

# Software Installation for the Virtual Internet Lab

This document walks you through the software installation for the virtual labs. The installation consists of

1. VirtualBox – a hypervisor for running virtual machines (GNS3 VM runs on Virtual Box) (If you already have VirtualBox installed or if you have VMware installed, you may skip this part of the installation process.);
2. GNS3 – a tool for network configuration of virtual network devices;
3. GNS3 VM – a virtual machine that supports virtual devices in GNS3;
4. **(Mac only)** Wireshark – a protocol analyzer.

The software installation must be completed before commencing with Lab 1. **All software is available for free without cost.**

Software versions: GNS3 2.2.x, VirtualBox 6.1, Wireshark 2.2.x (Windows), Wireshark 2.2.x (Mac)

## System Requirements

- Windows 10 with an Internet connection
- Mac OS X 10.15 or above with an Internet connection
- minimum 4GB memory, 8 GB or more is recommended



### YouTube Videos

The software installation and setup described in this document is available in YouTube videos:

- Windows: <https://youtu.be/0jRwq68-acU>
- Mac: <https://youtu.be/oQwkQC7vH5k>

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# Installation and Configuration of VirtualBox and GNS3

The following instructions guide you through the installation and configuration of the GNS3 network simulation software. In GNS3, routers and PCs are run on virtual machines. The virtual machines are controlled by the virtualization tool VirtualBox.

## Task 1. Installation of VirtualBox

**Step 1:** Download [VirtualBox](https://www.virtualbox.org/wiki/Downloads) (Version 6.1 or higher) for your operating system (Windows, Mac OS X) from

<https://www.virtualbox.org/wiki/Downloads>

**Step 1:** Install the downloaded software using the default settings. Upon successful installation, you should see the window in Figure 1. Close the window.

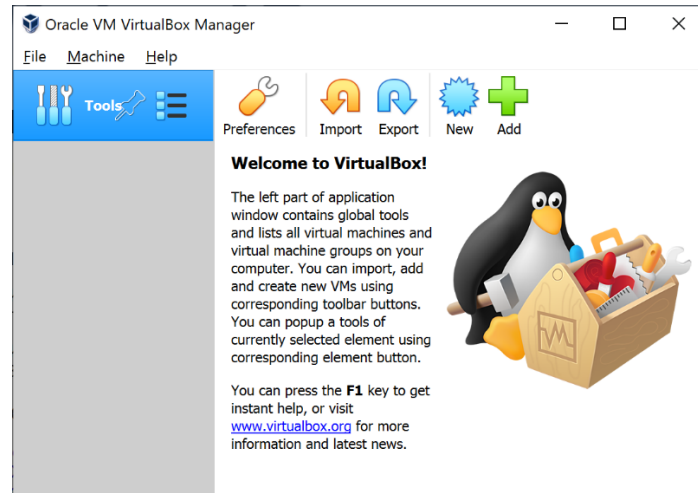


Figure 1. VirtualBox application.

**Step 2:** Open the “File” menu and select “Host Network Manager.” This opens a window as shown in Figure 2.

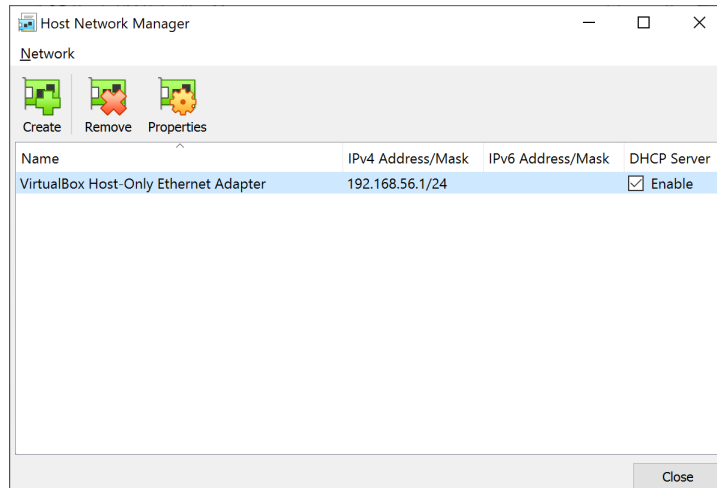


Figure 2. Host Network Manager.

**Step 3:** If you see an entry for “VirtualBox Host-only Ethernet Adapter” displayed, proceed to the next step. Otherwise, create a Host-only network by pressing “Create” button in the menu. Make sure that “DHCP Server” is enabled in the checkbox.

**Step 4:** Next, select the *Properties* icon in the Host Network Manager. In the *Adapter* tab, the IPv4 address should be set to 192.168.56.1, and the IPv4 Network Mask netmask should be set to 255.255.255.0 as shown in Figure 3.

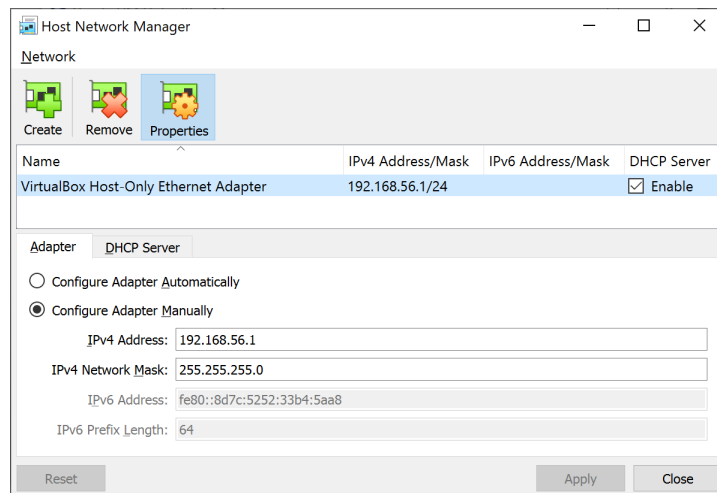


Figure 3. Host Network Manager (Adapter).

