

# Basic Setup Guide

Document revision 1.1 (Wed Sep 14 18:08:33 GMT 2005)

This document applies to V2.9

## Table of Contents

### [Table of Contents](#)

[Summary](#)

[Related Documents](#)

[Description](#)

### [Setting up MikroTik RouterOS™](#)

[Description](#)

[Notes](#)

### [Logging into the MikroTik Router](#)

[Description](#)

### [Adding Software Packages](#)

[Description](#)

### [Navigating The Terminal Console](#)

[Description](#)

[Notes](#)

### [Basic Configuration Tasks](#)

[Description](#)

[Notes](#)

### [Setup Command](#)

[Description](#)

[Configure IP address on router, using the Setup command](#)

### [Basic Examples](#)

[Example](#)

[Viewing Routes](#)

[Adding Default Routes](#)

[Testing the Network Connectivity](#)

### [Advanced Configuration Tasks](#)

[Description](#)

[Application Example with Masquerading](#)

[Example with Bandwidth Management](#)

[Example with NAT](#)

## General Information

### Summary

MikroTik RouterOS™ is independent Linux-based Operating System for IA-32 routers and thinrouters. It does not require any additional components and has no software prerequisites. It is designed with easy-to-use yet powerful interface allowing network administrators to deploy network structures and functions, that would require long education elsewhere simply by following the Reference Manual (and even without it).

## Related Documents

- [Software Package Management](#)
- [Device Driver List](#)
- [License Management](#)
- [Ping](#)
- [Bandwidth Control](#)
- [WinBox](#)
- [Installing RouterOS with NetInstall](#)
- [Installing RouterOS with CD-Install](#)
- [Installing RouterOS with Floppies](#)

## Description

MikroTik RouterOS™ turns a standard PC computer into a powerful network router. Just add standard network PC interfaces to expand the router capabilities. Remote control with easy real-time Windows application (WinBox)

- Advanced Quality of Service control with burst support
- Stateful firewall with P2P protocol filtering, tunnels and IPsec
- STP bridging with filtering capabilities
- WDS and Virtual AP features
- HotSpot for Plug-and-Play access
- RIP, OSPF, BGP routing protocols
- Gigabit Ethernet ready
- V.35, X.21, T1/E1 synchronous support
- async PPP with RADUIS AAA
- IP Telephony
- remote winbox GUI admin
- telnet/ssh/serial console admin
- real-time configuration and monitoring
- and much more (please see the Specifications Sheet)

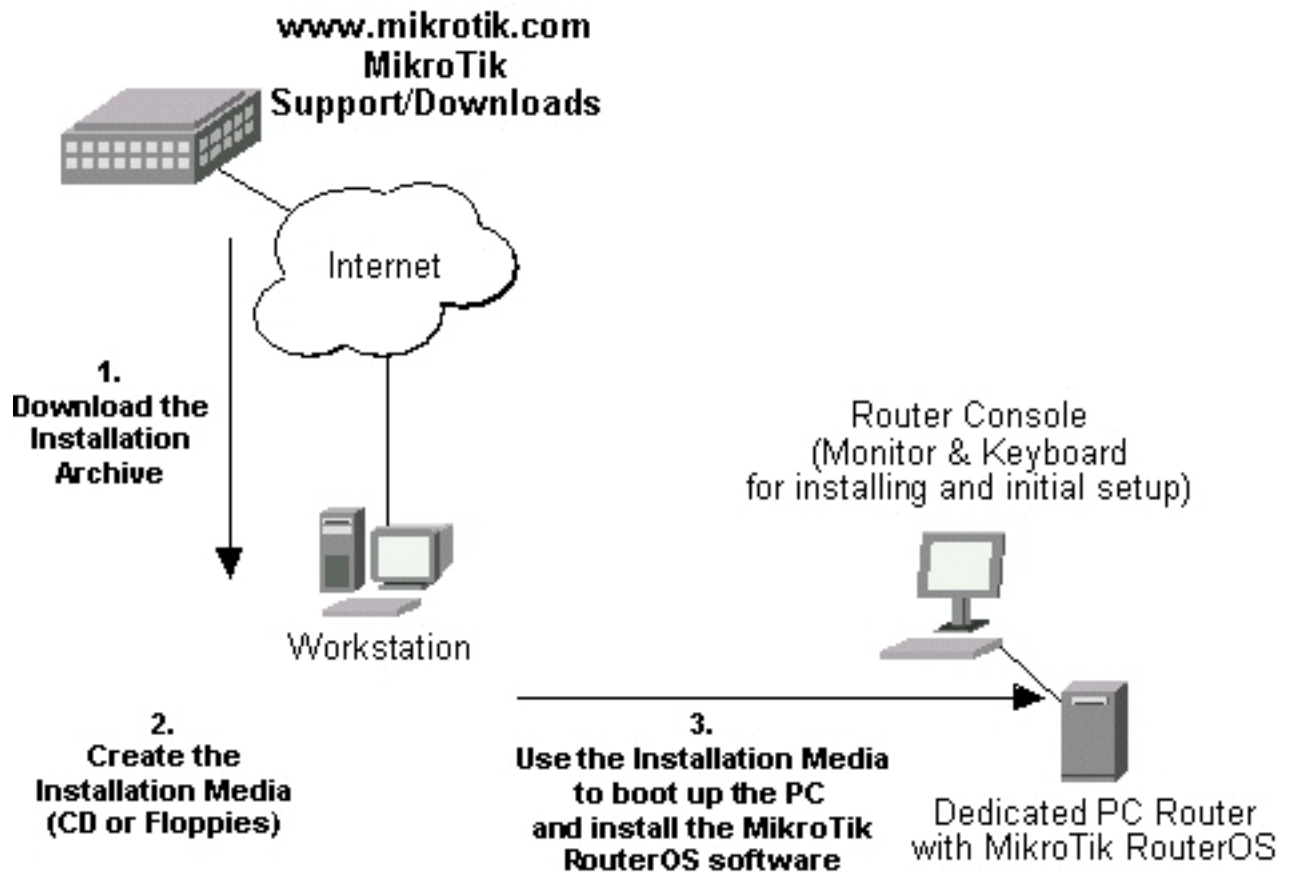
The Guide describes the basic steps of installing and configuring a dedicated PC router running MikroTik RouterOS™.

