Fundamentos de Segurança Informática

[2025-2026]

Linux CentOS Virtual Machine installation and configuration for practical exercises & assignments

Introduction

This document discusses the installation of Linux CentOS as a Virtual Machine (VM) using Oracle VirtualBox, but similar procedures can be adopted for other virtualization platforms (such as VMWare). The configuration of network interfaces to support communications between virtual machines is also discussed.

Installation of Oracle VirtualBox

First you should start by downloading the virtualization software, using the following links:

VirtualBox: https://www.virtualbox.org/

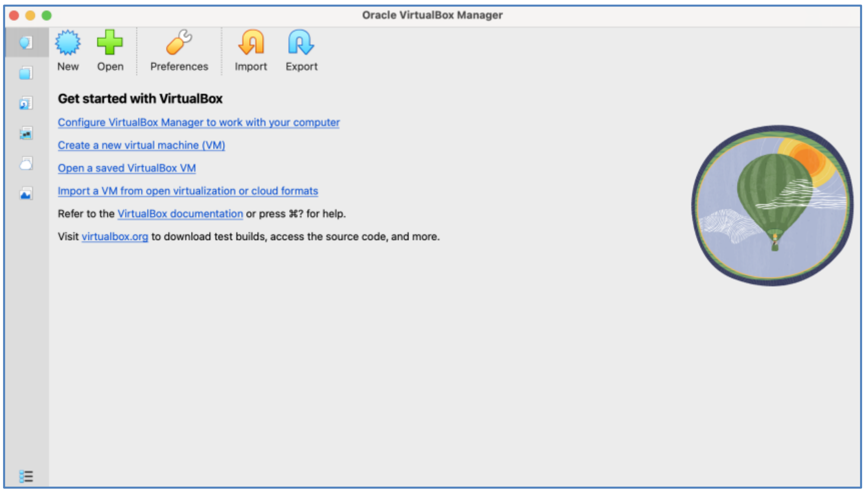
Notes:

- After version 6 it does not support 32 bits hosts
- After installation you should also install the VirtualBox Installation Pack

VMWare: https://www.vmware.com/products/desktop-hypervisor/workstation-and-fusion

- In Mac, use VMWare Fusion Player (register and download)

The following figure illustrates the usage of VirtualBox after installation (without any virtual machine installed yet).



Get started with VirtualBox

Configure VirtualBox Manager to work with your computer

Create a new virtual machine (VM)

Open a saved VirtualBox VM

Import a VM from open virtualization or cloud formats

Refer to the VirtualBox documentation or press ⌘? for help.

Visit virtualbox.org to download test builds, access the source code, and more.

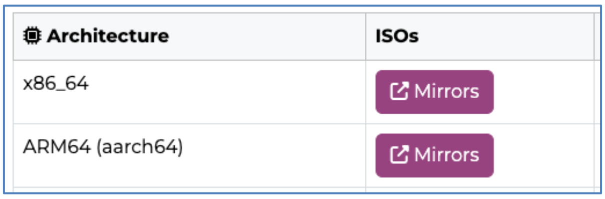
Figure 1 - Oracle VirtualBox ready for VM installation

Install Linux CentOS

Next, we need to install our first Linux CentOS virtual machine. For this purpose, the first step is to download the ISO installer from https://www.centos.org/download/.

You can select the ISO file for the **CentOS Stream 9** version and the architecture applicable to your machine:

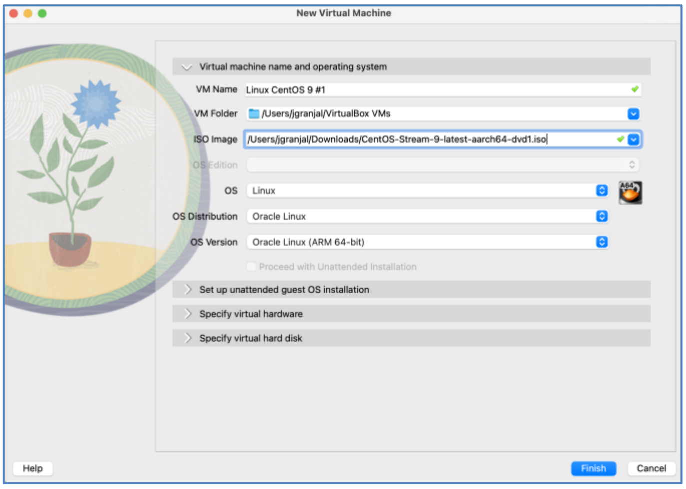
- Select the "x86_64" architecture if you are running VirtualBox in an Intel machine (Windows or older Macs)
- Select the "ARM 64" architecture for recent Mac computers using Apple Silicon