**Step 5:** Then, select the *DHCP Server* tab and verify that “Enable Server” is enabled. The displayed IP addresses should be as shown in Figure 4 and as listed her:

Server Address:	192.168.56.100
Server Mask:	255.255.255.0
Lower Address Bound:	192.168.56.101
Upper Address Bound:	192.168.56.254

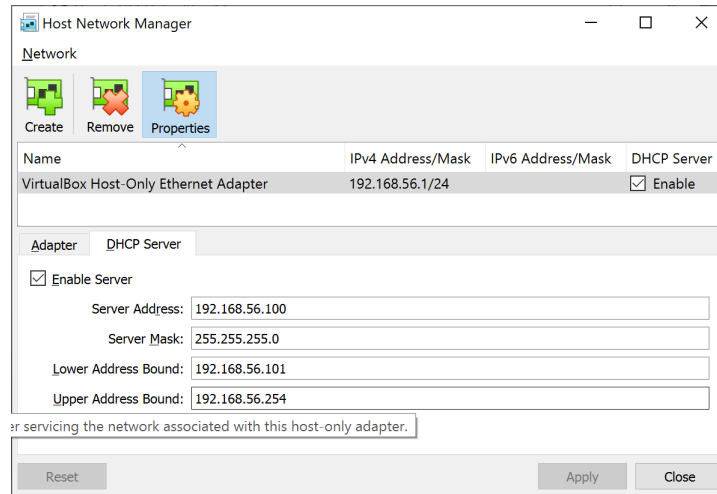


Figure 4. Host Network Manager (DHCP Server).

**Step 6:** Install the VirtualBox Extension Pack, which provides support for USB devices, shared folders, as well as copy/paste between virtual machines and your PC. In a web browser go to

<https://www.virtualbox.org/wiki/Downloads>

and find the entry “VirtualBox 6.1.6 Oracle VM VirtualBox Extension Pack”. Select “All supported platforms” to start the download of the software.

**Step 7:** When the software is downloaded, selecting “Open” starts the installation and displays a window as shown in Figure 5.

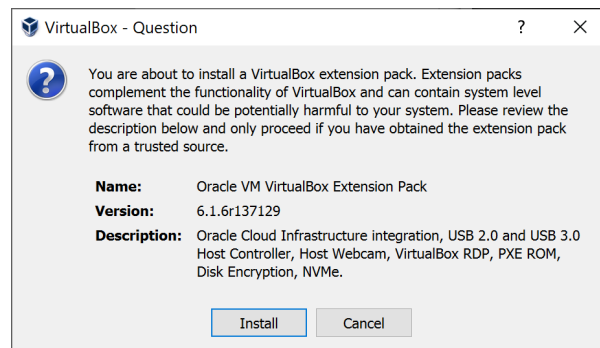


Figure 5. Install VirtualBox Extension Pack.

**Step 8:** Quit VirtualBox by selecting “File→Exit”

## Task 2. Installation of GNS3

**Step 1:** Go to the GNS3 website at <https://www.gns3.com/software> and select “Download.” You need to create an account to download the software. Create your own personal account.

**Step 2:** Download the appropriate version for your computer (MacOS, Windows). Once the download is complete, the window in Figure 6 is displayed and the setup GNS3 starts. Click “Next” a few times, unless you want to change the setup of the software.



Figure 6. Setup of GNS3.

**Step 3: (Windows only)** As part of the setup, a window for the WinPcap Setup Wizard as shown in Figure 7 is displayed. Click “Next” and follow the instructions with the default settings.

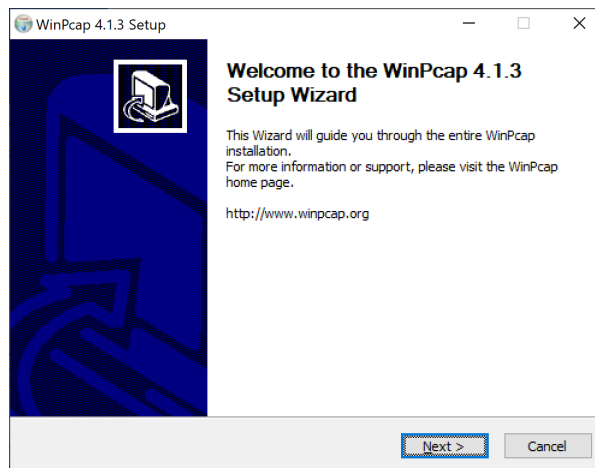


Figure 7. WinPcap Setup window.

**Step 4: (Windows only)** When the Npcap Setup window appears as shown in Figure 8, select “Install” with the default settings, and follow the instructions.

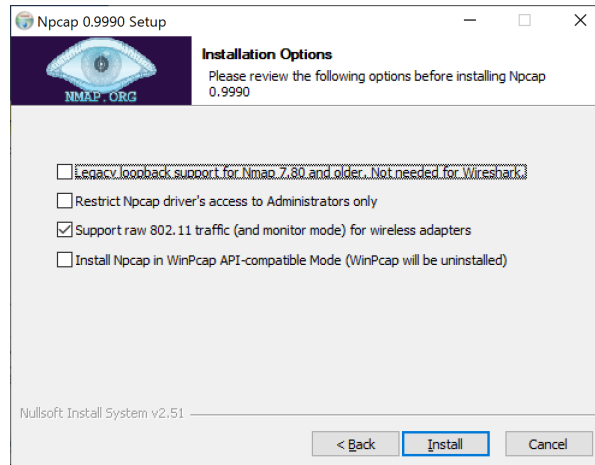


Figure 8. Npcap Setup window.

