



MIKROTIK NETWORK SIMULATOR



PRESENTED BY ROFIQ FAUZI

MUM Nov 2013 - Indonesia



ABOUT ROFIQ FAUZI

- Using MikroTik (v.2.97) since 2005, as Network Engineer at WISP.
- 2007, Network & Wireless Engineer at INDOSAT Central Java Area
- 2008, Network & Telco Procurement at INDOSAT Head Quarter
- 2012-Now, MikroTik Consultant & Certified Trainer (MTCNA, MTCRE, MTCTCE, MTCWE, MTCINE, Certified Trainer) at **ID-Networkers**.
- 2013-Now, Network Manager at WISP Indomedianet, Indonesia

CONSULTANT

<http://www.mikrotik.com/consultants/asia/indonesia>

CERTIFIED TRAINER

<http://www.mikrotik.com/training/partners/asia/indonesia>

ABOUT ID-NETWORKERS



EXPERT LEVEL TRAINERS & CONSULTANS

In the Most Prestigious Networking Certification

OVERVIEW

We are young entrepreneurs, we are only one training partner & consultant who has expert level trainers in the most prestigious networking certification, CCIE Guru , JNCIE Guru and MTCINE guru, which very limited number in Indonesia even Asia. Proven that hundred of our students pass the certification exam every year. We are the biggest certification factory in Indonesia.

WEBSITE

www.id-networkers.com



TOPIC BACKGROUND

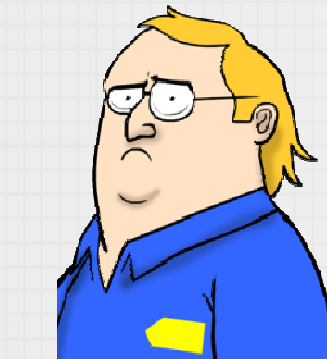
I have simulator, I am running on GNS3 Network simulator

I want too!!

Me too!!




CISCO




Juniper
NETWORKS



MikroTik

MAIN REASON

Another network device can running on simulator, make easy to learn and develop network topology

Sometime, we want to create some mikrotik network topology and test how it works, for example, we want to make some test with 4-8 routers to simulate real network and with real routerboard. We need a lot of money to make real lab.

MIKROTIK SIMULATOR OBJECTIVE

01. LEARN MIKROTIK FEATURES

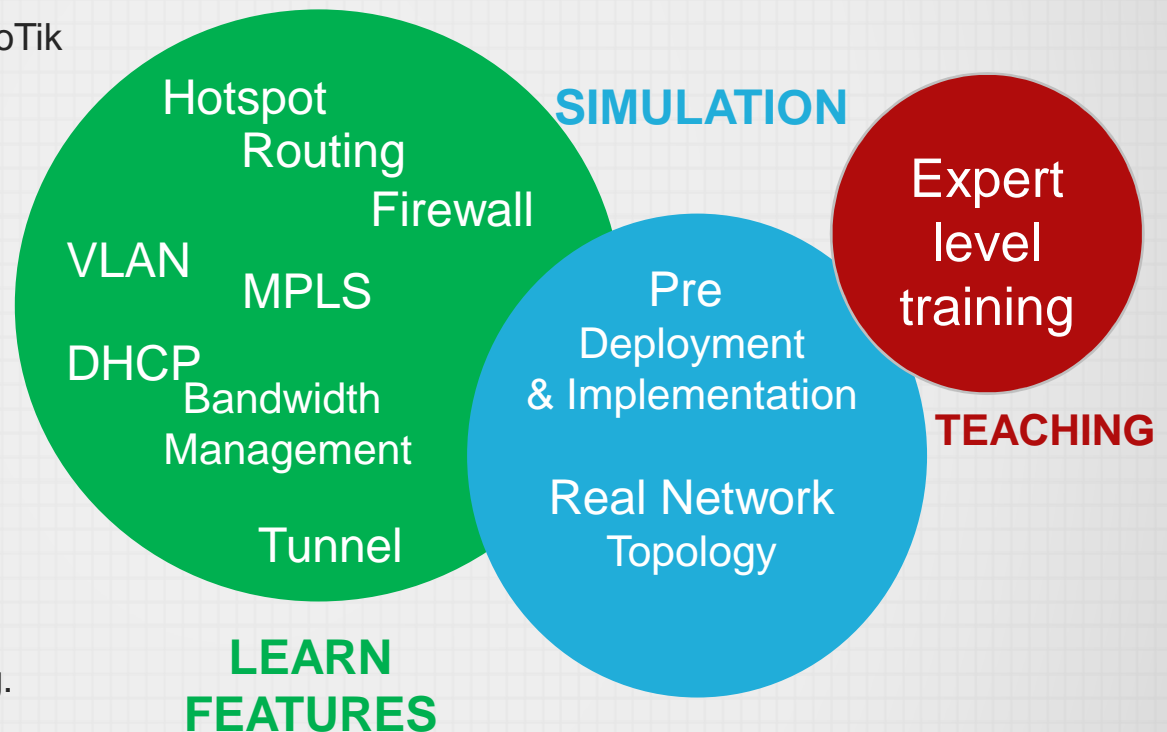
Easy to learn and practice more of MikroTik features, anytime anywhere

