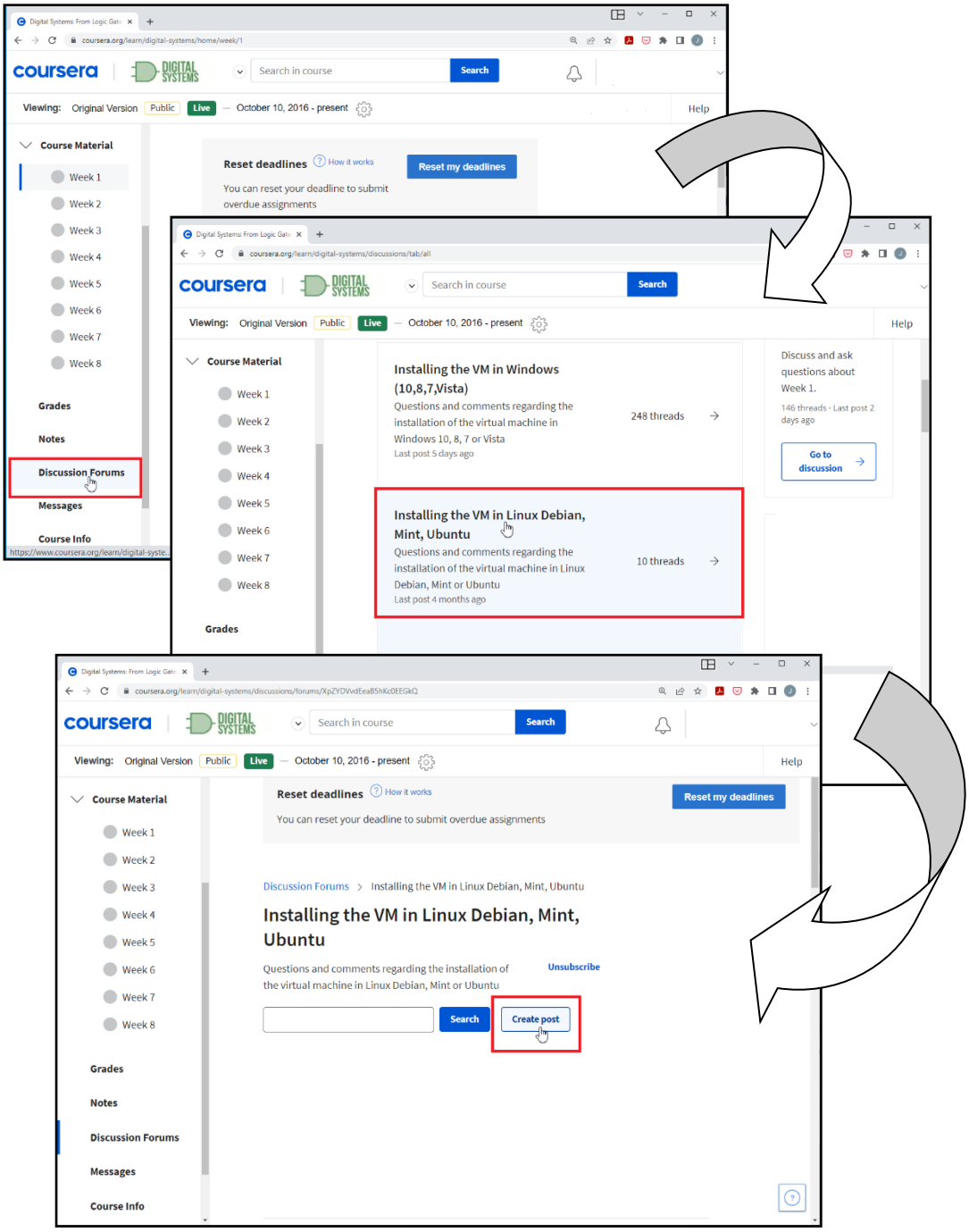
Installation of the DigitalSystemsVM virtual machine



