

First Time Configuration

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Connecting to the Router

There are two types of routers:

- With default configuration
- Without default configuration. When no specific configuration is found, the IP address 192.168.88.1/24 is set on ether1 or combo1, or sfp1.

More information about the current default configuration can be found in the Quick Guide document that came with your device. The quick guide document will include information about which ports should be used to connect for the first time and how to plug in your devices.

This document describes how to set up the device from the ground up, so we will ask you to clear away all defaults.

When connecting the first time to the router with the default username **admin** and **no password** (for some models, check the user password on the sticker), you will be asked to reset or keep the default configuration (even if the default config has only an IP address). Since this article assumes that there is no configuration on the router you should remove it by pressing "r" on the keyboard when prompted or click on the "Remove configuration" button in WinBox.

Router without Default Configuration

If there is no default configuration on the router you have several options, but here we will use one method that suits our needs.

Connect the Router's ether1 port to the WAN cable and connect your PC to ether2. Now open WinBox and look for your router in Neighbor Discovery. See detailed example in [Winbox article](#).

If you see the router in the list, click on the MAC address and click **Connect**.

The simplest way to make sure you have clean router, with no configuration, is to run:

```
/system reset-configuration no-defaults=yes skip-backup=yes
```

Or from WinBox (Fig. 1-1):

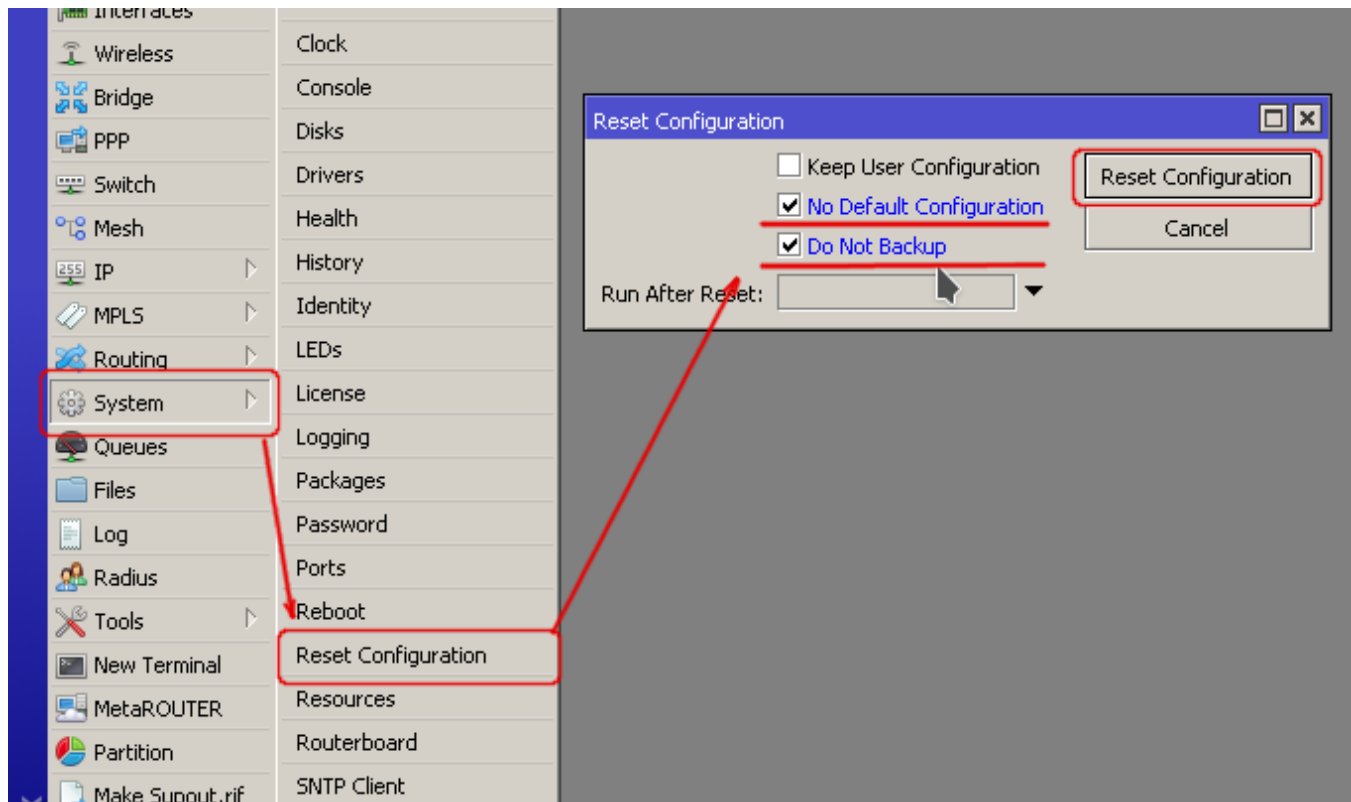


Fig. 1-1

Configuring IP Access

Since the MAC connection is not very stable, the first thing we need to do is to set up a router so that IP connectivity is available:

- add bridge interface and bridge ports;
- add an IP address to the LAN interface;
- set up a DHCP server.

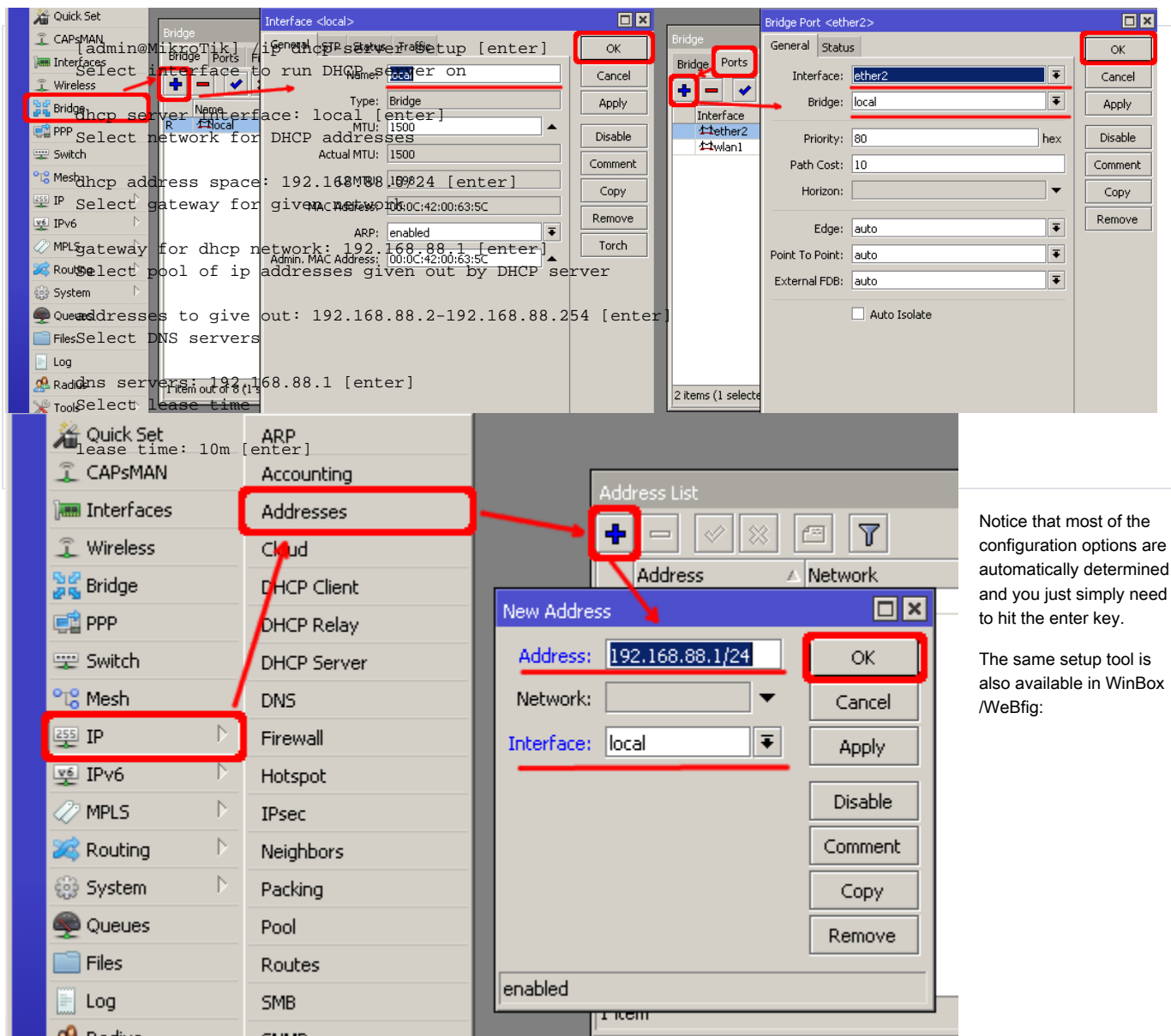
Set bridge and IP address are quite easy:

```
/interface bridge add name=local
/interface bridge port add interface=ether2 bridge=local
/ip address add address=192.168.88.1/24 interface=local
```

