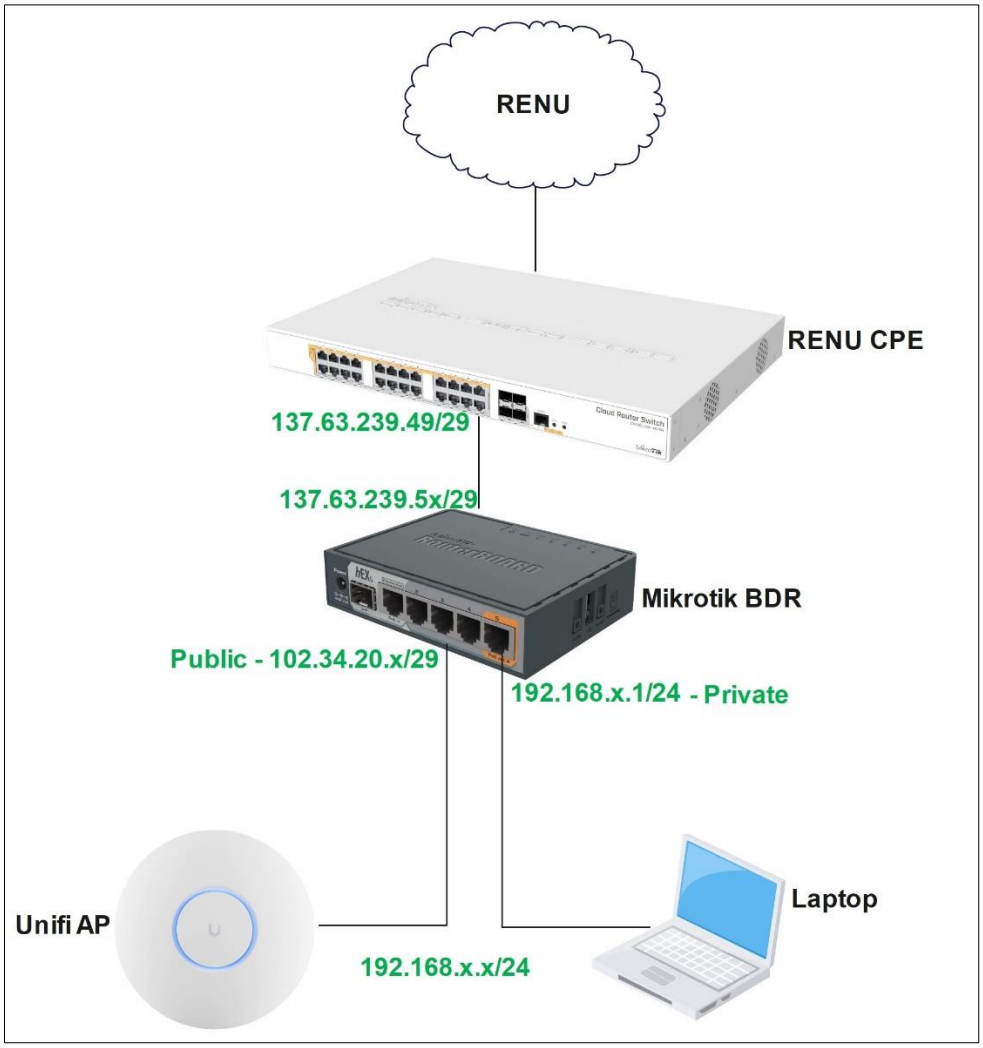
Lab Topology



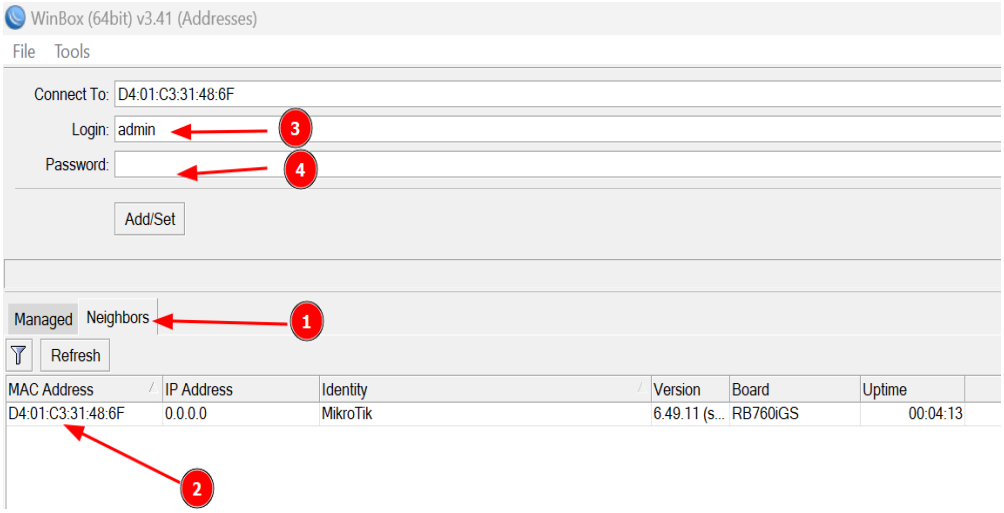
Step 1

Connect ether1 of the Mikrotik hEX BDR to a free port of the RENU CPE.