## Setting up MikroTik RouterOS™

## Description

### Downloading and Installing the MikroTik RouterOS™

The download and installation process of the MikroTik RouterOS™ is described in the following diagram:



1. Download the basic installation archive file.  
Depending on the desired media to be used for installing the MikroTik RouterOS™ please choose one of the following archive types for downloading:
  - **ISO image** - of the installation CD, if you have a CD writer for creating CDs. The ISO image is in the MTcdimage\_v2-9-x\_dd-mmm-yyyy\_(build\_z).zip archive file containing a bootable CD image. The CD will be used for booting up the dedicated PC and installing the MikroTik RouterOS™ on its hard-drive or flash-drive.
  - **Netinstall** - if you want to install RouterOS over a LAN with one floppy boot disk, or alternatively using PXE or EtherBoot option supported by some network interface cards, that allows truly networked installation. Netinstall program works on Windows 95/98/NT4/2K/XP.
  - **MikroTik Disk Maker** - if you want to create 3.5" installation floppies. The Disk Maker is a self-extracting archive DiskMaker\_v2-9-x\_dd-mmm-yyyy\_(build\_z).exe file, which should be run on your Windows 95/98/NT4/2K/XP workstation to create the installation floppies. The installation floppies will be used for booting up the dedicated PC and installing the MikroTik RouterOS™ on its hard-drive or flash-drive.
2. Create the installation media.

Use the appropriate installation archive to create the Installation CD or floppies.

- For the CD, write the ISO image onto a blank CD.
- For the floppies, run the Disk Maker on your Windows workstation to create the installation floppies. Follow the instructions and insert the floppies in your FDD as requested, label them as Disk 1,2,3, etc.

3. Install the MikroTik RouterOS™ software.

Your dedicated PC router hardware should have:

- **CPU and motherboard** - advanced 4th generation (core frequency 100MHz or more), 5th generation (Intel Pentium, Cyrix 6X86, AMD K5 or comparable) or newer uniprocessor Intel IA-32 (i386) compatible (multiple processors are not supported)
- **RAM** - minimum 64 MiB, maximum 1 GiB; 64 MiB or more recommended
- **Hard Drive/Flash** - standard ATA interface controller and drive (SCSI and USB controllers and drives are not supported; RAID controllers that require additional drivers are not supported) with minimum of 64 Mb space

Hardware needed for installation time only

Depending on installation method chosen the router must have the following hardware:

- **Floppy-based installation** - standard AT floppy controller and 3.5" disk drive connected as the first floppy disk drive (A); AT, PS/2 or USB keyboard; VGA-compatible video controller card and monitor
- **CD-based installation** - standard ATA/ATAPI interface controller and CD drive supporting "El Torito" bootable CDs (you might need also to check if the router's BIOS supports booting from this type of media; if El Torito is not supported by the BIOS, you can still boot up from the CD using Smart Boot Manager Floppy); AT, PS/2 or USB keyboard; VGA-compatible video controller card and monitor
- **Floppy-based network installation** - standard AT floppy controller and 3.5" disk drive connected as the first floppy disk drive (A); PCI Ethernet network interface card supported by MikroTik RouterOS (see the Device Driver List for the list)
- **Full network-based installation** - PCI Ethernet network interface card supported by MikroTik RouterOS (see the Device Driver List for the list) with PXE or EtherBoot extension booting ROM (you might need also to check if the router's BIOS supports booting from network)

Note that if you use Netinstall, you can license the software during the installation procedure (the next point of this section describes how to do it).

Boot up your dedicated PC router from the Installation Media you created and follow the instructions on the console screen while the HDD is reformatted and MikroTik RouterOS installed on it. After successful installation please remove the installation media from your CD or floppy disk drive and hit 'Enter' to reboot the router.

4. License the software.

When booted, the software allows you to use all its features for 24 hours (note that you can pause the countdown by shutting down the router). If the license key will not be entered during this period of time, the router will become unusable, and will need a complete reinstallation.