Architecture	ISOs
x86_64	Mirrors
ARM64 (aarch64)	Mirrors

Figure 2 - CentOS architectures (download ISO)

After downloading the ISO file, you should create the new virtual machine by clicking on the "New" button in VirtualBox. This process opens a window where you can add some information, in particular the VM Name, the location of the ISO file and the OS version, as the following figure illustrates.



New Virtual Machine

Virtual machine name and operating system

VM Name: Linux CentOS 9 #1

VM Folder: /Users/jgranjal/VirtualBox VMs

ISO Image: /Users/jgranjal/Downloads/CentOS-Stream-9-latest-aarch64-dvd1.iso

OS Edition:

OS: Linux

OS Distribution: Oracle Linux

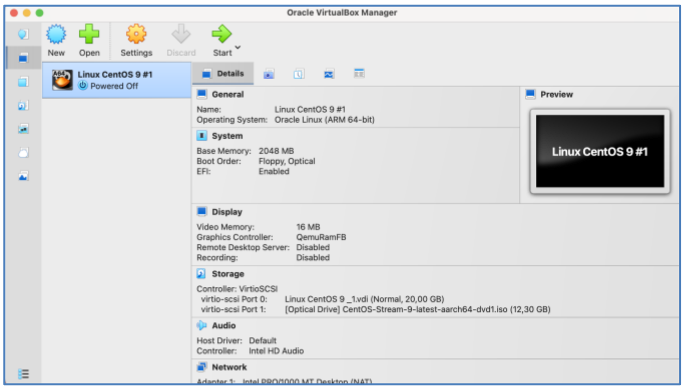
OS Version: Oracle Linux (ARM 64-bit)

□ Proceed with Unattended Installation

Set up unattended guest OS installation
Specify virtual hardware
Specify virtual hard disk
Help
Finish
Cancel

Figure 3 - Installation of CentOS Stream 9 from ISO file

Next, just press “Start” to start installation:



Oracle VirtualBox Manager

Linux CentOS 9 #1
Powered Off

General
Name: Linux CentOS 9 #1
Operating System: Oracle Linux (ARM 64-bit)

System
Base Memory: 2048 MB
Boot Order: Floppy, Optical
EFI: Enabled

Display
Video Memory: 16 MB
Graphics Controller: QemuRamFB
Remote Desktop Server: Disabled
Recording: Disabled

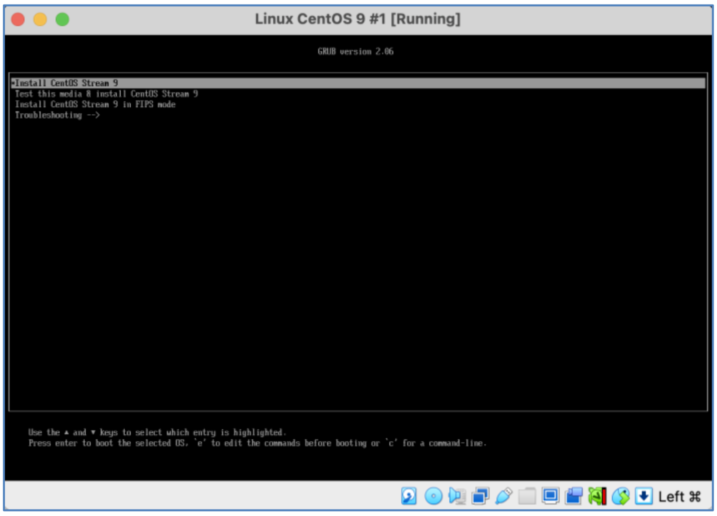
Storage
Controller: VirtioSCSI
virtio-scsi Port 0: Linux CentOS 9 _1.vdi (Normal, 20,00 GB)
virtio-scsi Port 1: [Optical Drive] CentOS-Stream-9-latest-aarch64-dvd1.iso (12,30 GB)

Audio
Host Driver: Default
Controller: Intel HD Audio

Network
Adapter 1: Intel PRO/1000 MT Desktop (NAT)

Figure 4 - Linux CentOS ready to install

After starting, you need to select the “Install CentOS Stream 9” option, as in the following figure.