**Step 5: (Windows only)** Next, the installation of GNS3 commences. The installation takes a few minutes and asks to agree to the license agreement.

- When asked for an email, you may type a bogus email address.
- Select “No” when prompted for the free license of the “Solarwinds Standard Toolset.”

**Step 6:** Once the installation is complete, GNS3 starts automatically and presents the window shown in Figure 9, as well as the GNS Setup window shown in Figure 10. Select “Cancel” to close the window.

**Step 7:** Close GNS3 by selecting “File→Quit” in the GNS3 application window.

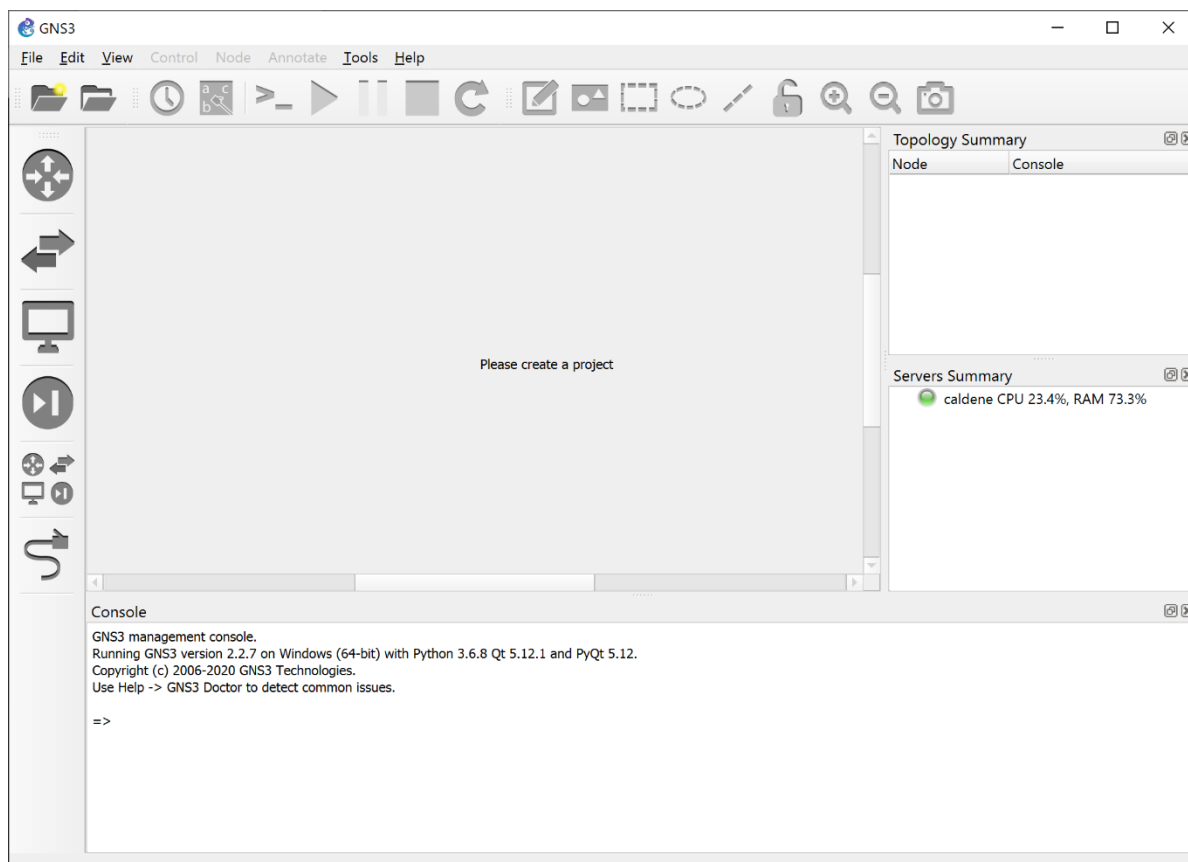


Figure 9. GNS3 application window.

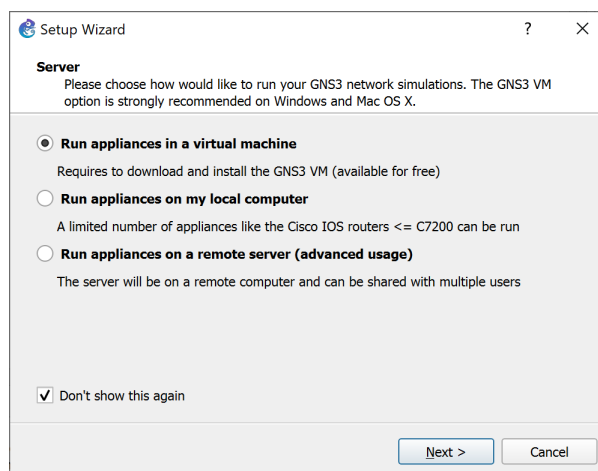


Figure 10. GNS3 Setup Wizard.



### **Task 3. Download and install GNS3 VM**

GNS3 VM is a virtual machine that accelerates the execution of routers and hosts in GNS3. The following instructions install GNS3 VM on VirtualBox. Since the size of GNS3 VM is > 500 MB, the download may take some time.

**Step 1:** In a web browser go to

<https://www.gns3.com/software/download-vm>

On the web page, shown in Figure 11, click on the “Download” button for VirtualBox. When asked, click “Save” to start the download.