Notice

This document explains how to install the DigitalSystemsVM virtual machine on a computer with Linux Ubuntu 22.04 LTS *Jammy Jellyfish*. If questions or problems relating to the installation process arise, you may enter a question in the forums. In order to efficiently manage the forums, you **must** enter into the forum **Installing the VM in Linux Debian, Mint, Ubuntu** and create a new post explaining your problem. Please add information about your computer (model, processor, RAM memory, available disk space, operating system, etc.). The following images show how to access to the **Installing the VM in Linux Debian, Mint, Ubuntu** forum and how to create a new post (red boxes).



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Installing a VirtualBox virtual machine on Linux – Ubuntu 22.04 LTS Operating System

This document is intended to help you install VirtualBox on **Linux Ubuntu 22.04 LTS OS**. It describes the steps to follow for installing a virtual machine that contains the necessary applications to solve the assignments of this course and their automatic correction. This virtual machine, named **DigitalSystemsVM**, is a VirtualBox virtual machine running the GNU/Linux operating system, specifically SliTaz GNU/Linux 4.0 distribution. However, **NO** previous experience with this distribution is required.

In order to follow these steps you must be logged into a computer with Internet connection. You should replace all instances of *username* with the name of the account in which you wish to use the virtual machine.

You will need *root* access to install VirtualBox. Root privileges can be requested via the **sudo** command; be sure to have *username* in the list of sudo-ers in /etc/sudoers.

We will be using the *gedit* text editor in this guide, but feel free to use your favorite text editor instead.

Step 1: Installing VirtualBox 6.1.X

The first step to install VirtualBox is adding the repository that contains your installation package to the file containing Ubunto repositories. To do so, open a **terminal console** and run:

```
gedit admin:///etc/apt/sources.list
```

（enter the password when required)

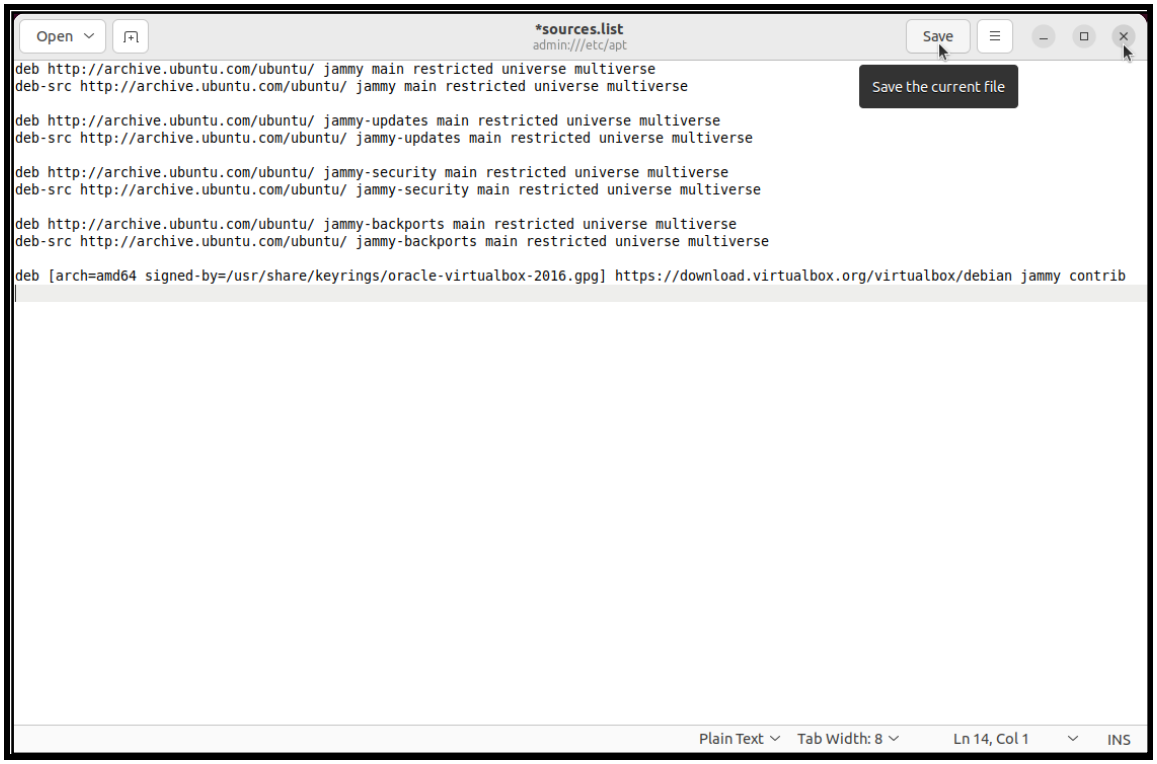
You should add the following line at the end of the *sources.list* file (all the text on a single line):

```
deb [arch=amd64 signed-by=/usr/share/keyrings/oracle-virtualbox-2016.gpg]
https://download.virtualbox.org/virtualbox/debian jammy contrib
```