02. NETWORK SIMULATION

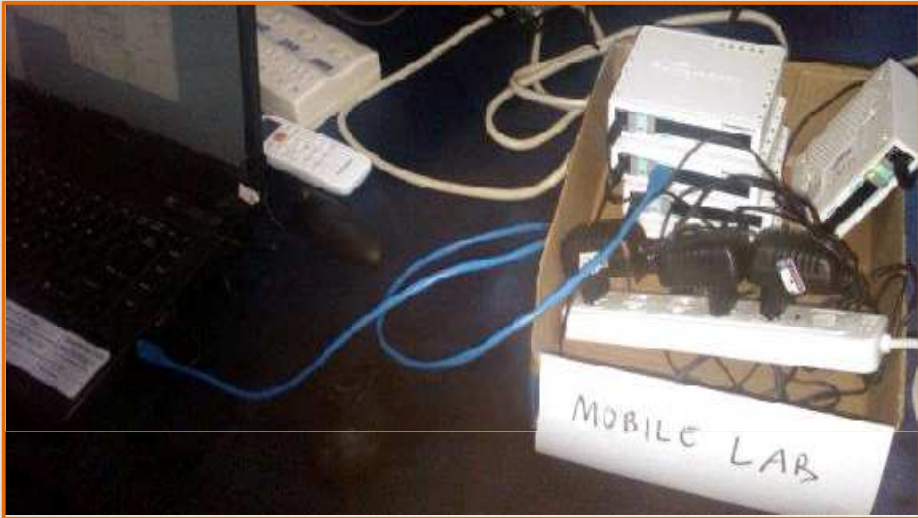
We can try some features in simulation network lab with any topology before its will deploy or implement in the real network.

03. TEACHING

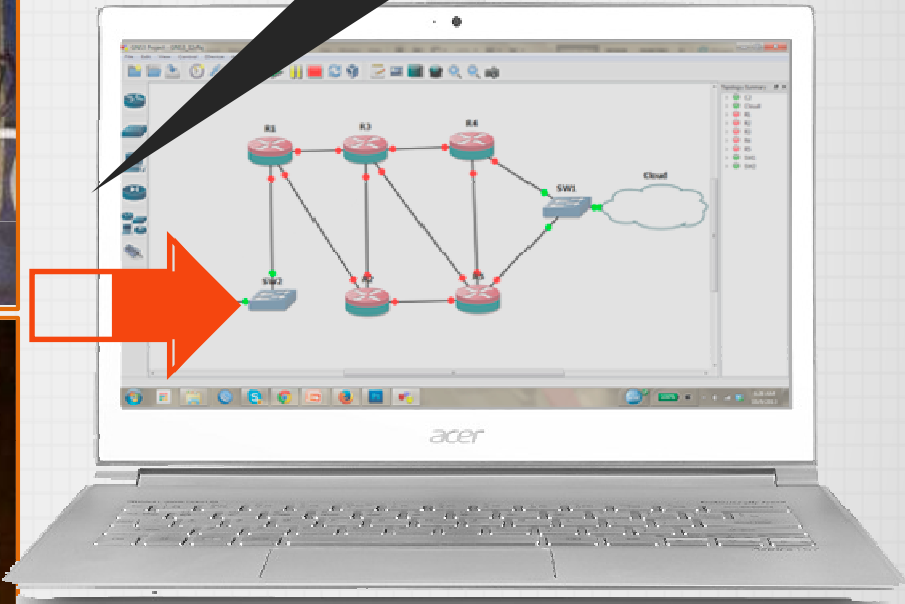
Teaching someone, In **ID-Networkers**, we use to teach MikroTik expert training.