Download winbox application from the Mikrotik Website on link below

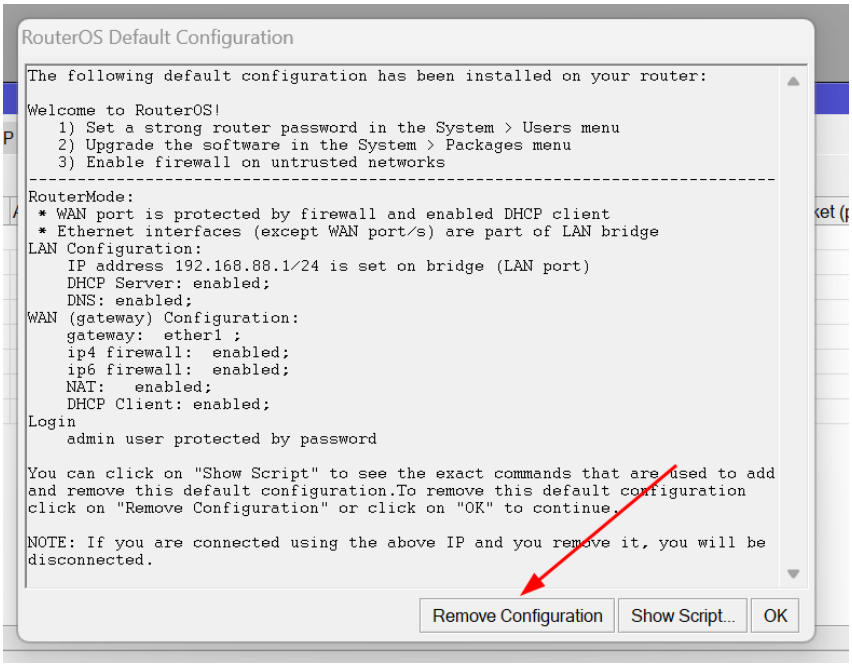
https://mikrotik.com/download

Connect your PC to the Mikrotik BDR and open the Winbox app



Login to the Mikrotik BDR with the password at the back of the router

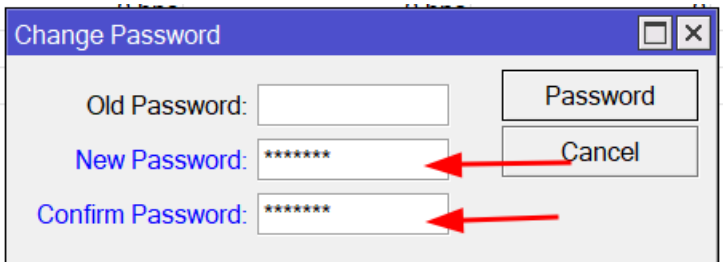
Remove the default configuration upon login



Step 2

Configure the login password for the router, in the formart Group@X; where X is group number