Linux CentOS 9 #1 [Running]

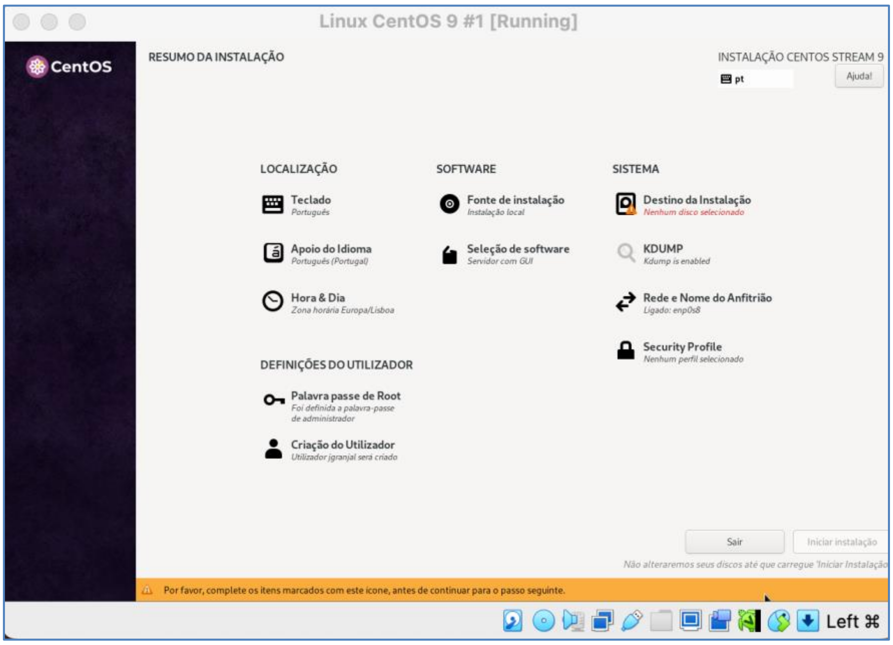
```
GRUB version 2.06

*Install CentOS Stream 9
 Test this media & install CentOS Stream 9
 Install CentOS Stream 9 in FIPS mode
 Troubleshooting -->

Use the ▲ and ▼ keys to select which entry is highlighted.
Press enter to boot the selected OS, `e' to edit the commands before booting or `c' for a command-line.
```

Figure 5 - Start of the installation process

In the process of installing Linux CentOS, you should define a root password, create a user with administration privileges (alternative to root), and define the destination of the installation (the local virtual disk). When ready, just press “Install” to proceed and wait for completion of the installation process.



Linux CentOS 9 #1 [Running]

RESUMO DA INSTALAÇÃO

INSTALAÇÃO CENTOS STREAM 9

LOCALIZAÇÃO

Teclado
Português

Apoio do Idioma
Português (Portugal)

