



MIKROTIK **NETWORK SIMULATOR**



PRESENTED BY ROFIQ FAUZI

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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

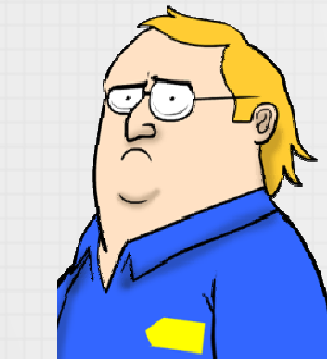
I have simulator, I am running on GNS3 Network simulator

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

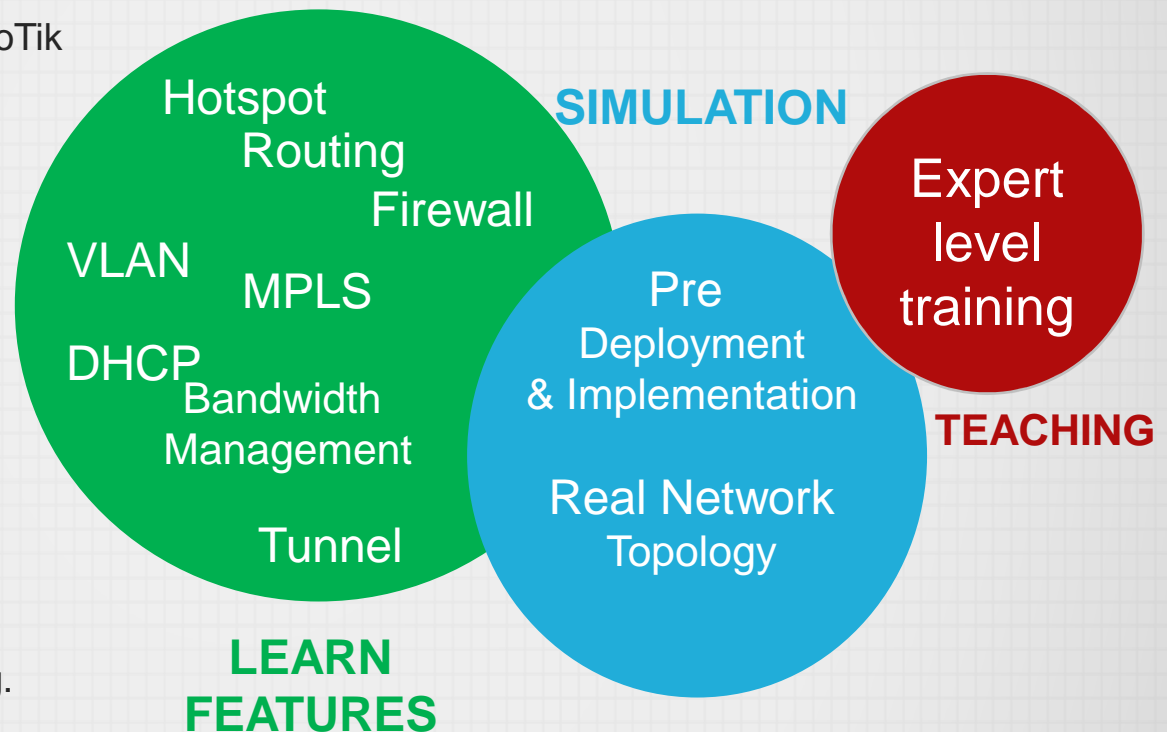
Easy to learn and practice more of MikroTik features, anytime anywhere