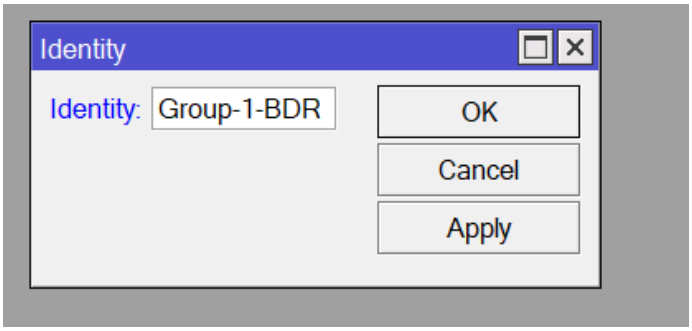
System>Password



Step 3

Change the system name for the router to Group-X-BDR; where X is group-number

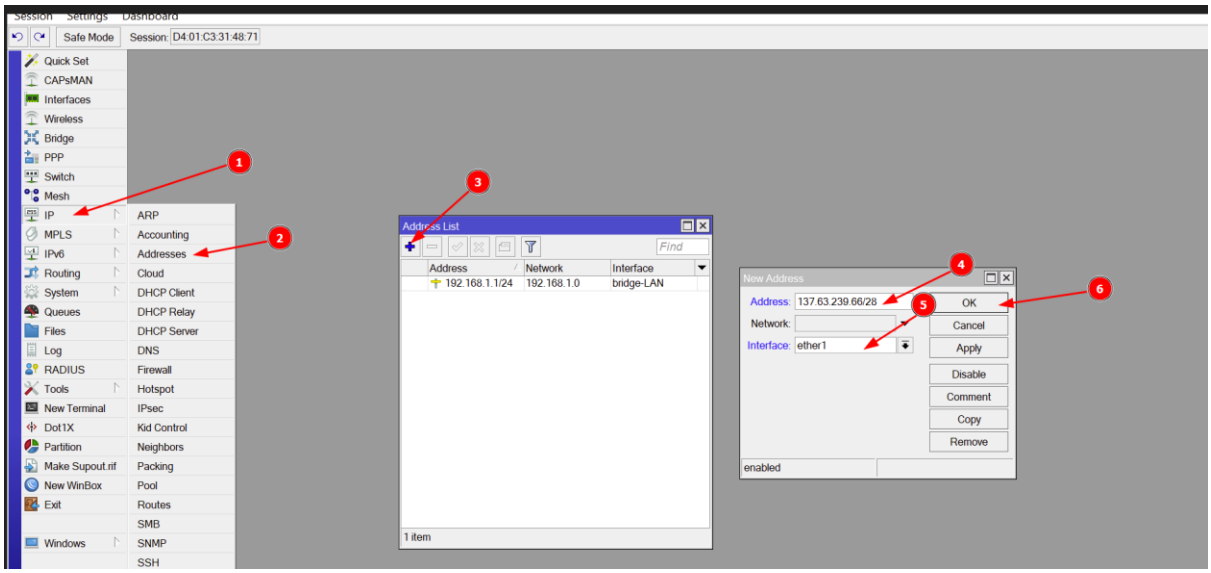
System>Identity



P2P Communication with the ISP Provider

Step 4

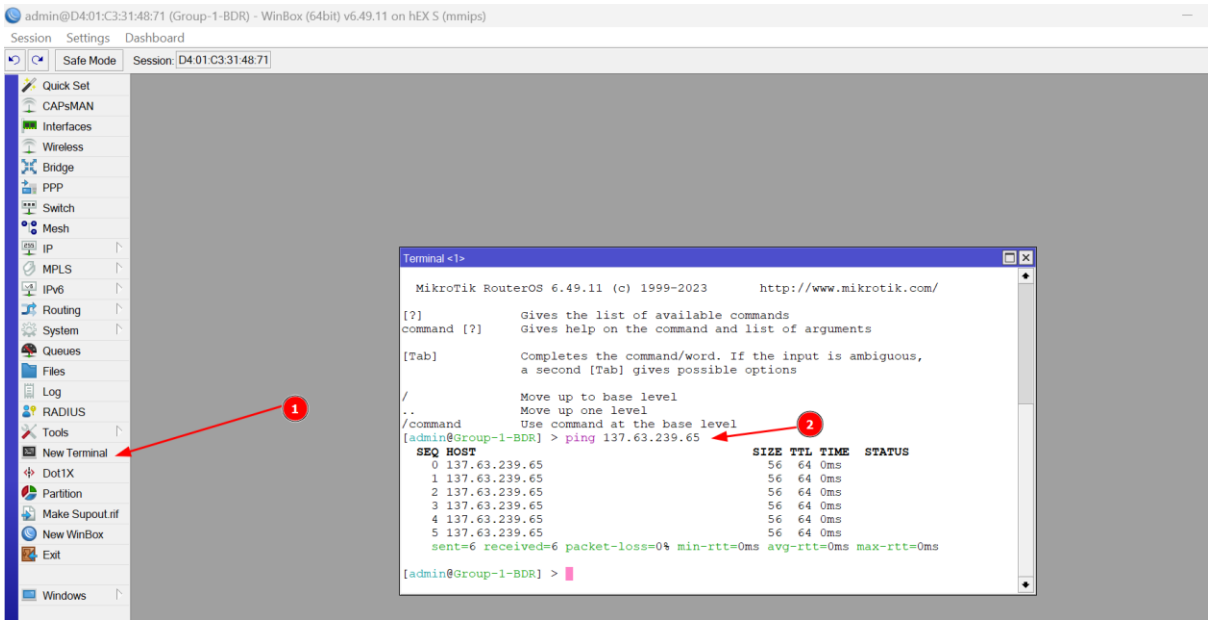
Configure a P2P IP on ether1 to the ISP CPE in the form **137.63.239.6x/28** as shown below



Verify that you can "Ping" the CPE

Open the Terminal of the Mikrotik Router and ping the IP of the CPE (**137.63.239.65**)

ping 137.63.239.65



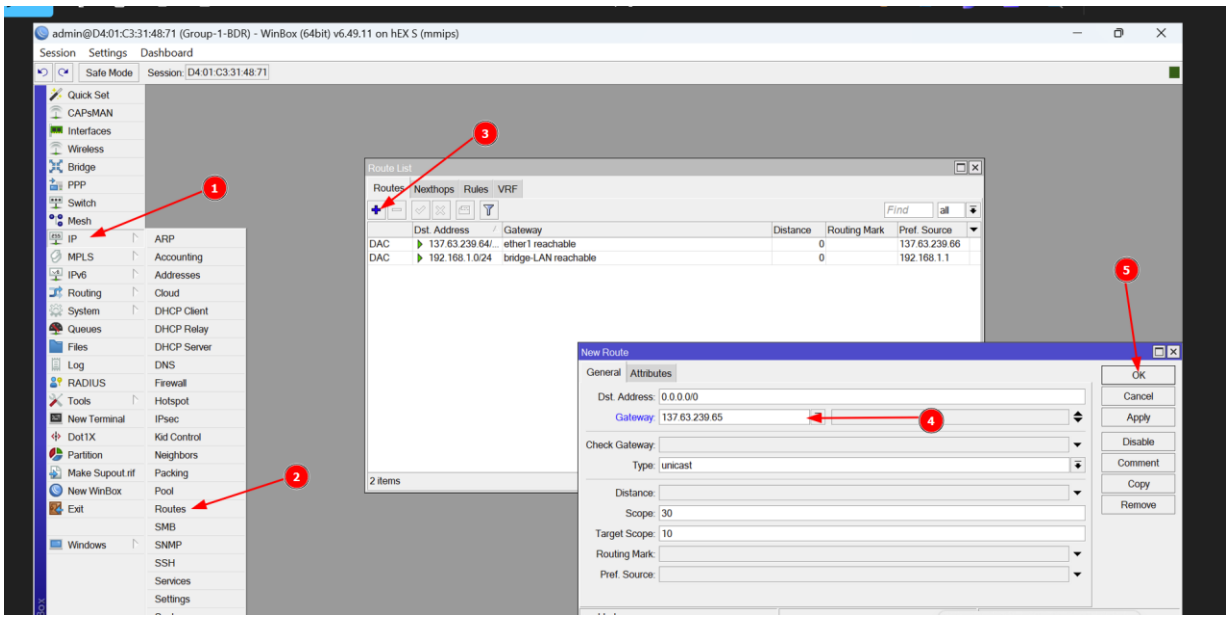
ping 1.1.1.1

```
[admin@Group-1-BDR] > ping 1.1.1.1
  SEQ HOST                                     SIZE TTL TIME  STATUS
    0                                                       no route to host
    1                                                       no route to host
    sent=2 received=0 packet-loss=100%
```