Hora & Dia
Zona horária Europa/Lisboa

SOFTWARE

Fonte de instalação
Instalação local

Seleção de software
Servidor com GUI

SISTEMA

Destino da Instalação
Nenhum disco selecionado

KDUMP
Kdump is enabled

Rede e Nome do Anfitrião
Ligado: enp0s8

Security Profile
Nenhum perfil selecionado

DEFINIÇÕES DO UTILIZADOR

Palavra passe de Root
Foi definida a palavra-passe de administrador

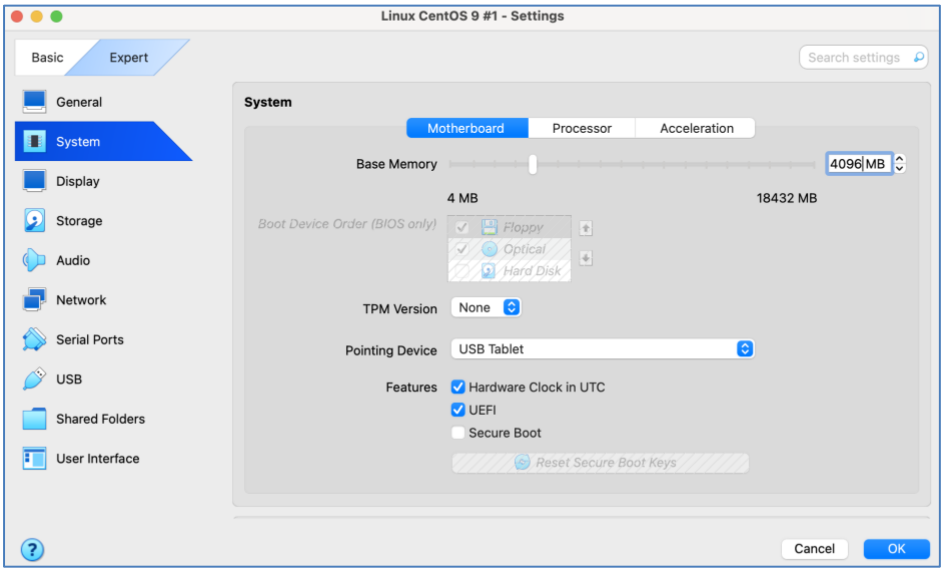
Criação do Utilizador
Utilizador jgranjal será criado

Não alteraremos seus discos até que carregue 'Iniciar Instalação

⚠ Por favor, complete os itens marcados com este icone, antes de continuar para o passo seguinte.

Figure 6 - Linux CentOS installer

After installation, the virtual machine should be ready to use. You can also adjust some configuration parameters, particularly the RAM available to the virtual machine and screen resolution. Depending on how much RAM do you have on the host system, you may consider enabling more RAM to the VM, as illustrated next. Another configuration setting that can be adjusted is screen resolution, via the scale factor. This may be necessary in some screens.



Linux CentOS 9 #1 - Settings

System

Base Memory: 4096 MB (4 MB – 18432 MB)

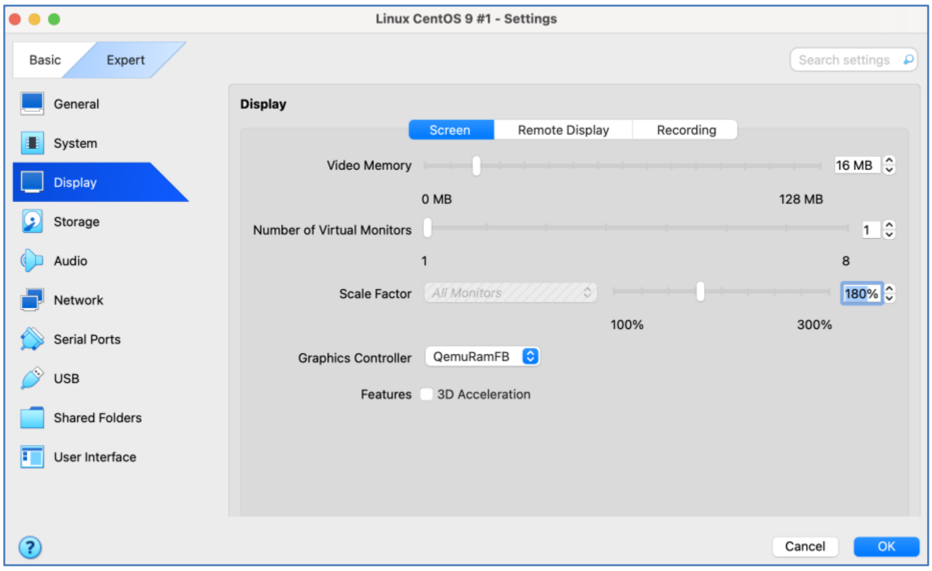
Boot Device Order (BIOS only): ☑ Floppy, ☑ Optical, Hard Disk

TPM Version: None

Pointing Device: USB Tablet

Features:
☑ Hardware Clock in UTC
☑ UEFI
□ Secure Boot

Figure 7 - Changing the RAM available to the VM (to 4Gb)



