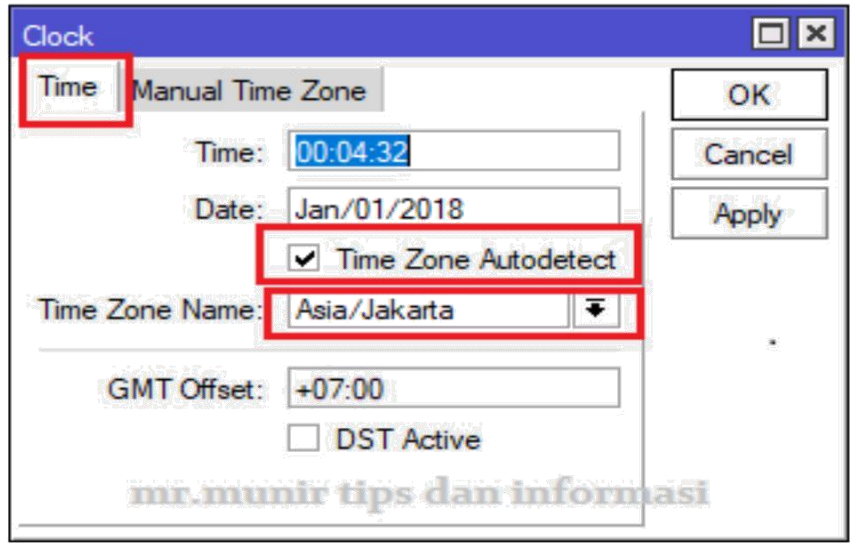


NTP/SNTP Client

- SNTP client is included in the *system* package. RouterOS implements SNTP protocol defined in RFC4330.

How to get NTP server IP ?
Search on google by using
"ntp server asia/bd"



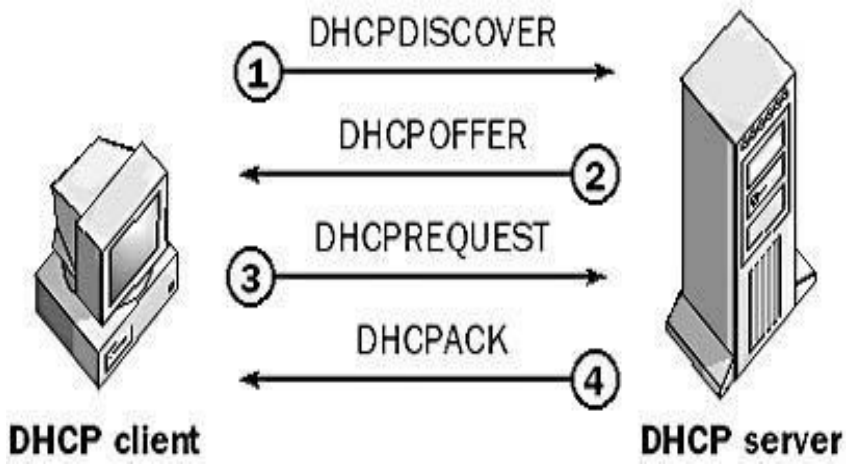


DHCP Server Configurations

What is DHCP?

Dynamic Host Configuration Protocol (DHCP) is a client/server protocol that automatically provides an Internet Protocol (IP) host with its IP address and other related configuration information such as the subnet mask and default gateway.

DHCP servers works in a four-step process:



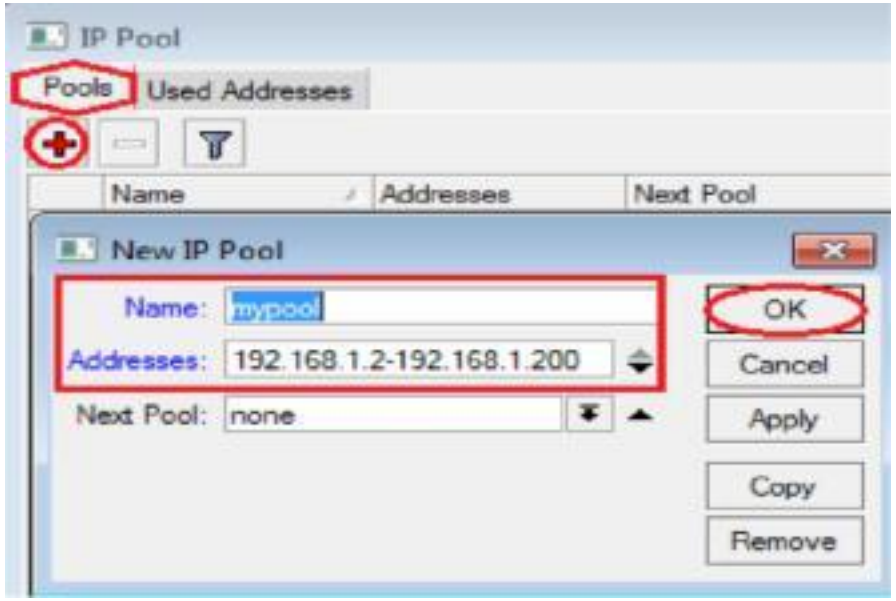
DHCP Server Configurations

To configure **MikroTik** as a **DHCP Server** we have to complete the all the stages of Basic Configurations and after that we have to proceed the **DHCP Server** Configuration.

IP Pool

Here we will declare the IP Range for Leases and be aware that the Gateway IP should be excluded in that IP Pool.

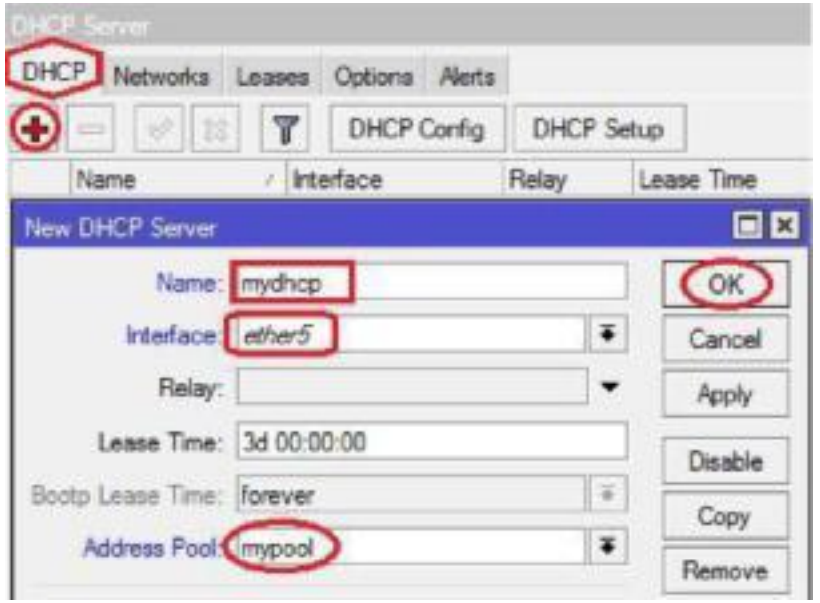
Go to **IP** □ **Pool** then add a Pool as follows:



DHCP Server Configurations

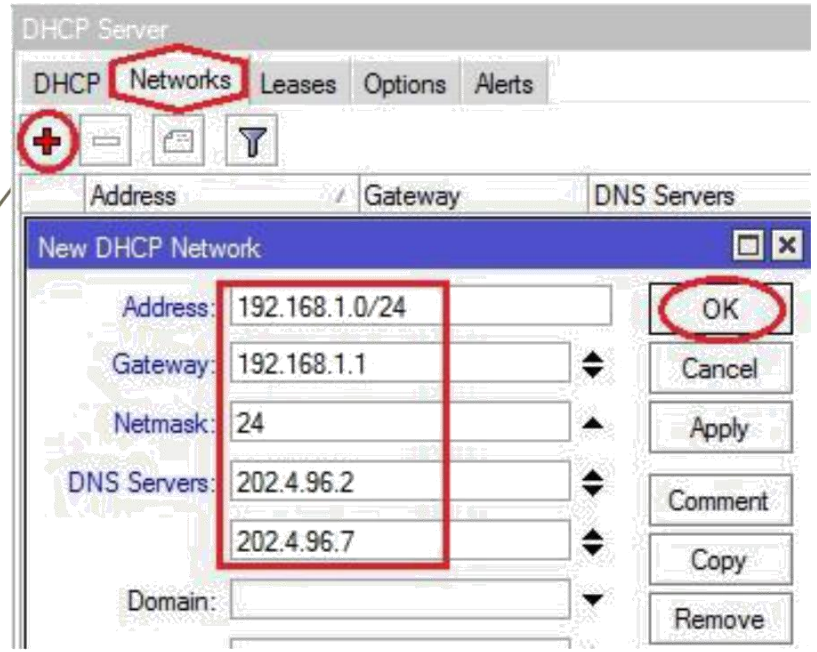
To configure DHCP Server we have to determine the Local Interface which will forward the DHCP Broadcast so that every PC's of our Network should acquire an IP Address as Leases.