If you prefer WinBox/WeBfig as configuration tools:

- Open the **Bridge** window, **Bridge** tab should be selected;
- Click on the **+** button, a new dialog will open, enter bridge name **local** and click on **OK**;
- Select the Ports tab and click on the **+** button, a new dialog will open;
- select interface **ether2** and bridge **local** from drop-down lists and click on the **OK** button to apply settings;
- You may close the bridge dialog.
- Open **Ip -> Addresses** dialog;
- Click on the **+** button, a new dialog will open;
- Enter IP address **192.168.88.1/24** select interface **local** from the drop-down list and click on **OK** button;

The next step is to set up a DHCP server. We will run the **setup** command for easy and fast configuration:



Notice that most of the configuration options are automatically determined and you just simply need to hit the enter key.

The same setup tool is also available in WinBox /WeBfig:

- Open IP -> DHCP Server window, DHCP tab should be selected;
- Click on the DHCP Setup button, a new dialog will open, enter DHCP Server Interface **local** and click on the **Next** button;
- Follow the wizard to complete the setup.

Now connected PC should be able to get a dynamic IP address. Close the Winbox and reconnect to the router using the IP address (192.168.88.1)

Configuring Internet Connection

The next step is to get internet access to the router. There can be several types of internet connections, but the most common ones are:

- dynamic public IP address;
- static public IP address;
- PPPoE connection.

Dynamic Public IP

Dynamic address configuration is the simplest one. You just need to set up a DHCP client on the public interface. DHCP client will receive information from an internet service provider (ISP) and set up an IP address, DNS, NTP servers, and default route for you.

After adding the client you should see the assigned address and the status should be bound

Static Public IP

In the case of static address configuration, your ISP gives you parameters, for example:

- IP: 1.2.3.100/24
- Gateway: 1.2.3.1
- DNS: 8.8.8.8

These are three basic parameters that you need to get the internet connection working

To set this in RouterOS we will manually add an IP address, add a default route with a provided gateway, and set up a DNS server

```
/ip address add address=1.2.3.100/24 interface=ether1
/ip route add gateway=1.2.3.1
/ip dns set servers=8.8.8.8
```

PPPoE Connection

PPPoE connection also gives you a dynamic IP address and can configure dynamically DNS and default gateway. Typically service provider (ISP) gives you a username and password for the connection

```
/interface pppoe-client
add disabled=no interface=ether1 user=me password=123 add-default-route=yes use-peer-dns=yes
```

Winbox/Webfig actions:

- Open **PPP** window, **Interfaces** tab should be selected;
- Click on the **+** button, and choose **PPPoE Client** from the dropdown list, a new dialog will open;
- Select interface **ether1** from the dropdown list and click on the **OK** button to apply settings.

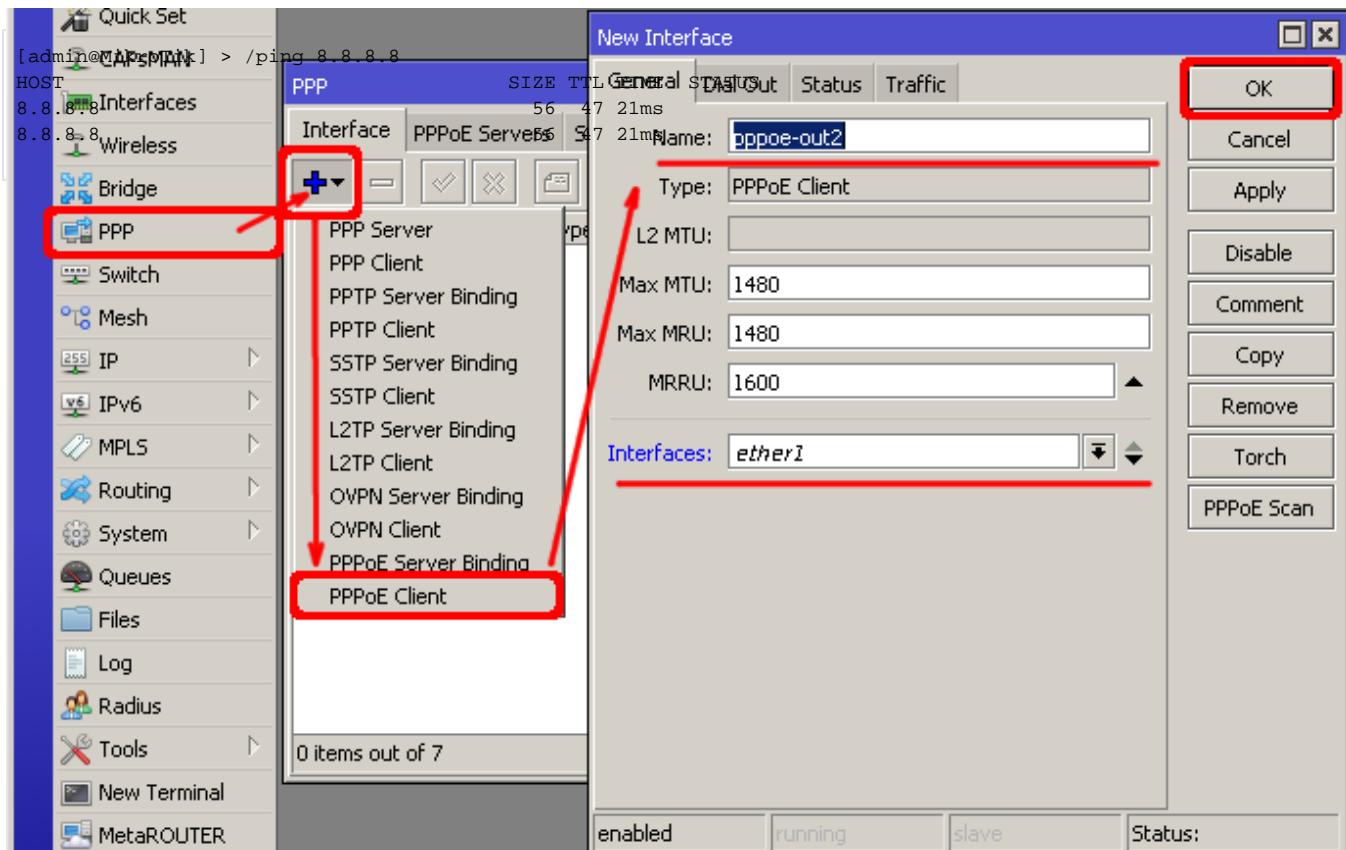


Now in configuration **WAN** interface is **pppoe-out** interface, not **ether1**, make sure to adjust "/interface/list/member" to reflect these changes, if you are referencing interface lists in your configuration.

Verify Connectivity

After successful configuration, you should be able to access the internet from the router.