THE CONCEPT



Put all your devices in your POCKET



TOOLS & INGREDIENTS



GNS3

- Graphic Network Simulator
- **Open Source** Software
- Running on Windows, Linux
- Simulate complex network topologies
- Running multi vendor devices
- See detail at www.gns3.net



QEMU

- Known as Quick EMUlator
- **Open source** software
- Emulates full system (usually a PC).
- Launch a different OS
- As alternative: VMware, Virtual Box, KVM, etc
- See detail at www.qemu.org



MikroTik ISO file

- Has Mikrotik license level 0
- Made for x86 hardware architecture
- Usually burn in to CD
- To install MikroTik in to PC or power PC
- Download at www.mikrotik.com/download

MIKROTIK VIRTUALIZATION PROGRAM

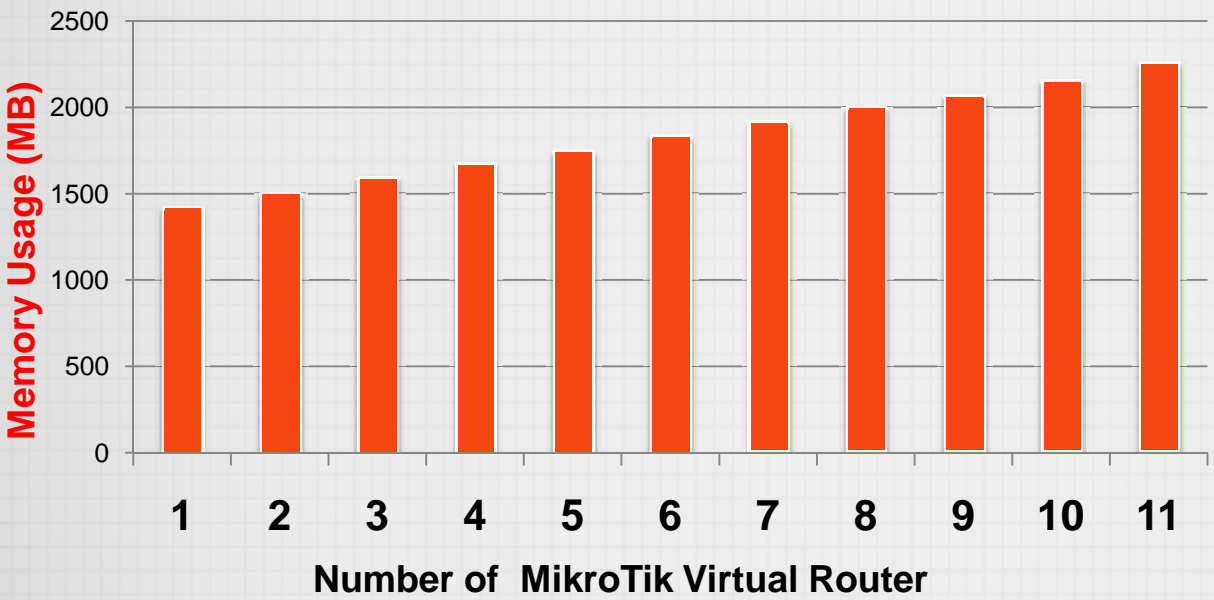
Comparing between VMWare, VirtualBox and Qemu

COMPANY	Possible Put in GNS3 (GUI)	License	Memory Load	Remark
VMWare	Only connect	Free, commerce	High	1 image for 1 router
Virtual Box	Yes	Free	High	1 image for 1 router
Qemu	Yes	Free	Low	1 image for all router

Qemu is the best emulator to run MikroTik routers and put on GNS3 Network simulator (GUI)

PERFORMANCE GRAPH

This graph represents how if we are using windows 7 and add some Mikrotik-Qemu device (virtual mikrotik router) in GNS3 , how it will affect performance of our Laptop or PC, especially in memory usage.



UTILISATION

Run Mikrotik with Qemu (mikrotik virtual router) will only increase Memory/RAM usage, CPU usage will not affected

Every add one Mikrotik-Qemu on GNS3 will consume memory/RAM usage approximately **80Mb** each router

Mean that if for example we have 4GB memory, we can calculate:
 $(4000\text{MB} - 1500\text{MB}) / 80 = 31$ routers



HOW TO DO IT

Download MikroTik ISO file



Install ISO to **Image** file



Run image in Virtual Machine



Put virtual machine on **Network Simulator**



LAB DEMO

1. After download All tool & ISO file, move ISO file to the folder where the GNS3 program located. Go to command line and move to GNS3 folder.

```
C:\Users\admin>cd C:\Program Files\GNS3  
C:\Program Files\GNS3>
```

2. Then run the command to make the image file, for example named mikrotik.img

```
C:\Program Files\GNS3>qemu-img.exe create -f qcow2 mikrotik.img 256M
```