Video Memory: 16 MB

Number of Virtual Monitors: 1

Scale Factor: All Monitors 180%

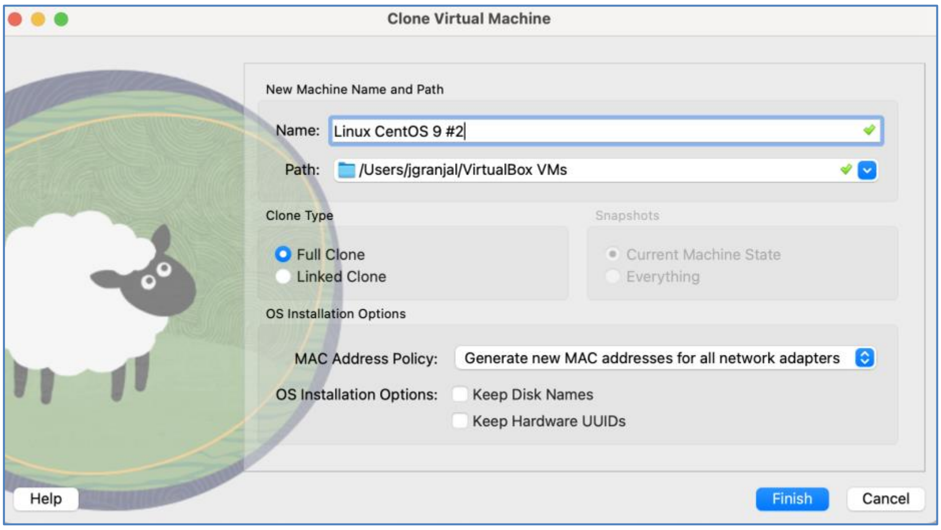
Graphics Controller: QemuRamFB

Features: □ 3D Acceleration

Figure 8 - Adjusting the display scale factor

Create a new Linux CentOS VM via cloning

The easiest way to create more VMs is by cloning an existing VM host (note that the machine to be cloned needs to be shut down). In VirtualBoxt select "Clone", and next the name for the new virtual machine. You should also choose the option "Generate new MAC addresses for all network adapters", otherwise the new machine will use the same MAC addresses as the previous one, preventing normal communications between the two VMs. Also, select "Full Clone", as illustrated in the following figure:



Name: Linux CentOS 9 #2

Path: /Users/jgranjal/VirtualBox VMs

● Full Clone

○ Linked Clone

○ Current Machine State

○ Everything

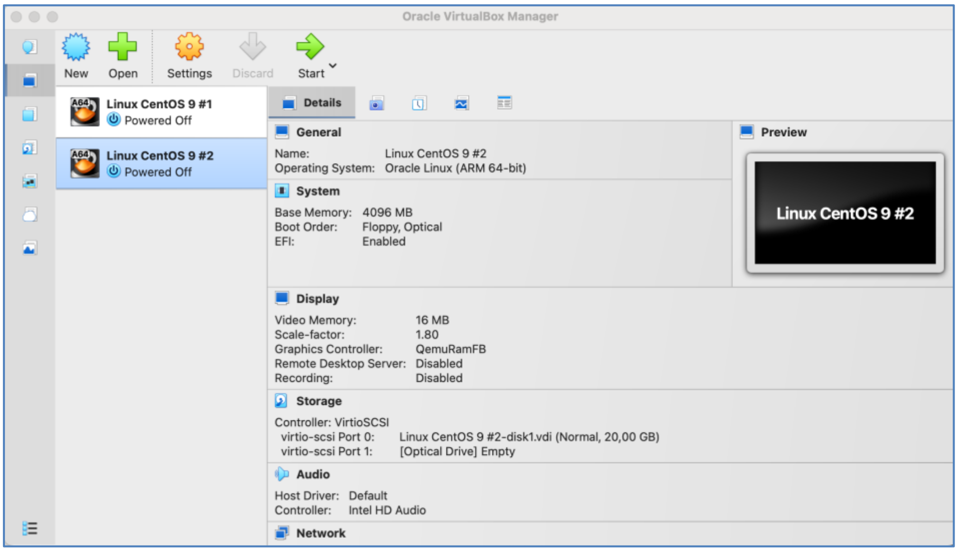
MAC Address Policy: Generate new MAC addresses for all network adapters

OS Installation Options: □ Keep Disk Names

□ Keep Hardware UUIDs

Figure 9 - Creating a clone of the Linux CentOS virtual machine

Next you should have two VMs available in VirtualBox, as the following figure illustrates:



Linux CentOS 9 #1
Powered Off

Linux CentOS 9 #2
Powered Off

General
Name: Linux CentOS 9 #2
Operating System: Oracle Linux (ARM 64-bit)