Verify IP connectivity by pinging a known IP address (google DNS server for example)



Verify DNS request

```
[admin@MikroTik] > /ping www.google.com
HOST                SIZE  TTL  TIME  STATUS
173.194.32.49        56   55  13ms
173.194.32.49        56   55  12ms
```

If everything is set up correctly, ping in both cases should not fail.

In case of failure refer to the [Troubleshooting](#) section

Protecting the Router

Now anyone over the world can access our router so it is the best time to protect it from intruders and basic attacks

User Password Access

MikroTik routers require password configuration, we suggest using a password generator tool to create secure and non-repeating passwords. By secure password, we mean:

- Minimum 12 characters;
- Include numbers, Symbols, Capital and lowercase letters;
- Is not a Dictionary Word or a combination of Dictionary Words;

```
/user set 0 password="!= {Ba3N!40TX+GvKBzjTLIUcx/, "
```

Another option to set a password,

```
/password
```

We strongly suggest using a second method or Winbox interface to apply a new password for your router, just to keep it safe from other unauthorized access.

```
[admin@MikroTik] > / password
old password:
new password: *****
retype new password: *****
```

Make sure you remember the password! If you forget it, there is no recovery. You will need to reinstall the router!

You can also add more users with full or limited router access in **/user** menu



The best practice is to add a new user with a strong password and disable or remove the default **admin** user.

```
/user add name=myname password=mypassword group=full
/user remove admin
```



Note: login to the router with new credentials to check that the username/password is working.

MAC Connectivity Access

By default, MAC server runs on all interfaces, so we will disable the default **"all"** entry and add a local interface to disallow MAC connectivity from the WAN port. MAC Telnet Server feature allows you to apply restrictions to the interface "list".

First, create an interface list:

```
[admin@MikroTik] > /interface list add name=listBridge
```

Then, add your previously created bridge named "local" to the interface list:

```
[admin@MikroTik] > /interface list member add list=listBridge interface=local
```

Apply newly created "list" (of interfaces) to the MAC server:

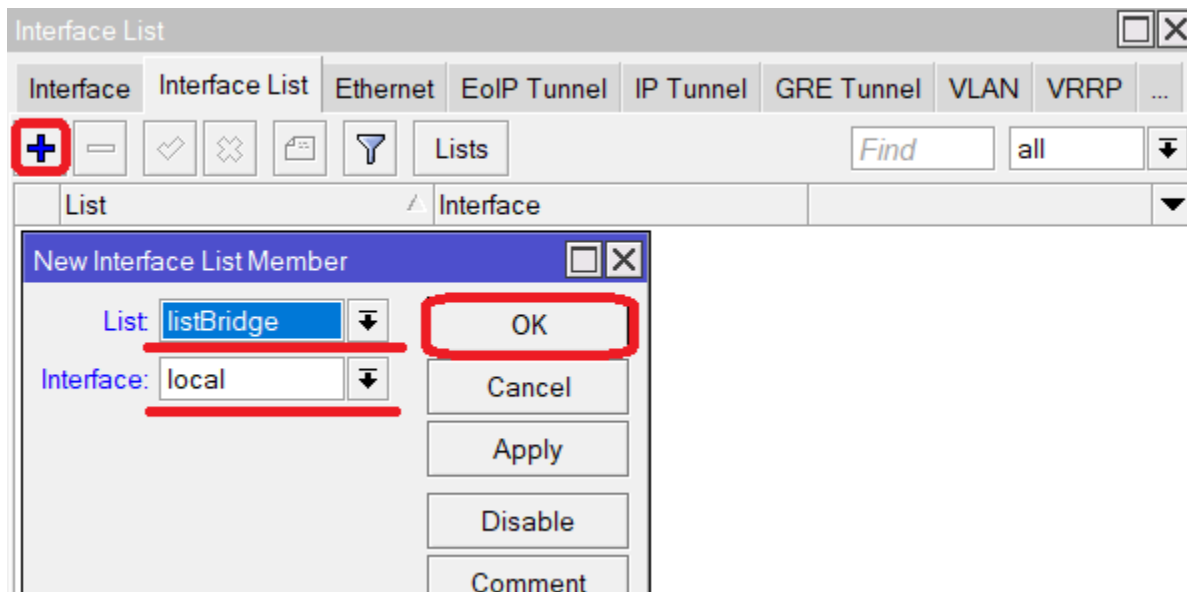
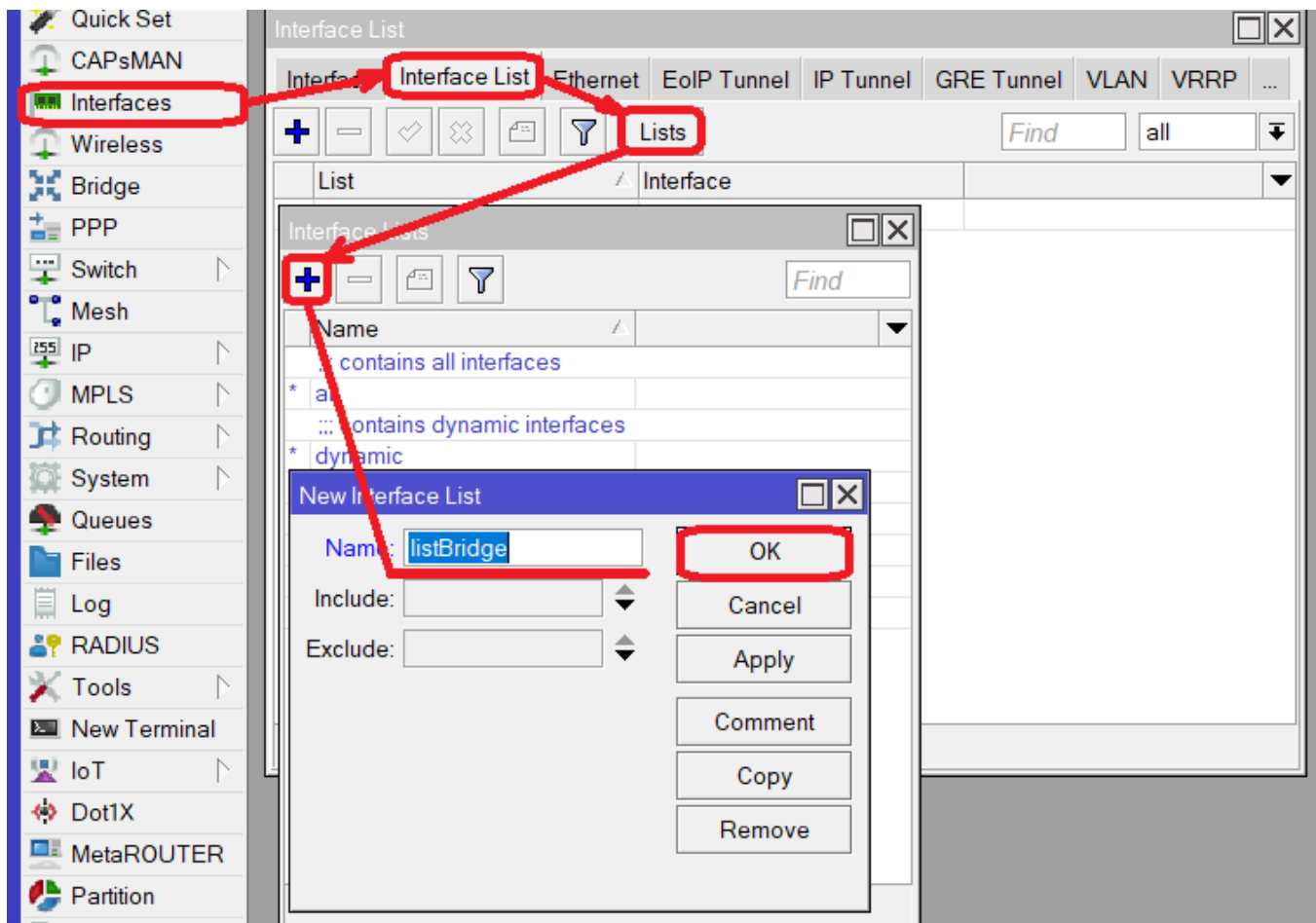
```
[admin@MikroTik] > tool mac-server set allowed-interface-list=listBridge
```