then save and close by clicking on (see next figure):

Save button **Close** button

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The next step is to get the public key linked to the repository. To do so, run the following commands from the terminal:

Note: each individual command that needs more than one line in this handbook is shown enclosed with a box to avoid confusion with a series of commands.

```
cd
```

```
wget https://www.virtualbox.org/download/oracle_vbox_2016.asc
```

```
sudo gpg --yes --output /usr/share/keyrings/oracle-virtualbox-2016.gpg
--dearmor oracle_vbox_2016.asc
```

Then, to install *p7zip-full*, *dkms* and *virtualbox-6.1* packages, run (it may take some time, be patient):

```
sudo apt update
```

```
sudo apt install p7zip-full dkms
```

```
sudo apt install virtualbox-6.1
```


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Important note for those who use a computer with Secure Boot enabled.

Four modules are generated while installing Virtual Box (**vboxdrv, vboxnetflt, vboxnetadp and vboxpci**) and loaded into memory when VirtualBox is running. **If your computer has Secure Boot enabled**, you must digitally sign the modules, or otherwise the VirtualBox running will result in a failure. To sign the modules you should know which file each module is stored in. This information can be obtained with the `modinfo module_name -n` command. The explanation about Secure Boot, the digital signature procedure and the required elements to perform it are beyond the scope of this manual.

Finally, you need to add your user (here *username*) to the **vboxusers** group:

```
sudo usermod -a -G vboxusers username
```

Step 2: Installing DigitalSystemsVM virtual machine

Create the folders **Coursera** and **VirtualBox VMs** inside the home directory. Enter the **VirtualBox VMs** directory to download the DigitalSystemsVM machine:

```
cd

mkdir --mode=777 Coursera

mkdir "VirtualBox VMs"

cd "VirtualBox VMs"
```

To download a *7z* file containing the DigitalSystemsVM virtual machine, type

```
wget
https://crsrdigitalsystems.eu-central-1.linodeobjects.com/coursera/DigitalSystems/v2/VirtualMachine/DigitalSystemsVM.7z
```

followed by

```
7z x DigitalSystemsVM.7z
```

to decompress the file (it will take a long time). You should have now a directory named **DigitalSystemsVM** with the virtual machine files inside, including **DigitalSystemsVM.vbox** and **DigitalSystemsVM.vmdk**.