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

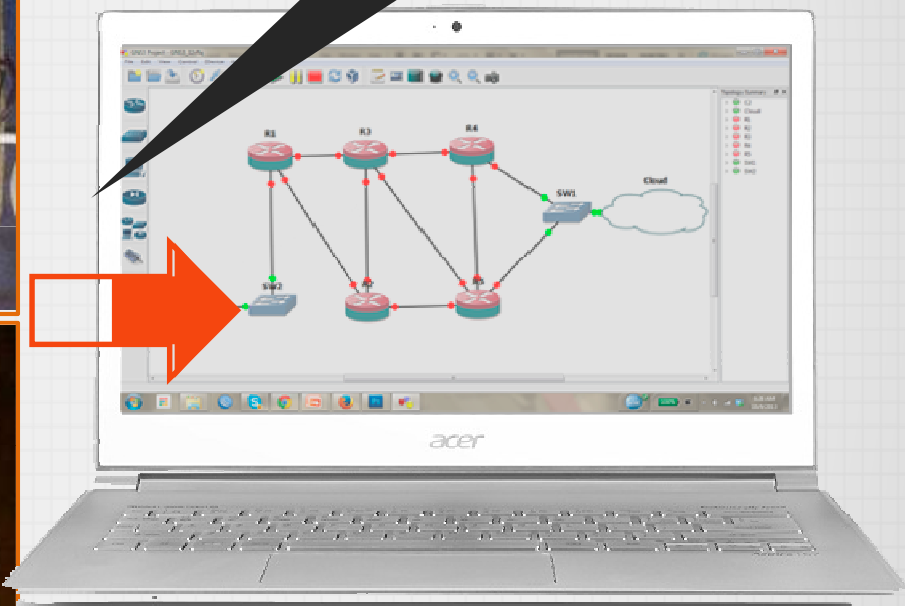
Teaching someone, In **ID-Networkers**, we use to teach MikroTik expert training.



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

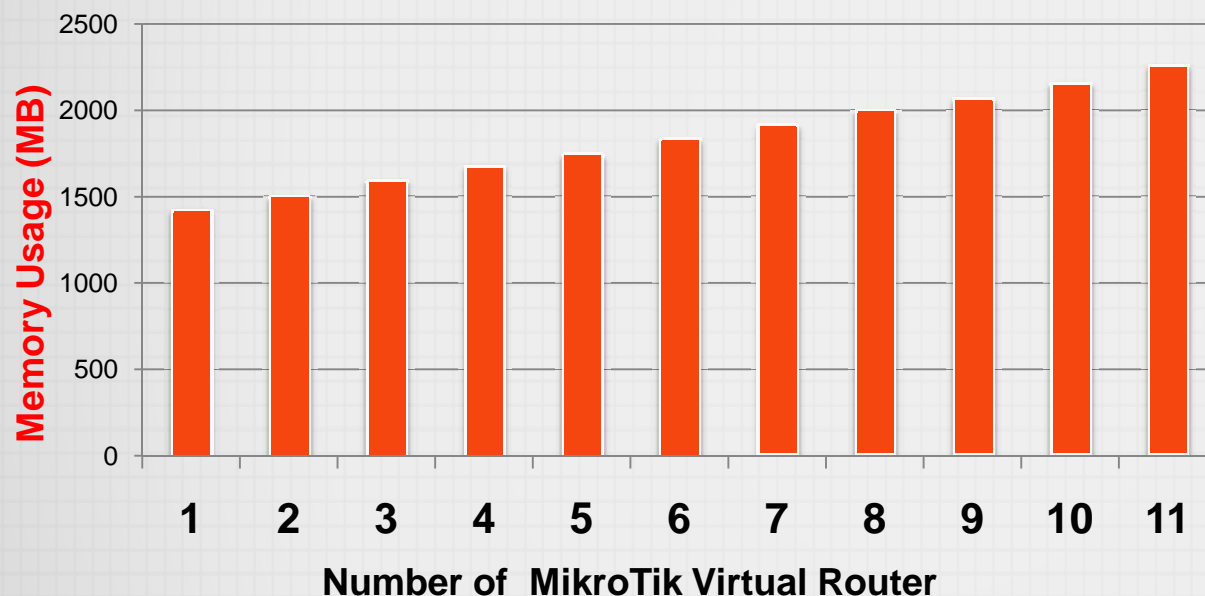
Comparing between VMWare, VirtualBox and Qemu