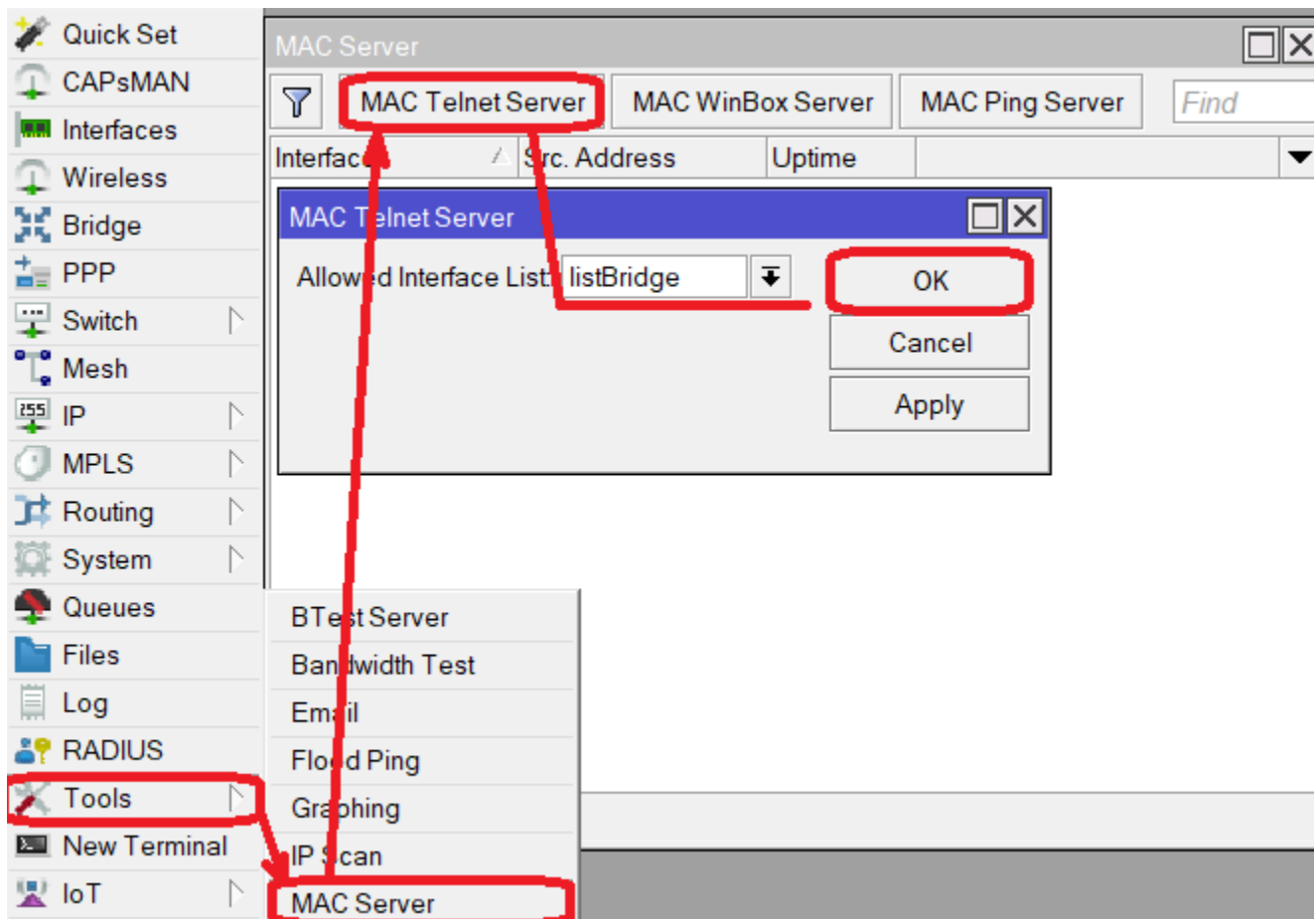
Do the same for Winbox MAC access

```
[admin@MikroTik] > tool mac-server mac-winbox set allowed-interface-list=listBridge
```

Winbox/Webfig actions:

- Open **Interfaces → Interface List → Lists** window and add a new list by clicking "+";
- Input the interface list name "listBridge" into the **Name** field and click **OK**;
- Go back to the **Interfaces → Interface List** section and click "+";
- Select "listBridge" from the dropdown **List** options and select "local" from the dropdown **Interface** options and click **OK**;
- Open **Tools → Mac Server** window;
- Click on the **"MAC Telnet Server"** button, a new dialog will open;
- Select the newly created list "listBridge" from the dropdown list and click on the **OK** button to apply settings.





Do the same in the **MAC Winbox Server** tab to block Mac Winbox connections from the internet.

Neighbor Discovery

MikroTik Neighbor discovery protocol is used to show and recognize other MikroTik routers in the network. Disable neighbor discovery on public interfaces:

```
/ip neighbor discovery-settings set discover-interface-list=listBridge
```

IP Connectivity Access

Besides the fact that the firewall protects your router from unauthorized access from outer networks, it is possible to restrict username access for the specific IP address

```
/user set 0 allowed-address=x.x.x.x/yy
```

x.x.x.x/yy - your IP or network subnet that is allowed to access your router.

IP connectivity on the public interface must be limited in the firewall. We will accept only ICMP(ping/traceroute), IP Winbox, and SSH access.


```

/ip firewall filter
add chain=input connection-state=established,related action=accept comment="accept established,related";
add chain=input connection-state=invalid action=drop;
add chain=input in-interface=ether1 protocol=icmp action=accept comment="allow ICMP";
add chain=input in-interface=ether1 protocol=tcp port=8291 action=accept comment="allow Winbox";
add chain=input in-interface=ether1 protocol=tcp port=22 action=accept comment="allow SSH";
add chain=input in-interface=ether1 action=drop comment="block everything else";