Finally, move back to your home directory by typing:

```
cd
```

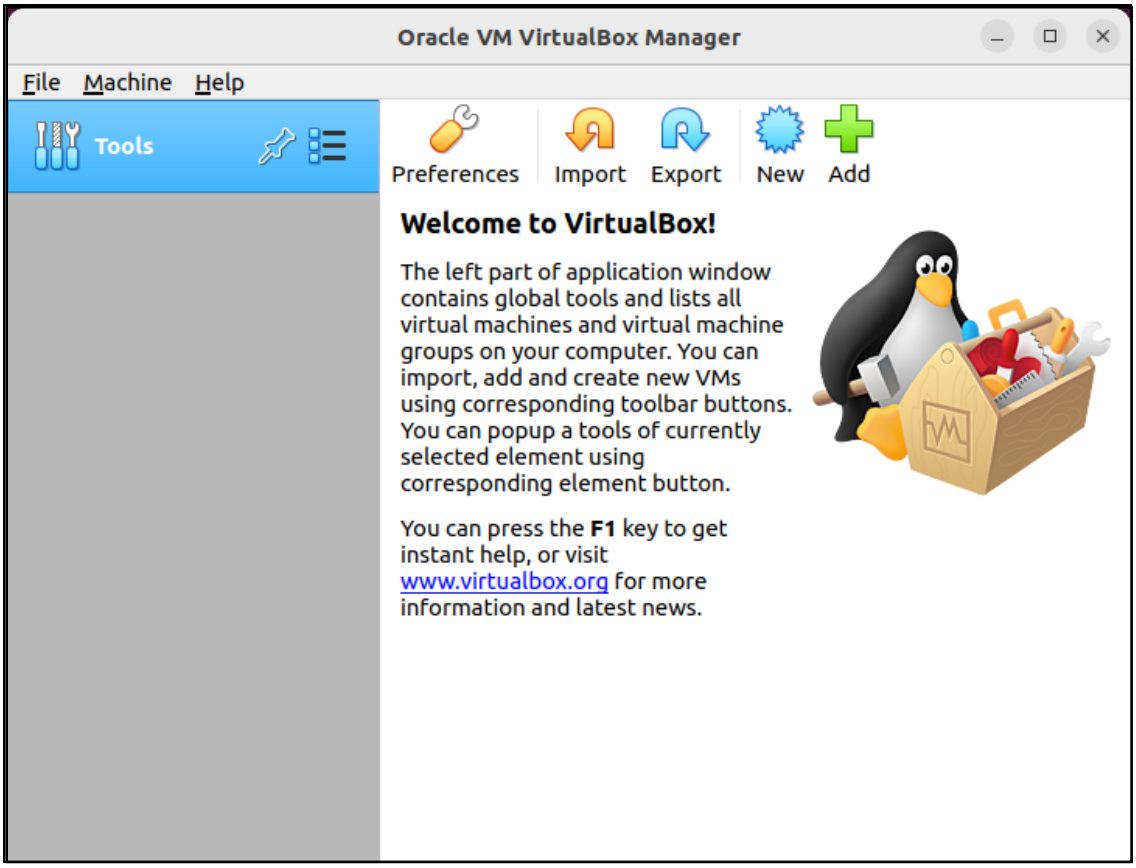

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Step 3: Adding the virtual machine and defining a shared folder