RouterOS licensing scheme is based on software IDs. To license the software, you must know the software ID. It is shown during installation procedures, and also you can get it from system console or Winbox. To get the software ID from system console, type: **/system license print** (note that you must first log in the router; by default there is user **admin** with no password (just press [Enter] key

when prompted for password)). See sections below on basic configuration of your router

Once you have the ID, you can obtain a license:

- You should have an account on our account server. If you do not have an account at [www.mikrotik.com](http://www.mikrotik.com), just press the 'New' button on the upper right-hand corner of the MikroTik's web page to create your account
- Choose the appropriate licence level that meets your needs. Please see the [License Manual](#) or the [Software price list](#). Note that there is a free license with restricted features (no time limitation)
- There are different methods how to get a license from the account server:
  1. Enter the software ID in the account server, and get the license key by e-mail. You can upload the file received on the router's FTP server, or drag-and-drop it into opened Winbox window
  2. You can open the file with a text editor, and copy the contents. Then paste the text into system console (in any menu - you just should be logged in), or into System->License window of Winbox
  3. If the router has Internet connection, you can obtain the license directly from within it. The commands are described in the [License Manual](#). Note that you must have **Allow to use my account in netinstall** option enabled for your account. You can set it by following **change user information** link on the main screen of the account server.

## Notes

The hard disk will be entirely reformatted during the installation and all data on it will be lost!

You can move the hard drive with MikroTik RouterOS installed to a new hardware without losing a license, but you cannot move the RouterOS to a different hard drive without purchasing another license (except hardware failure situations). For additional information write to [key-support@mikrotik.com](mailto:key-support@mikrotik.com).

**Note!** Do not use MS-DOS format command or other disk format utilities to reinstall your MikroTik router! This will cause the Software-ID to change, so you will need to buy another license in order to get MikroTik RouterOS running.

## Logging into the MikroTik Router

### Description

Normally you connect to the router by IP addresses with any telnet or SSH client software (a simple text-mode telnet client is usually called telnet and is distributed together with almost any OS). You can also use graphical configuration tool for Windows (also can be run in Linux using Wine) called Winbox. To get Winbox, connect to the router's IP address with a web browser, and follow the link to download winbox.exe from the router.

MAC-telnet is used to connect to a router when there is no other way to connect to it remotely if the router has no IP address or in case of misconfigured firewall. MAC-telnet can only be used from the same broadcast

domain (so there should be no routers in between) as any of the router's enabled interfaces (you can not connect to a disabled interface). MAC-telnet program is a part of the Neighbor Viewer. Download it from [www.mikrotik.com](http://www.mikrotik.com), unpack both files contained in the archive to the same directory, and run NeighborViewer.exe. A list of MikroTik routers working in the same broadcast domain will be showed double-click the one you need to connect to. Note that Winbox is also able to connect to routers by their MAC addresses, and has the discovery tool built-in.

You can also connect to the router using a standard DB9 serial null-modem cable from any PC. Default settings of the router's serial port are 9600 bits/s (for RouterBOARD 500 series - 115200 bits/s), 8 data bits, 1 stop bit, no parity, hardware (RTS/CTS) flow control. Use terminal emulation program (like HyperTerminal or SecureCRT in Windows, or minicom in UNIX/Linux) to connect to the router. The router will beep twice when booted up, and you should see the login prompt shortly before that (check cabling and serial port settings if you do not see anything in the terminal window).

When logging into the router via terminal console, you will be presented with the MikroTik RouterOS™ login prompt. Use 'admin' and no password (hit [Enter]) for logging in the router for the first time, for example:

```
MikroTik v2.9
Login: admin
Password:
```

The password can be changed with the `/password` command.

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

## Adding Software Packages

### Description

The basic installation comes only with the **system** package. This includes basic IP routing and router administration. To have additional features such as IP Telephony, OSPF, wireless and so on, you will need to [download](#) additional software packages.

The additional software packages should have **the same version** as the system package. If not, the package won't be installed. Please consult the MikroTik RouterOS™ Software Package Installation and Upgrading Manual for more detailed information about installing additional software packages.

To upgrade the router packages, simply upload the packages to the router via ftp, using the binary transfer mode. After you have uploaded the packages, reboot the router, and the features that are provided by those packages will be available (regarding your license type, of course).

## Navigating The Terminal Console

### Description

#### Welcome Screen and Command Prompt

After logging into the router you will be presented with the MikroTik RouterOS™ Welcome Screen and command prompt, for example:

```
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 2.9 (c) 1999-2004      http://www.mikrotik.com/
```

```
Terminal xterm detected, using multiline input mode
[admin@MikroTik] >
```

The command prompt shows the identity name of the router and the current menu level, for example:

```
[admin@MikroTik] >
[admin@MikroTik] interface>
[admin@MikroTik] ip address>
```