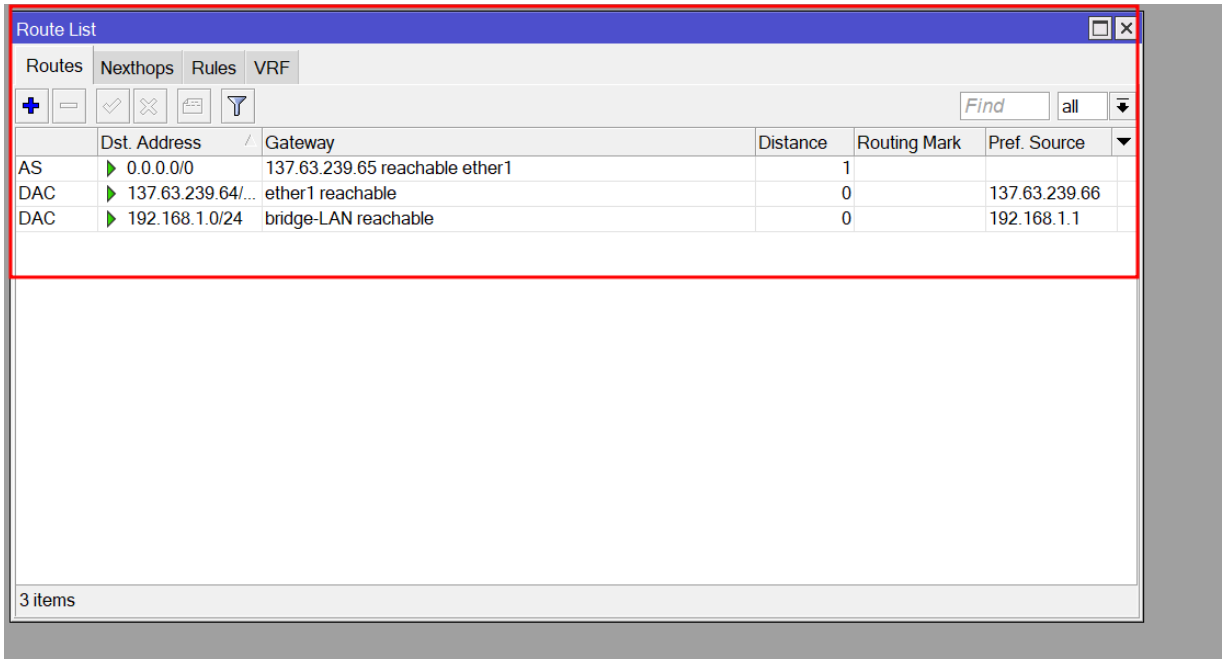
Step 5: Configure Static Routing to your ISP