To add the **DigitalSystemsVM** virtual machine, run VirtualBox by typing

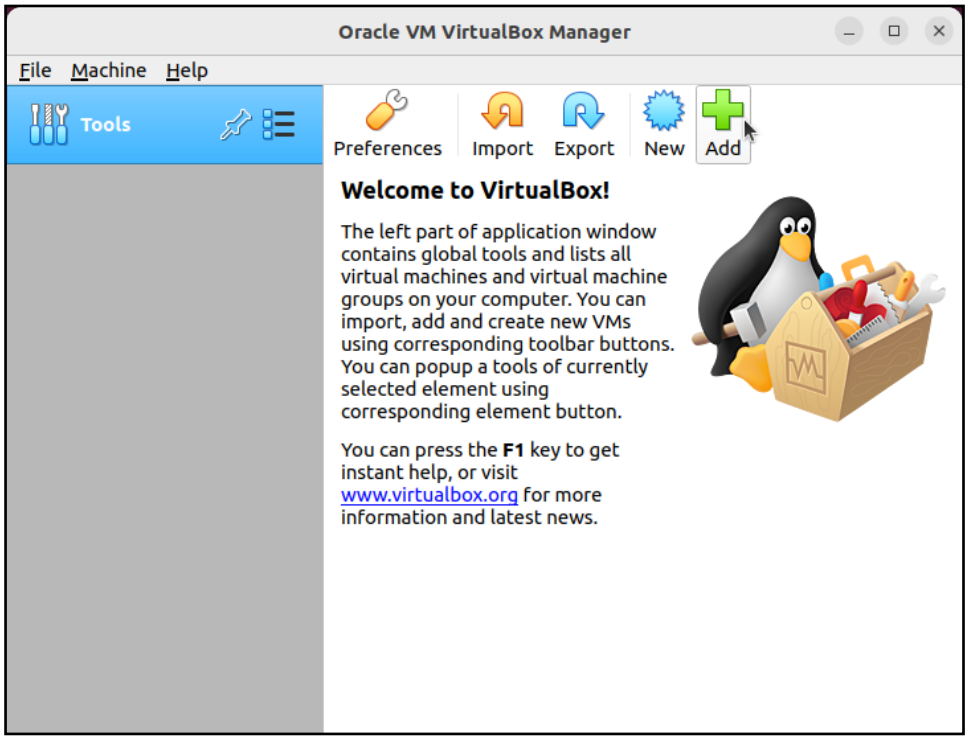
```
virtualbox &
```

You will be presented with the following welcome window:

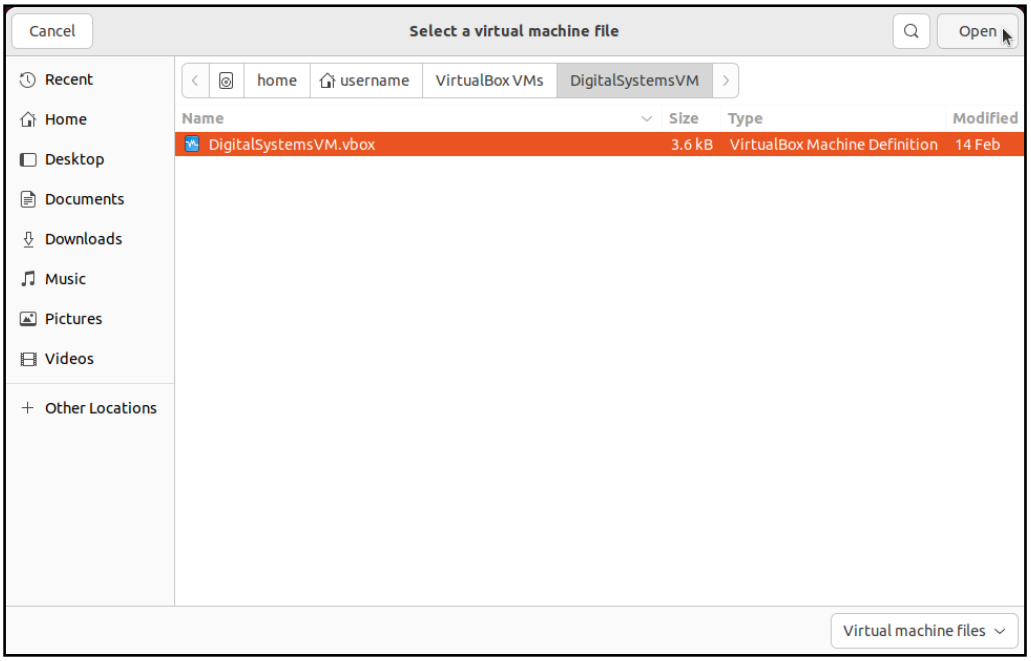


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To add the **DigitalSystemsVM** machine**,** click on **Add**.