Go to **IP** □ **DHCP Server** □ **DHCP**



DHCP Server Configurations

Then go to **IP □ DHCP Server □ Networks**

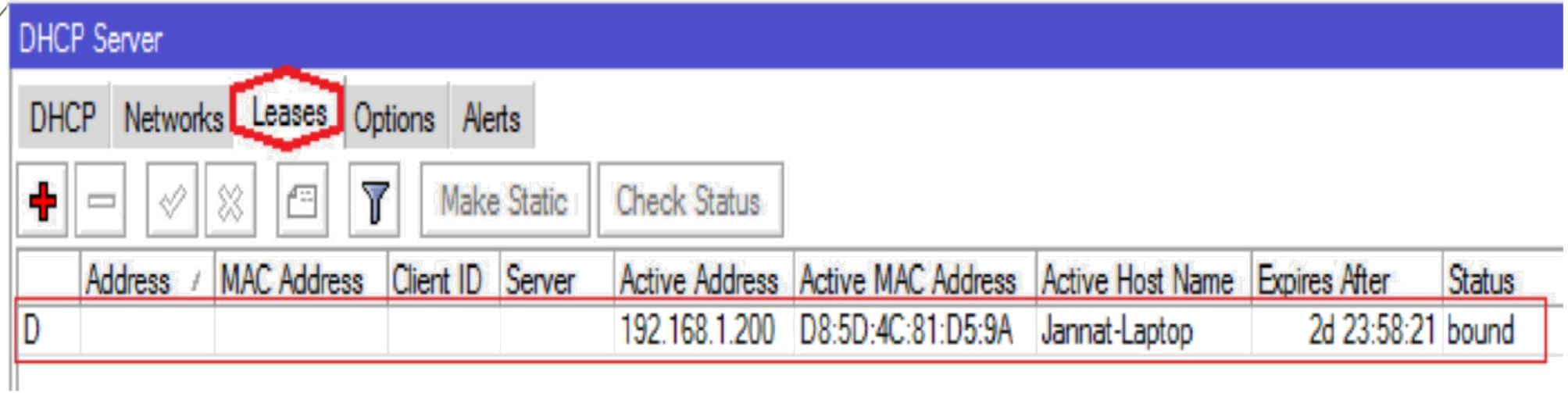


Add a DHCP Network with the following information so that a DHCP Client PC should acquire an IP Address with it appropriate Mask and DNS.

DHCP Server Configurations (Con.)

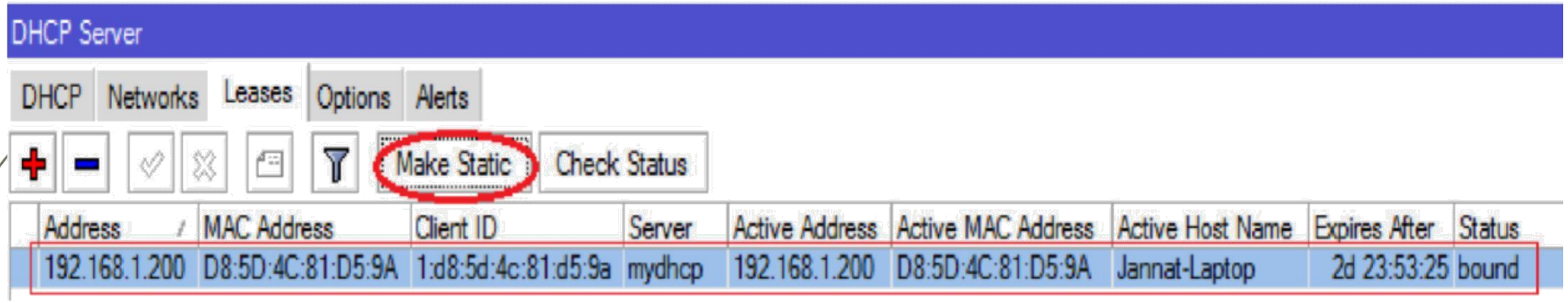
Then connect your Laptop/PC with the Local Interface of MikroTik and configure IP mode as DHCP then check that your DHCP Server is working or not.

Go to **IP** → **DHCP Server** → **Leases** for checking



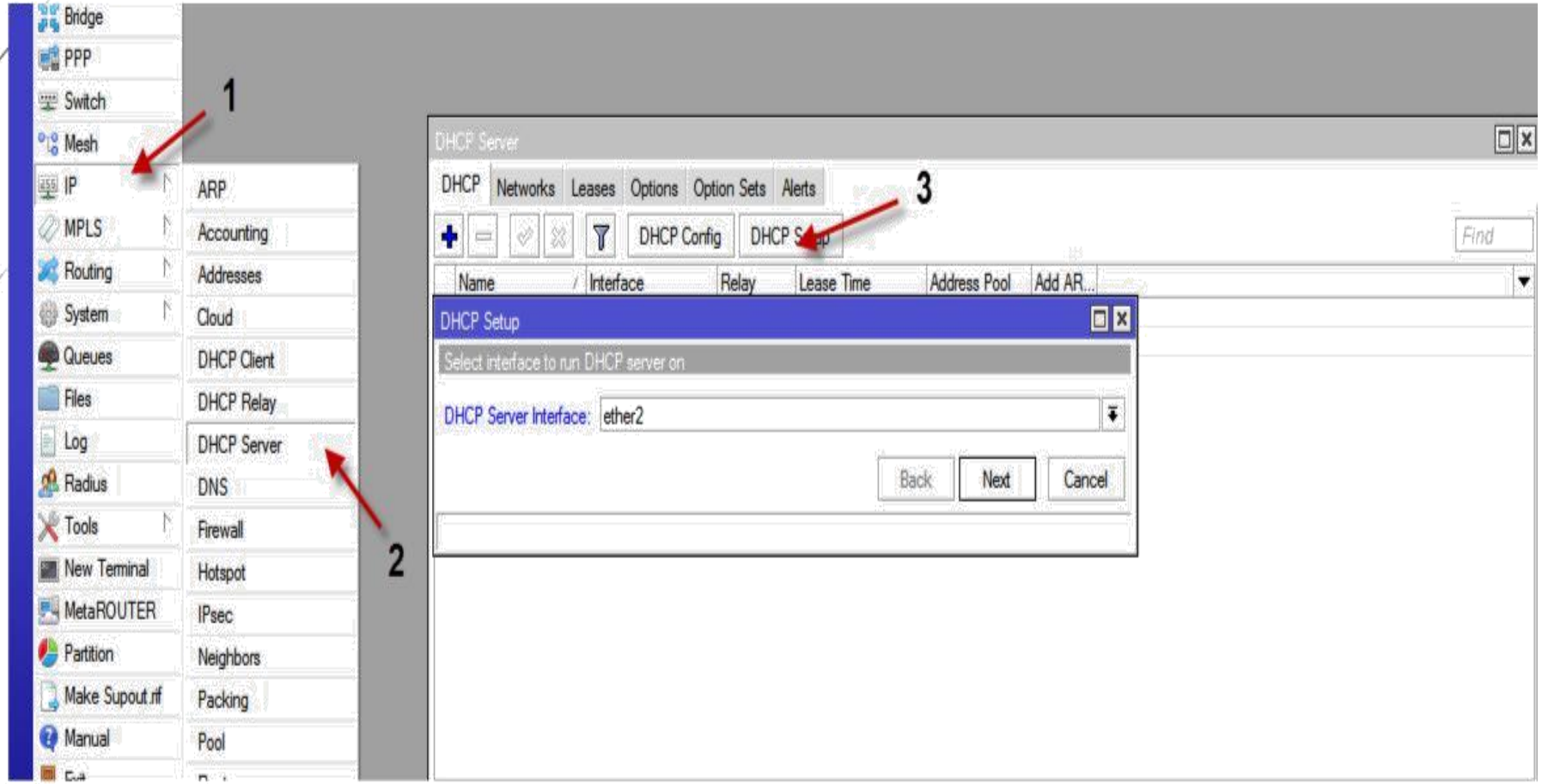
Make a Static Lease

If we want to make a Static Lease for every PC's of our Network then we will do the followings:



Note The Benefits of making Static Lease are: i) Client PC's need not to set IP Address, ii) Every time PC's will get the same IP's so that you can apply ACL, Filter Rules, Bandwidth Shaping or any other Rules over that IP's.