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

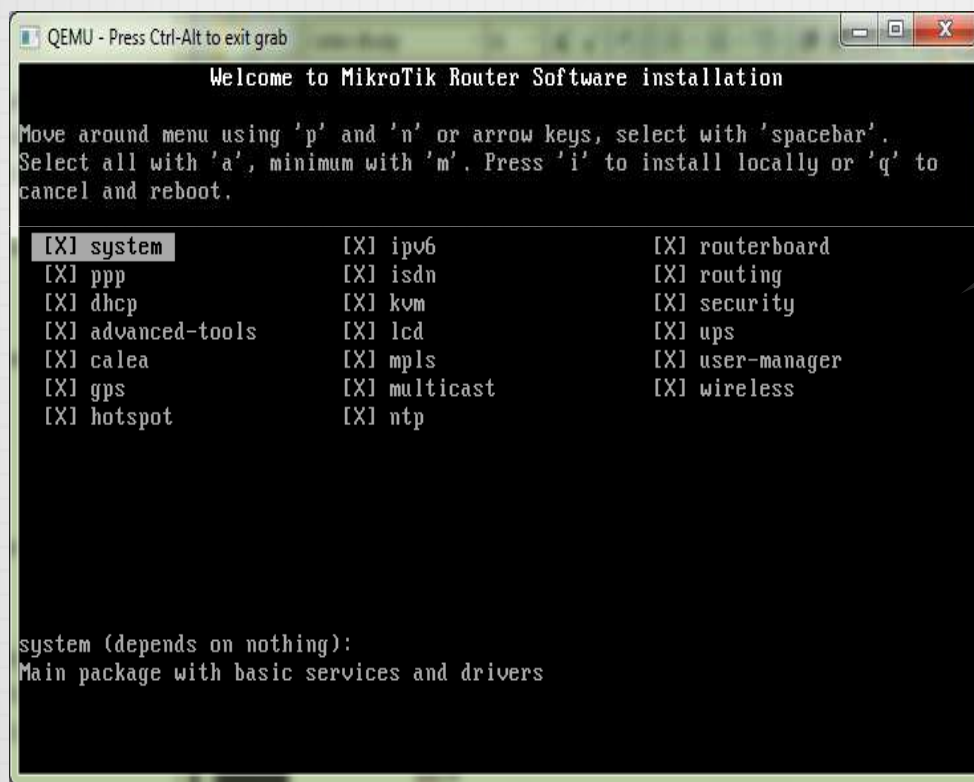
```
Formatting 'mikrotik.img', fmt=qcow2 size=268435456 encryption=off  
cluster_size=0
```