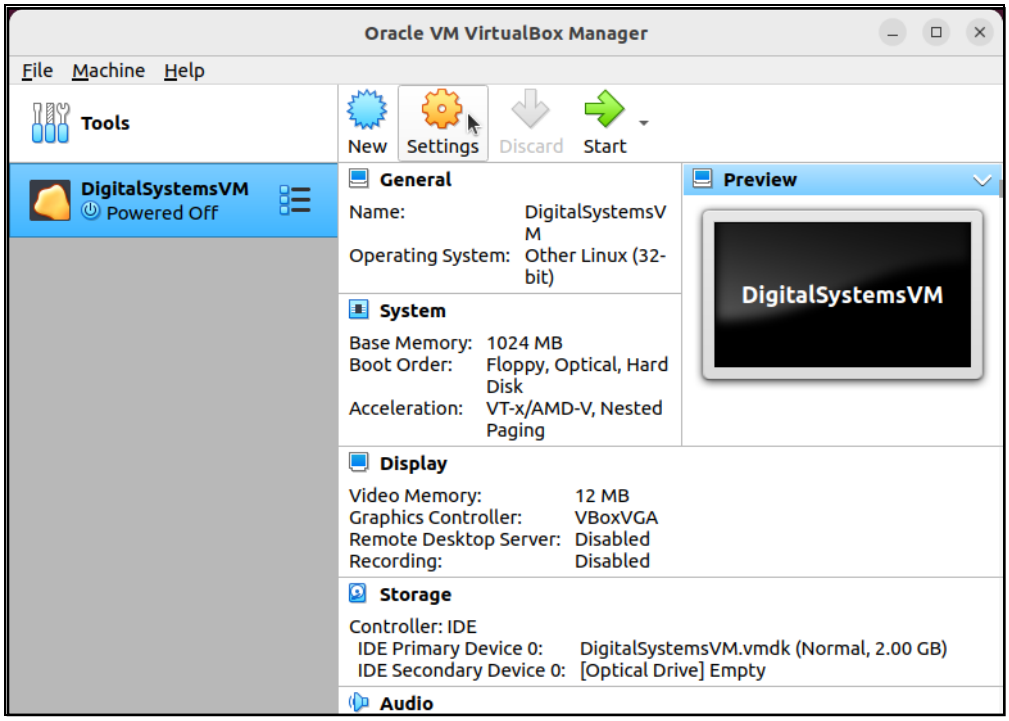
Specify the location of the **DigitalSystemsVM.vbox** file (it is in the directory **~/VirtualBox VMs/DigitalSystemsVM)** and click on the **Open** button.



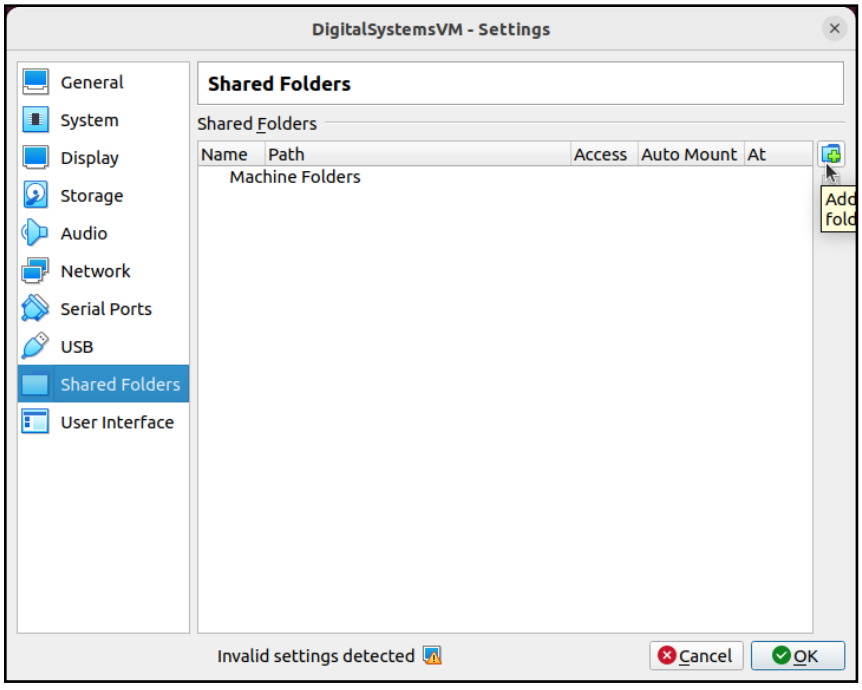
Once our machine has been added to VirtualBox, it will appear in the left panel of the VirtualBox window.