DHCP Server Configurations (Short cut)



PPTP Server Configurations

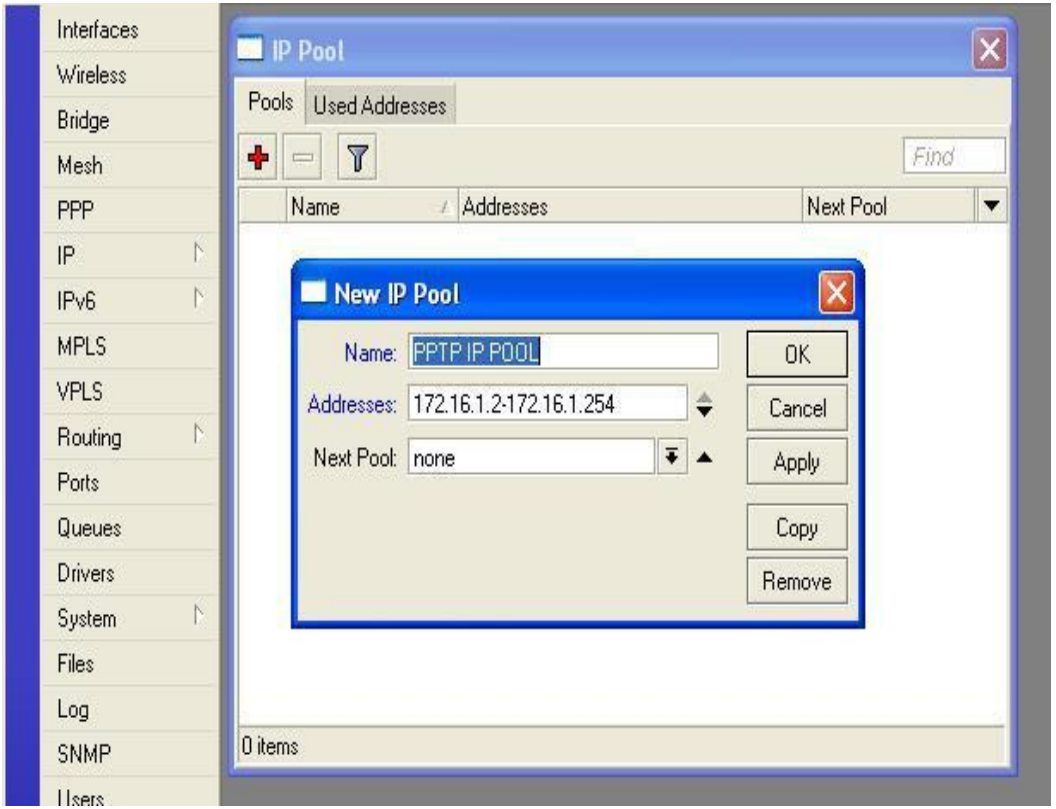
In this article i will be setting up a Point-to-Point Tunnelling Protocol (PPTP) Server

After completed basic configuration

Steaps:

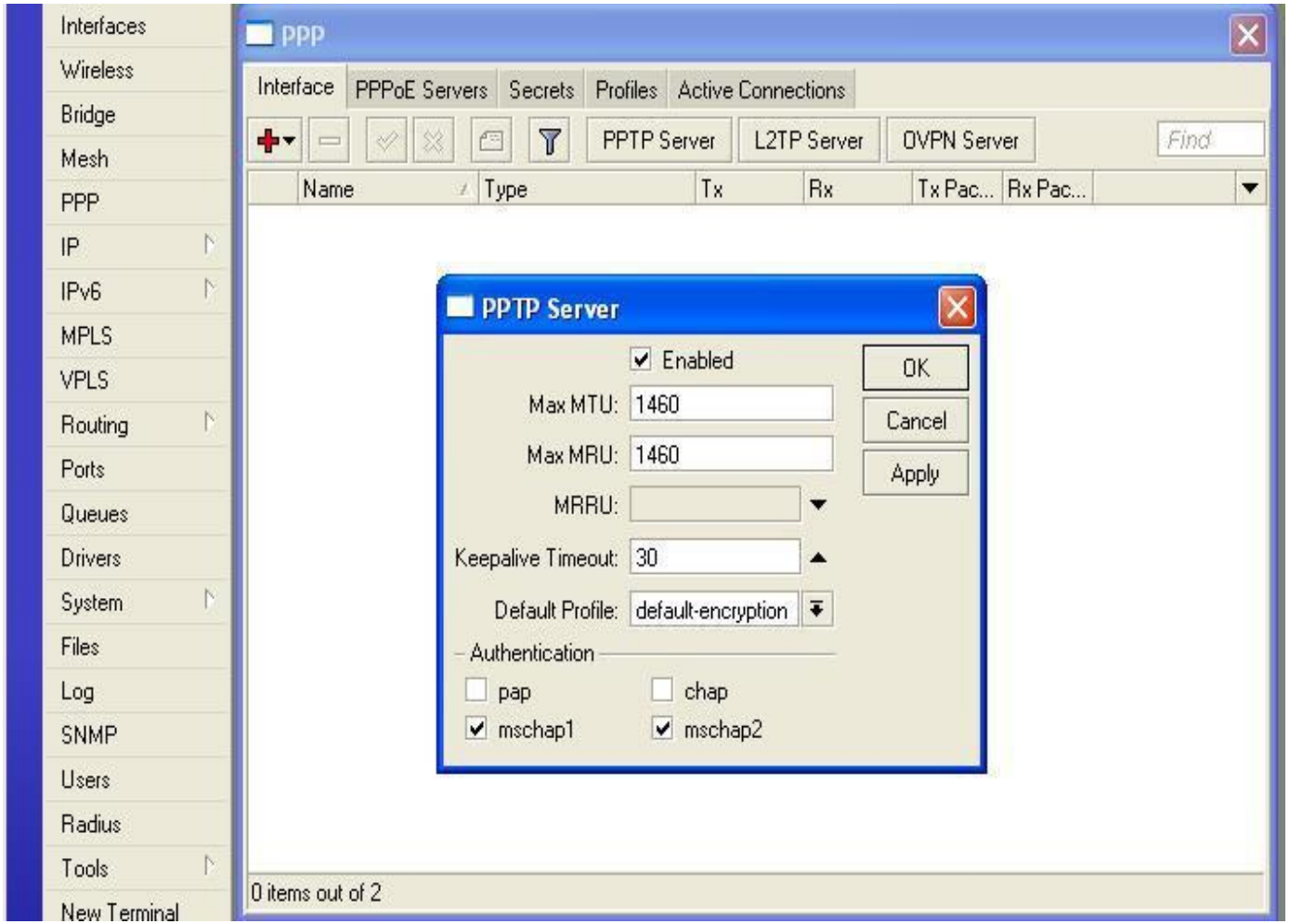
- Pool
- PPTP Server Enable
- Profiles
- Secrets

Now go to IP > Pool. Press the PLUS sign in RED, then create a IP Address Pool that will be used by the PPTP to give out IP and Press OK.