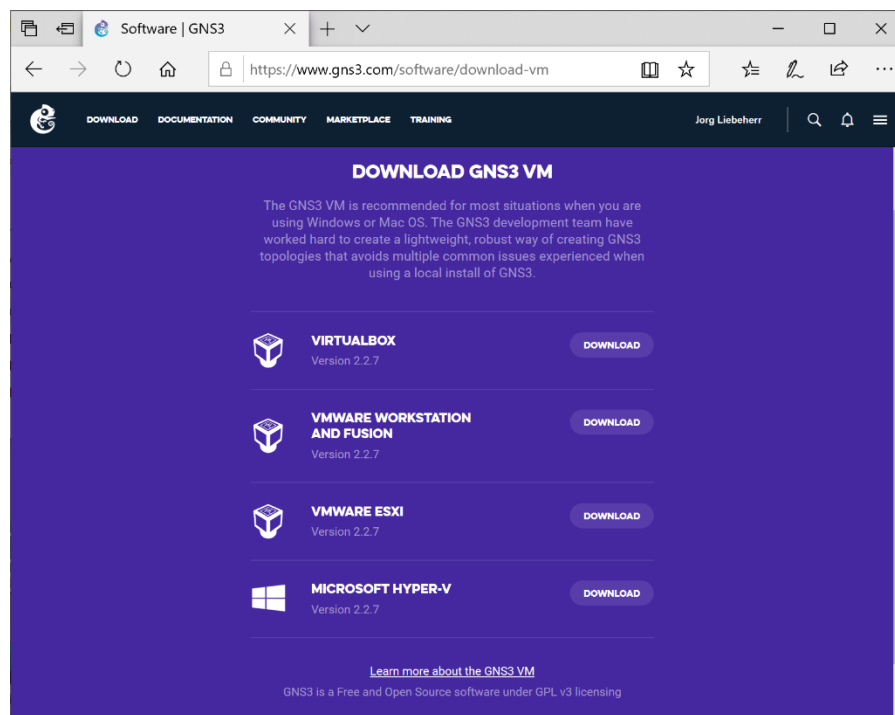


Figure 11. Webpage for downloading GNS3 VM.

**Step 2:** Once the download is complete, go to the *Downloads* folder on your computer. You will find a ZIP file “GNS3.VM.VirtualBox.2.2.7.zip”.

The label “2.2.7” in the ZIP file represents a version number. When you download the virtual machine, the version number may be different. This is not an issue, as long as the version number matches that of the downloaded GNS3 application.

In Windows: When you click on the ZIP file in the Downloads folder, the file explorer opens the “Compressed Folder Tools” view, which shows an “Extract All” button. The folder now displays the file “GNS3 VM.ovf.” Select “Extract All.” This starts VirtualBox and displays the “Appliance Settings” windows shown in Figure 12. In this window, select “Import” to start the import of GNS3 VM.

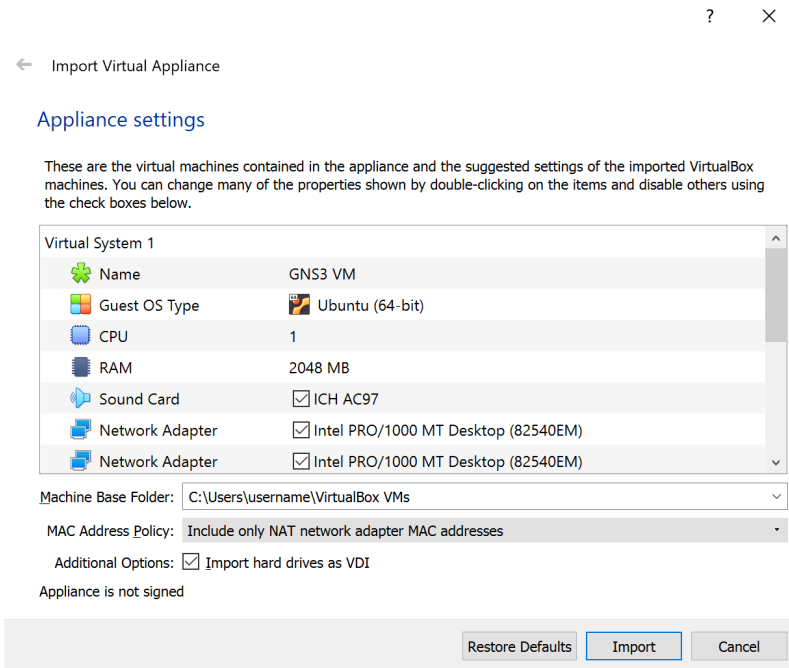


Figure 12. Appliance setting window for importing GNS3 VM.