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

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



```
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] cala       [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 MikroTik 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

14

GNS3 Project - GNS3_zqmmvu

File Edit View Control Device Annotate Tools Help

Undo Ctrl+Z
Redo Ctrl+Y
Select all Ctrl+A
Select none Ctrl+Shift+A
IOS images and hypervisors Ctrl+Shift+I
Symbol manager Ctrl+Shift+S
Preferences... Ctrl+Shift+P

Symbol Manager

Symbol libraries
Library path:
Add Remove

Available symbols

- Built-in symbols
 - PIX_firewall
 - frame_relay_switch
 - call_manager
 - access_point
 - optical_router
 - computer
 - sip_server
 - dslam
 - atm_bridge
 - router_firewall
 - route_switch_processor
 - label_switch_router
 - cloud
 - voice_router
 - ids
 - hub
 - printer

Customized node settings

Name: MikroTik ROS
Type: Qemu guest
Apply

Customized nodes

MikroTik ROS

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:

The screenshot shows the GNS3 Project - GNS3_zqmmvu window. The 'Edit' menu is open, and 'Preferences...' is highlighted. The 'Preferences' dialog is open, showing the 'Qemu' tab. The 'Qemu Guest' sub-tab is selected. The 'Qemu Guest Settings' section is highlighted, showing the following configuration:

- Qemu flavor: -i386
- Identifier name: Mikrotik
- Binary image: C:\Program Files\GNS3\mikrotik.img
- RAM: 128 MIB
- Number of NICs: 5
- NIC model: rtl8139

The 'Qemu Options' section is also visible, with the following options:

- ☐ Use KVM (Linux host only)
- ☐ Add user network backend
- ☐ Monitor mode (pause and resume)

The 'Qemu Guest Images' section shows a table with the following data:

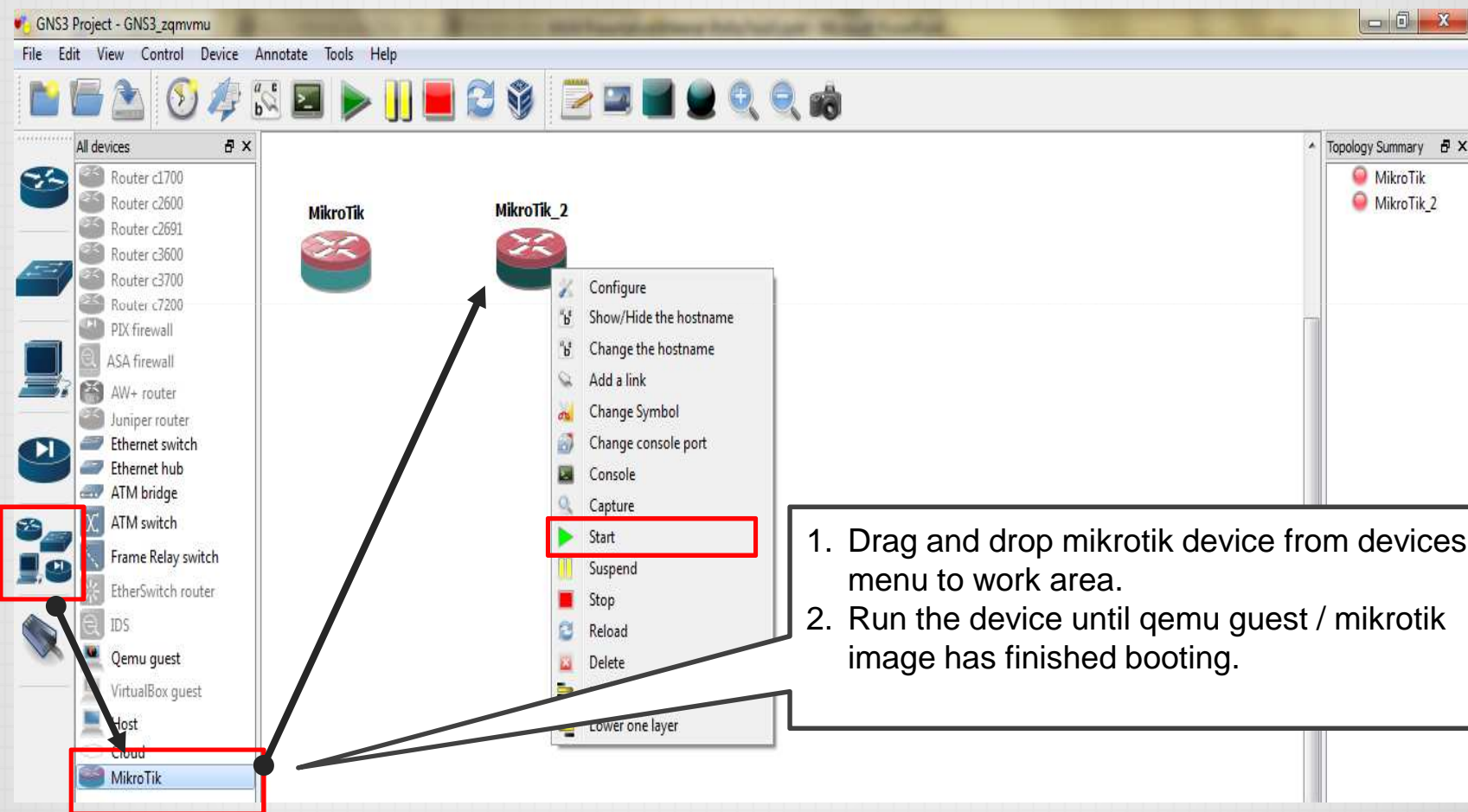
Name	Image path
Mikrotik	C:\Program Files\GNS3\mikrotik.img

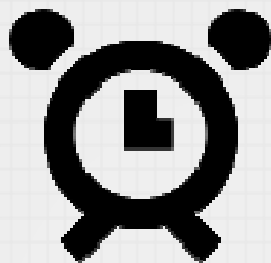
A callout box contains the following instructions:

- 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



An orange vertical bar is positioned on the left side of the slide, partially overlapping the text.

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"

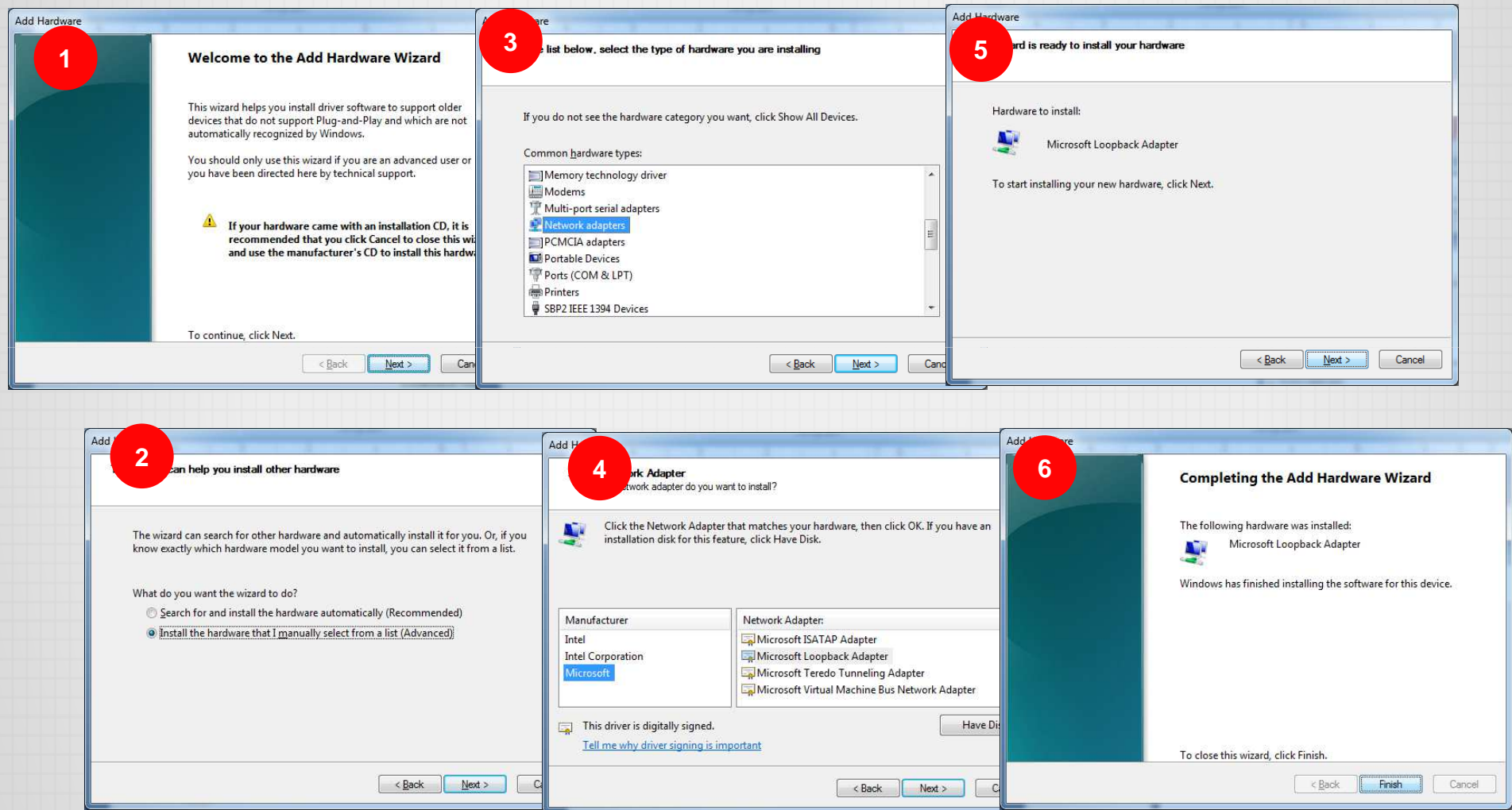