Configure a **default route** to the IP of the CPE **(137.63.239.65)**

IP>Routes>



Verify that the Route is reachable

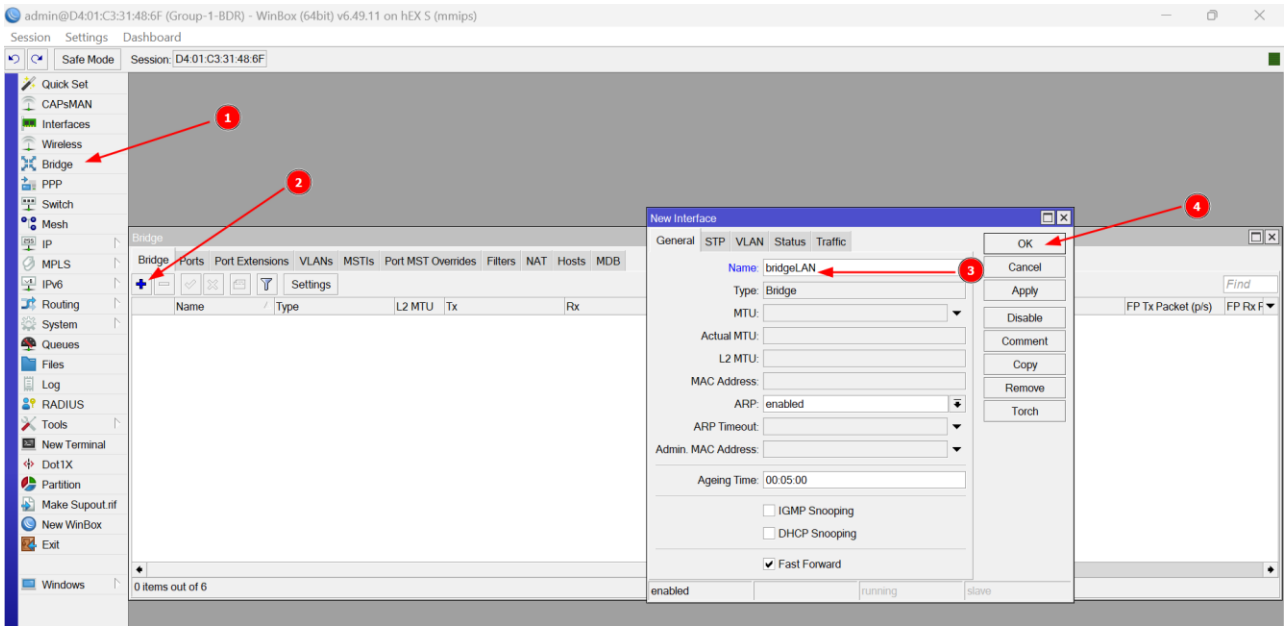


ping 1.1.1.1

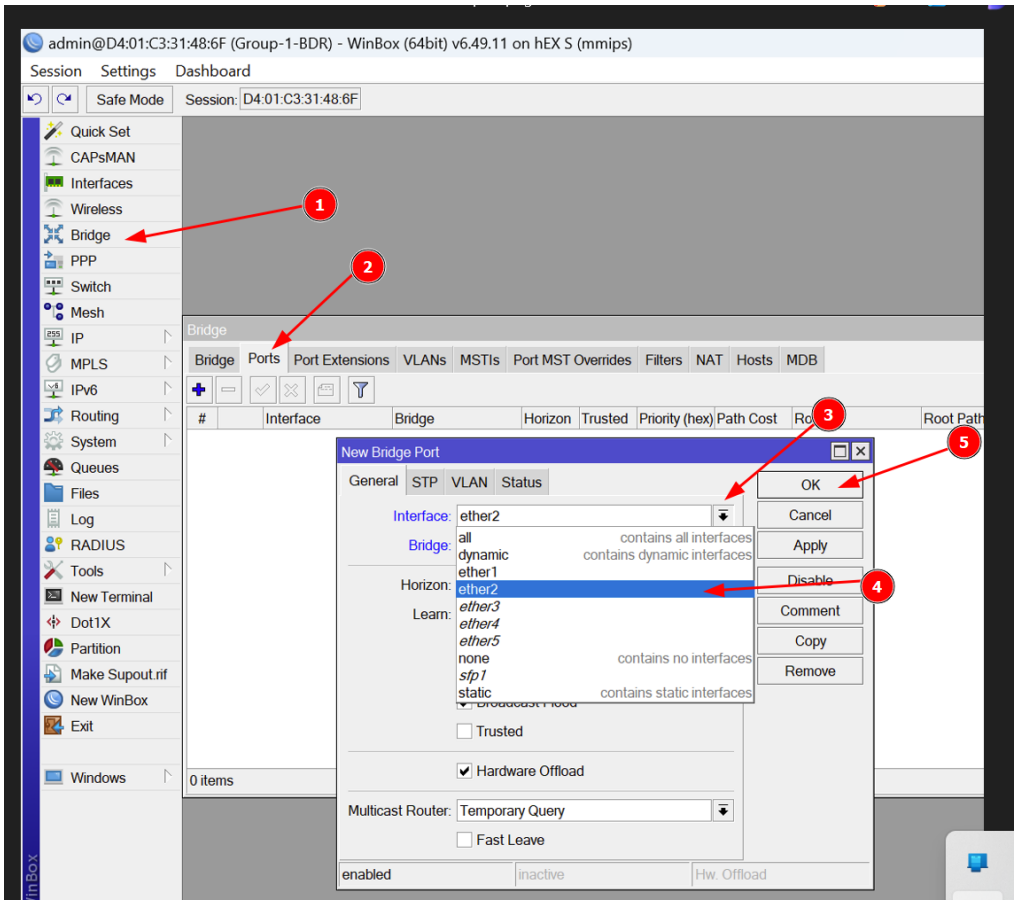
```
 MMM       MMM        KKK                          TTTTTTTTTTT      KKK
 MMMM     MMMM        KKK                          TTTTTTTTTTT      KKK
 MMM MMMM MMM  III   KKK  KKK  RRRRRR     OOOOOO      TTT     III  KKK  KKK
 MMM  MM  MMM  III   KKKKK     RRR  RRR  OOO  OOO     TTT     III  KKKKK
 MMM       MMM  III   KKK KKK   RRRRRR    OOO  OOO     TTT     III  KKK KKK
 MMM       MMM  III   KKK  KKK  RRR  RRR   OOOOOO      TTT     III  KKK  KKK

 MikroTik RouterOS 6.49.11 (c) 1999-2023       http://www.mikrotik.com/

?]             Gives the list of available commands
ommand [?]     Gives help on the command and list of arguments

Tab]           Completes the command/word. If the input is ambiguous,
               a second [Tab] gives possible options

               Move up to base level
.              Move up one level
command        Use command at the base level
admin@Group-1-BDR] > ping 1.1.1.1
 SEQ HOST                                     SIZE TTL TIME  STATUS
   0 1.1.1.1                                    56  52 19ms
   1 1.1.1.1                                    56  52 19ms
   2 1.1.1.1                                    56  52 19ms
   3 1.1.1.1                                    56  52 19ms
   4 1.1.1.1                                    56  52 19ms
```

Step 6: Create a bridge and name it "bridgeLAN" and add the necessary ports

Create a bridge for the LAN



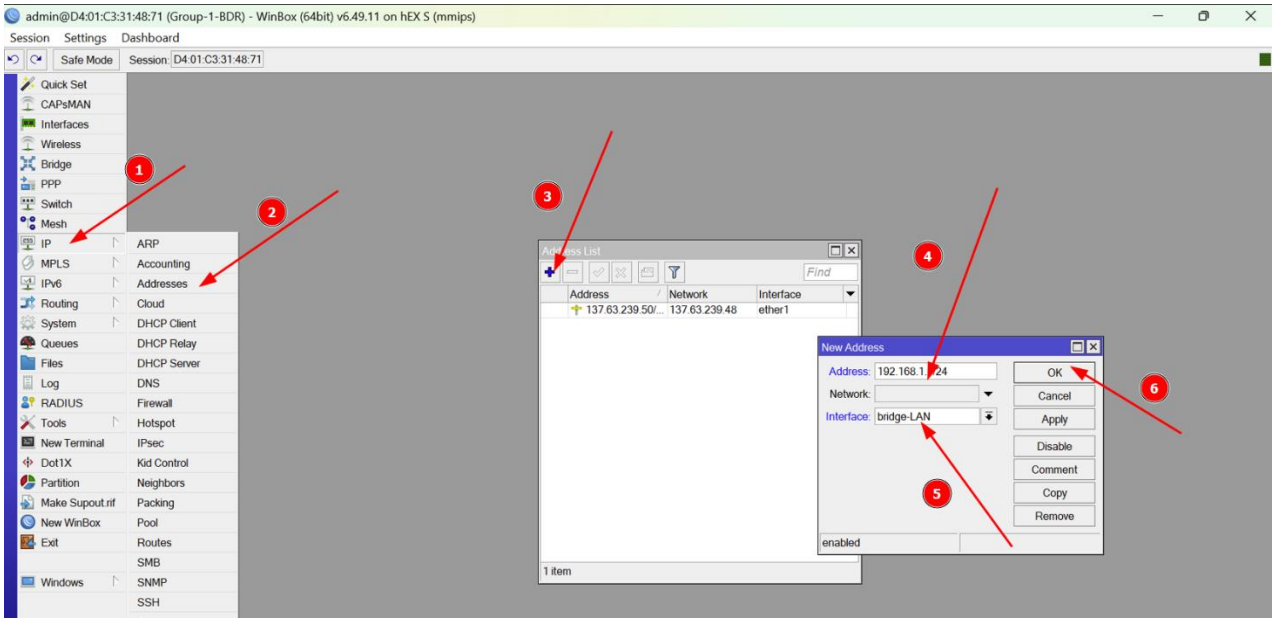
Add four ports to the bridge i.e. ether2, ether3, ether4, ether5



Step 7: Configure the Private IP Subnet for the LAN (192.168.x.0/24)