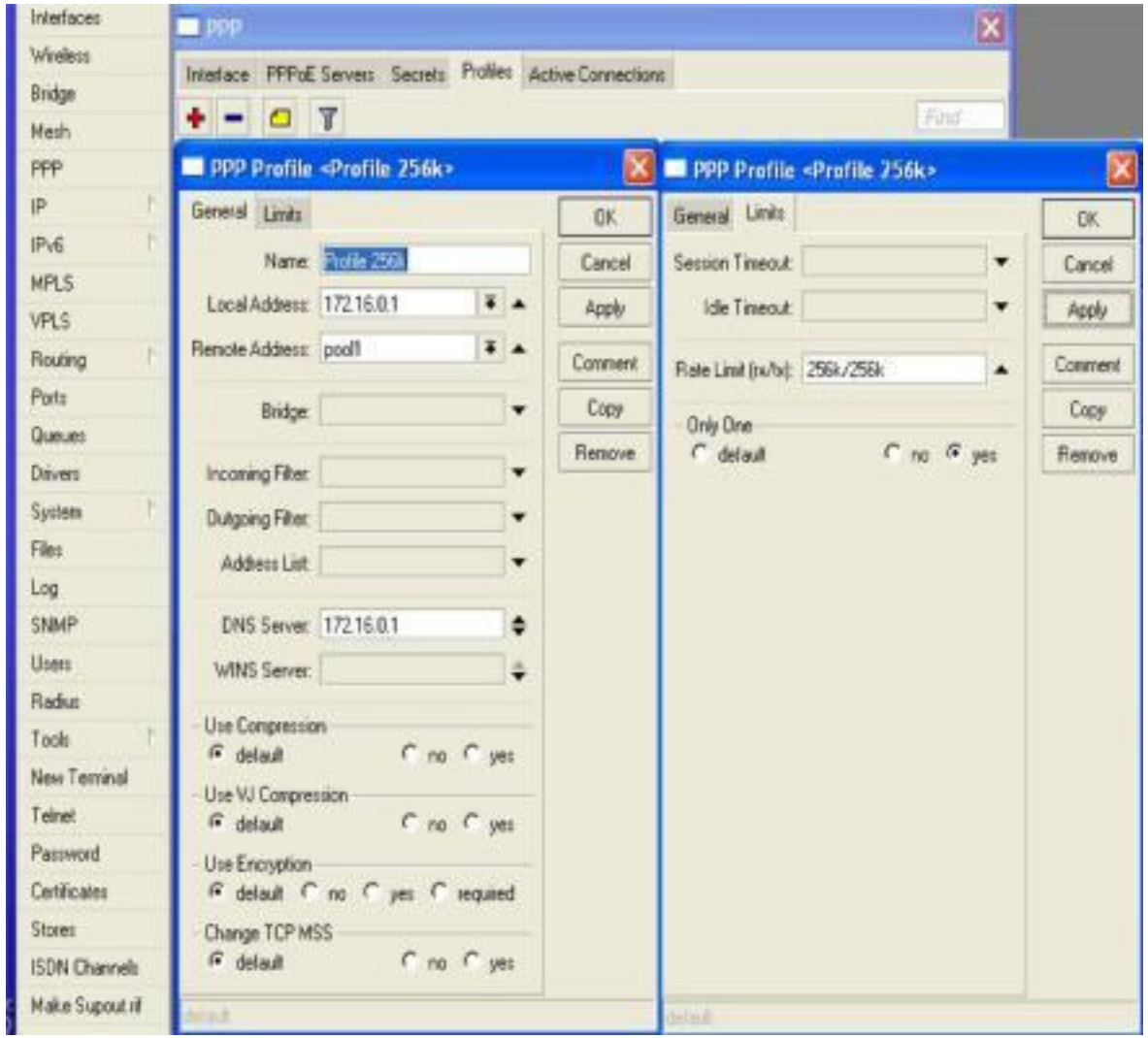
PPTP Server Enable

Now we will create a PPTP Server. Go to PPP then press PPTP Server, a new small window will popup, and select Enabled and just press OK.



Profiles

Now we will create a profile that will be used by different users. Go to the main PPP window, go to Profiles tab, here you will see two profiles by default, don't do any thing to these default profiles, create a new profile by pressing the PLUS sign. Local Address is the address of the server (here it is 172.16.0.1). In Remote Address box press the down arrow button you will see the name of the pool that we created in the first step, select it. In the DNS Server, enter the IP of your SERVER. Then go to Limits tab in the same window, now here we have to setup the bandwidth rate at which the users using this profile will be restricted at. Here set the Rate Limit (tx/rx) to what ever you like (i am setting it to 256k up/down). Then press APPLY and OK.



Secrets

Now we will create users.

Our PPTP Server Setup is complete.

How to Configure PPTP Dialler in Windows:

For Win-7 : https://www.home-network-help.com/windows-7-pptp-vpn.html

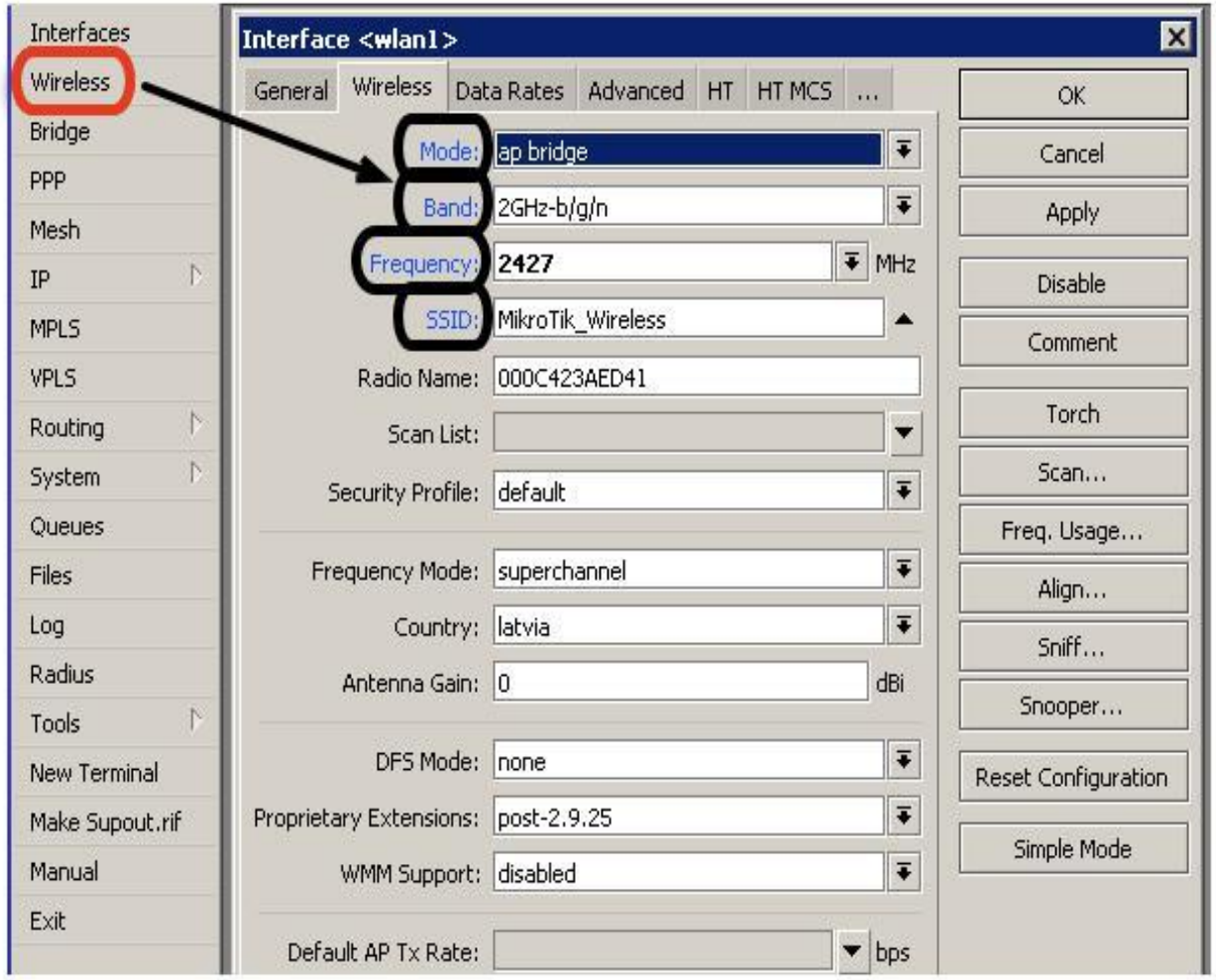
For Win-10 https://www.ibvpn.com/billing/knowledgebase/267/Set-up-the-PPTPon-Windows-10.html

Mikrotik Wireless/Access Point Configuration

- **Before this Configuration. Router has must a DHCP server configuration on Wireless interface or under on a DHCP distributed Bridge.**

- Setup **Wireless** interface, necessary configuration options are **mode**=ap-bridge **band**=ap_operated_band **frequency**=ap_operated_frequency **ssid**=network_identification

  - These settings are enough to establish wireless connection.

