Planning RouterOS Networks with GNS3

By: Michael Omondi
Who am I?

Name: Michael Omondi

Preferred Name: Mike

8+ years in the IT industry.

Introduced to Mikrotik in 2014

Areas of interest:

- ISP Solutions
- Wireless Services
- Network Security

Certifications

- Mikrotik: MTCNA, MTCRE, MTCWE & MTCTCE,
- Other Vendors: Cisco, CompTIA, Vmware, Solarwinds, Ubiquiti, Cyberoam
We are an IT company

- Training
- Consultancy
- Design, deployment and management of computer networks
- Server deployment and management
- Cloud services (storage, backup & archiving, web & application hosting etc.), Data Center Virtualization and many more.
- For more about us, please visit http://lockstepit.com
Provide adequate knowledge to make you comfortable running RouterOS in GNS3
In 2015, Mikrotik released a virtual RouterOS instance for x86_64 architecture.

They called it Cloud Hosted Router (CHR)

Designed for virtualized environments.

Introduction
Currently there are 4 levels of licensing.

a) Free - 1Mbps interface speed
b) P1 - 1Gbps
c) P10 - 10Gbps
d) P-Unlimited
• Training classes
• Exam preparation
• Testing configuration before deployment
• Production
• Graphical Network Simulator
• Originally developed to emulate Cisco’s IOS
• It’s capabilities have been extended beyond just Ciscos’ IOS
• For this Lab setup version 1.5.2 of GNS3 installation and its Virtual Machine counterpart will be used.
• Quick Emulator
• Developed to virtualize x86_64 architectures in Linux
• REMEMBER: RouterOS is a Linux
• To successfully build a virtual RouterOS Lab we will enlist QEMU version 2.5.0
• 64bit CPU with virtualization support

• 128 MB or more RAM for the CHR instance

• 128 MB disk space for the CHR virtual hard drive
CHR has been tested on the following platforms:

• VirtualBox 5 on Linux and OS X
• VMWare Fusion 7 and 8 on OS X
• Qemu 2.4.0.1 on OS X
• Hyper-V on Windows Server 2012 (Only Generation 1 Hyper-V virtual machine is supported at the moment)
GNS3 can run on Windows, Linux and OSX

For my Presentation, I have used:
Processor: Intel Core i5 2.50GHz
RAM: 8GB
OS: Windows 10 Pro
Hypervisor: VMware Workstation 12 Pro
• Download GNS3 from her: https://gns3.com/software/download
• NB: sign in is required or create an account
Downloading the GNS3 VM

The official GNS3 VM (Virtual Machine) can be downloaded from our Github page for the corresponding GNS3 version you run: https://github.com/GNS3/gns3-vm/releases.

The VM is distributed in three different flavors:

- VMware Workstation to be used with Workstation Pro/Player and Fusion (Recommended)
- VMware ESXi (For experts only)
- VirtualBox (No nested virtualization support)

We highly recommend VMware because VirtualBox doesn't support nested virtualization, this means any VM running inside the GNS3 VM will be slow because the guest VM cannot access to your CPU virtualization instructions (VT-x or AMD-V).

Please note that VMware Workstation Player is free and you can get 20% off VMware Workstation Pro and VMware Fusion thanks to our deal with VMware.
Fix exporting portable projects with QEMU includes base images even when selecting no.
• Catch error when md5sum file is corrupted
• requirements.txt : added support for newer aiohttp version
• Improve compaction of .gns3project
• Fix crash when wicdp is not installed

Downloads

- GNS3-1.5.2-all-in-one.exe
- GNS3-1.5.2.dmg
- GNS3-1.5.2.source.zip
- GNS3.VM.VirtualBox.1.5.2.zip
- GNS3.VM.ESXi15.2.zip
- GNS3.VM.VMware.Workstation.15.2.zip

Download the two circled files
Once the download is finished;

Run the .exe file, follow the prompts.

NB: you need to be connected to the internet as the installation will download additional files
Welcome to the GNS3 1.5.2 Setup Wizard

This wizard will guide you through the installation of GNS3 1.5.2.

It is recommended that you close all other applications before starting Setup. This will make it possible to update relevant system files without having to reboot your computer.

Click Next to continue.

Choose Start Menu Folder

Choose a Start Menu folder for the GNS3 1.5.2 shortcuts.