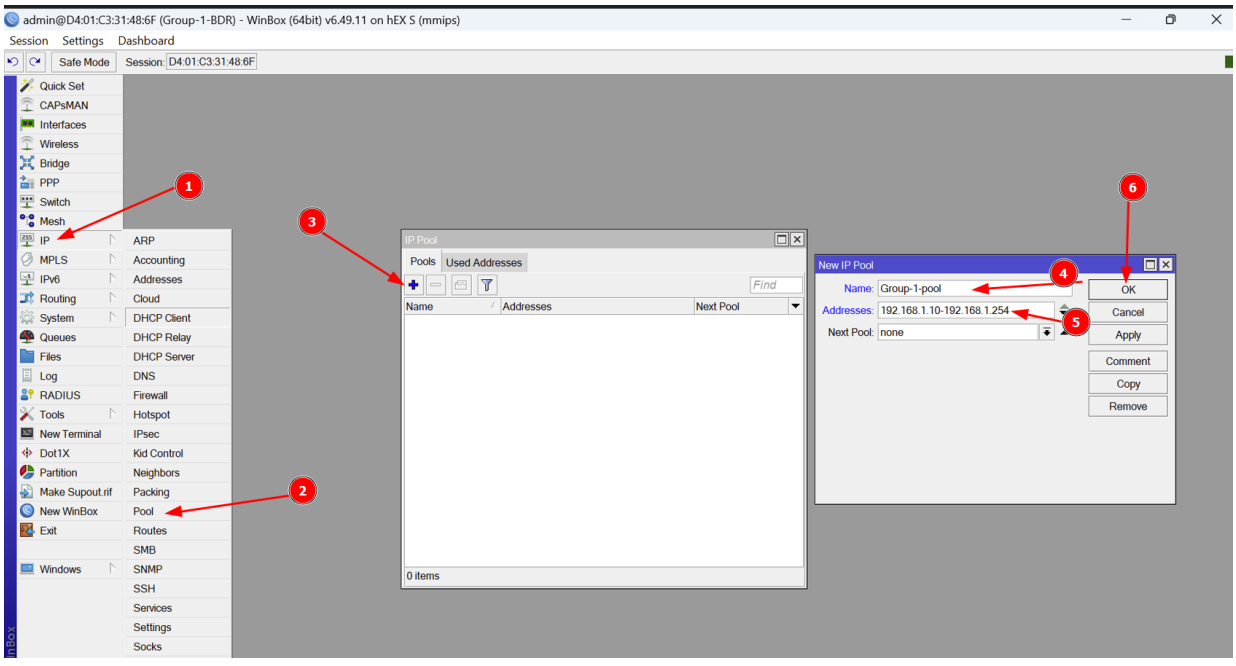
Configure your LAN gateway (192.168.x.1/24) on the bridgeLAN interface.