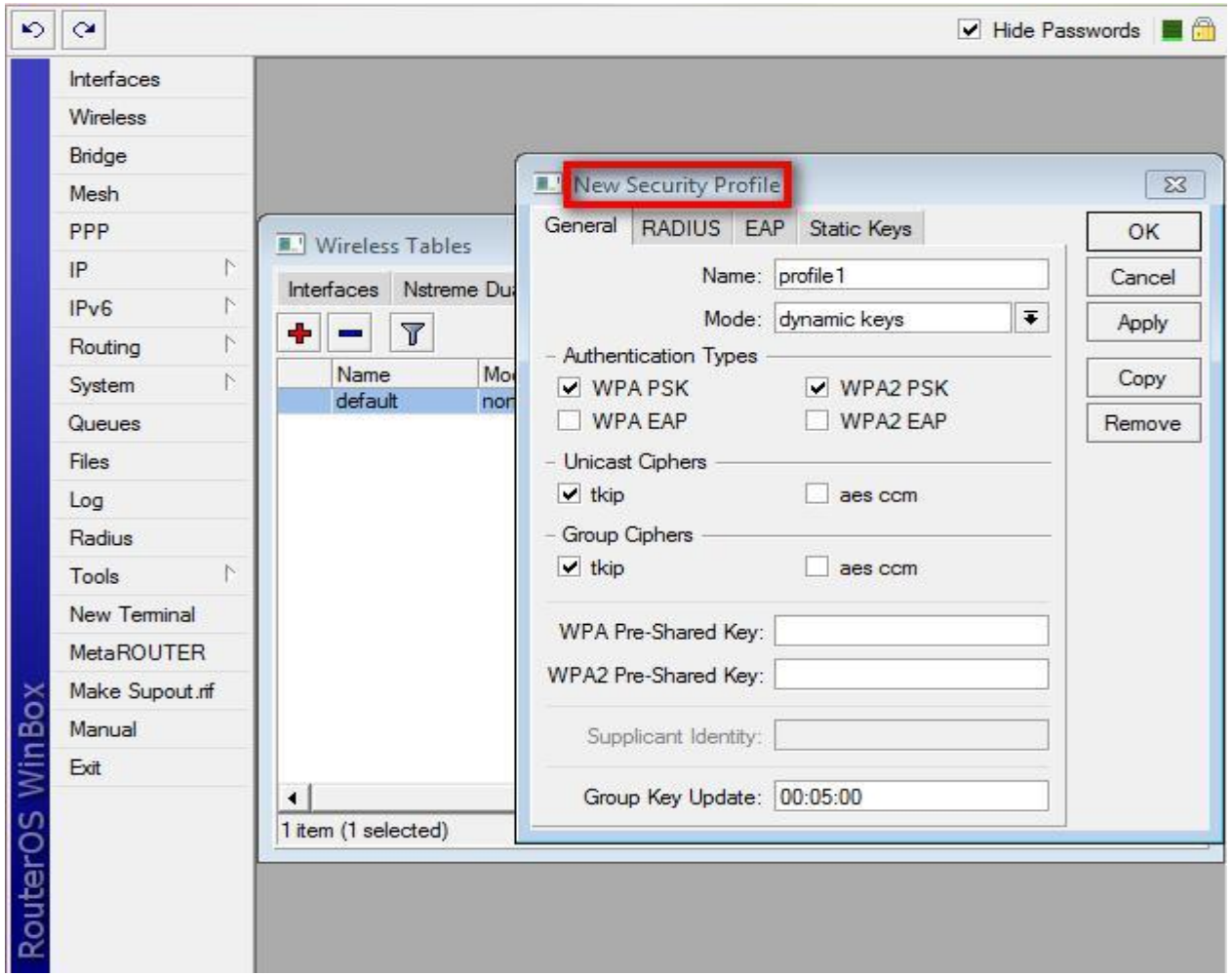


Security Profiles

You probably want your AP to be secure, so you need to configure WPA2 security. Close the wireless setting window with OK if you are done, and move to the **Security Profiles** tab of the *Wireless interface window*.

Give tik(✓) Mark on Authentication Types which you want to active.

Then Give the password on
WPA Pre-Shared key: ****
WPA2 Pre-Shared key: ****



Bandwidth Management

- Now the most common thread is Bandwidth Control. We can create Bandwidth Policy against each and every IP's of our LAN. The Policy will active while traversing Traffic from LAN across the WAN.
- In **MikroTik**, we can manage Bandwidth by two (02) methods:
  - Simple Queues
  - PCQ (Per Connection Queue)

Simple Queues

- **Queues are used to limit and prioritize Traffic:**
  - ✓ Limit data rate for certain IP Addresses, Subnets, Protocols, Ports, and other parameters.
  - ✓ Limit peer-to-peer traffic.
  - ✓ Prioritize some packet flows over others.
  - ✓ Configure traffic bursts for faster web browsing.
  - ✓ Apply different limits based on time.
  - ✓ Share available traffic among users equally, or depending on the load of the channel.

How To ???

- **HTB Properties**
- ✓ Parent Queues
- ✓ Child Queues

Stpe:1

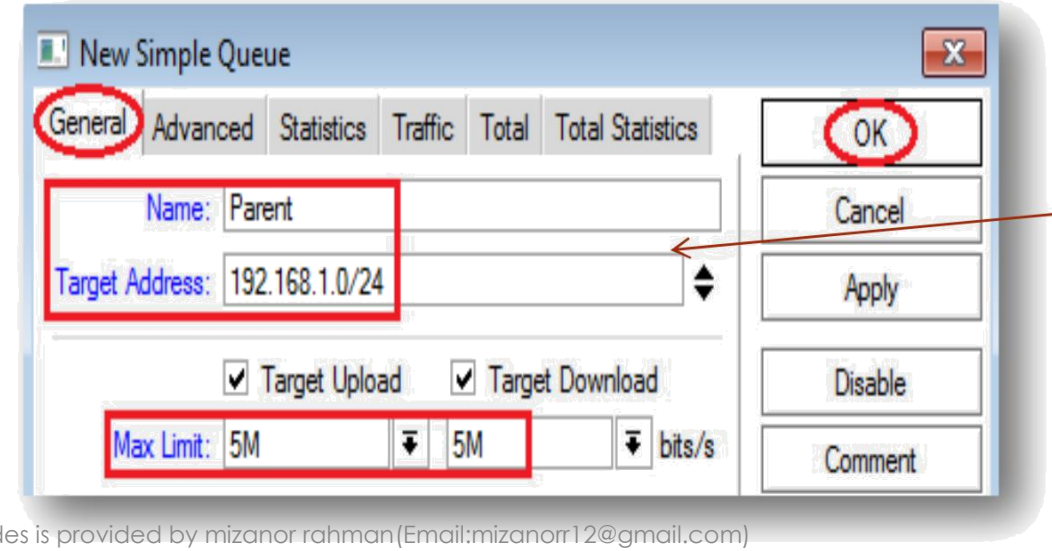
Firstly we will create a Parent Queues then assign our Full subscribed Bandwidth on that Queues.

Step:2

Then we will create Child Queues whose Bandwidth will be controlled by Parent Queues.

Parent Queues

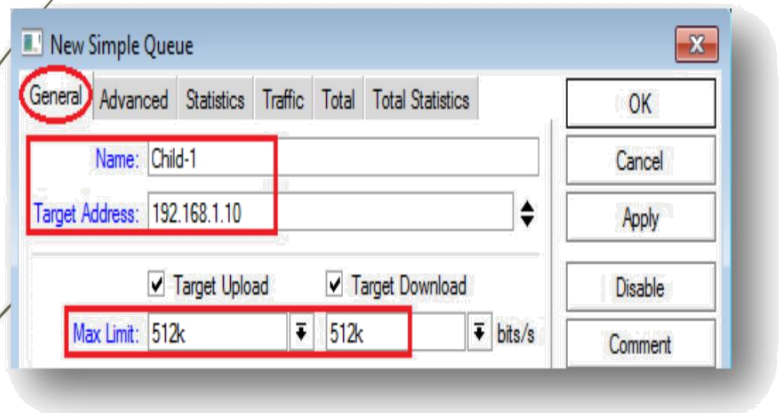
Procedure: **Queues → Simple Queues** 

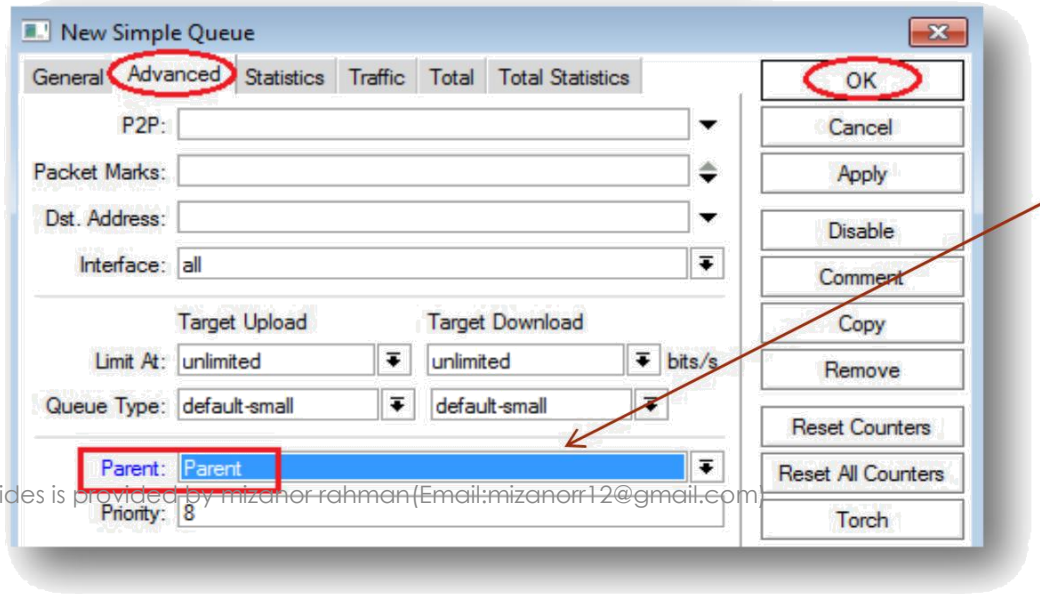


Target Address should be "**192.168.1.0/24**" so that all individual IP's are belongs to it.