```

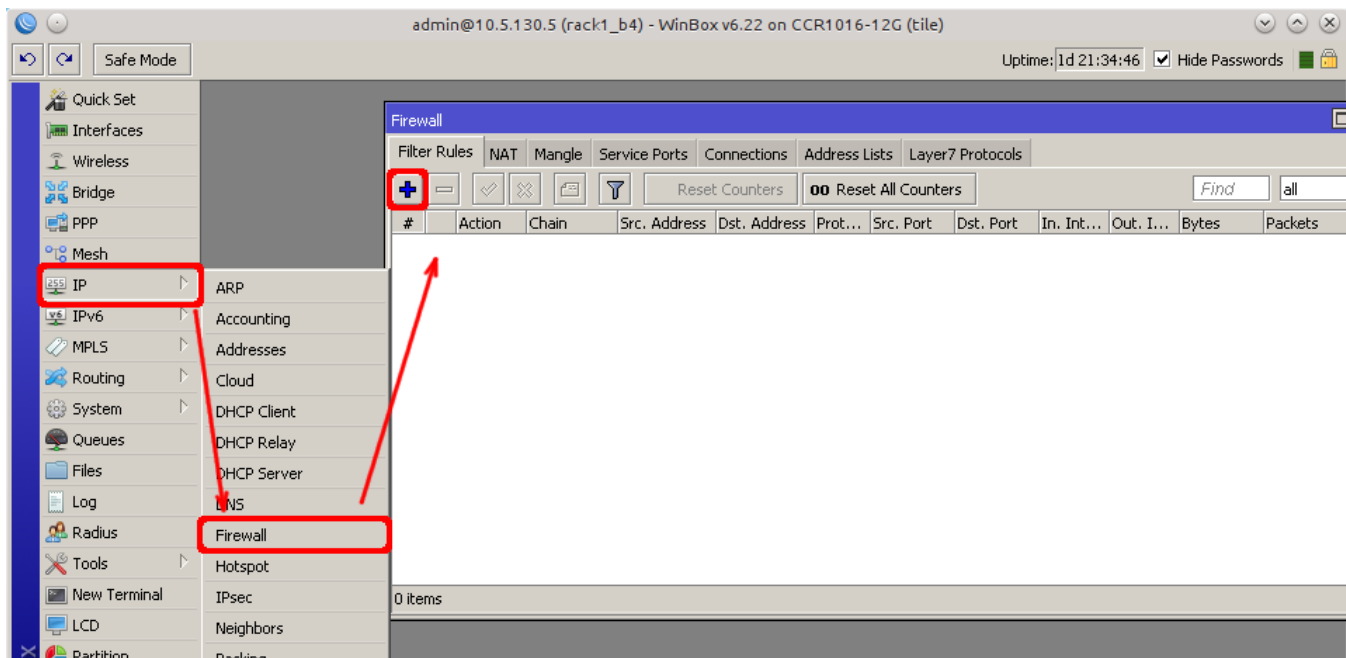


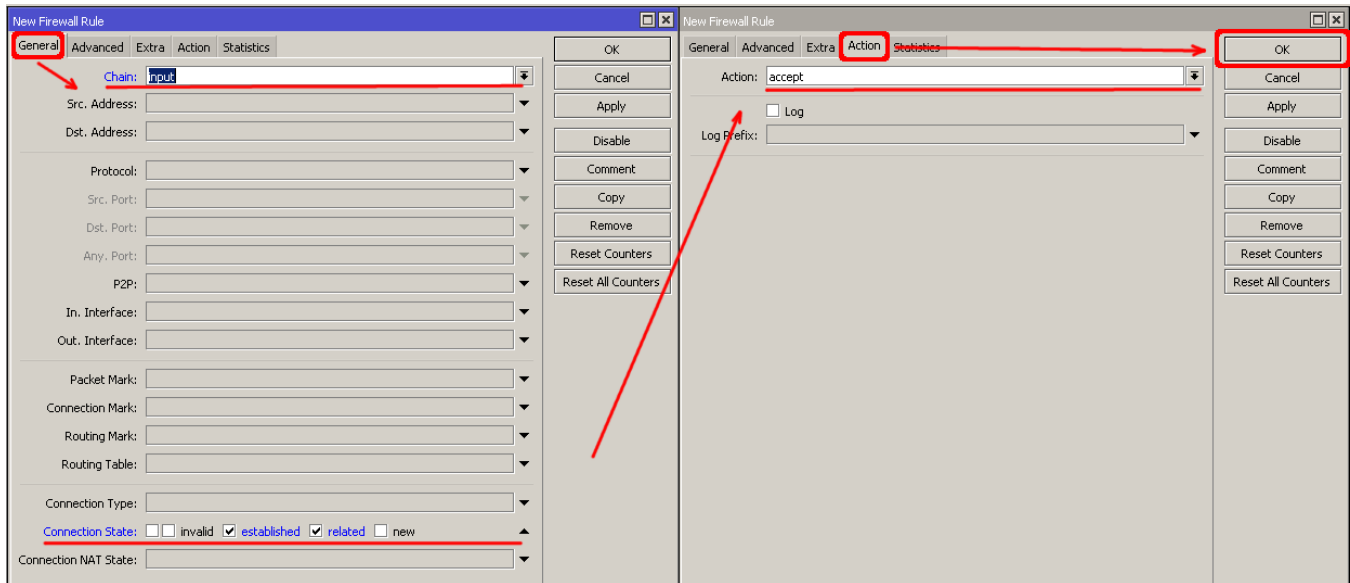
In case the public interface is PPPoE, then the in-interface should be set to "pppoe-out".

The first two rules accept packets from already established connections, so we assume those are OK to not overload the CPU. The third rule drops any packet that connection tracking thinks is invalid. After that, we set up typical accept rules for specific protocols.

If you are using Winbox/Webfig for configuration, here is an example of how to add an established/related rule:

- Open **IP -> Firewall** window, click on the **Filter rules** tab;
- Click on the **+** button, a new dialog will open;
- Select chain input, click on **Connection state**, and select checkboxes for established and related;
- Click on the **Action** tab and make sure action accept is selected;
- Click on the **OK** button to apply settings.





To add other rules click on + for each new rule and fill the same parameters as provided in the console example.

Administrative Services

Although the firewall protects the router from the public interface, you may still want to disable RouterOS services.

Most of RouterOS administrative tools are configured at the [/ip service](#) menu

Keep only secure ones,

```
/ip service disable telnet,ftp,www,api
```

Change default service ports, this will immediately stop most of the random SSH brute force login attempts:

```
/ip service set ssh port=2200
```

Additionally, each service can be secured by the allowed IP address or address range(the address service will reply to), although the preferred method is to block unwanted access in the firewall filter,because the firewall will not even allow to open socket

```
/ip service set winbox address=192.168.88.0/24
```

Other Services

A bandwidth server is used to test throughput between two MikroTik routers. Disable it in the production environment.

```
/tool bandwidth-server set enabled=no
```

A router might have DNS cache enabled, which decreases the resolving time for DNS requests from clients to remote servers. In case DNS cache is not required on your router or another router is used for such purposes, disable it.

```
/ip dns set allow-remote-requests=no
```

Some RouterBOARDS have an LCD module for informational purposes, set a pin or disable it.

```
/lcd set enabled=no
```

It is good practice to disable all unused interfaces on your router, to decrease the chances of unauthorized access to your router.

```
/interface print
/interface set x disabled=yes
```

Where "X" is the number of the unused interfaces.

You can enable stronger crypto for SSH, most newer programs use it, to turn on SSH strong crypto:

```
/ip ssh set strong-crypto=yes
```

The following services are disabled by default, nevertheless, it is better to make sure that none of them were enabled accidentally:

- MikroTik caching proxy,

```
/ip proxy set enabled=no
```

- MikroTik socks proxy,

```
/ip socks set enabled=no
```

- MikroTik UPNP service,

```
/ip upnp set enabled=no
```

- MikroTik dynamic name service or IP cloud,

```
/ip cloud set ddns-enabled=no update-time=no
```

NAT Configuration

At this point, the PC is not yet able to access the Internet, because locally used addresses are not routable over the Internet. Remote hosts simply do not know how to correctly reply to your local address.

The solution for this problem is to change the source address for outgoing packets to the router's public IP. This can be done with the NAT rule:

```
/ip firewall nat
add chain=srcnat out-interface=ether1 action=masquerade
```



In case if a public interface is a pppoe, then the out-interface should be set to "pppoe-out".

Another benefit of such a setup is that NATed clients behind the router are not directly connected to the Internet, that way additional protection against attacks from outside mostly is not required.

Port Forwarding

Some client devices may need direct access to the internet over specific ports. For example, a client with an IP address 192.168.88.254 must be accessible by Remote desktop protocol (RDP).

After a quick search on Google, we can find out that RDP runs on TCP port 3389. Now we can add a destination NAT rule to redirect RDP to the client's PC.

```
/ip firewall nat
add chain=dstnat protocol=tcp port=3389 in-interface=ether1 action=dst-nat to-address=192.168.88.254
```



If you have set up strict firewall rules then RDP protocol must be allowed in the firewall filter forward chain.