Select the Start Menu folder in which you would like to create the program's shortcuts. You can also enter a name to create a new folder.
Once the installation is finished;

Extract the zipped VM (OVA) file

Import it into VMware

NB: you can use VMware player (free) or VMware workstation (license required).

We will use VMware Workstation 12 Pro.
Import VM

Store the new Virtual Machine
Provide a name and local storage path for the new virtual machine.

Name for the new virtual machine:
GNS3 VM

Storage path for the new virtual machine:
C: \Users\McCharles\Documents\Virtual Machines

[Import] [Cancel]
Imported VM
The Next thing is;

Download CHR from here:
http://www.mikrotik.com/download

NB: The file format to be downloaded depends on the hypervisor.

For our case we will download the VHDX file.
Time to put the pieces together.

Open GNS3

Configure GNS3 to use the GNS3 VM
Initial Setup Cont..

Setup Wizard

Server

Please choose a server type to run your GNS3 network simulations. The GNS3 VM is strongly recommended on Windows and Mac OS X.

- Local GNS3 VM
- Local server

Don't show this again

Next >  Cancel
Initial Setup Cont..

**GNS3 VM**

In order to run the GNS3 VM you must first have VMware or VirtualBox installed and the GNS3 VM.ova imported in one of these.

Virtualization software:
- VMware (recommended)
- VirtualBox

The GNS3 VM can [downloaded here](#). Import the VM in your virtualization software and hit refresh.

**VM name:** GNS3 VM

**vCPU cores:** 2

**RAM size:** 4048 MB
Add virtual machines
Now that you have configured the server type you can choose to add one or more virtual machines (VMs) of different types.

- [ ] Add an IOS router using a real IOS image (supported by Dynamips)
- [ ] Add an IOU (IOS on UNIX) device using a L3 or L2 IOU image
- [x] Add a Qemu virtual machine
- [ ] Add a VirtualBox virtual machine
- [ ] Add a VMware virtual machine
- [ ] Add a Docker container
Select “Run Qemu VM on the GNS3 VM”
Give Your VM a name
- Select the Qemu binary & location
- Set the Memory
• Select “existing image”
• Browse to the location of your VHDX and select
Qemu VM template is now set and ready for use
• Click ‘Edit’ then general tab
• Change category to ‘Routers’
• Change Symbol to that of a router
Navigate to Network tab, Under ‘Adapters’ Specify number of interfaces in the VM
To allow VMs external access, Configure GNS3 VM second network adapter to ‘bridge mode’
Drag RouterOS to the blank canvas to set up your desired network
Use the Cloud to connect your VMs to external resources
Power up your routers by right-clicking each and selecting ‘start’
Or power all at once with green ‘start’ button at the top.
Console in by right-clicking and select ‘console’
At this point, the router can be configured using Winbox.

/tool romon set enabled=yes
• Consulting for a small WISP that wanted to scale up
• Need for uptime/HA with BGP
• Faster convergence with OSPF
• Improved Network Security
NOTE: Swap IP address and AS Number with the correct ones for each of the Core Routers and the Upstream Routers.
NOTE: Swap Router ID, Network statements, Loopback IP Address with the correct ones for each of the participating routers.
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<td>ctf add</td>
<td>6 (tcp)</td>
<td>25.587.1...</td>
<td>0 B</td>
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GNS3 is bundled with useful tools such as:

- **VPCS (Virtual PC Simulator)** - This is a simple network testing tool that has essential commands like traceroute, ping, arp built in.
- **Wireshark** - A powerful protocol analyzer that can be used to capture and analyze packets.
Q. How do we move from simulation to production or to another platform?

- GNS3 stores all project files under one folder which is movable to another computer. RouterOS template image file (.img) should also be copied together with the project itself and placed into 'GNS3/images' folder on target machine.

- Qemu stores images in qcow2 (copy-on-write) format. These images can be run separately from GNS3.

- If in production environment different hypervisor is used, qcow2 image can be converted to various formats using 'qemu-img convert' command.
Advantages

- Training – Almost as realistic as building a mock network with real equipment
- Network Validation – Allows you to test network designs and changes before they are applied to a production network
- Reduces downtime
- Increases ROI
• CHR is a fully functional RouterOS
• Any descent computer that supports virtualization can be used for Lab scenario
• GNS3 Lab configurations can be migrated to other systems or production.
• Wireshark and other tools are bundled with GNS3 for testing and analysis
• The uses are only limited by your imagination
The End
Thank You!