System
Base Memory: 4096 MB
Boot Order: Floppy, Optical
EFI: Enabled

Display
Video Memory: 16 MB
Scale-factor: 1.80
Graphics Controller: QemuRamFB
Remote Desktop Server: Disabled
Recording: Disabled

Storage
Controller: VirtioSCSI
virtio-scsi Port 0: Linux CentOS 9 #2-disk1.vdi (Normal, 20,00 GB)
virtio-scsi Port 1: [Optical Drive] Empty

Audio
Host Driver: Default
Controller: Intel HD Audio

Network

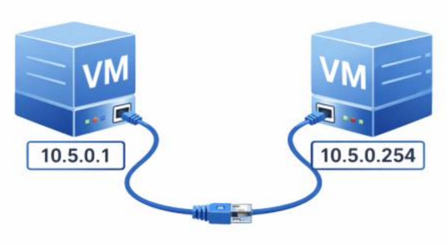
Figure 10 - Linux virtual machines available after cloning

We are now ready for the next step: configure network interfaces for communications between the two machines.

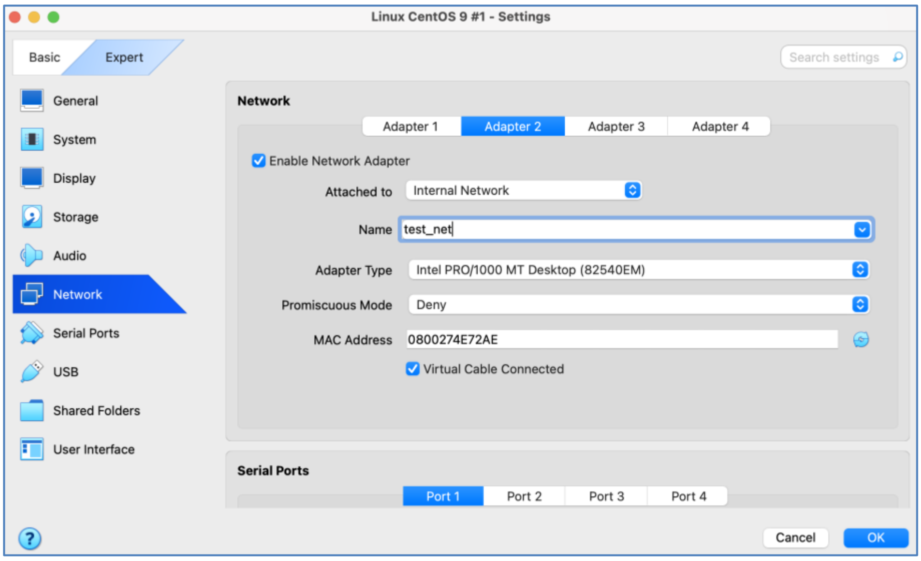
Configuring network adapters

Many experimental scenarios in FSI will require the configuration of network adapters, to enable networking scenarios where two or more hosts communicate via the network. The first thing to consider is that usually the virtualization application automatically enables one interface for the machine by default, using NAT to communicate with the Internet via the virtualizer.

The following examples consider the direct connection of the two Linux hosts, thus as if they were directly connected using a networking cable. We will use the network 10.5.0.0/24 with the illustrated IP addresses.



We start by enabling a second network adapter in each Linux host, as the following figure illustrates.



Network

☑ Enable Network Adapter

Attached to: Internal Network

Name: test_net

Adapter Type: Intel PRO/1000 MT Desktop (82540EM)