Setting up Wireless

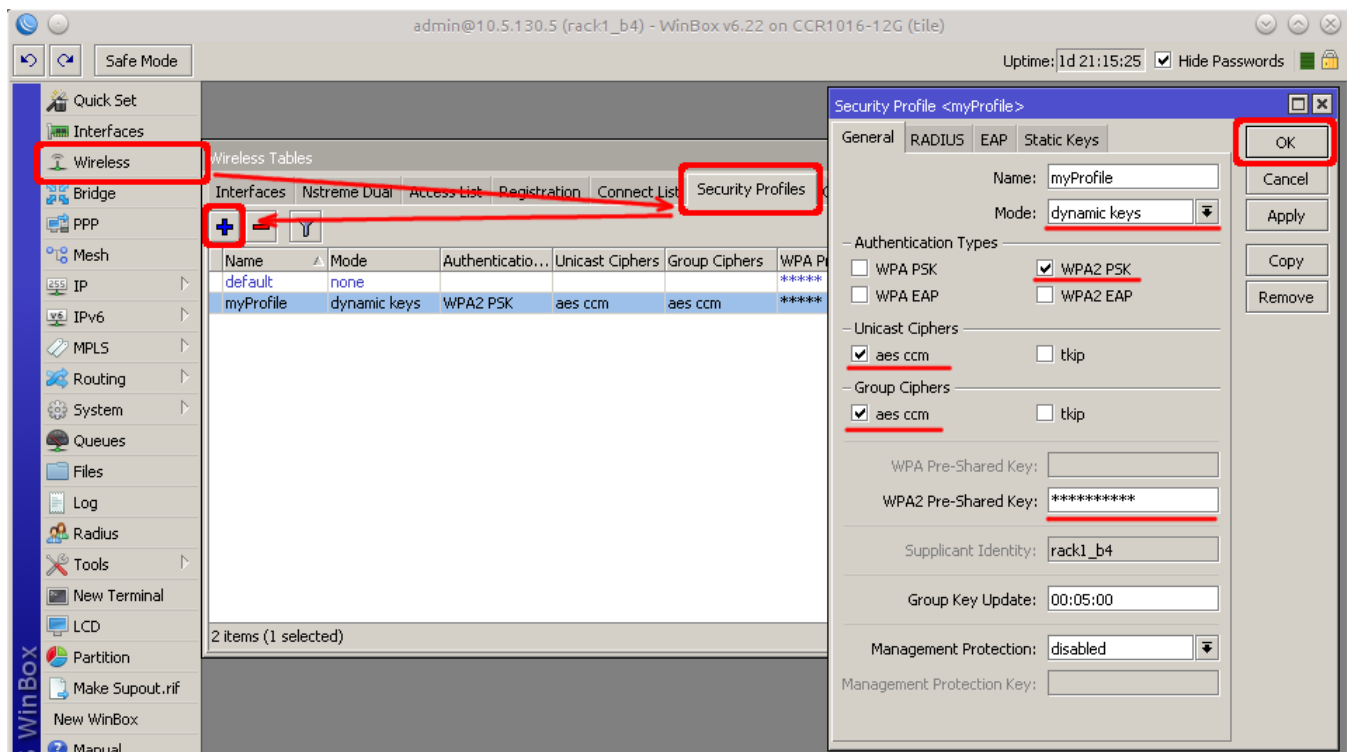
For ease of use bridged wireless setup will be made so that your wired hosts are in the same Ethernet broadcast domain as wireless clients.

The important part is to make sure that our wireless is protected, so the first step is the security profile.

Security profiles are configured from `/interface wireless security-profiles` menu in a terminal.

```
/interface wireless security-profiles
add name=myProfile authentication-types=wpa2-psk mode=dynamic-keys wpa2-pre-shared-key=1234567890
```

in Winbox/Webfig click on **Wireless** to open wireless windows and choose the **Security Profile** tab.



If there are legacy devices that do not support WPA2 (like Windows XP), you may also want to allow WPA protocol.



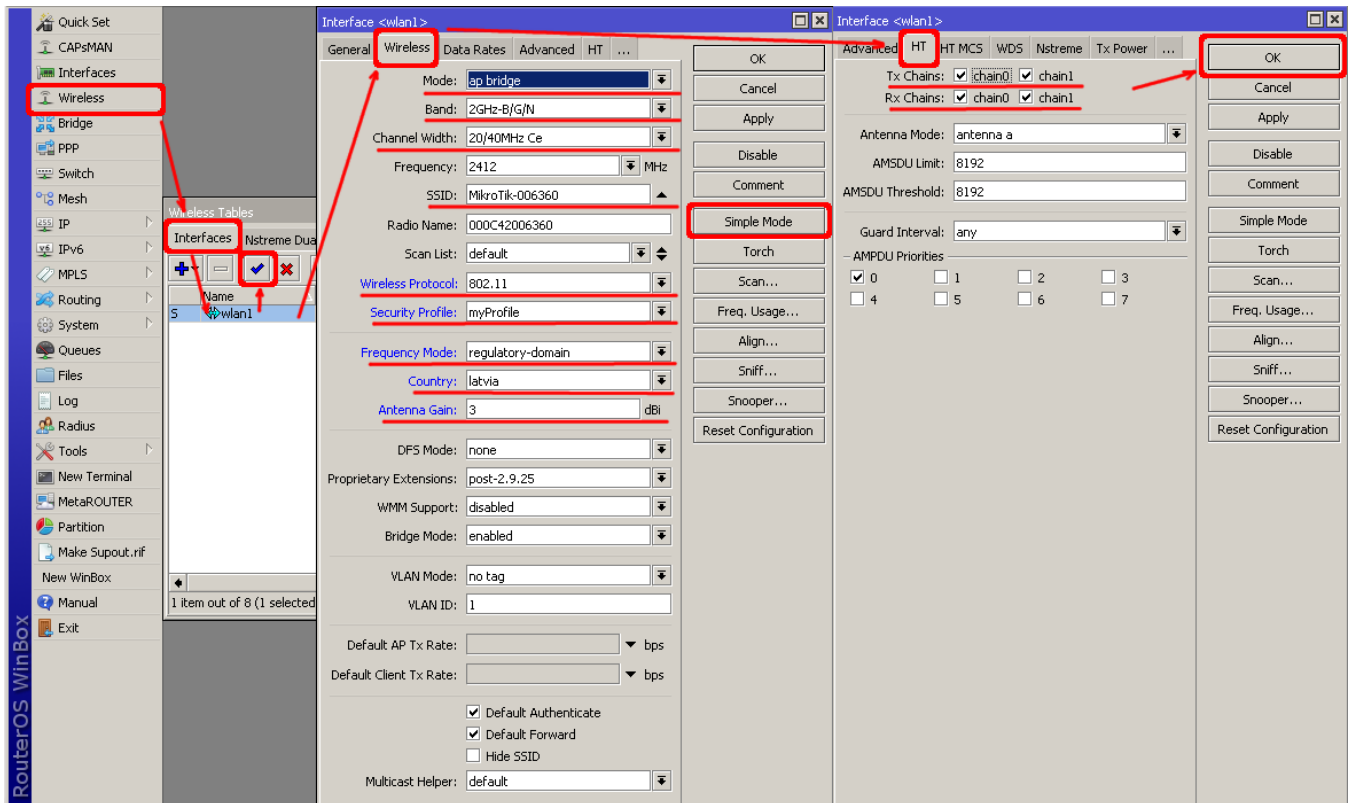
WPA and WPA2 pre-shared keys should not be the same.

Now when the security profile is ready we can enable the wireless interface and set the desired parameters

```
/interface wireless
enable wlan1;
set wlan1 band=2ghz-b/g/n channel-width=20/40mhz-Ce distance=indoors mode=ap-bridge ssid=MikroTik-006360
wireless-protocol=802.11 security-profile=myProfile frequency-mode=regulatory-domain set country=latvia
```

To do the same from Winbox/Webfig:

- Open the Wireless window, select wlan1 interface, and click on the *enable* button;
- Double-click on the wireless interface to open the configuration dialog;
- In the configuration dialog click on the **Wireless** tab and click the **Advanced mode** button on the right side. When you click on the button additional configuration parameters will appear and the description of the button will change to **Simple mode**;
- Choose parameters as shown in the screenshot, except for the country settings and SSID. You may want to also choose a different frequency and antenna gain;
- Next, click on the **HT** tab and make sure both chains are selected;
- Click on the **OK** button to apply settings.