Child Queues

Procedure: **Queues → Simple Queues** 



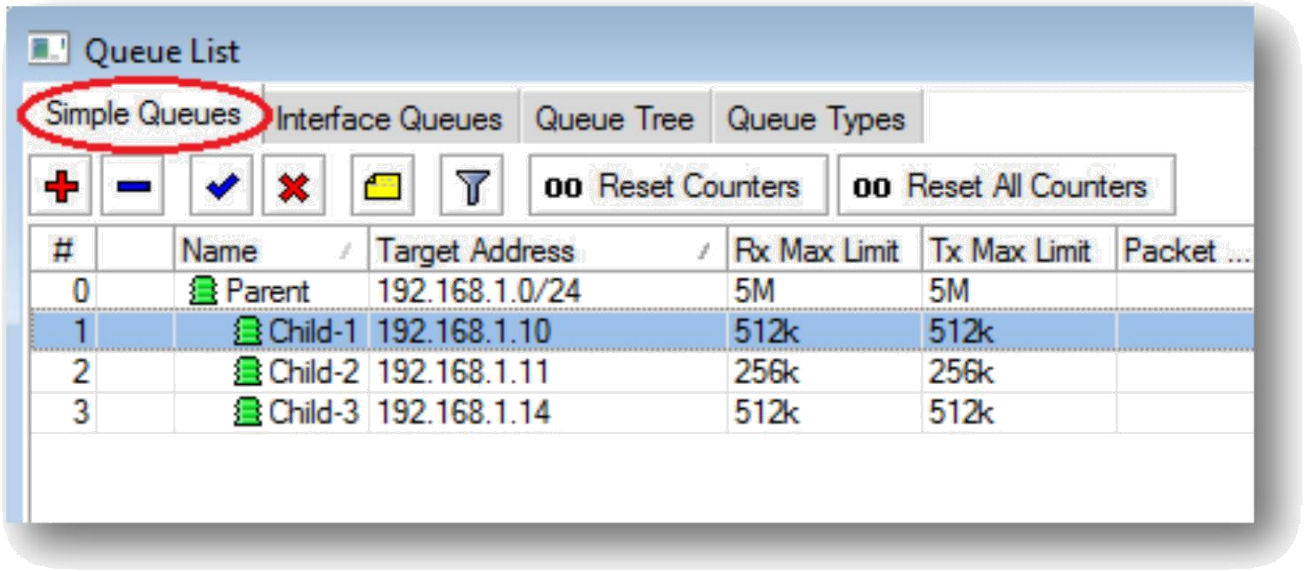


For Child Queues, we'll assign B/W for individual IP then include that Queues under **Parent Queues.**

Note: parent has no parent because he is parent itself

Queues List View

- This is the standard view of Queues configured based on HTB Properties.

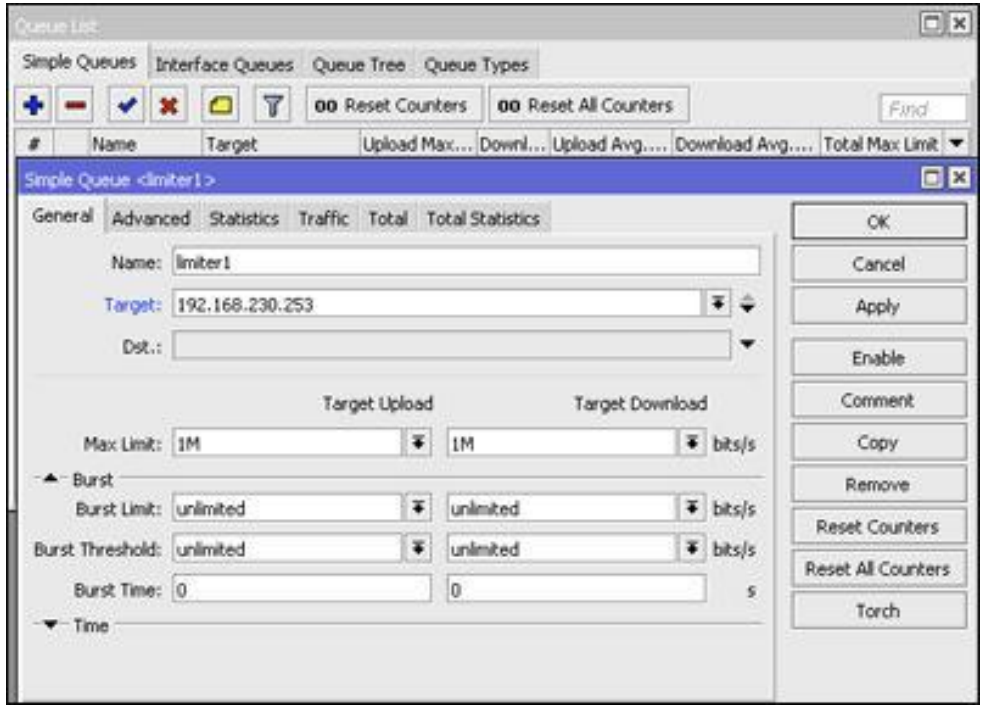


Simple Queues (Cont.)

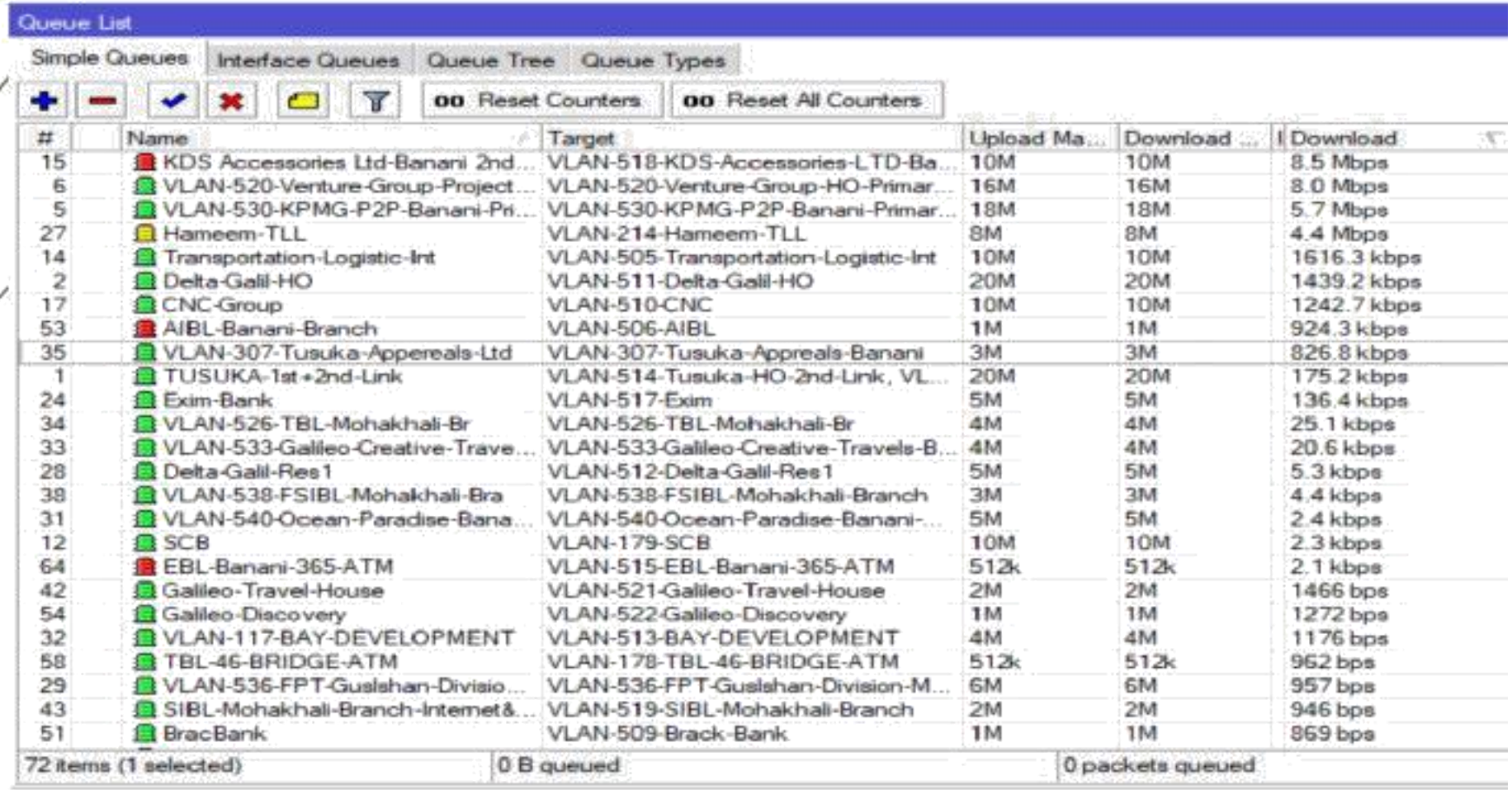
Actually now a days simple queues is more popular then HTP properties. We create only simple queues for single clients.

