

# Static routing

## Introduction

Entry In the case of a local area network where all devices are on one network, communication takes place by means of switches, or less often by means of switches hub. However, in the event that we want to transfer data from our network to another, or vice versa, such the solution is not enough. To ensure communication between different networks, it is necessary to use a device such as a router. Mainly a router type device deals with the analysis and routing of traffic between different networks, based on defined routes packet transfer. The very process of determining these paths is called routing. Routes can determine in many ways, one of them is the static method.

## Application

Static routing is used for small networks, or for networks that require specific ones configurations that cannot be generated automatically. Routing in practice static are used in configurations consisting of two or more computer networks.

## Sample network

The figure below (Fig. 1) shows an example of a demanding network structure proper static routing configuration.

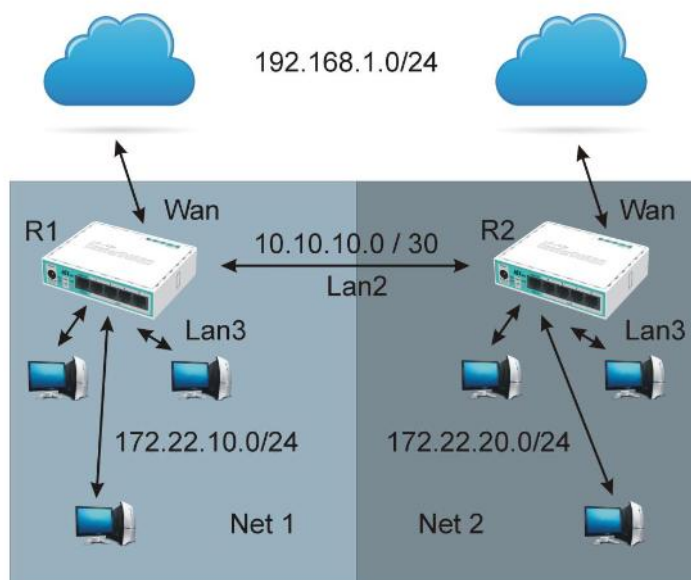


Figure 1. Example network structure

## Functional description of the network

The network consists of two subnets that need to be connected. Routers in the presented configuration R1 and R2 provide services to devices on their local computer networks, i.e. capability machine-to-machine communication, Internet access via WAN interface, and security local machines from outside access (NAT). Each of the local networks has a different range of IP addresses, so they cannot be connected directly via using a switch or hub. For this purpose, the appropriate configuration of routers R1, R2 is required. To ensure adequate security, and functionality that will ensure that it will be possible interconnection of these two local networks, a third network interface was provided named Lan2.

## Description of static routing setup steps

In the first step, you need to properly configure the routers so that they can work properly, within their local networks. For simplicity, it is assumed that the local networks will have similar ranges of IP addresses, differing by only one octet. The entire setup process will be done in the VirtualBox environment, names like "tab network N" refers to the next NIC of the virtual machine, the name "interface K" will be concerned the name of the network card visible in the Mikrotik Router OS environment.

Prepare the following configuration for the R1 router:

- network card 1 - WAN interface, dhcp from the host's local network, network: 192.168.1.0/24
- network card 2 - interface lan1, ip: 172.22.10.1/24, internal network with DHCP server, range of available addresses: 172.22.10.2 - 172.22.10.254
- network card 3 - lan2 interface, ip: 10.10.10.1/30, no DHCP server

Prepare the following configuration for the R2 router:

- network card 1 - WAN interface, dhcp from the host's local network, network: 192.168.1.0/24
- network card 2 - lan1 interface, ip: 172.22.20.1/24, internal network with DHCP server, range of available addresses: 172.22.20.2 - 172.22.20.254
- network card 3 - lan2 interface, ip: 10.10.10.2/30, no DHCP server

One or more test machines must be connected to each internal network interface of each router test machines.

## Stages of task implementation

- provide machines in the local network with the ability to communicate with each other,

- provide machines in the local network with Internet access,
- provide machines on one network with the ability to communicate with the router of the other network

Fig.2 shows the correct network configuration for individual routers:

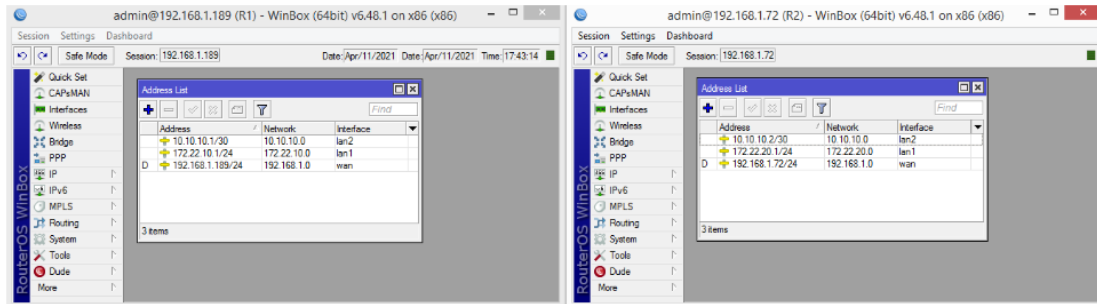


Figure 2. Routers configuration

To set up routing, select Routes from the IP menu:

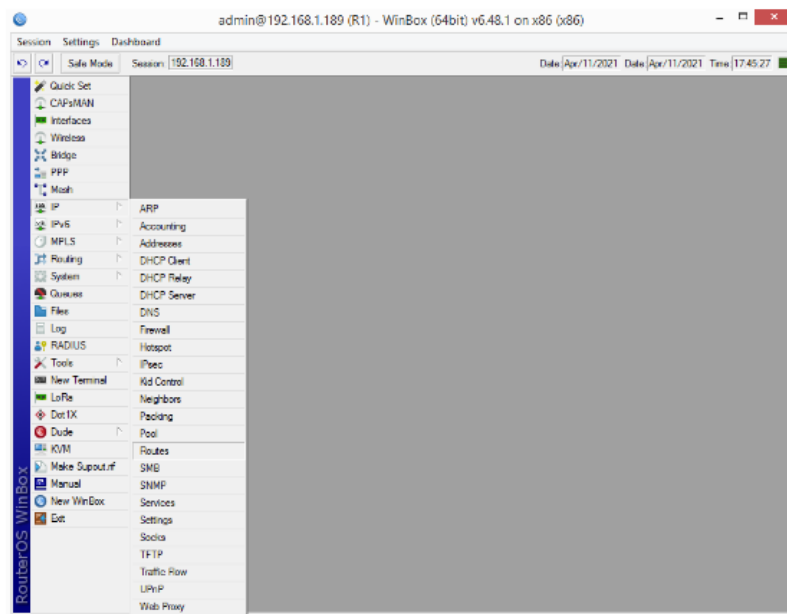


Figure 3. Routes option

To add the appropriate entries, select the "+" button and set the appropriate routes for packages:

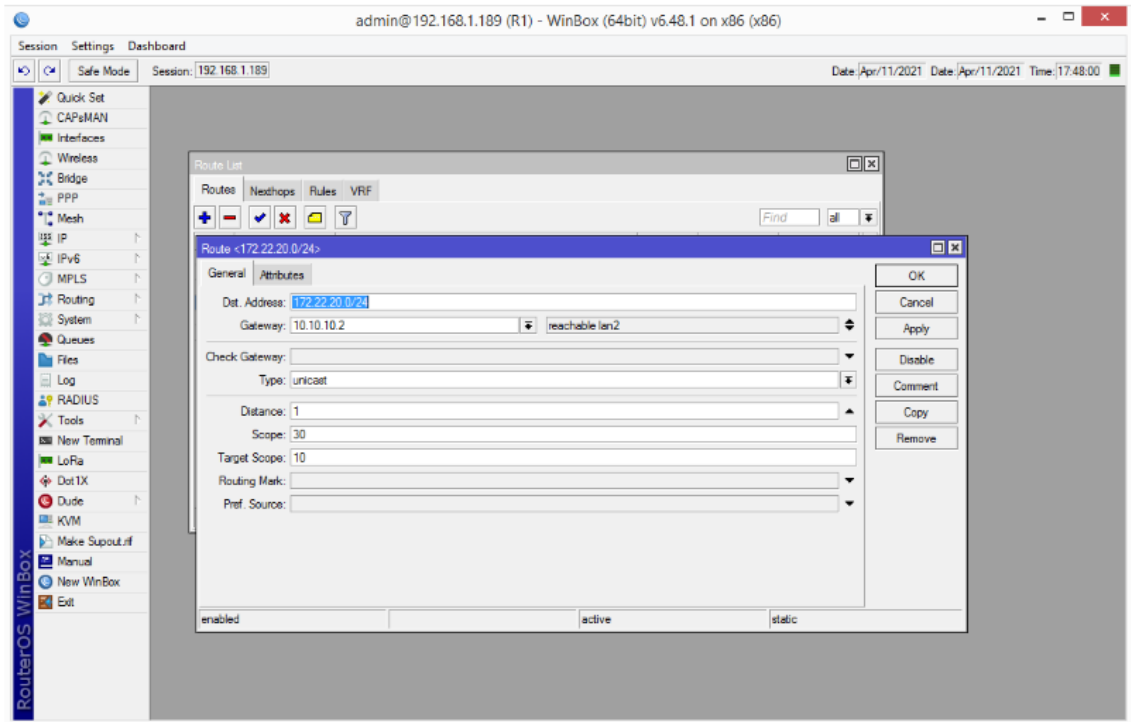


Figure 4. Adding a route to the routing table

After adding a static route, the string "AS" will appear in the first column for that entry as per the figure below:

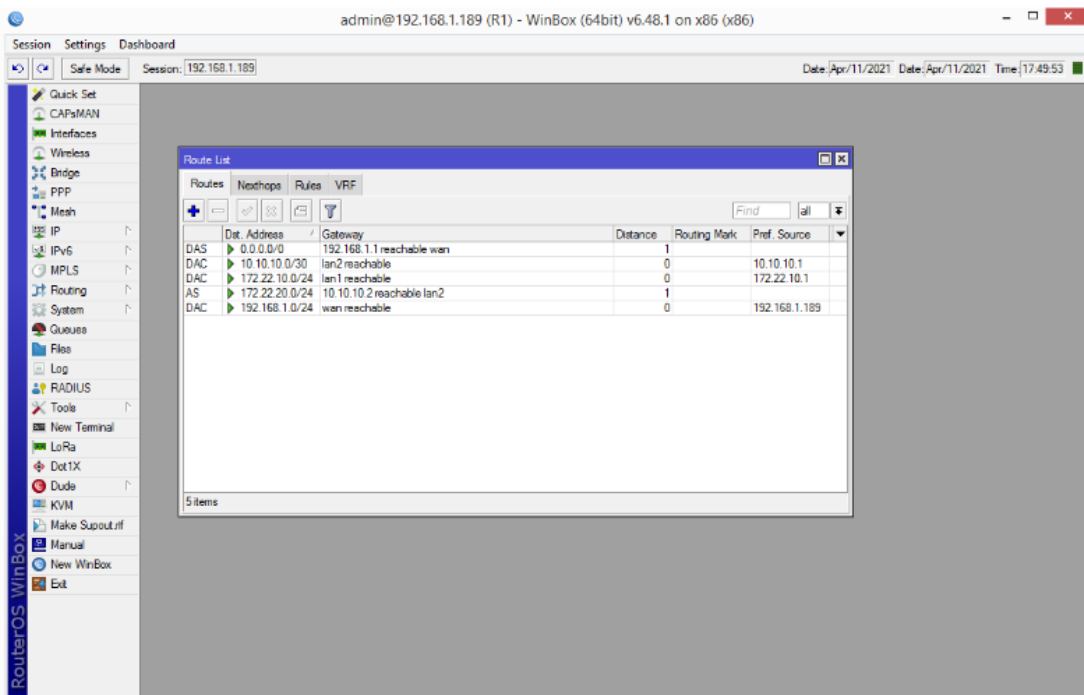


Figure 5. Routing route list

Valid entries for the respective routers:

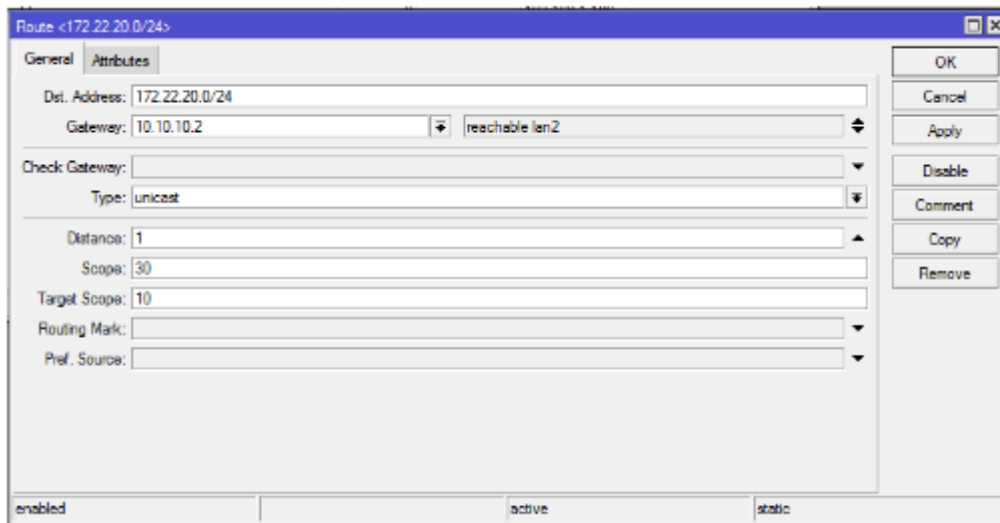


Figure 5. R1's static route

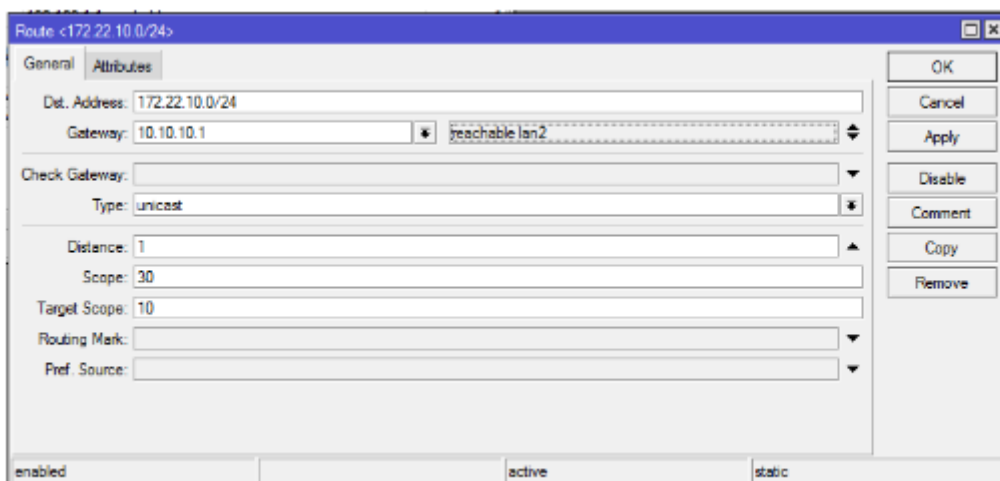


Figure 6. R2's static route

## Warning

If in the "Dst Address:" item, instead of the network, we enter the router's IP, then we will provide machines with different ones networks with router-only access, machine-to-machine communication will not be possible.

## Test configuration

Fig. 9 shows a test configuration presenting the operation of the routing mechanism static, such as pinging machines on different networks.

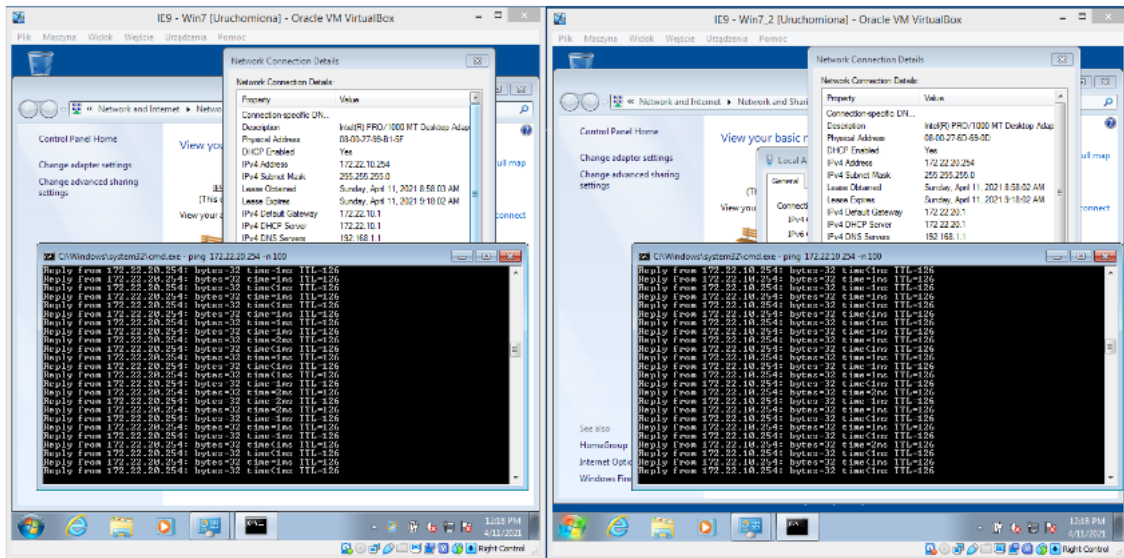


Fig. 9. Example results of the ping command executed on machines in different networks

### Tips - tips to make work easier

When making changes to the configuration of routers, pay attention to the following situations, which are difficult to diagnose as the cause of network malfunction:

- check that the IP addresses of the selected network interfaces do not have the last one octet set to 0, because such a configuration is not signaled as incorrect, e.g.
  - 172.22.10.0/24 lan - WRONG!!!!
  - 172.22.10.1/24 lan - good
- check if we have the correct MAC addresses assigned to network interfaces in the case of duplicates or invalid bindings, the router services behave unpredictably