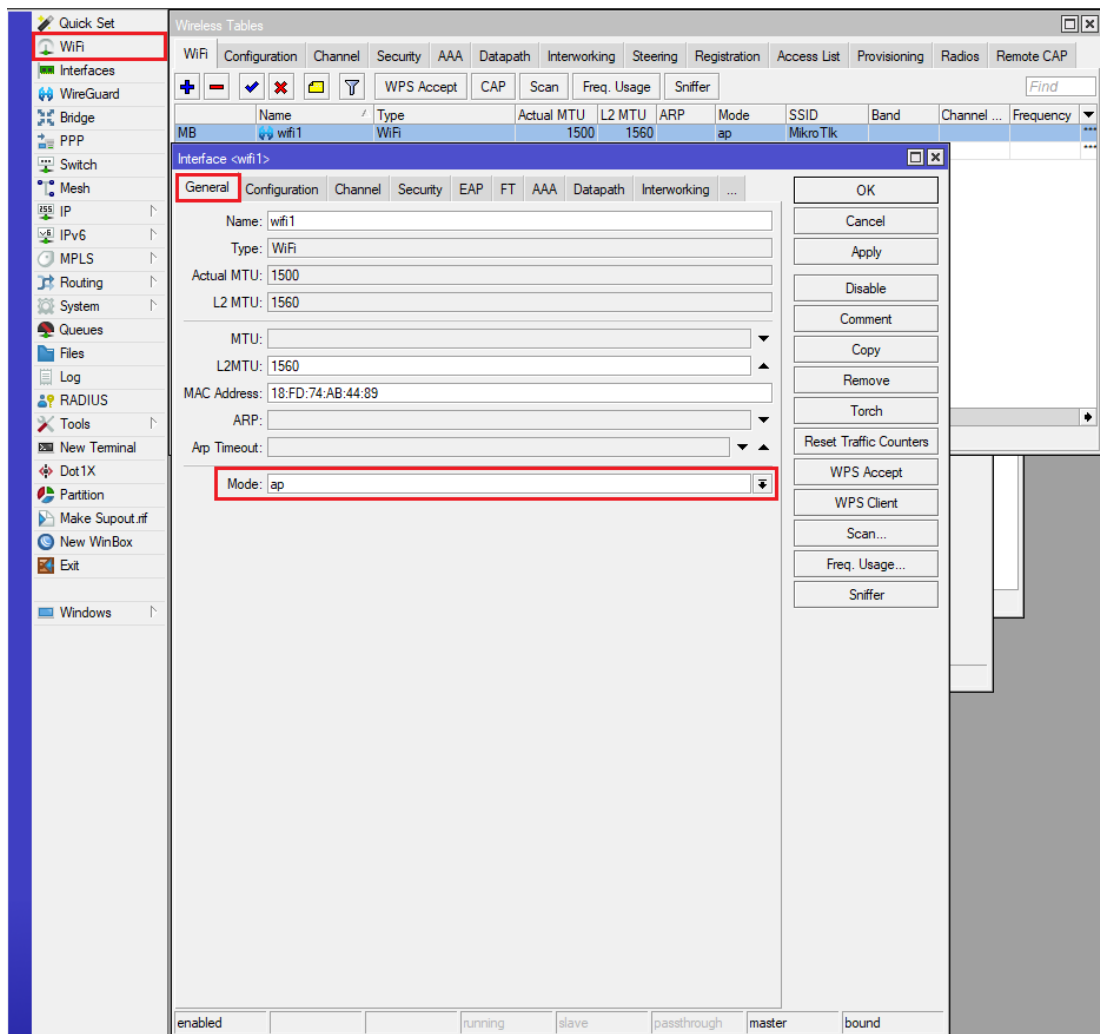
The last step is to add a wireless interface to a local bridge, otherwise, connected clients will not get an IP address:

```
/interface bridge port
add interface=wlan1 bridge=local
```

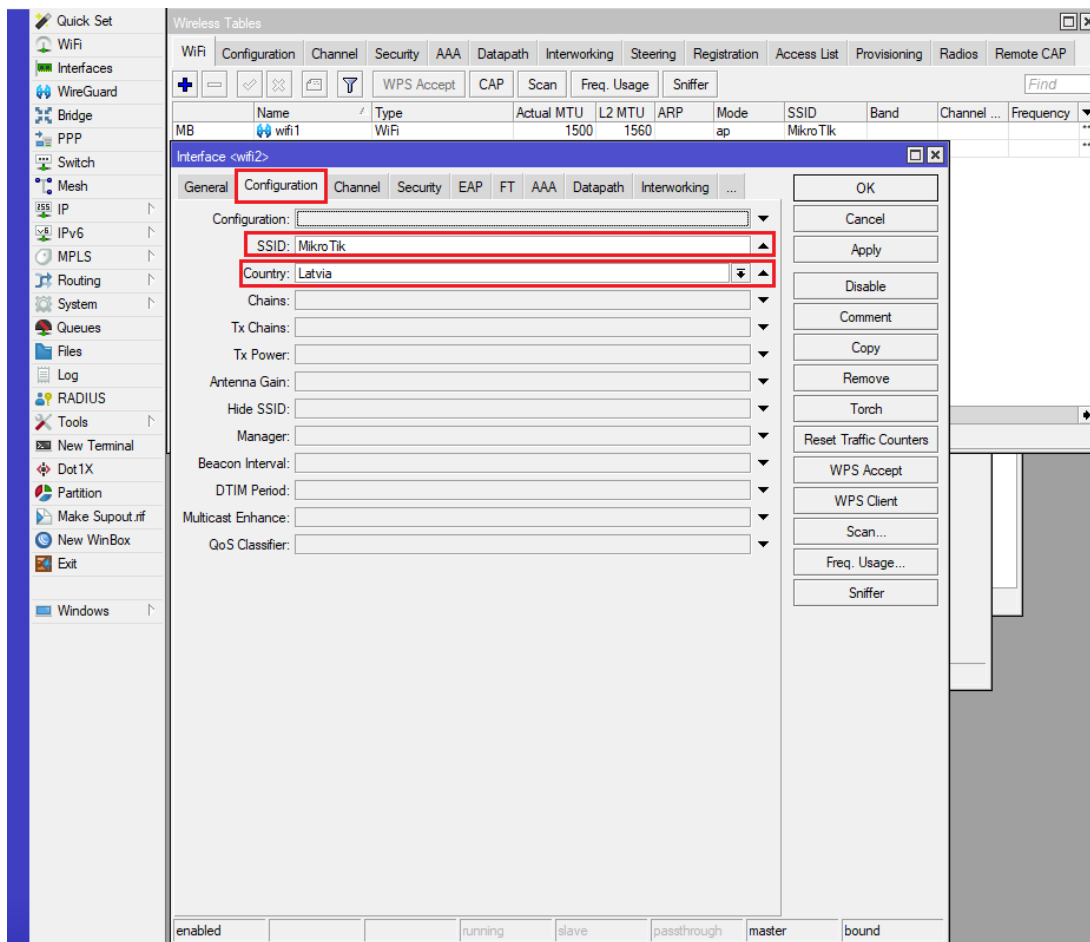
Now wireless should be able to connect to your access point, get an IP address, and access the internet.