**Step 3:** Once the import of the GNS3 VM is complete, VirtualBox displays a window as seen in Figure 13.

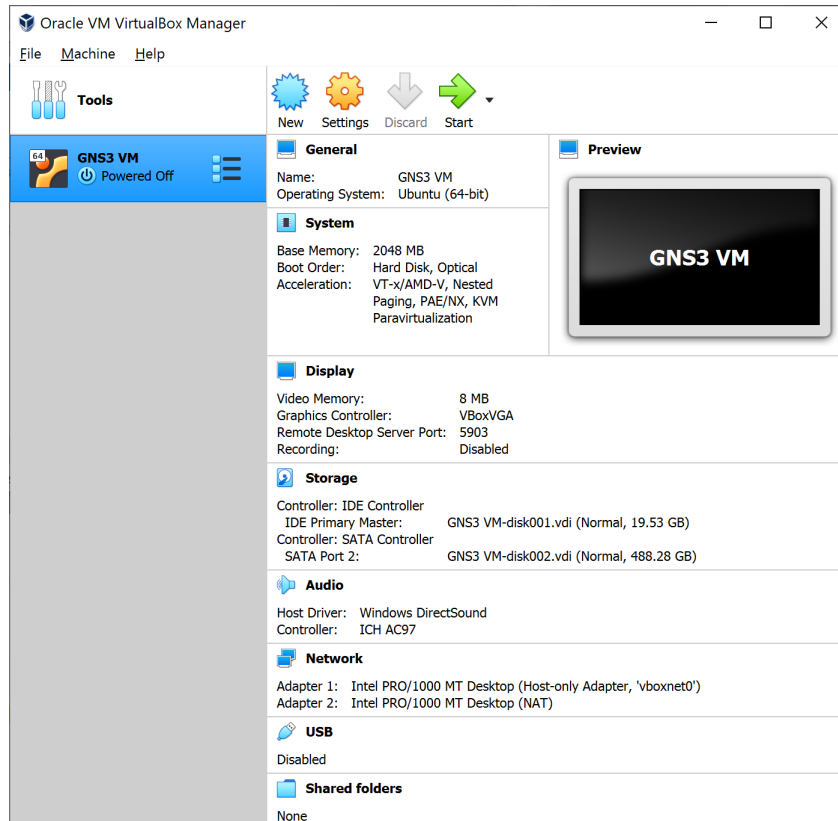


Figure 13. VirtualBox Manager after importing the GNS3 VM.

**Step 4:** Select the GNS3 VM on the left-hand side, then select “Settings” in the top of the window, and then click on “Network” in the popup window. You now see the window in Figure 14.

**Step 5:** The window in Figure 14 shows the network configuration for “Adapter 1.” Make sure that “Enable Network Adapter” is checked and that the “Attached to” field shows “Host-only Adapter.”

Then click on "Advanced" to obtain the window shown in Figure 15.

**Important:** In the field “Promiscuous Mode” change the selection from “Deny” (indicated by a red arrow) to “Allow All.”

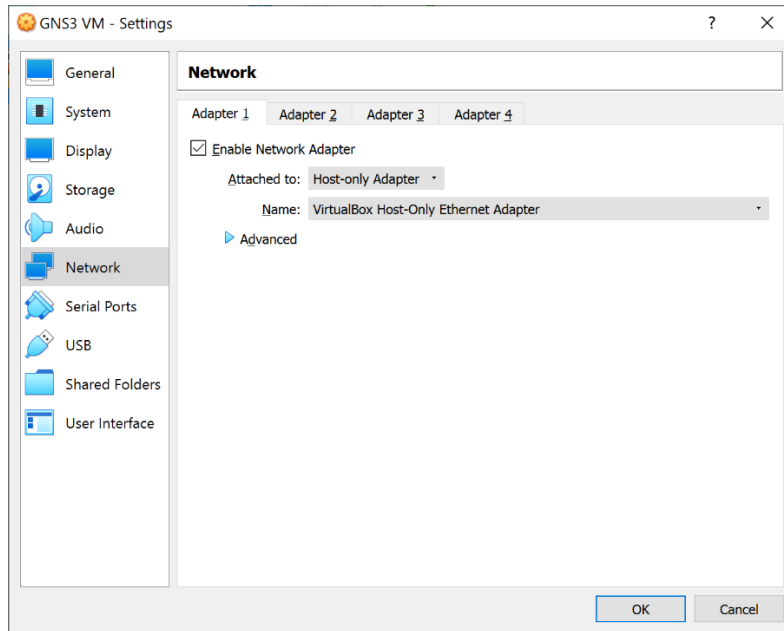


Figure 14. Network Settings of GNS3 VM (Adapter 1).

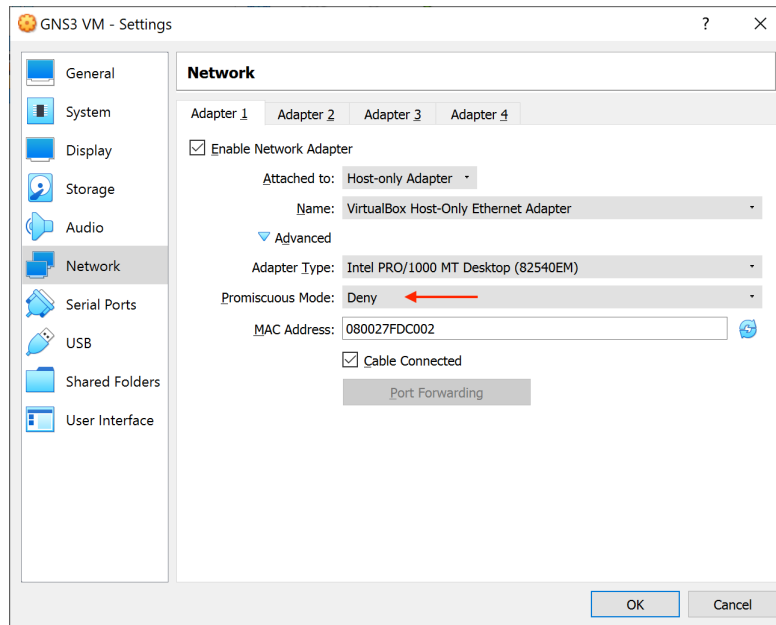


Figure 15. Network Settings of GNS3 VM (Adapter 1, Advanced).

**Step 6:** Continuing with the window in Figure 15, select the tab for “Adapter 2” to obtain the window in Figure 16. Make sure that “Enable Network Adapter” is checked and that the “Attached to” field shows “NAT.”