## Commands

The list of available commands at any menu level can be obtained by entering the question mark '?', for example:

```
[admin@MikroTik] >
log/ -- System logs
quit -- Quit console
radius/ -- Radius client settings
certificate/ -- Certificate management
special-login/ -- Special login users
redo -- Redo previously undone action
driver/ -- Driver management
ping -- Send ICMP Echo packets
setup -- Do basic setup of system
interface/ -- Interface configuration
password -- Change password
undo -- Undo previous action
port/ -- Serial ports
import -- Run exported configuration script
snmp/ -- SNMP settings
user/ -- User management
file/ -- Local router file storage.
system/ -- System information and utilities
queue/ -- Bandwidth management
ip/ -- IP options
tool/ -- Diagnostics tools
ppp/ -- Point to Point Protocol
routing/ -- Various routing protocol settings
export --

[admin@MikroTik] >
```

```
[admin@MikroTik] ip>
.. -- go up to root
service/ -- IP services
socks/ -- SOCKS version 4 proxy
```

```

arp/ -- ARP entries management
upnp/ -- Universal Plug and Play
dns/ -- DNS settings
address/ -- Address management
accounting/ -- Traffic accounting
the-proxy/ --
vrrp/ -- Virtual Router Redundancy Protocol
pool/ -- IP address pools
packing/ -- Packet packing settings
neighbor/ -- Neighbors
route/ -- Route management
firewall/ -- Firewall management
dhcp-client/ -- DHCP client settings
dhcp-relay/ -- DHCP relay settings
dhcp-server/ -- DHCP server settings
hotspot/ -- HotSpot management
ipsec/ -- IP security
web-proxy/ -- HTTP proxy
export --

[admin@MikroTik] ip>

```

The list of available commands and menus has short descriptions next to the items. You can move to the desired menu level by typing its name and hitting the [Enter] key, for example:

```

[admin@MikroTik] >
[admin@MikroTik] > driver
[admin@MikroTik] driver> /
[admin@MikroTik] > interface
[admin@MikroTik] interface> /ip
[admin@MikroTik] ip>

```

<pre> Base level menu Enter 'driver' to move to the driver level menu Enter '/' to move to the base level menu from any level Enter 'interface' to move to the interface level menu Enter '/ip' to move to the IP level menu from any level </pre>
--

A command or an argument does not need to be completed, if it is not ambiguous. For example, instead of typing **interface** you can type just **in** or **int**. To complete a command use the [Tab] key. Note that the completion is optional, and you can just use short command and parameter names

The commands may be invoked from the menu level, where they are located, by typing its name. If the command is in a different menu level than the current one, then the command should be invoked using its full (absolute) or relative path, for example:

```

[admin@MikroTik] ip route> print
[admin@MikroTik] ip route> .. address print
[admin@MikroTik] ip route> /ip address print

```

<pre> Prints the routing table Prints the IP address table Prints the IP address table </pre>
---

The commands may have arguments. The arguments have their names and values. Some commands, may have a required argument that has no name.

## Summary on executing the commands and navigating the menus

Command	Action
<b>command [Enter]</b>	<b>Executes the command</b>
<b>[?]</b>	<b>Shows the list of all available commands</b>
<b>command [?]</b>	<b>Displays help on the command and the list of arguments</b>



<b>command argument [?]</b>	<b>Displays help on the command's argument</b>
<b>[Tab]</b>	<b>Completes the command/word. If the input is ambiguous, a second [Tab] gives possible options</b>
<b>/</b>	<b>Moves up to the base level</b>
<b>/command</b>	<b>Executes the base level command</b>
<b>..</b>	<b>Moves up one level</b>
<b>""</b>	<b>Specifies an empty string</b>
<b>"word1 word2"</b>	<b>Specifies a string of 2 words that contain a space</b>

You can abbreviate names of levels, commands and arguments.

For the IP address configuration, instead of using the **address** and **netmask** arguments, in most cases you can specify the address together with the number of true bits in the network mask, i.e., there is no need to specify the **netmask** separately. Thus, the following two entries would be equivalent:

```
/ip address add address 10.0.0.1/24 interface ether1
/ip address add address 10.0.0.1 netmask 255.255.255.0 interface ether1
```

## Notes

You must specify the size of the network mask in the address argument, even if it is the 32-bit subnet, i.e., use **10.0.0.1/32** for address=10.0.0.1 netmask=255.255.255.255

## Basic Configuration Tasks

### Description

#### Interface Management

Before configuring the IP addresses and routes please check the **/interface** menu to see the list of available interfaces. If you have Plug-and-Play cards installed in the router, it is most likely that the device drivers have been loaded for them automatically, and the relevant interfaces appear on the **/interface print** list, for example:

```
[admin@MikroTik] interface> print
Flags: X - disabled, D - dynamic, R - running
#  NAME          TYPE      RX-RATE  TX-RATE  MTU
0  R ether1       ether     0         0        1500
1  R ether2       ether     0         0        1500
2  X wavelan1     wavelan  0         0        1500
3  X prism1      wlan     0         0        1500
[admin@MikroTik] interface>
```

The interfaces need to be enabled, if you want to use them for communications. Use the **/interface enable name** command to enable the interface with a given name or number, for example:

```
[admin@MikroTik] interface> print
Flags: X - disabled, D - dynamic, R - running
```

```

#      NAME                TYPE      RX-RATE  TX-RATE  MTU
0 X   ether1              ether     0        0        1500
1 X   ether2              ether     0        0        1500
[admin@MikroTik] interface> enable 0
[admin@MikroTik] interface> enable ether2
[admin@MikroTik] interface> print
Flags: X - disabled, D - dynamic, R - running
#      NAME                TYPE      RX-RATE  TX-RATE  MTU
0 R   ether1              ether     0        0        1500
1 R   ether2              ether     0        0        1500
[admin@MikroTik] interface>