Until a successful image-making information

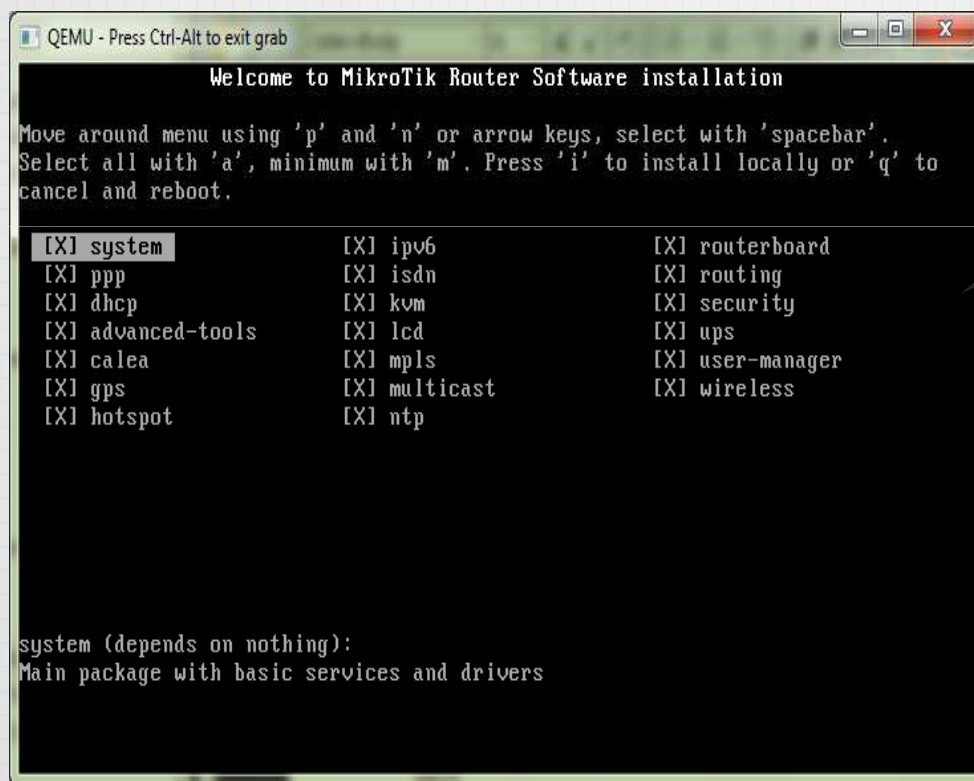
```
Formatting 'mikrotik.img', fmt=qcow2 size=268435456 encryption=off  
cluster_size=0
```

3. Install ISO file to the current image, I assume that the ISO file name is "mikrotik.iso", you can adjust file name to match with the following command

```
C:\Program Files\GNS3> qemu.exe mikrotik.img -boot d -cdrom  
"mikrotik.iso"
```

LAB DEMO

- Qemu will show MikroTik installation process similar to when we install it using CD-room



The screenshot shows a terminal window titled "QEMU - Press Ctrl-Alt to exit grab". The terminal displays the MikroTik Router Software installation wizard. The text reads: "Welcome to MikroTik Router Software installation. Move around menu using 'p' and 'n' or arrow keys, select with 'spacebar'. Select all with 'a', minimum with 'm'. Press 'i' to install locally or 'q' to cancel and reboot." Below this, there is a list of software packages with checkboxes, all of which are checked. The packages are: system, ppp, dhcp, advanced-tools, calea, gps, hotspot, ipv6, isdn, kvm, lcd, mpls, multicast, ntp, routerboard, routing, security, ups, user-manager, and wireless. The "system" package is highlighted. Below the list, it says "system (depends on nothing): Main package with basic services and drivers".

```
QEMU - Press Ctrl-Alt to exit grab
Welcome to MikroTik Router Software installation
Move around menu using 'p' and 'n' or arrow keys, select with 'spacebar'.
Select all with 'a', minimum with 'm'. Press 'i' to install locally or 'q' to
cancel and reboot.

[X] system      [X] ipv6       [X] routerboard
[X] ppp         [X] isdn      [X] routing
[X] dhcp        [X] kvm       [X] security
[X] advanced-tools [X] lcd       [X] ups
[X] calea       [X] mpls      [X] user-manager
[X] gps         [X] multicast [X] wireless
[X] hotspot     [X] ntp

system (depends on nothing):
Main package with basic services and drivers
```

Just follow the
INSTALLATION WIZARD

LAB DEMO

5. After the installation is complete (indicated by RouterOS reboot), close the window and try boot from image

```
C:\Program Files\GNS3>qemu.exe mikrotik.img -boot c
```