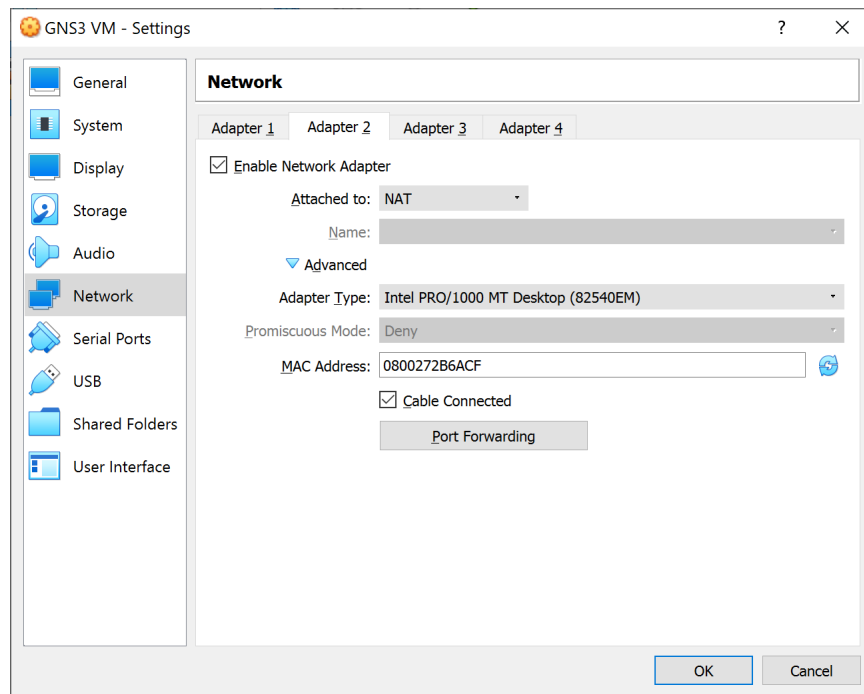


Figure 16. Network Settings of GNS3 VM (Adapter 2).

**Step 7:** Click “OK” to confirm the configuration of the GNS3 VM. This completes the installation of GNS3 VM for use by the GNS3 application.

**Step 8:** In the VirtualBox window, select “File→Exit.”

#### **Task 4. Configuration of GNS3**

The last task of the software installation is the configuration of the GNS3 application so that it can access the installed GNS3 VM. For reasons not fully understood, the configuration is sometimes not successful even when all pieces are in place. Restarting the applications and/or the installation of the VM generally resolves arising issues.

**Step 1:** Start GNS3 (installed in Task 2) and select “Help→Setup Wizard”.

**Step 2:** The first window of the Setup Wizard is shown Figure 10. Proceed with the default selection “Run applications in a virtual machine” and click “Next”.

**Step 3:** Select the setting `192.168.56.1` for “Host binding” and click “Next” as shown in Figure 17 below. (On a Mac, if `192.168.56.1` is not shown, select `127.0.0.1` instead.)

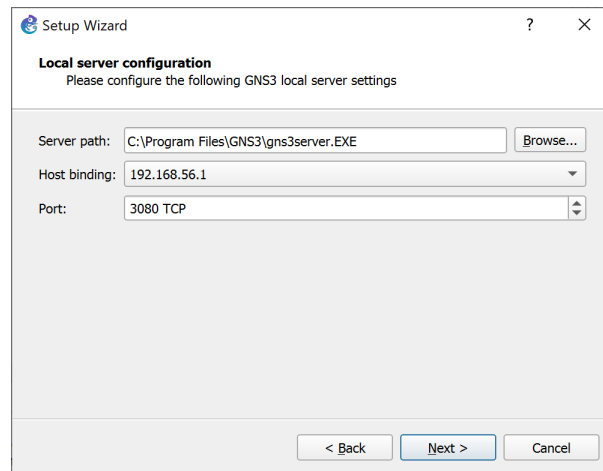


Figure 17. GNS3 Local server configuration.

**Step 4:** The software will proceed with some installation. In the process, you may see an error message, which you may ignore. Eventually, you see a window as shown in Figure 18, telling you that connection to the local server has succeeded. Select “Next.”

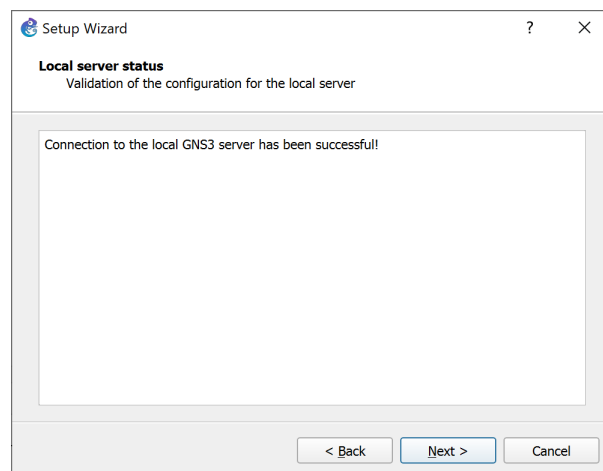


Figure 18. GNS3 Local server status.

**Step 5:** You now get a warning message as shown in Figure 19, which you can safely ignore. Click OK to proceed to the next screen.

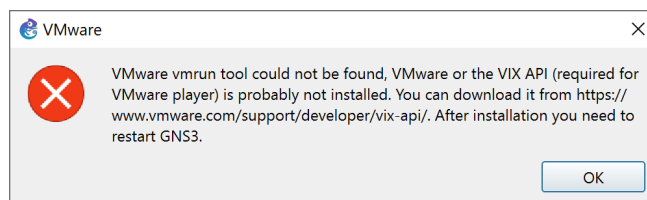


Figure 19. Warning message during GNS3 setup.

**Step 6:** The next window that is displayed, shown in Figure 20 is for the setup of GNS3 VM. Select the box “VirtualBox” as shown in the figure. After a short time, you should see that the filed “VM Name” shows *GNS3 VM* as in the figure. If this is not the case, click on the “Refresh” button. Once GNS3 VM is displayed, click “Next”.