```

The interface name can be changed to a more descriptive one by using **/interface set** command:

```

[admin@MikroTik] interface> set 0 name=Local; set 1 name=Public
[admin@MikroTik] interface> print
Flags: X - disabled, D - dynamic, R - running
#      NAME                TYPE      RX-RATE  TX-RATE  MTU
0 R   Local                ether     0        0        1500
1 R   Public                ether     0        0        1500
[admin@MikroTik] interface>

```

## Notes

The device drivers for NE2000 compatible ISA cards need to be loaded using the **add** command under the **/drivers** menu. For example, to load the driver for a card with IO address 0x280 and IRQ 5, it is enough to issue the command:

```

[admin@MikroTik] driver> add name=ne2k-isa io=0x280
[admin@MikroTik] driver> print
Flags: I - invalid, D - dynamic
#      DRIVER                IRQ IO      MEMORY  ISDN-PROTOCOL
0 D   RealTek 8139
1 D   Intel EtherExpressPro
2 D   PCI NE2000
3     ISA NE2000                280
4     Moxa C101 Synchronous      C8000
[admin@MikroTik] driver>

```

There are some other drivers that should be added manually. Please refer to the respective manual sections for the detailed information on how drivers are to be loaded.

## Setup Command

Command name: **/setup**

### Description

The initial setup of the router can be done by using the **/setup** command which offers the following configuration:

- reset all router configuration
- load interface driver
- configure ip address and gateway
- setup dhcp client
- setup dhcp server
- setup pppoe client

- setup pptp client

## Configure IP address on router, using the Setup command

Execute the `/setup` command from command line:

```
[admin@MikroTik] > setup
Setup uses Safe Mode. It means that all changes that are made during setup
are reverted in case of error, or if [Ctrl]+[C] is used to abort setup. To keep
changes exit setup using the [X] key.

[Safe Mode taken]
Choose options by pressing one of the letters in the left column, before
dash. Pressing [X] will exit current menu, pressing Enter key will select the
entry that is marked by an '*'. You can abort setup at any time by pressing
[Ctrl]+[C].
Entries marked by '+' are already configured.
Entries marked by '-' cannot be used yet.
Entries marked by 'X' cannot be used without installing additional packages.
  r - reset all router configuration
+ l - load interface driver
* a - configure ip address and gateway
  d - setup dhcp client
  s - setup dhcp server
  p - setup pppoe client
  t - setup pptp client
  x - exit menu
your choice [press Enter to configure ip address and gateway]: a
```

To configure IP address and gateway, press **a** or [Enter], if the **a** choice is marked with an asterisk symbol (\*).

```
* a - add ip address
- g - setup default gateway
  x - exit menu
your choice [press Enter to add ip address]: a
```

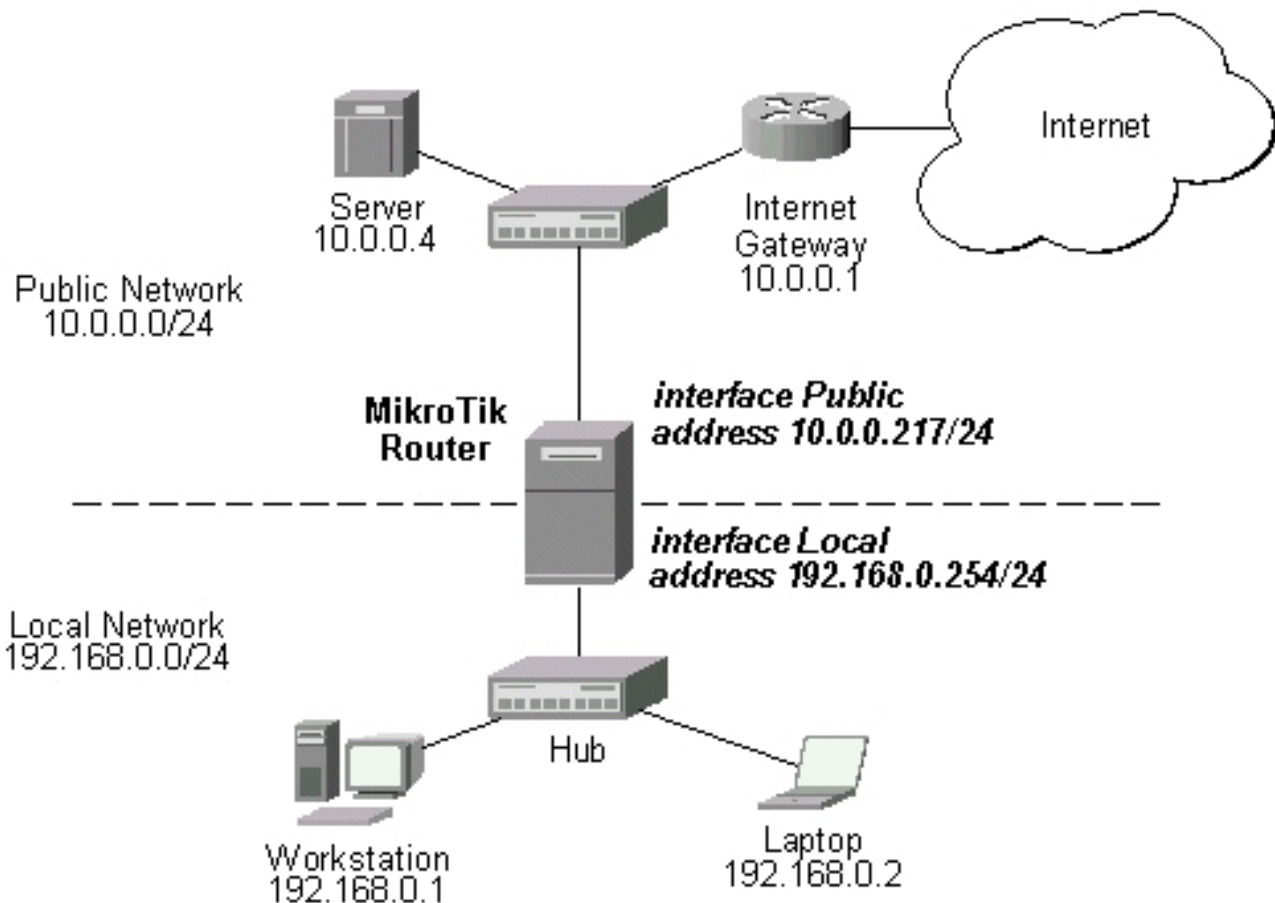
Choose **a** to add an IP address. At first, setup will ask you for an interface to which the address will be assigned. If the setup offers you an undesirable interface, erase this choice, and press the [Tab] key twice to see all available interfaces. After the interface is chosen, assign IP address and network mask on it:

```
your choice: a
enable interface:
ether1 ether2 wlan1
enable interface: ether1
ip address/netmask: 10.1.0.66/24
#Enabling interface
/interface enable ether1
#Adding IP address
/ip address add address=10.1.0.66/24 interface=ether1 comment="added by setup"
+ a - add ip address
* g - setup default gateway
  x - exit menu
your choice: x
```