We can create simple queues in different ways:

- Target Address (single IP or IP Block)
- Target Interface or Bridge
- Destination IP Address
- Destination Interfaces



Simple Queues (Cont.) Properties



#	Name	Target	Upload Ma...	Download ...	Download
15	KDS Accessories Ltd-Banani 2nd...	VLAN-518-KDS-Accessories-LTD-Ba...	10M	10M	8.5 Mbps
6	VLAN-520-Venture-Group-Project...	VLAN-520-Venture-Group-HO-Primar...	16M	16M	8.0 Mbps
5	VLAN-530-KPMG-P2P-Banani-Pri...	VLAN-530-KPMG-P2P-Banani-Primar...	18M	18M	5.7 Mbps
27	Hameem-TLL	VLAN-214-Hameem-TLL	8M	8M	4.4 Mbps
14	Transportation-Logistic-Int	VLAN-505-Transportation-Logistic-Int	10M	10M	1616.3 kbps
2	Delta-Galil-HO	VLAN-511-Delta-Galil-HO	20M	20M	1439.2 kbps
17	CNC-Group	VLAN-510-CNC	10M	10M	1242.7 kbps
53	AIBL-Banani-Branch	VLAN-506-AIBL	1M	1M	924.3 kbps
35	VLAN-307-Tusuka-Appereals-Ltd	VLAN-307-Tusuka-Appreals-Banani	3M	3M	826.8 kbps
1	TUSUKA-1st+2nd-Link	VLAN-514-Tusuka-HO-2nd-Link, VL...	20M	20M	175.2 kbps
24	Exim-Bank	VLAN-517-Exim	5M	5M	136.4 kbps
34	VLAN-526-TBL-Mohakhali-Br	VLAN-526-TBL-Mohakhali-Br	4M	4M	25.1 kbps
33	VLAN-533-Galileo-Creative-Trave...	VLAN-533-Galileo-Creative-Travels-B...	4M	4M	20.6 kbps
28	Delta-Galil-Res1	VLAN-512-Delta-Galil-Res1	5M	5M	5.3 kbps
38	VLAN-538-FSIBL-Mohakhali-Bra	VLAN-538-FSIBL-Mohakhali-Branch	3M	3M	4.4 kbps
31	VLAN-540-Ocean-Paradise-Bana...	VLAN-540-Ocean-Paradise-Banani-...	5M	5M	2.4 kbps
12	SCB	VLAN-179-SCB	10M	10M	2.3 kbps
64	EBL-Banani-365-ATM	VLAN-515-EBL-Banani-365-ATM	512k	512k	2.1 kbps
42	Galileo-Travel-House	VLAN-521-Galileo-Travel-House	2M	2M	1466 bps
54	Galileo-Discovery	VLAN-522-Galileo-Discovery	1M	1M	1272 bps
32	VLAN-117-BAY-DEVELOPMENT	VLAN-513-BAY-DEVELOPMENT	4M	4M	1176 bps
58	TBL-46-BRIDGE-ATM	VLAN-178-TBL-46-BRIDGE-ATM	512k	512k	962 bps
29	VLAN-536-FPT-Guslshan-Divisio...	VLAN-536-FPT-Guslshan-Division-M...	6M	6M	957 bps
43	SIBL-Mohakhali-Branch-Internet&...	VLAN-519-SIBL-Mohakhali-Branch	2M	2M	946 bps
51	BracBank	VLAN-509-Brack-Bank	1M	1M	869 bps

72 items (1 selected) | 0 B queued | 0 packets queued

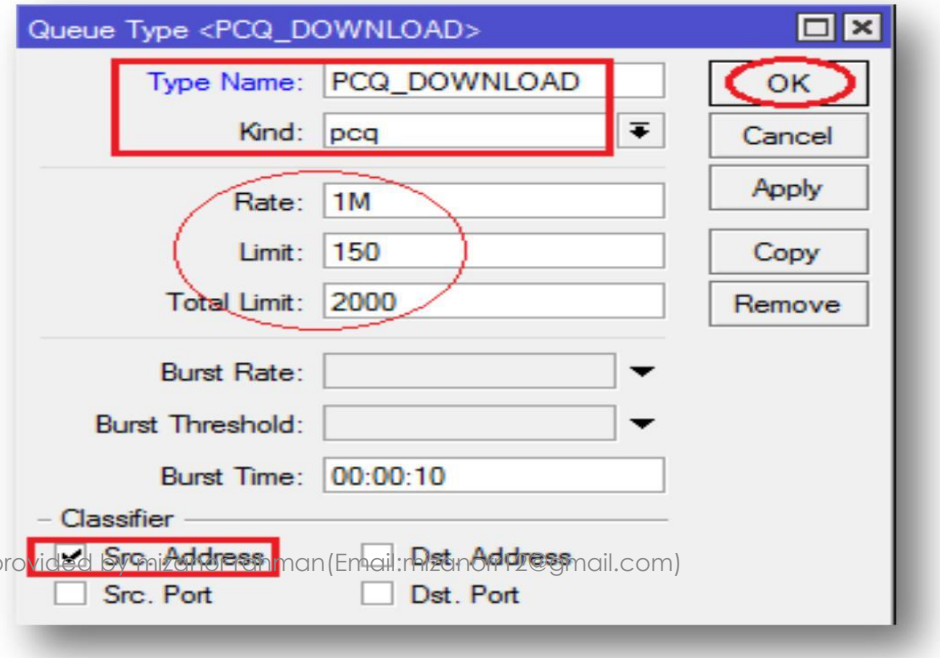
PCQ

- Per Connection Queue **(PCQ)** is a queuing discipline that can be used to dynamically equalize or shape traffic for multiple users, using little administration.
- It is possible to divide **PCQ** scenarios into three major groups: equal bandwidth for a number of users, certain bandwidth equal distribution between users, unknown bandwidth equal distribution between users.

How To ???

- **Queue Types**
  - ✓ PCQ UPLOAD
  - ✓ PCQ DOWNLOAD
- **PCQ UPLOAD**

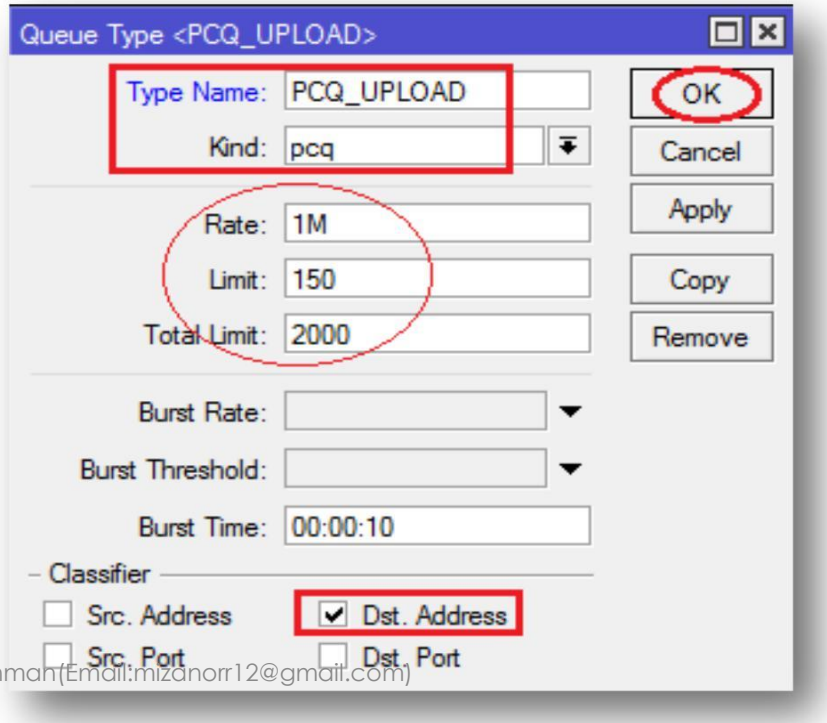
Procedure: **Queue → Queue Types** 



Queue Types (Cont.)