MICROSOFT LOOPBACK ADAPTER

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



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_lxpvh

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)

npcap://Device\NPF_{B2F7FE9C-C5B1-400A-A258-99B57E52399F} : Network

Adapter 'MS LoopBack Driver' on local host: loopback

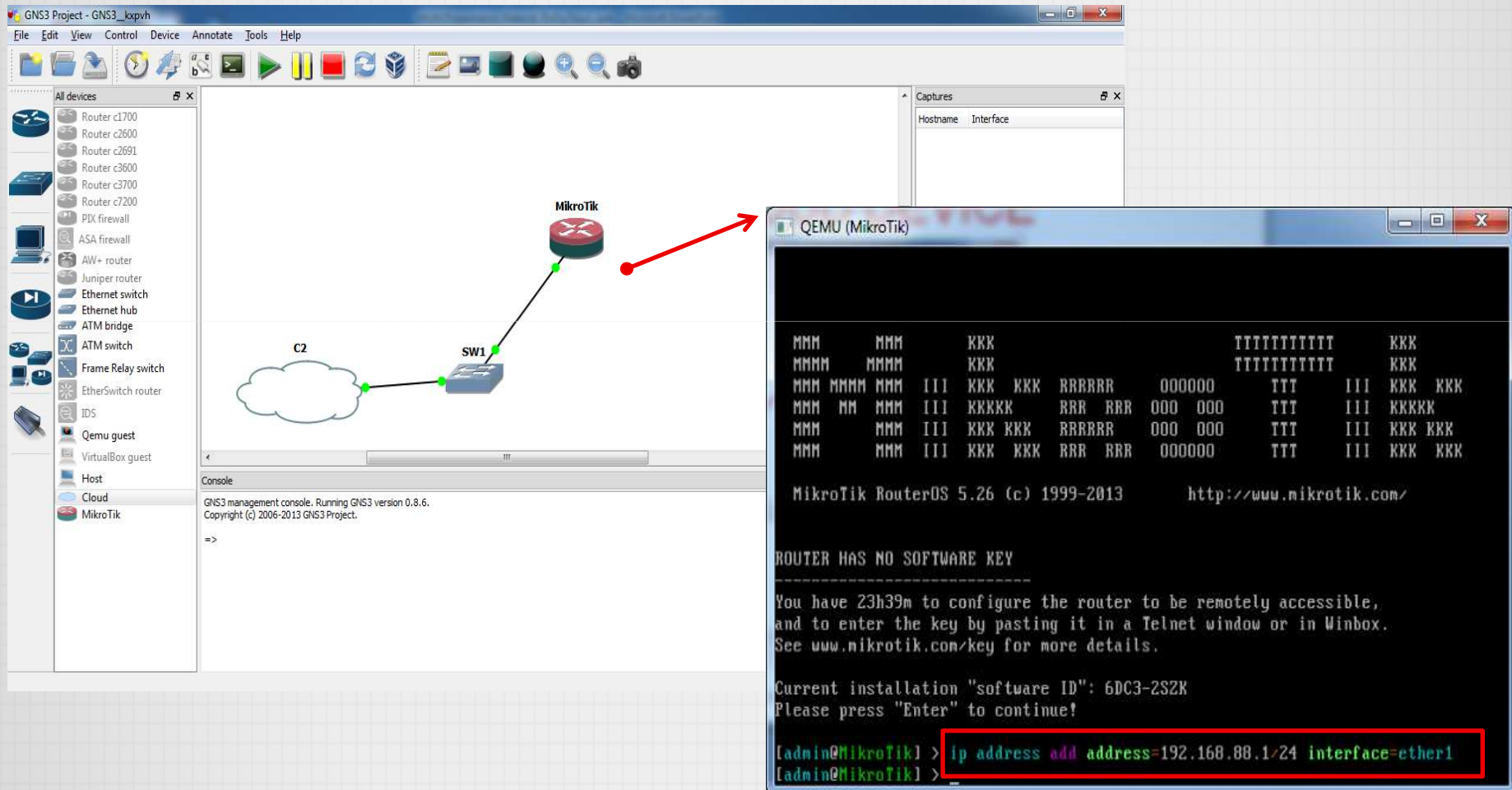
nio_gen_eth:\device\npf_{b2f7fe9c-c5b1-400a-a258-99b57e52399f}

Linux Ethernet NIO (Administrator or root access required)

OK Cancel Apply

Choose loopback interface, add and OK

CONFIGURE DEVICE IP ADDRESS



The screenshot displays the GNS3 Project - GNS3_kxpvh interface. On the left, the 'All devices' list includes various routers, switches, and other network components. The main workspace shows a network topology with a cloud labeled 'C2' connected to a switch labeled 'SW1', which is connected to a MikroTik router. A red arrow points from the MikroTik router to a QEMU (MikroTik) terminal window.

The QEMU (MikroTik) terminal window shows the MikroTik RouterOS 5.26 (c) 1999-2013 boot screen. The screen displays the MikroTik logo and the following text:

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

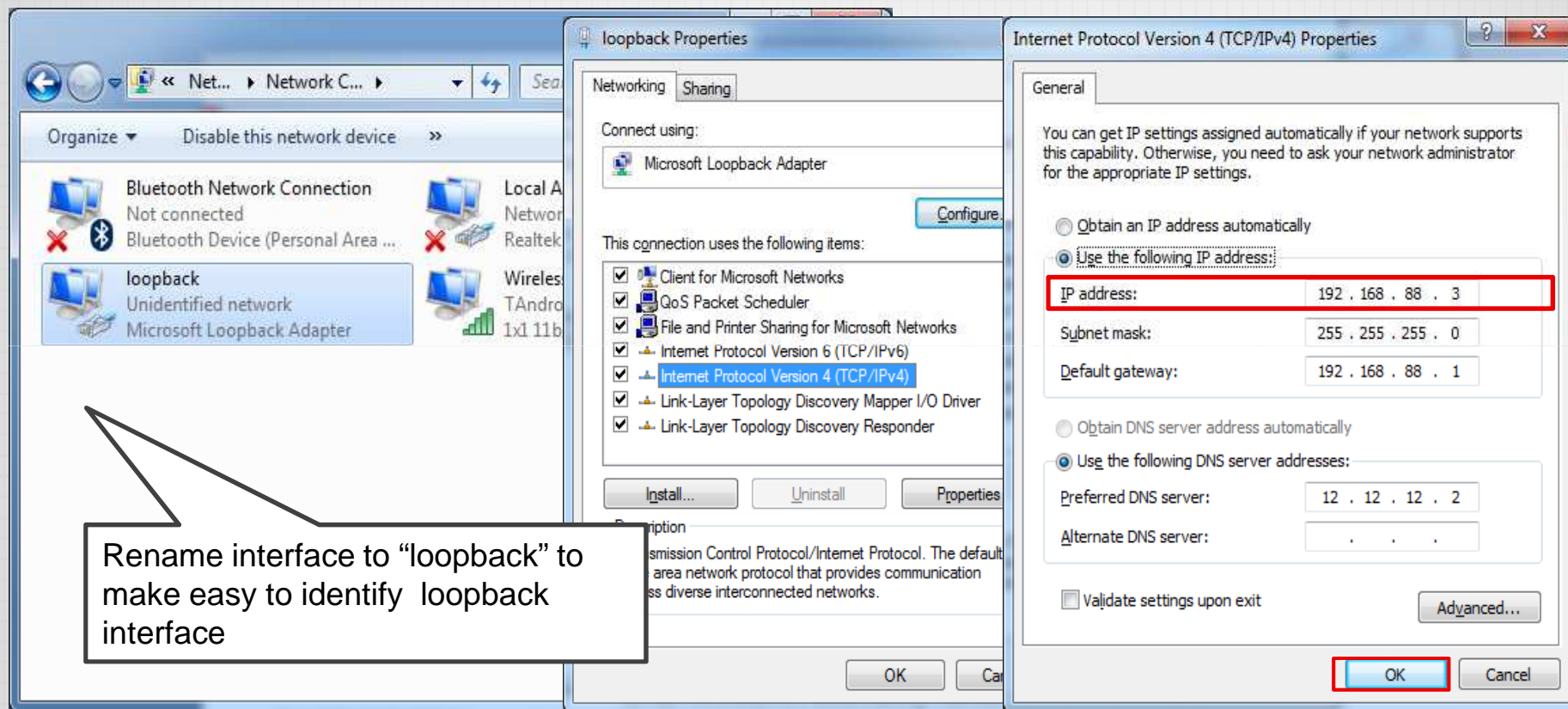
ROUTER HAS NO SOFTWARE KEY

-----
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": 6DC3-2S2K
Please press "Enter" to continue!

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


CONFIGURE IP LOOPBACK INTERFACE



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 connected to a MikroTik router. A 'MikroTik WinBox Loader v2.2.18' dialog box is open, showing the 'Connect To' field with the IP address '192.168.88.1' highlighted in red. A red arrow points from this field to the WinBox interface. The WinBox interface shows the 'Resources' tab with system information: Uptime: 00:01:54, Free Memory: 110.6 MiB, Total Memory: 122.8 MiB, CPU: Pentium, CPU Count: 1, CPU Frequency: 2394 MHz, CPU Load: 2 %, Free HDD Space: 200.8 MB, Total HDD Size: 248.8 MB, Sector Writes Since Reboot: 384, Total Sector Writes: 384, Architecture Name: x86, Board Name: x86, and Version: 5.26.

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



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