## Application Examples

### Example

Assume you need to configure the MikroTik router for the following network setup:



In the current example we use two networks:

- The local LAN with network address 192.168.0.0 and 24-bit netmask: 255.255.255.0. The router's address is 192.168.0.254 in this network
- The ISP's network with address 10.0.0.0 and 24-bit netmask 255.255.255.0. The router's address is 10.0.0.217 in this network

The addresses can be added and viewed using the following commands:

```
[admin@MikroTik] ip address> add address 10.0.0.217/24 interface Public
[admin@MikroTik] ip address> add address 192.168.0.254/24 interface Local
[admin@MikroTik] ip address> print
Flags: X - disabled, I - invalid, D - dynamic
#   ADDRESS           NETWORK           BROADCAST         INTERFACE
0   10.0.0.217/24      10.0.0.217       10.0.0.255        Public
1   192.168.0.254/24  192.168.0.0     192.168.0.255    Local
[admin@MikroTik] ip address>
```

Here, the network mask has been specified in the value of the address argument. Alternatively, the argument 'netmask' could have been used with the value '255.255.255.0'. The network and broadcast addresses were not specified in the input since they could be calculated automatically.

Please **note** that the addresses assigned to different interfaces of the router should belong to different networks.

Address	Network	Broadcast	Interface
10.0.0.217/24	10.0.0.0	10.0.0.255	ether2
192.168.0.254/24	192.168.0.0	192.168.0.255	ether1

## Viewing Routes

You can see two dynamic (D) and connected (C) routes, which have been added automatically when the addresses were added in the example above:

```
[admin@MikroTik] ip route> print
Flags: A - active, X - disabled, I - invalid, D - dynamic, C - connect,
       S - static, r - rip, b - bgp, o - ospf, d - dynamic
#   DST-ADDRESS      G GATEWAY      DISTANCE INTERFACE
0 ADC 192.168.0.0/24  r 0.0.0.0      0         Local
1 ADC 10.0.0.0/24    r 0.0.0.0      0         Public
[admin@MikroTik] ip route> print detail
Flags: A - active, X - disabled, I - invalid, D - dynamic, C - connect,
       S - static, r - rip, b - bgp, o - ospf, d - dynamic
0 ADC dst-address=192.168.0.0/24 prefsrc=192.168.0.254 interface=Local scope=10
1 ADC dst-address=10.0.0.0/24 prefsrc=10.0.0.217 interface=Public scope=10
[admin@MikroTik] ip route>
```

These routes show, that IP packets with destination to 10.0.0.0/24 would be sent through the interface Public, whereas IP packets with destination to 192.168.0.0/24 would be sent through the interface Local. However, you need to specify where the router should forward packets, which have destination other than networks connected directly to the router.