- **PCQ DOWNLOAD**

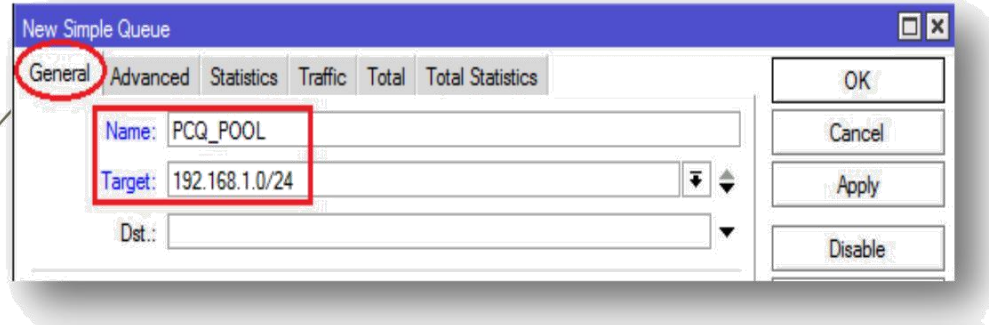
Procedure: **Queue → Queue Types** 

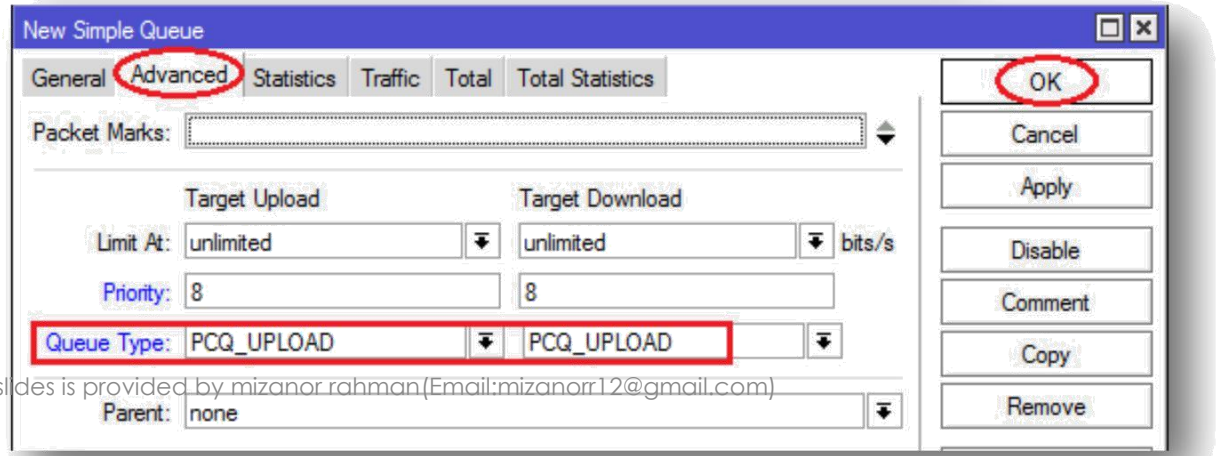


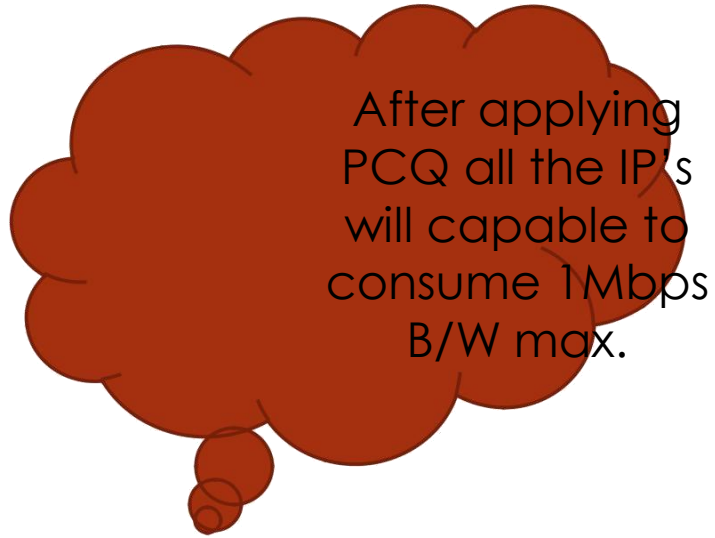
Simple Queues

- Now we've to introduce Queue Types with Simple Queues so that it can be handle Traffic.

Procedure: **Queue → Queue Types** 







References

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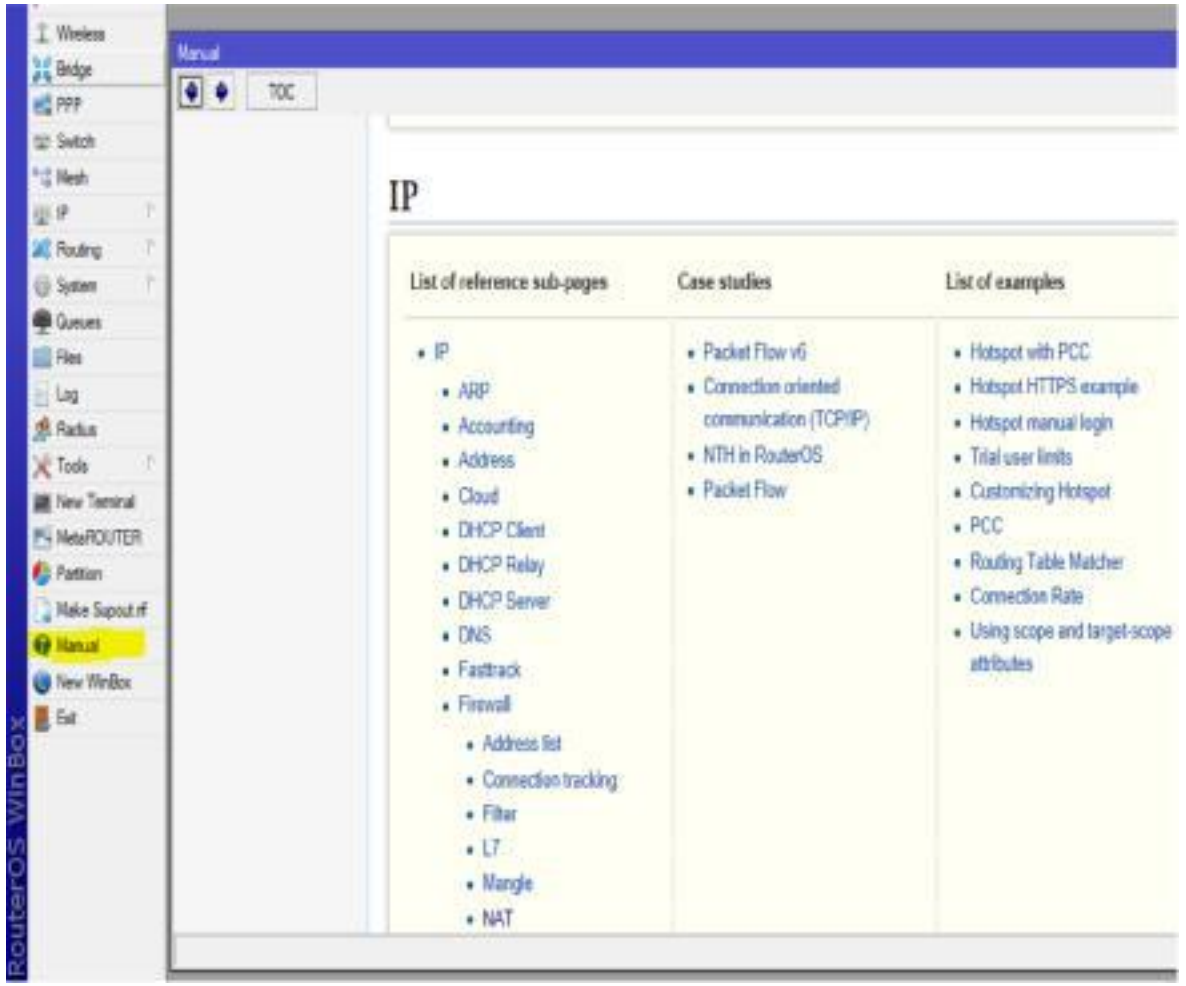


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&
A