Qemu will boot and run routeros until see the login prompt MiroTik routeros

6. Put Mikrotik image to the Qemu Guest in GNS3
 - Open GNS3 program
 - Make a symbol for mikrotik device, click Edit > Symbol Manager

LAB DEMO

The screenshot shows the GNS3 interface with the Symbol Manager window open. The 'Edit' menu is open, and the 'Symbol manager' option is highlighted. In the Symbol Manager, the 'router_firewall' symbol is selected in the 'Available symbols' list. The 'Customized node settings' panel shows the 'Name' field set to 'MikroTik ROS' and the 'Type' dropdown set to 'Qemu guest'. The 'Customized nodes' list on the right shows the newly added 'MikroTik ROS' node. A callout box points to the 'router_firewall' symbol with the text: 'Choose one of symbol that we want to use as Qemu Guest, and give a name "MikroTik ROS"'. Red boxes highlight the 'Edit' menu, 'Symbol manager', 'router_firewall', and the 'Name' and 'Type' fields in the settings panel.

Choose one of symbol that we want to use as Qemu Guest, and give a name "MikroTik ROS"

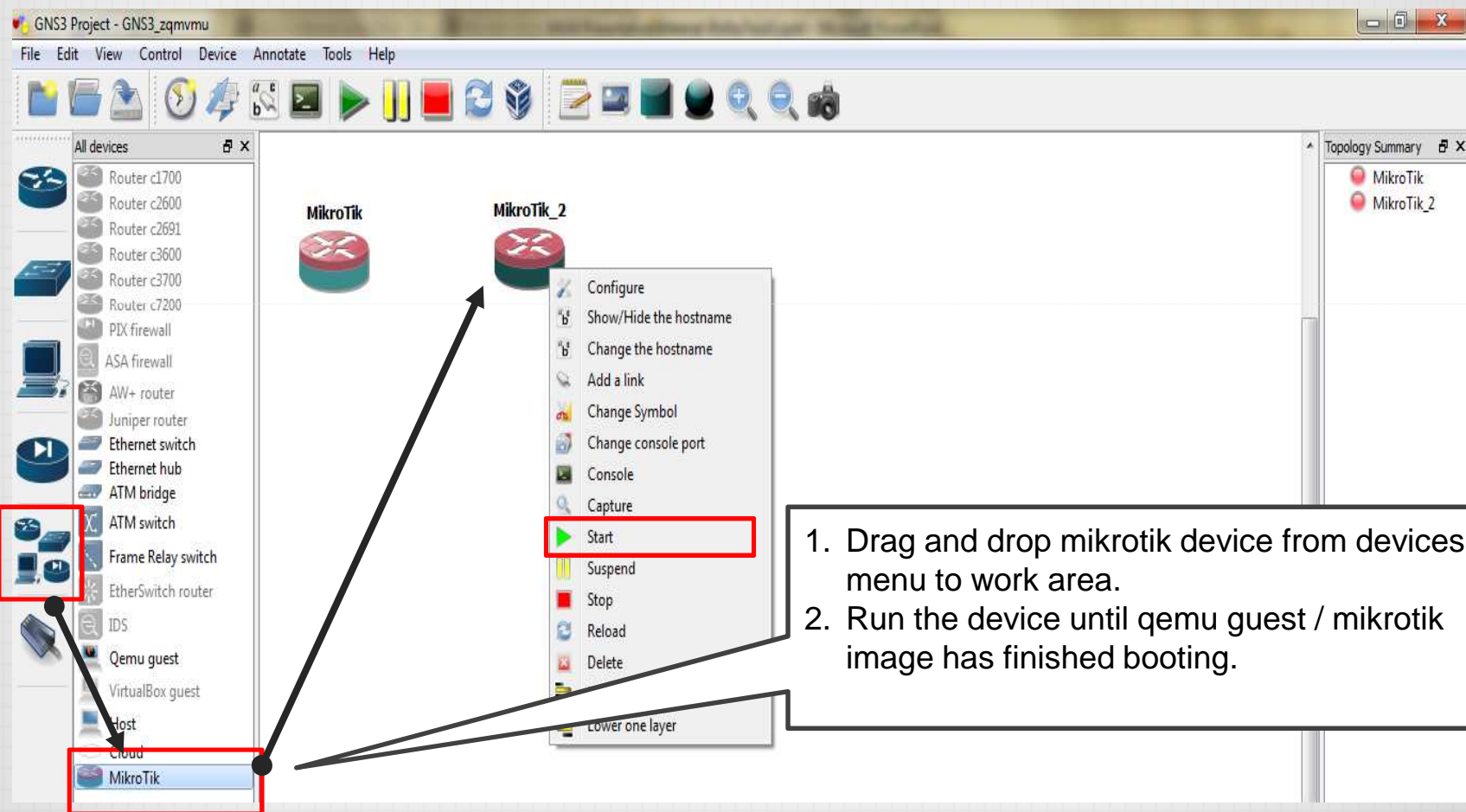
LAB DEMO

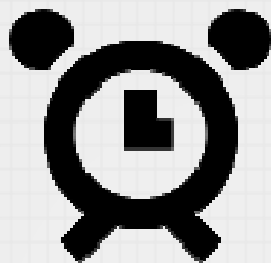
7. Make Qemu Guest in order to load mikrotik image that we create before, in GNS3 menu, go to Edit > Preferences > and go to Qemu Guest tab:

Set Qemu Guest name
Set binary image, direct to mikrotik image
Set virtual memory allocation
Set number of ethernet card
Set ethercart model

LAB DEMO

8. Mikrotik in GNS3 device is ready to use.






BREAK, **its time to QUIZ**

Answer the question, and get free MikroTik **RB951Ui-2HnD**

Powered by

Free!MikroTik
dari MU untuk MU





How to use winbox to remote **our**
virtual router?

INSTALL LOOPBACK INTERFACE

HARDWARE WIZARD

Find the Hardware Wizard command:

1. Click the Start menu.
2. Search for "cmd".
3. Right-click on "cmd" and select "Run as Administrator"
4. Enter "hdwwiz.exe"

MICROSOFT LOOPBACK ADAPTER

Then follow this step:

1. In the "Welcome to the Add Hardware Wizard", click Next.
2. Select "Install the hardware, manually select from a list (Advanced)" and click Next.
3. Scroll down and select "Network adapters" and click Next.
4. Select under Manufacturer "Microsoft" and then under Network Adapter "Microsoft Loopback Adapter" and click Next.

We also possible to create loopback interface in your PC/laptop using GNS3, in menu Tool>Loopback Manager

PROCESS SCREENSHOT

The screenshots illustrate the following steps:

- 1. Welcome to the Add Hardware Wizard:** The wizard explains its purpose for installing driver software for older devices. A warning icon indicates that if hardware came with an installation CD, the user should use that instead of Windows. The 'Next >' button is highlighted.
- 2. Can help you install other hardware:** The user is asked what they want the wizard to do. The 'Install the hardware that I manually select from a list (Advanced)' option is selected. The 'Next >' button is highlighted.
- 3. Select the type of hardware you are installing:** A list of hardware categories is shown, with 'Network adapters' selected. The 'Next >' button is highlighted.
- 4. Select a Network Adapter:** The user is prompted to select a network adapter. The 'Microsoft' manufacturer is selected, and 'Microsoft Loopback Adapter' is chosen from the list. The 'Next >' button is highlighted.
- 5. Hardware is ready to install your hardware:** The 'Microsoft Loopback Adapter' is listed as hardware to install. The 'Next >' button is highlighted.
- 6. Completing the Add Hardware Wizard:** The wizard confirms that the 'Microsoft Loopback Adapter' has been installed. The 'Finish' button is highlighted.



CONNECT LOOPBACK INTERFACE TO GNS3

CONFIGURE CLOUD IN GNS3

To connect between loopback interface & GNS3 we need to do following steps:

1. In GNS3 choose device type cloud and drag and drop to work area,.
2. Right click twice on the device to configure it.
3. Go to “C1” menu and tab “NIO Ethernet”
4. Point “Generic Ethernet NIO” to loopback interface that we created previously, if not yet detected you need to reboot your laptop.
5. Choose, add, apply and OK

CONNECT LAPTOP TO ROUTER DEVICE

To connect between laptop and Mikrotik virtual router device, we need to do following steps:

1. After cloud had been configured, add mikrotik device and Ethernet switch device on work area.
2. Connect between three of them using link device.
3. Configure IP address on MikroTik device one subnet with loopback interface, now you can ping and remote it via laptop

CONFIGURE CLOUD DEVICE

GNS3 Project - GNS3_loxvh

File Edit View Control Device Annotate Tools Help

All devices

- Router c1700
- Router c2600
- Router c2691
- Router c3600
- Router c3700
- Router c7200
- PIX firewall
- ASA firewall
- AW+ router
- Juniper router
- Ethernet switch
- Ethernet hub
- ATM bridge
- ATM switch
- Frame Relay switch
- EtherSwitch router
- IDS
- Qemu guest
- VirtualBox guest
- Host
- Cloud
- MikroTik