## Adding Default Routes

In the following example the default route (destination 0.0.0.0 (any), netmask 0.0.0.0 (any)) will be added. In this case it is the ISP's gateway 10.0.0.1, which can be reached through the interface **Public**

```
[admin@MikroTik] ip route> add gateway=10.0.0.1
[admin@MikroTik] ip route> print
Flags: X - disabled, I - invalid, D - dynamic, J - rejected,
       C - connect, S - static, R - rip, O - ospf, B - bgp
#   DST-ADDRESS      G GATEWAY      DISTANCE INTERFACE
0 ADC 192.168.0.0/24  Local
1 ADC 10.0.0.0/24    Public
2 A S 0.0.0.0/0      r 10.0.0.1      0         Public
[admin@MikroTik] ip route>
```

Here, the default route is listed under #2. As we see, the gateway 10.0.0.1 can be reached through the interface 'Public'. If the gateway was specified incorrectly, the value for the argument 'interface' would be unknown.

### Notes

You cannot add two routes to the same destination, i.e., destination-address/netmask! It applies to the default routes as well. Instead, you can enter multiple gateways for one destination. For more information on IP routes, please read the [Routes, Equal Cost Multipath Routing, Policy Routing](#) manual.

If you have added an unwanted static route accidentally, use the **remove** command to delete the unneeded one. You will not be able to delete dynamic (DC) routes. They are added automatically and represent routes to the networks the router connected directly.

## Testing the Network Connectivity

From now on, the **/ping** command can be used to test the network connectivity on both interfaces. You can reach any host on both connected networks from the router.

How the **/ping** command works:

```
[admin@MikroTik] ip route> /ping 10.0.0.4
10.0.0.4 64 byte ping: ttl=255 time=7 ms
10.0.0.4 64 byte ping: ttl=255 time=5 ms
10.0.0.4 64 byte ping: ttl=255 time=5 ms
3 packets transmitted, 3 packets received, 0% packet loss
round-trip min/avg/max = 5/5.6/7 ms
[admin@MikroTik] ip route>
[admin@MikroTik] ip route> /ping 192.168.0.1
192.168.0.1 64 byte ping: ttl=255 time=1 ms
192.168.0.1 64 byte ping: ttl=255 time=1 ms
192.168.0.1 64 byte ping: ttl=255 time=1 ms
3 packets transmitted, 3 packets received, 0% packet loss
round-trip min/avg/max = 1/1.0/1 ms
[admin@MikroTik] ip route>
```

The workstation and the laptop can reach (ping) the router at its local address 192.168.0.254, If the router's address 192.168.0.254 is specified as the default gateway in the TCP/IP configuration of both the workstation and the laptop, then you should be able to ping the router:

```
C:\>ping 192.168.0.254
Reply from 192.168.0.254: bytes=32 time=10ms TTL=253
Reply from 192.168.0.254: bytes=32 time<10ms TTL=253
Reply from 192.168.0.254: bytes=32 time<10ms TTL=253

C:\>ping 10.0.0.217
Reply from 10.0.0.217: bytes=32 time=10ms TTL=253
Reply from 10.0.0.217: bytes=32 time<10ms TTL=253
Reply from 10.0.0.217: bytes=32 time<10ms TTL=253

C:\>ping 10.0.0.4
Request timed out.
Request timed out.
Request timed out.
```

## Notes

You cannot access anything beyond the router (network 10.0.0.0/24 and the Internet), unless you do the one of the following:

- Use source network address translation (masquerading) on the MikroTik router to 'hide' your private LAN 192.168.0.0/24 (see the information below), or
- Add a static route on the ISP's gateway 10.0.0.1, which specifies the host 10.0.0.217 as the gateway to network 192.168.0.0/24. Then all hosts on the ISP's network, including the server, will be able to communicate with the hosts on the LAN

To set up routing, it is required that you have some knowledge of configuring TCP/IP networks. We strongly recommend that you obtain more knowledge, if you have difficulties configuring your network setups.

## Advanced Configuration Tasks

### Description

Next will be discussed situation with 'hiding' the private LAN 192.168.0.0/24 'behind' one address 10.0.0.217 given to you by the ISP.

### Application Example with Masquerading

If you want to 'hide' the private LAN 192.168.0.0/24 'behind' one address 10.0.0.217 given to you by the ISP, you should use the source network address translation (masquerading) feature of the MikroTik router. Masquerading is useful, if you want to access the ISP's network and the Internet appearing as all requests coming from the host 10.0.0.217 of the ISP's network. The masquerading will change the source IP address and port of the packets originated from the network 192.168.0.0/24 to the address 10.0.0.217 of the router when the packet is routed through it.

Masquerading conserves the number of global IP addresses required and it lets the whole network use a single IP address in its communication with the world.

To use masquerading, a source NAT rule with action 'masquerade' should be added to the firewall configuration:

```
[admin@MikroTik] ip firewall nat> add chain=srcnat action=masquerade
out-interface=Public
[admin@MikroTik] ip firewall nat> print
Flags: X - disabled, I - invalid, D - dynamic
0 chain=srcnat out-interface=Public action=masquerade
```

### Notes

Please consult [Network Address Translation](#) for more information on masquerading.