IP>address>

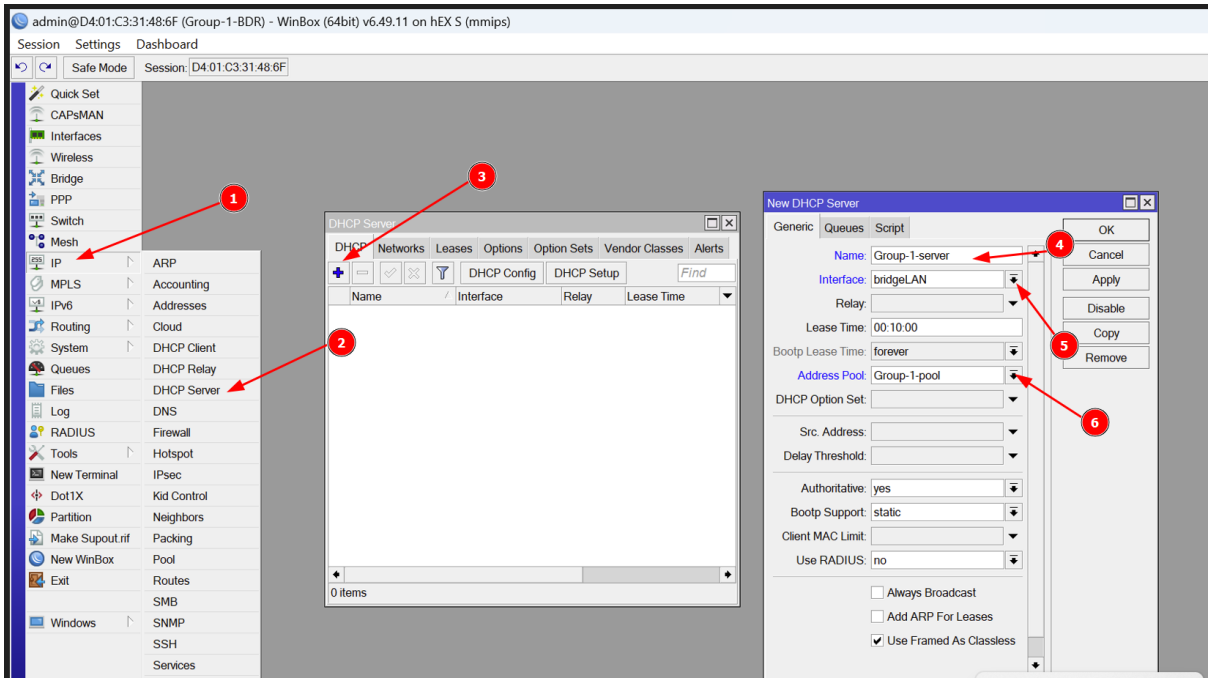


Step 8: Configure DHCP for Dynamic allocation of the Private IPs

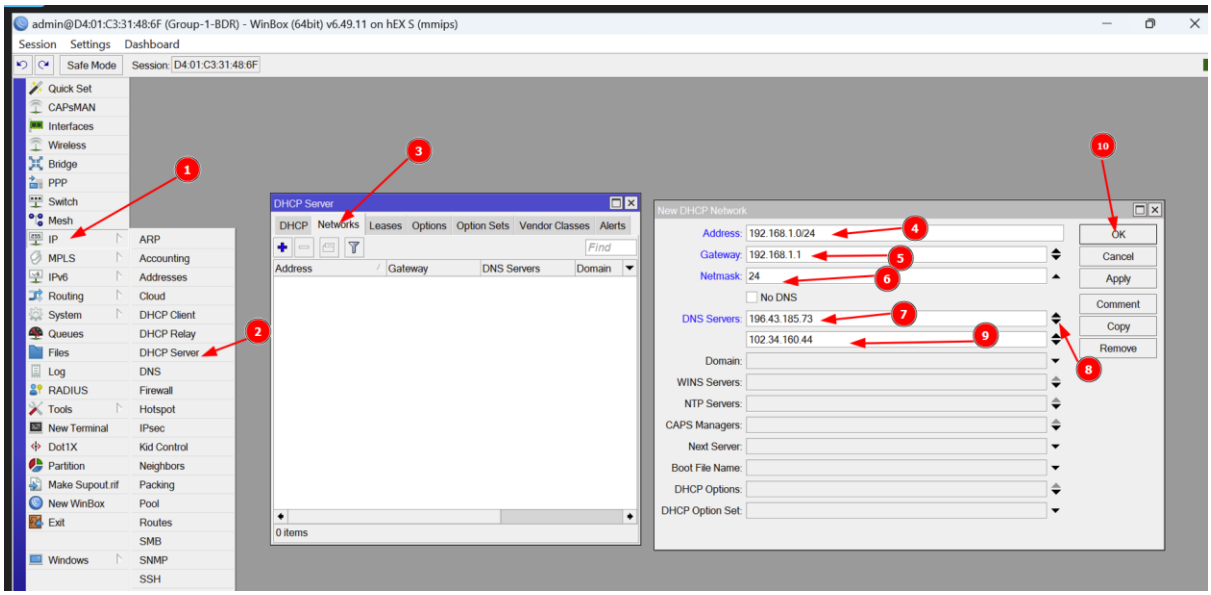
- Create an IP pool and name it Group-x-pool
- Configure the IPs you want given out by DHCP reserving the first 10 IP addresses



- Create a DHCP server and name it **Group-x-server**
- Select the IP pool the server will use it assign IPs and select the bridgeLAN interface for DHCP.



- Configure the Private Network under DHCP (**192.168.x.0/24**), assign it a gateway (**192.168.x.1)** and also configure DNS addresses (**102.34.160.44, 196.43.185.73**)