C2

SW1

MikroTik

Node configurator

C2 node

NIO Ethernet NIO UDP NIO TAP NIO UNIX NIO VDE NIO NULL

Generic Ethernet NIO (Administrator or root access required)

rxcap://Device\NPF_{B2F7E9C-C5B1-400A-A258-99B57E52399F} : Network

ip driver 'MS LoopBack Driver' on local host: loopback Add Delete

nio_gen_eth:\device\npf_{b2f7e9c-c5b1-400a-a258-99b57e52399f}

Linux Ethernet NIO (Administrator or root access required)

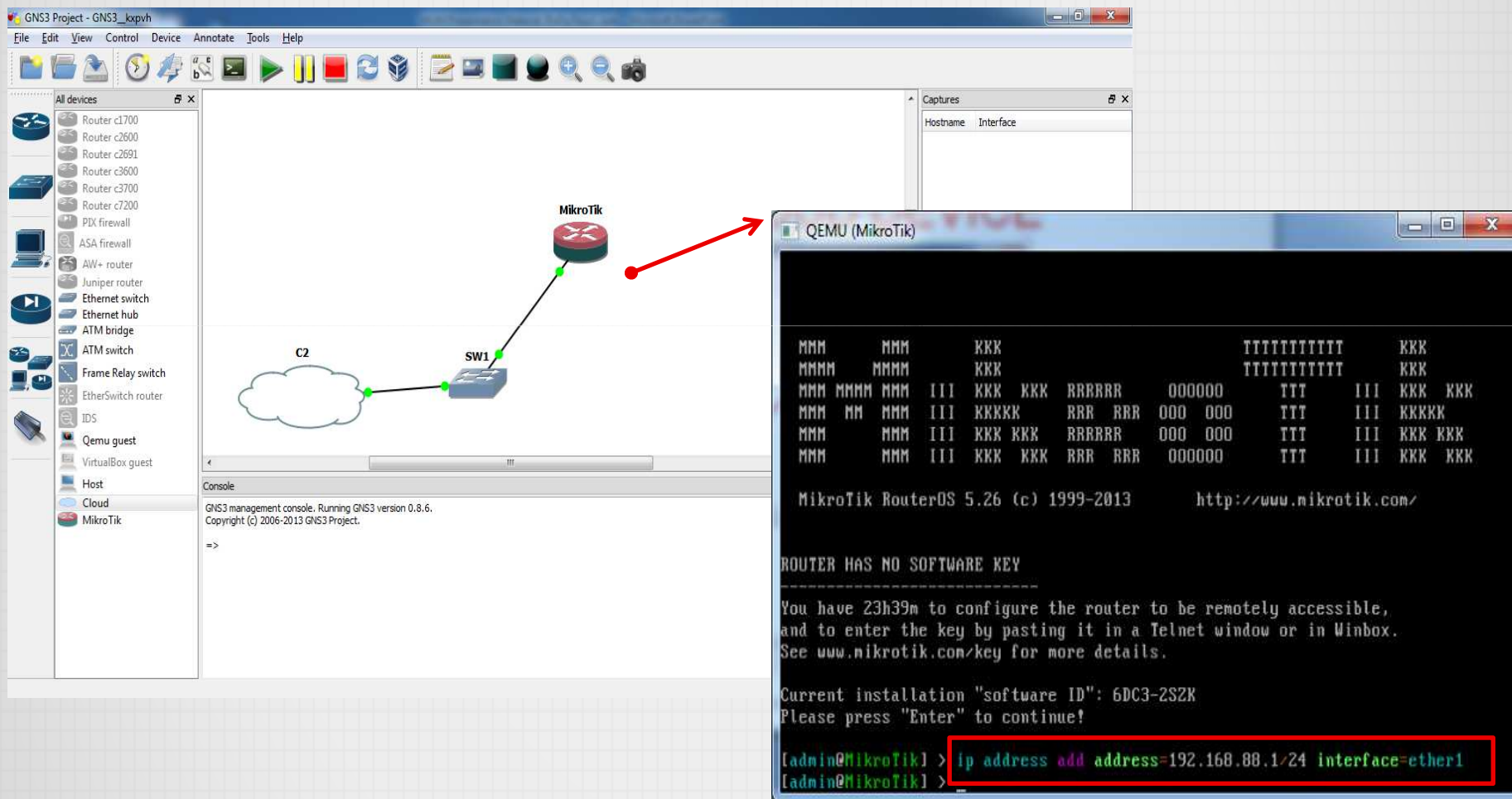
Add Delete

Reset OK Cancel Apply

Choose loopback interface, add and OK

GNS3 management console, Running GNS3 version 0.8.6.
Copyright (c) 2006-2013 GNS3 Project.