### Example with Bandwidth Management

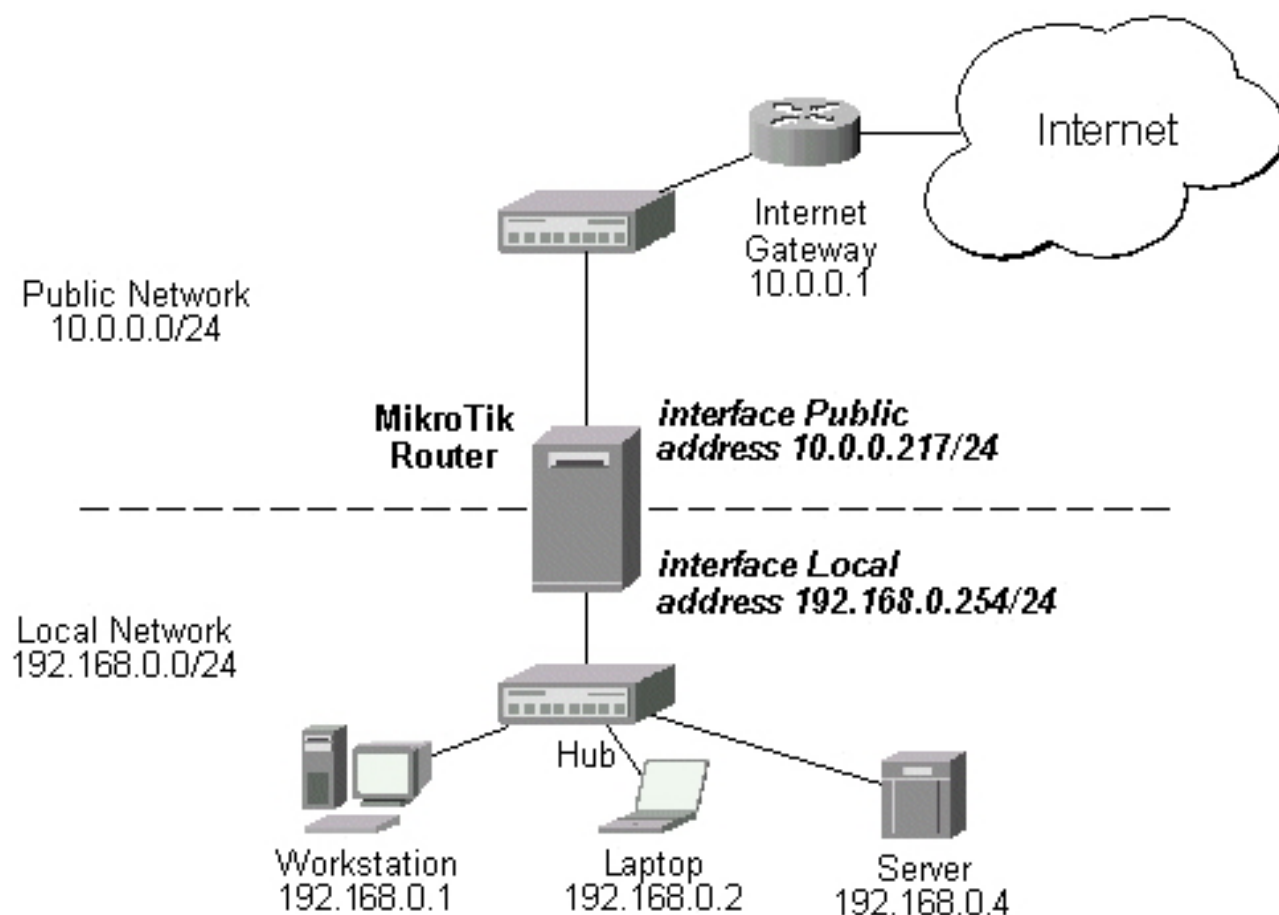
Assume you want to limit the bandwidth to 128kbps on downloads and 64kbps on uploads for all hosts on the LAN. Bandwidth limitation is done by applying queues for outgoing interfaces regarding the traffic flow. It is enough to add a single queue at the MikroTik router:

```
[admin@MikroTik] queue simple> add max-limit=64000/128000 interface=Local
[admin@MikroTik] queue simple> print
Flags: X - disabled, I - invalid, D - dynamic
0 name="queue1" target-address=0.0.0.0/0 dst-address=0.0.0.0/0
interface=Local queue=default/default priority=8 limit-at=0/0
max-limit=64000/128000 total-queue=default
[admin@MikroTik] queue simple>
```

Leave all other parameters as set by default. The limit is approximately 128kbps going to the LAN (download) and 64kbps leaving the client's LAN (upload).

### Example with NAT

Assume we have moved the server in our previous examples from the public network to our local one:



The server's address is now 192.168.0.4, and we are running web server on it that listens to the TCP port 80. We want to make it accessible from the Internet at address:port 10.0.0.217:80. This can be done by means of Static Network Address translation (NAT) at the MikroTik Router. The Public address:port 10.0.0.217:80 will be translated to the Local address:port 192.168.0.4:80. One destination NAT rule is required for translating the destination address and port:

```
[admin@MikroTik] ip firewall nat> add chain=dstnat action=dst-nat protocol=tcp
dst-address=10.0.0.217/32                                dst-port=80 to-addresses=192.168.0.4
[admin@MikroTik] ip firewall nat> pr
Flags: X - disabled, I - invalid, D - dynamic
0 chain=dstnat dst-address=10.0.0.217/32 protocol=tcp dst-port=80
  action=dst-nat to-addresses=192.168.0.4 to-ports=0-65535
```

## Notes

Please consult [Network Address Translation](#) for more information on Network Address Translation.