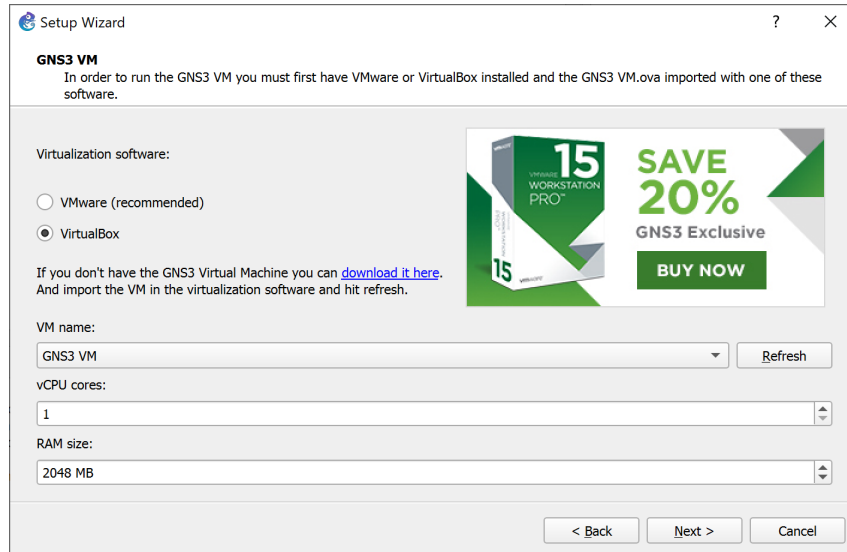


Figure 20. Configuration of GNS3 VM.

**Step 7:** Next, the window in Figure 21 displays that the configuration is complete. Click on “Finish.”

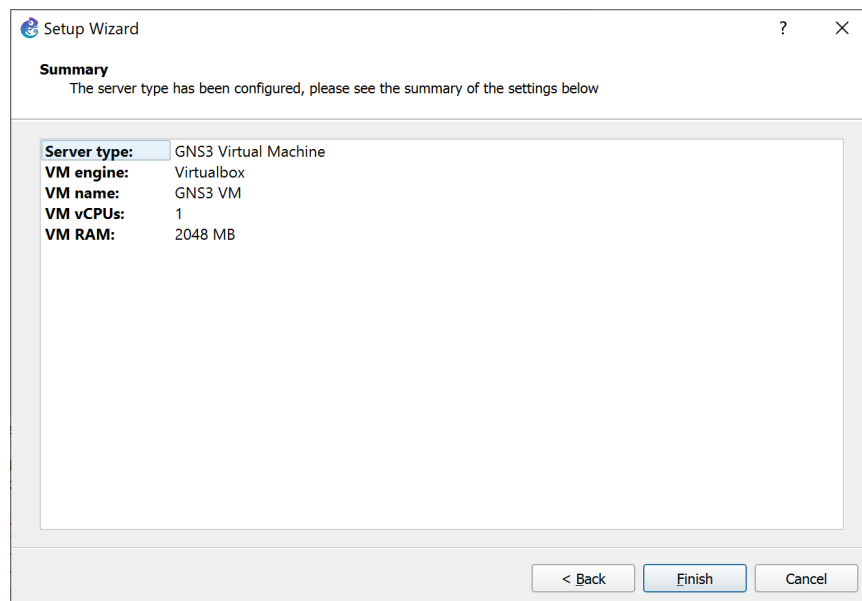


Figure 21. Summary of GNS3 VM configuration.

**Step 8:** When the configuration of GNS3 is complete, the virtual machine GNS3 VM will boot up. Once the boot is completed, you see a window as shown in Figure 22.



### Auto capture keyboard (for all VirtualBox virtual machines)

If you click inside the window of the GNS3 VM (Figure 22), the control of the mouse and the keyboard is transferred to the virtual machine. When you type on the keyboard, the input will go to virtual machine, and when you move the mouse, it will only move within the boundaries of the window of the virtual machine.

When this is enabled, the arrow in the lower right corner of the window in Figure 11 (showing a downward pointing arrow) turns green.

To transfer the control of keyboard and mouse back to the host computer, press the right control key (Right Ctrl) on your keyboard. This is of course a problem when your keyboard does not have two control keys. On Windows computers, Ctrl+ALT+DEL followed by selecting “Cancel” also transfers control to the host.