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Finally, define the folder **Coursera** created in the previous step as a "shared folder", i.e., a folder accessible from the host and from the virtual machine. To do so, select the virtual machine and click on **`Settings`**.

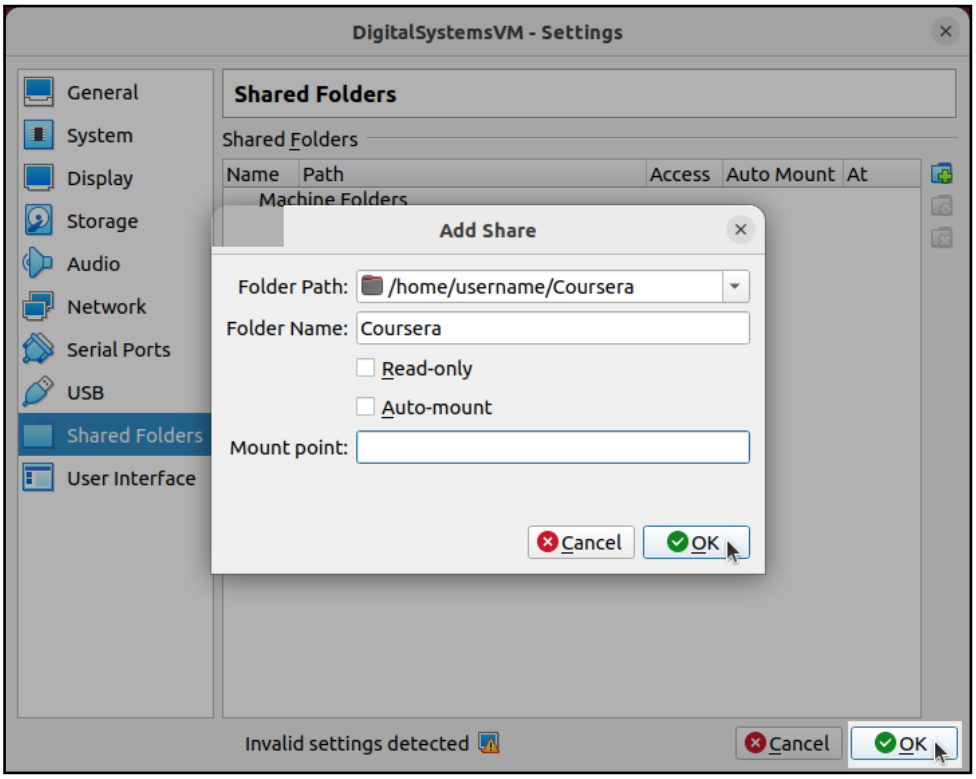


A window opens. Select the option **Shared Folders** in the new window and click on the icon "+" located at right (see arrow in the next figure). Don't worry about the *Invalid settings detected* message shown at the bottom of the window.



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A new window opens. Select the path **/home/username/Coursera** in the "Folder Path", introduce **Coursera** in the "Folder Name" and click on **OK** in both windows (in the little one and in the Settings window).