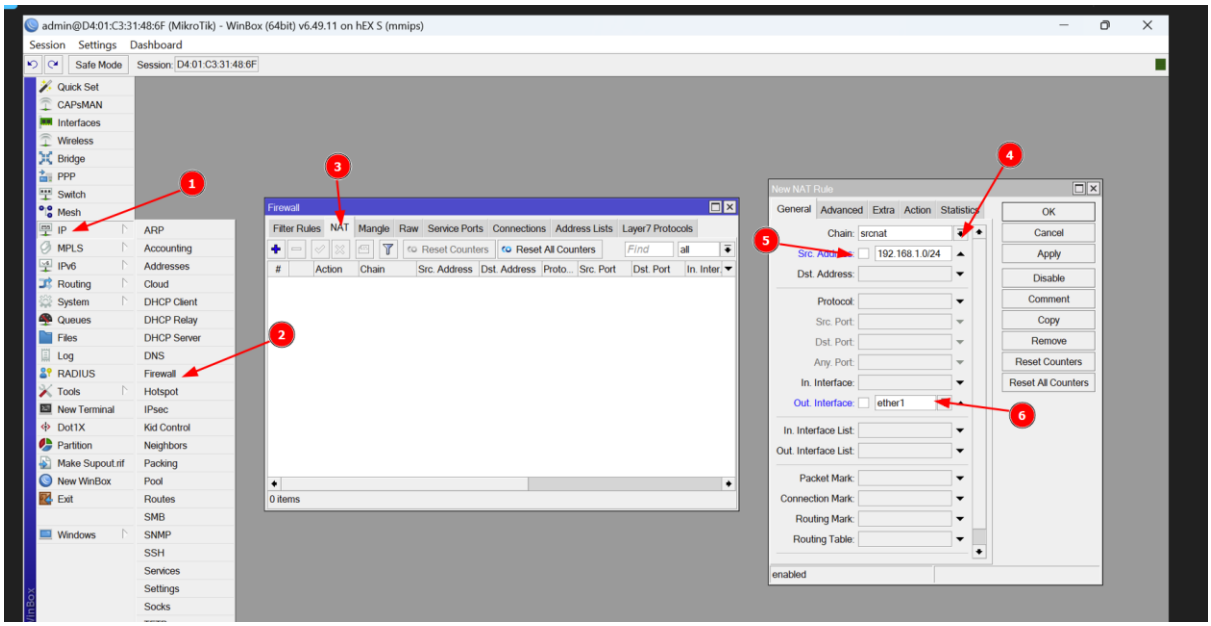


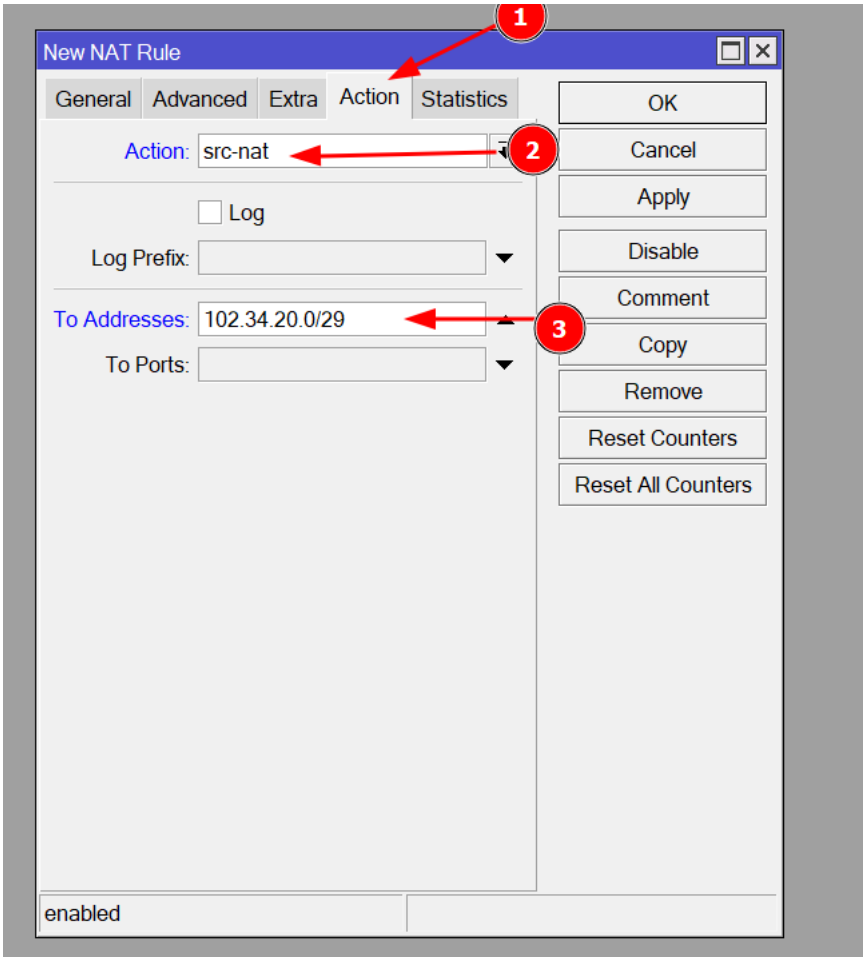
- Confirm that your computer is obtaining IP addresses dynamically according to the DHCP configuration.
- Open the terminal on your computer (**Windows + R**); type (**cmd**) and press enter.
- On the terminal, type **ipconfig /all**

ipconfig /all

```
PS C:\Users\mugam> ipconfig /all

Windows IP Configuration

   Host Name . . . . . . . . . . . . : RENU-NO-MUGAMBE
   Primary Dns Suffix  . . . . . . . :
   Node Type . . . . . . . . . . . . : Hybrid
   IP Routing Enabled. . . . . . . . : No
   WINS Proxy Enabled. . . . . . . . : No
   DNS Suffix Search List. . . . . . : renu.ac.ug
                                       net.renu.ac.ug

Ethernet adapter Ethernet 5:

   Connection-specific DNS Suffix  . : renu.ac.ug
   Description . . . . . . . . . . . : Realtek USB GbE Family Controller
   Physical Address. . . . . . . . . : AC-91-A1-8E-F3-D9
   DHCP Enabled. . . . . . . . . . . : Yes
   Autoconfiguration Enabled . . . . : Yes
   Link-local IPv6 Address . . . . . : fe80::4a3e:abf7:3afe:a12f%8(Preferred)
   IPv4 Address. . . . . . . . . . . : 192.168.1.253(Preferred)
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Lease Obtained. . . . . . . . . . : Wednesday, 30 April 2025 09:41:41
   Lease Expires . . . . . . . . . . : Wednesday, 30 April 2025 17:41:40
   Default Gateway . . . . . . . . . : 192.168.1.1
   DHCP Server . . . . . . . . . . . : 192.168.1.1
   DHCPv6 IAID . . . . . . . . . . . : 934056353
   DHCPv6 Client DUID. . . . . . . . : 00-01-00-01-2F-93-9B-83-F0-D4-15-B2-79-EC
   DNS Servers . . . . . . . . . . . : fe80::4a3e:abf7:3afe:a12f%8
                                       127.7.7.5
   NetBIOS over Tcpip. . . . . . . . : Enabled
   Connection-specific DNS Suffix Search List :
                                       renu.ac.ug
                                       net.renu.ac.ug
```

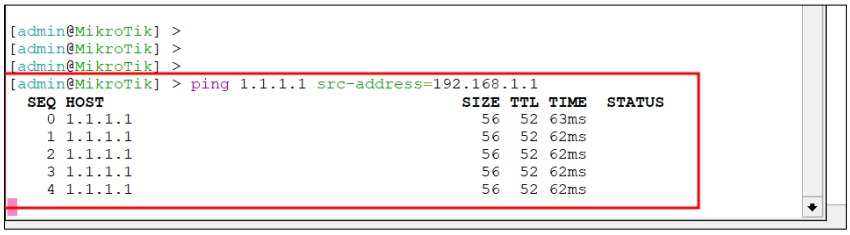
Step 9: Configure NAT for the Private IPs (192.168.x.0/24) to the public IPs (102.34.20.x/24)





Confirm that the NAT rule is working by issuing **ping 1.1.1.1 source-address 192.168.x.1**

ping 1.1.1.1 source-address 192.168.x.1



- After verifying that you can reach the internet from the router, its time to confirm that you can reach the internet from your laptop.
- Issue the following commands on your computer terminal

  ping 8.8.8.8

  ping google.com

  nslookup google.com
- Open any browser on you computer and perform the following speed tests

  https://pfs-raxio.renu.ac.ug/speedtest/

fast.com

speedtest.net

https://speed.cloudflare.com/

- Also download PingPlotter from the url below

  https://www.pingplotter.com/download/

Step 10: Connecting Network equipment to the network

- Congratulations for reaching this far and configuring your own router to connect you to the global network
- Now connect the provided access point, and confirm that it is picking an IP
- Confirm you can ping the AP's IP both on the router's terminal and on your computer's terminal.
- Repeat the procedure with any other peripherals available like printers, VoIP phones if any, cameras etc

Step 11: Questions from Participants and Troubleshooting Tips

- Loose cables
- Not picking an IP
- DNS not resolving??
- Can ping but can't browse
- AP not picking an IP
- Any other issues from the Participants