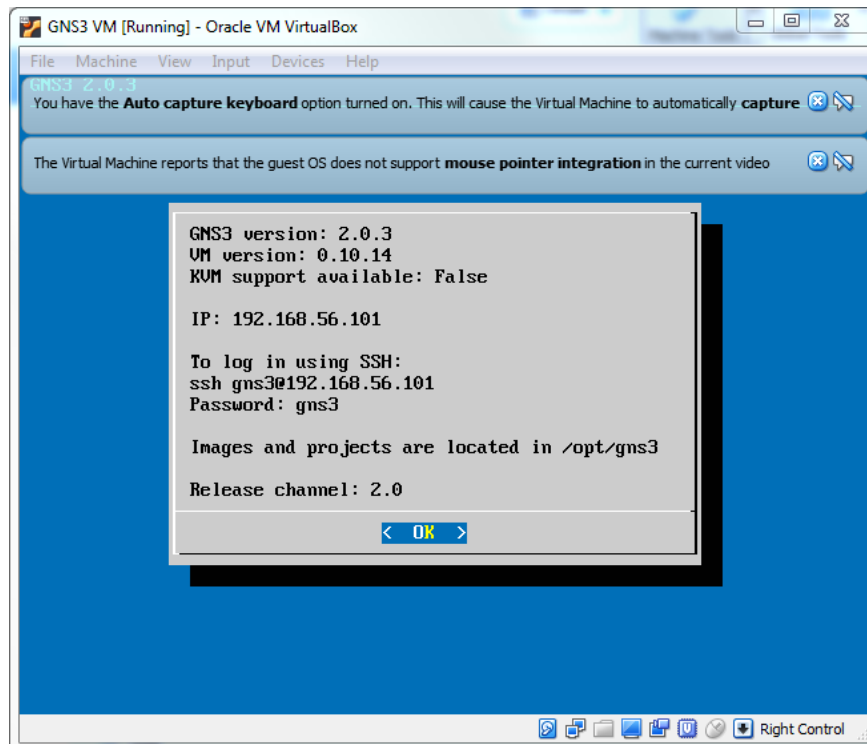


Figure 22. GNS3 VM running.

**Step 9:** In the main window of the GNS3 application, the status of GNS3 VM is displayed in the pane “Servers Summary” (see Figure 16). If the GNS3 VM is running properly the status indicator should be green.





### Status light of GNS3 VM does not turn green

If the status indicator is gray or red, GNS3 cannot communicate properly with GNS3 VM. There are several potential causes.

- Close GNS3 and restart your computer. Then start GNS3 and observe if the status indicators turn green.
- Open VirtualBox and check that the “DHCP Server option” is checked in the host-only adapter (Figure 2) and that adapter is configured as shown (Figures 3–4). If not then, quit GNS3 and delete GNS3 VM from VirtualBox. Redo Task 3 (skipping Step 1) and follow the instructions to reinstall the VM. Then, give GNS3 another try.
- A last resort is to abandon VirtualBox and instead use the VMWare hypervisor. Follow the instructions provided at

<https://docs.gns3.com/1wdfvS-OIFfOf7HWZoSXMbG58C4pMSy7vKJFiKKVResc/index.html#>

On Windows, there is a free version (VMWare Workstation Player) and a paid version (VMWare Workstation Pro). For Mac computers, there is VMWare Fusion, which is not free software.

Windows users are done! For Mac users, there is an additional task (Task 5).

### **Task 5. (Mac only) Download and install Wireshark**

On Mac systems, there is an additional task to install the Wireshark protocol analyzer.

If you are running Windows, Wireshark is installed as part of the GNS3 installation. **Skip Task 5!**

**Step 1:** In a web browser go to

<https://www.wireshark.org>

On the web page, shown in Figure 23, select “macOS Intel 64-bit.dmg” and start the download.

**Step 10:** Once the download is complete, go to the *Downloads* folder and open the downloaded file.

**Step 11:** When you see the window shown in Figure 24, drag the Wireshark icon (blue shark fin) to the application folder. Wait until Wireshark is copied to the Application folder.

**Step 12:** To test the installation, go to the Application folder and find the Wireshark icon. Double-click to start Wireshark. Select “Wireshark→Quit Wireshark” to close the application.

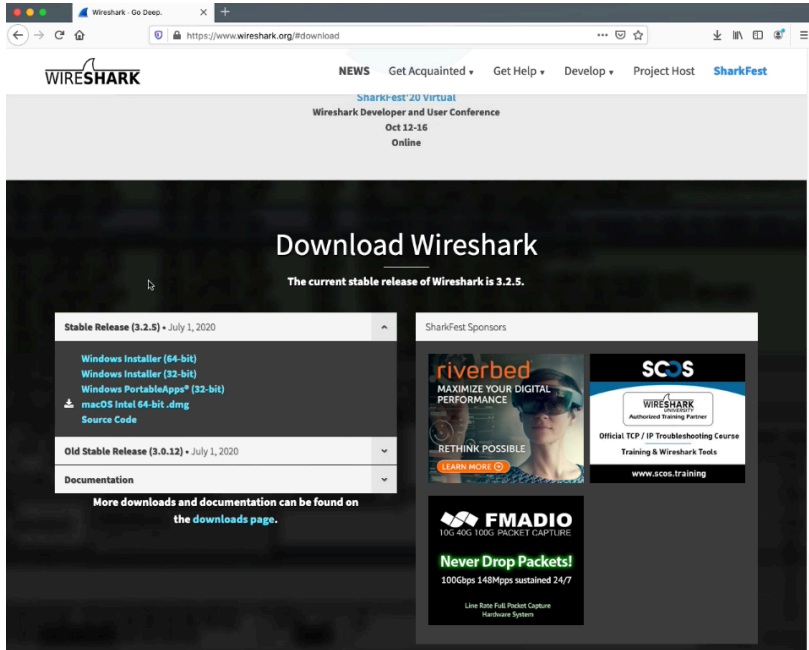


Figure 23. Webpage for downloading Wireshark.

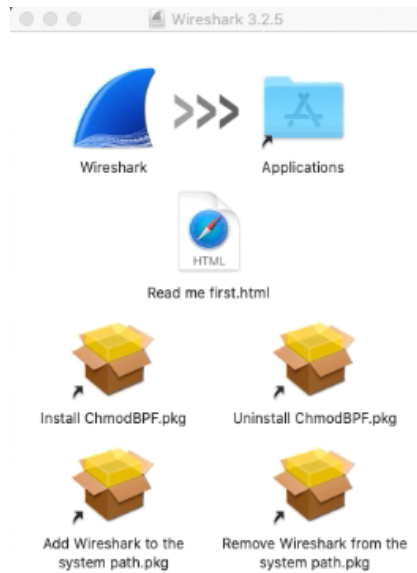


Figure 12. Installation of Wireshark (Mac only).

**Now you are ready to move on to Lab 1!**