Promiscuous Mode: Deny

MAC Address: 0800274E72AE

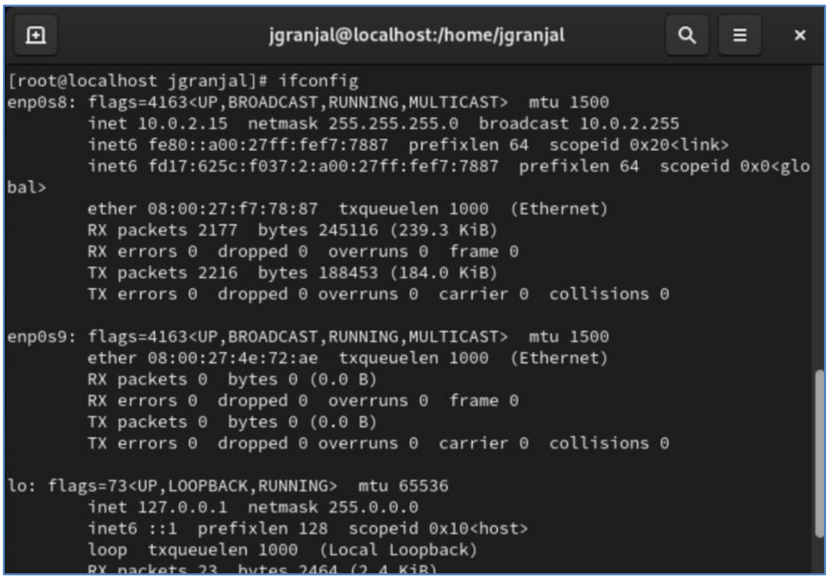
☑ Virtual Cable Connected

Figure 11 - Enabling a new network interface

As illustrated, we are enabling a second network adapter. This adapter is attached to an “Internal Network” named “test_net”. An “Internal network” (in VirtualBox) is an isolated network for communications only between virtual machines. In this example the name chosen for the internal network is “test_net” (it could be anything else), and <u>the same internal network should be attached to an interface in the other virtual machine.</u>

Network adapter configuration in Linux

Now that we have enable an additional network adapter in each virtual machine, we must configure the correct network addresses in the Linux operating system. First, we address the configuration of the second adapter manually.



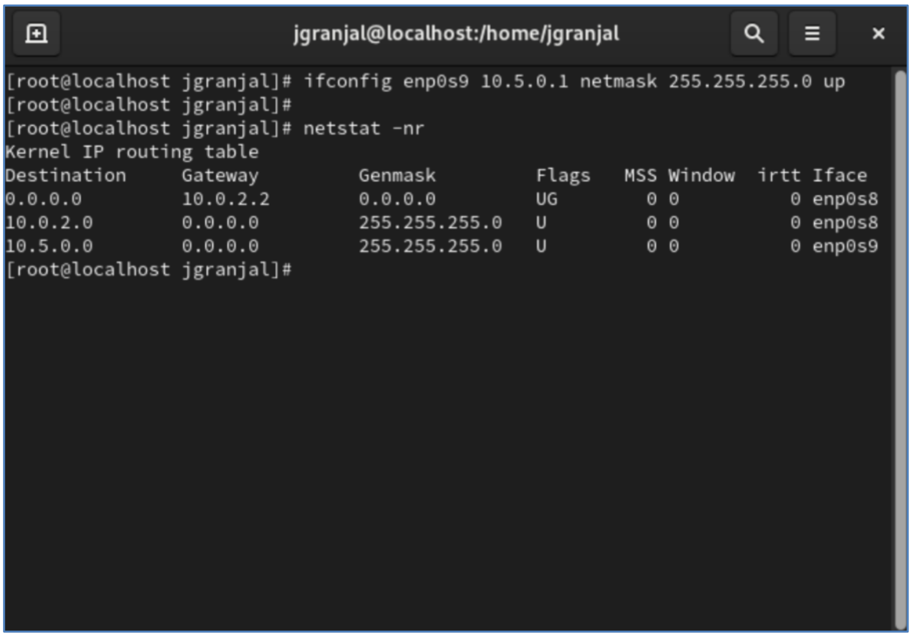
```
[root@localhost jgranjal]# ifconfig
enp0s8: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 10.0.2.15  netmask 255.255.255.0  broadcast 10.0.2.255
        inet6 fe80::a00:27ff:fef7:7887  prefixlen 64  scopeid 0x20<link>
        inet6 fd17:625c:f037:2:a00:27ff:fef7:7887  prefixlen 64  scopeid 0x0<glo
bal>
        ether 08:00:27:f7:78:87  txqueuelen 1000  (Ethernet)
        RX packets 2177  bytes 245116 (239.3 KiB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 2216  bytes 188453 (184.0 KiB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

enp0s9: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        ether 08:00:27:4e:72:ae  txqueuelen 1000  (Ethernet)
        RX packets 0  bytes 0 (0.0 B)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 0  bytes 0 (0.0 B)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING>  mtu 65536
        inet 127.0.0.1  netmask 255.0.0.0
        inet6 ::1  prefixlen 128  scopeid 0x10<host>
        loop  txqueuelen 1000  (Local Loopback)
        RX packets 23  bytes 2464 (2.4 KiB)
```