RouterOS 7.13+ wireless setup

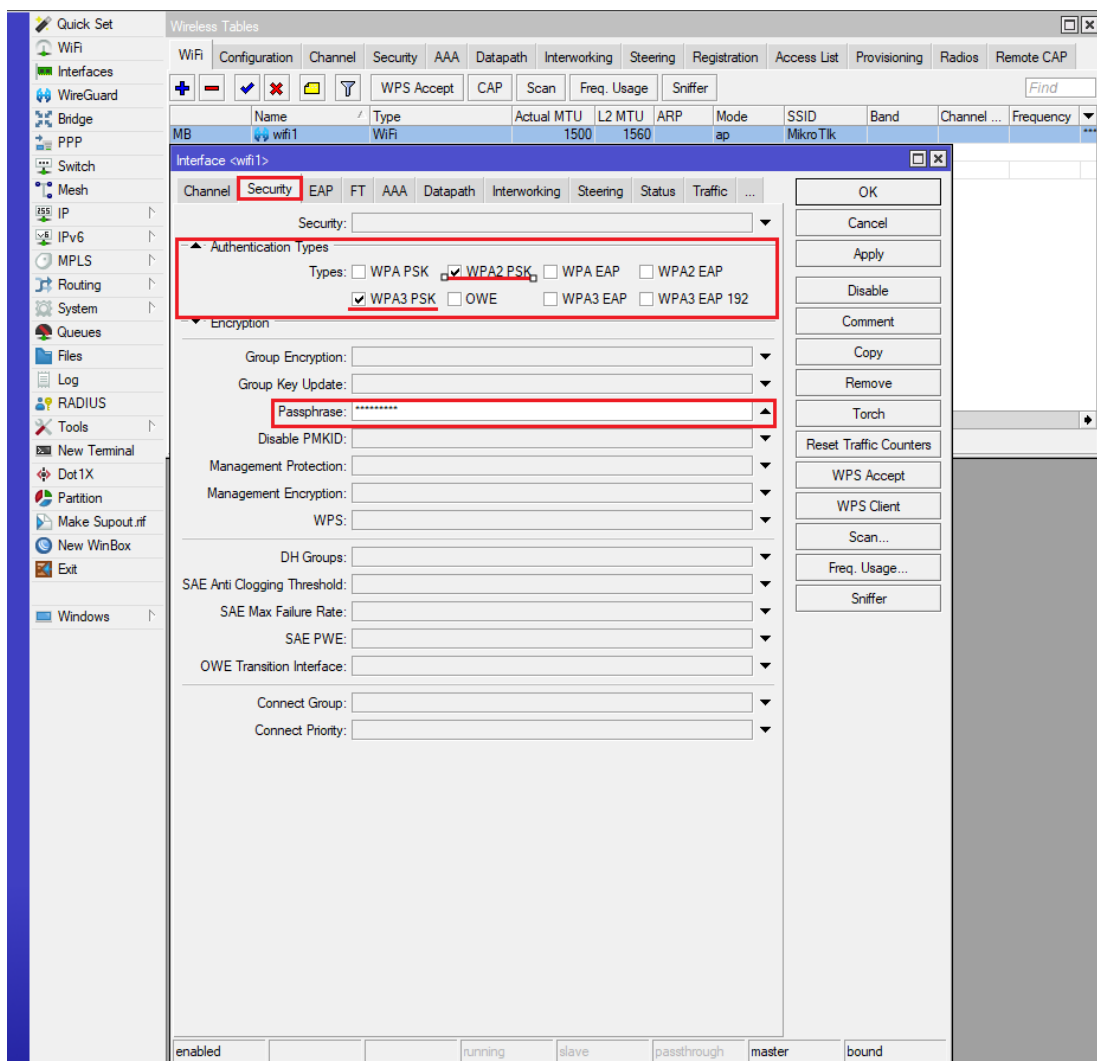
First enable the device as an Access Point, by navigating to the **General** tab and setting **Mode** to **AP**:



In the "Configuration tab" set the **Country** and **SSID**



Configure the wireless network's security, we recommend using both WPA3 and WPA2 protocols, to ensure compatibility with older wireless clients, **authentication-types** and **passphrase** should be set here:



```
interface/wifi/set wifi1 configuration.country=Latvia .mode=ap .ssid=MikroTik security.authentication-
types=wpa2-psk,wpa3-psk .passphrase=123456789
```

WPA2 is optional, some older devices may not support WPA3.

Protecting the Clients

Now it is time to add some protection for clients on our LAN. We will start with a basic set of rules.

```
/ip firewall filter
add chain=forward action=fasttrack-connection connection-state=established,related comment="fast-track for
established,related";
add chain=forward action=accept connection-state=established,related comment="accept established,related";
add chain=forward action=drop connection-state=invalid
add chain=forward action=drop connection-state=new connection-nat-state=!dstnat in-interface=ether1 comment="
drop access to clients behind NAT from WAN"
```

A ruleset is similar to input chain rules (accept established/related and drop invalid), except the first rule with `action=fasttrack-connection`. This rule allows established and related connections to bypass the firewall and significantly reduce CPU usage.

Another difference is the last rule which drops all new connection attempts from the WAN port to our LAN network (unless DstNat is used). Without this rule, if an attacker knows or guesses your local subnet, he/she can establish connections directly to local hosts and cause a security threat.

For more detailed examples on how to build firewalls will be discussed in the firewall section, or check directly [Building Your First Firewall](#) article.

Blocking Unwanted Websites

Sometimes you may want to block certain websites, for example, deny access to entertainment sites for employees, deny access to porn, and so on. This can be achieved by redirecting HTTP traffic to a proxy server and using an access-list to allow or deny certain websites.

First, we need to add a NAT rule to redirect HTTP to our proxy. We will use RouterOS built-in proxy server running on port 8080.

```
/ip firewall nat
  add chain=dst-nat protocol=tcp dst-port=80 src-address=192.168.88.0/24 action=redirect to-ports=8080
```

Enable web proxy and drop some websites:

```
/ip proxy set enabled=yes
/ip proxy access add dst-host=www.facebook.com action=deny
/ip proxy access add dst-host=*.youtube.* action=deny
/ip proxy access add dst-host=:vimeo action=deny
```

Using Winbox:

- On the left menu navigate to IP -> Web Proxy
- Web proxy settings dialog will appear.
- Check the "Enable" checkbox and click on the "Apply" button
- Then click on the "Access" button to open the "Web Proxy Access" dialog
- In the "Web Proxy Access" dialog click on "+" to add a new Web-proxy rule
- Enter the Dst hostname that you want to block, in this case, "www.facebook.com", and choose the action "deny"
- Then click on the "Ok" button to apply changes.
- Repeat the same to add other rules.

Troubleshooting

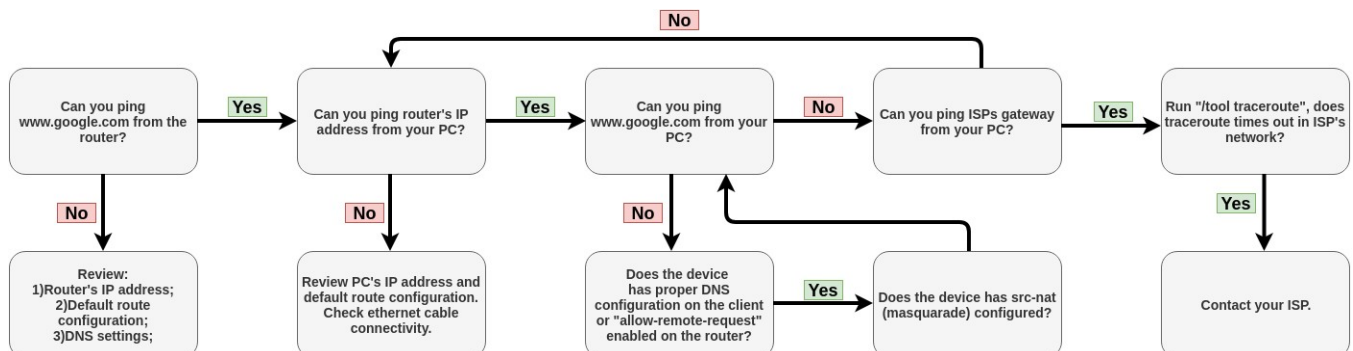
RouterOS has built-in various troubleshooting tools, like ping, traceroute, torch, packet sniffer, bandwidth test, etc.

We already used the ping tool in this article to [verify internet connectivity](#).

Troubleshoot if ping fails

The problem with the ping tool is that it says only that the destination is **unreachable**, but no more detailed information is available. Let's overview the basic mistakes.

You cannot reach www.google.com from your computer which is connected to a MikroTik device:





If you are not sure how exactly to configure your gateway device, please reach out to MikroTik's official [consultants](#) for configuration support.