CONFIGURE DEVICE IP ADDRESS



The screenshot displays the GNS3 Project - GNS3_kxpvh interface. The main workspace shows a network diagram with a cloud labeled 'C2' connected to a switch labeled 'SW1', which is connected to a MikroTik router. A red arrow points from the router icon in the diagram to a terminal window titled 'QEMU (MikroTik)'. The terminal window shows the MikroTik RouterOS 5.26 boot sequence, including the 'MikroTik RouterOS 5.26 (c) 1999-2013' banner and the 'ROUTER HAS NO SOFTWARE KEY' warning. The terminal prompt is '[admin@MikroTik] >'. The command 'ip address add address=192.168.88.1/24 interface=ether1' is entered and highlighted with a red box.

```
GNS3 Project - GNS3_kxpvh
File Edit View Control Device Annotate Tools Help

All devices
Router c1700
Router c2600
Router c2691
Router c3600
Router c3700
Router c7200
PIX firewall
ASA firewall
AW+ router
Juniper router
Ethernet switch
Ethernet hub
ATM bridge
ATM switch
Frame Relay switch
EtherSwitch router
IDS
Qemu guest
VirtualBox guest
Host
Cloud
MikroTik

C2
SW1
MikroTik

Console
GNS3 management console. Running GNS3 version 0.8.6.
Copyright (c) 2006-2013 GNS3 Project.
=>

QEMU (MikroTik)
MMM   MMM   KKK               TTTTTTTTTT   KKK
MMMM  MMMM  KKK               TTTTTTTTTT   KKK
MMM MMMM MMM III KKK KKK RRRRRR  000000   TTT   III KKK KKK
MMM MM  MMM III KKKKK  RRR RRR  000 000   TTT   III KKKKK
MMM   MMM III KKK KKK RRRRRR  000 000   TTT   III KKK KKK
MMM   MMM III KKK KKK RRR RRR  000000   TTT   III KKK KKK

MikroTik RouterOS 5.26 (c) 1999-2013      http://www.mikrotik.com/

ROUTER HAS NO SOFTWARE KEY
-----
You have 23h39m to configure the router to be remotely accessible,
and to enter the key by pasting it in a Telnet window or in Winbox.
See www.mikrotik.com/key for more details.

Current installation "software ID": 6DC3-2SZK
Please press "Enter" to continue!

[admin@MikroTik] > ip address add address=192.168.88.1/24 interface=ether1
[admin@MikroTik] >
```


CONFIGURE IP LOOPBACK INTERFACE

The screenshot shows three overlapping windows in a Windows operating system:

- Network Connections:** A window showing a list of network adapters. The 'loopback' adapter, which is an 'Unidentified network' using a 'Microsoft Loopback Adapter', is selected. A callout box points to it with the text: "Rename interface to 'loopback' to make easy to identify loopback interface".
- loopback Properties:** A window showing the configuration for the selected 'loopback' adapter. Under the 'Networking' tab, 'Internet Protocol Version 4 (TCP/IPv4)' is checked and highlighted.
- Internet Protocol Version 4 (TCP/IPv4) Properties:** A dialog box for configuring the IP settings. The 'General' tab is active. The 'Use the following IP address:' radio button is selected. The 'IP address' field is highlighted with a red box and contains the value '192 . 168 . 88 . 3'. Other fields include 'Subnet mask: 255 . 255 . 255 . 0' and 'Default gateway: 192 . 168 . 88 . 1'. The 'OK' button at the bottom right is also highlighted with a red box.

REMOTE DEVICE USING WINBOX

The image shows a GNS3 project window with a network diagram. A cloud labeled 'C2' is connected to a switch labeled 'SW1', which is in turn connected to a MikroTik router. A 'MikroTik WinBox Loader v2.2.18' dialog box is open, with the 'Connect To' field containing the IP address '192.168.88.1'. A red arrow points from this field to the 'WinBox' window, which displays system resources like Uptime, Free Memory, Total Memory, CPU, and HDD Space.

Open winbox in your PC/Laptop and connect to device IP address



THANK YOU FOR YOUR TIME

And see u in the next MUM

This slide also can be found at www.training-mikrotik.com and www.freemikrotik.com.

“If you cannot survive in the tired of learning, then you will be suffering by the pain of stupidity” (*Imam Syafi'i*)

MY CONTACT DETAILS

If you have any other questions or would like me to clarify anything else, please, let me know. I am always glad to help in any way I can



ADDRESS: Jakarta & Semarang, Indonesia

WEBSITE: www.training-mikrotik.com

EMAIL: rofiq.fauzi@gmail.com

TELEPHONE: +62 8156583545



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