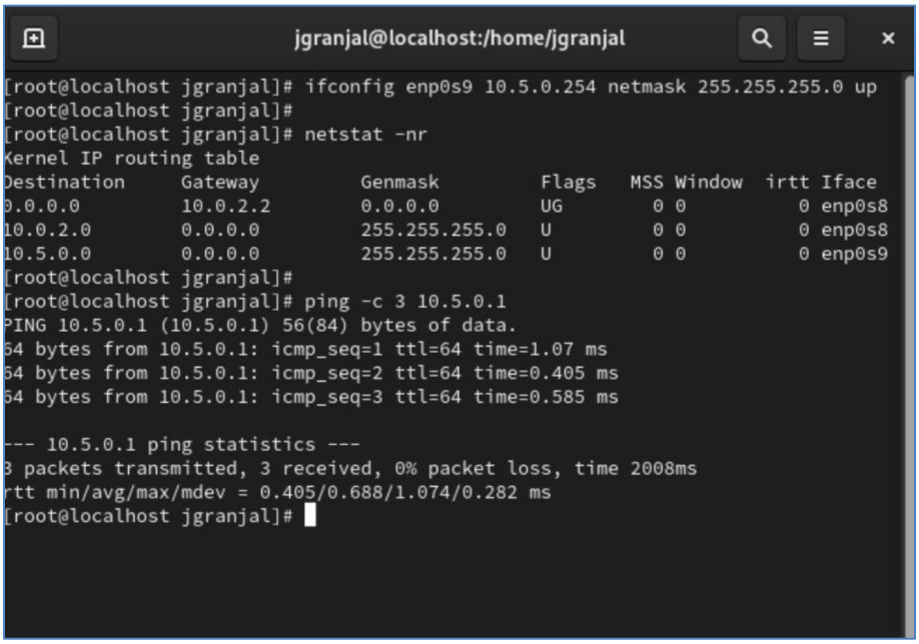
Figure 12 - Network adapters available in the Linux Virtual Machine

We start by noting the first adapter (enp0s8) which connects to the Internet via VirtualBox. The second adapter (enp0s9) is the one we will configure. Next, we configure the network adapter manually.



```
[root@localhost jgranjal]# ifconfig enp0s9 10.5.0.1 netmask 255.255.255.0 up
[root@localhost jgranjal]#
[root@localhost jgranjal]# netstat -nr
Kernel IP routing table
Destination     Gateway         Genmask         Flags   MSS Window  irtt Iface
0.0.0.0         10.0.2.2        0.0.0.0         UG        0 0          0 enp0s8
10.0.2.0        0.0.0.0         255.255.255.0   U         0 0          0 enp0s8
10.5.0.0        0.0.0.0         255.255.255.0   U         0 0          0 enp0s9
[root@localhost jgranjal]#
```

Figure 13 - Configuration of the network adapter (first VM)



```
[root@localhost jgranjal]# ifconfig enp0s9 10.5.0.254 netmask 255.255.255.0 up
[root@localhost jgranjal]#
[root@localhost jgranjal]# netstat -nr
Kernel IP routing table
Destination     Gateway         Genmask         Flags   MSS Window  irtt Iface
0.0.0.0         10.0.2.2        0.0.0.0         UG        0 0          0 enp0s8
10.0.2.0        0.0.0.0         255.255.255.0   U         0 0          0 enp0s8
10.5.0.0        0.0.0.0         255.255.255.0   U         0 0          0 enp0s9
[root@localhost jgranjal]#
[root@localhost jgranjal]# ping -c 3 10.5.0.1
PING 10.5.0.1 (10.5.0.1) 56(84) bytes of data.
64 bytes from 10.5.0.1: icmp_seq=1 ttl=64 time=1.07 ms
64 bytes from 10.5.0.1: icmp_seq=2 ttl=64 time=0.405 ms
64 bytes from 10.5.0.1: icmp_seq=3 ttl=64 time=0.585 ms

--- 10.5.0.1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2008ms
rtt min/avg/max/mdev = 0.405/0.688/1.074/0.282 ms
[root@localhost jgranjal]#
```

Figure 14 - Configuration of the network adapter (second VM)

As illustrated previously, we are now able to communicate between the two virtual machines, as per our goal.