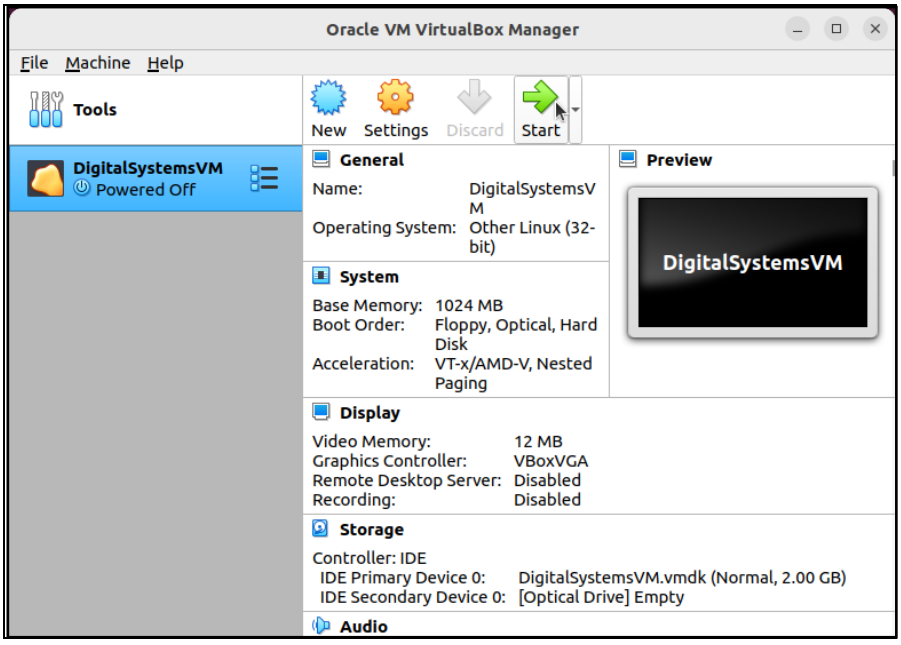


Processes described in this step only have to be performed ONE TIME, before the first run of the machine.

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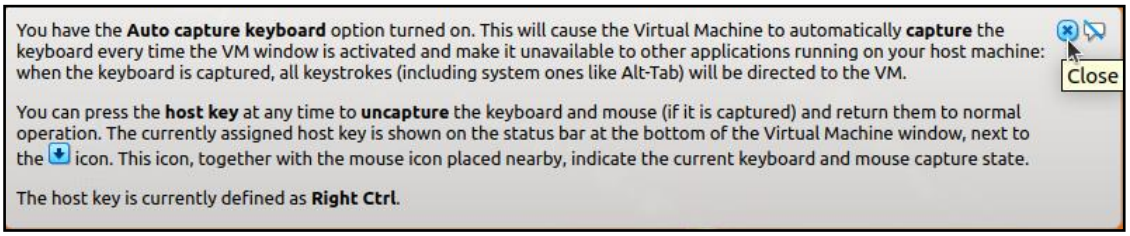
Step 4: Running the virtual machine

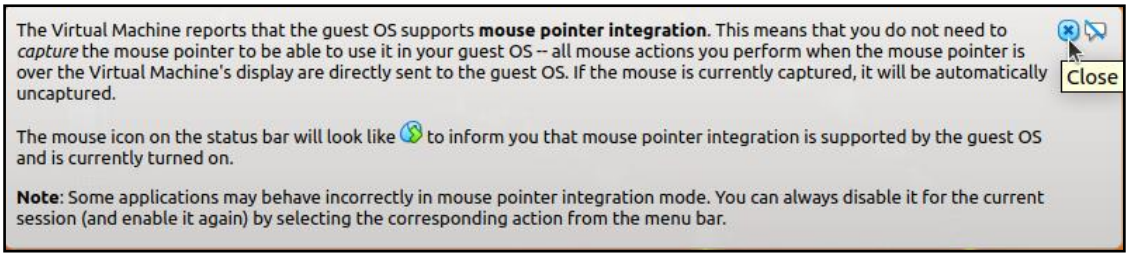
To run the machine, press the **`Start`** button as shown in the following picture.



The window displaying the launch process may remain black during some time, depending of the host computer performance. If this happen, don't do anything, just patiently wait.

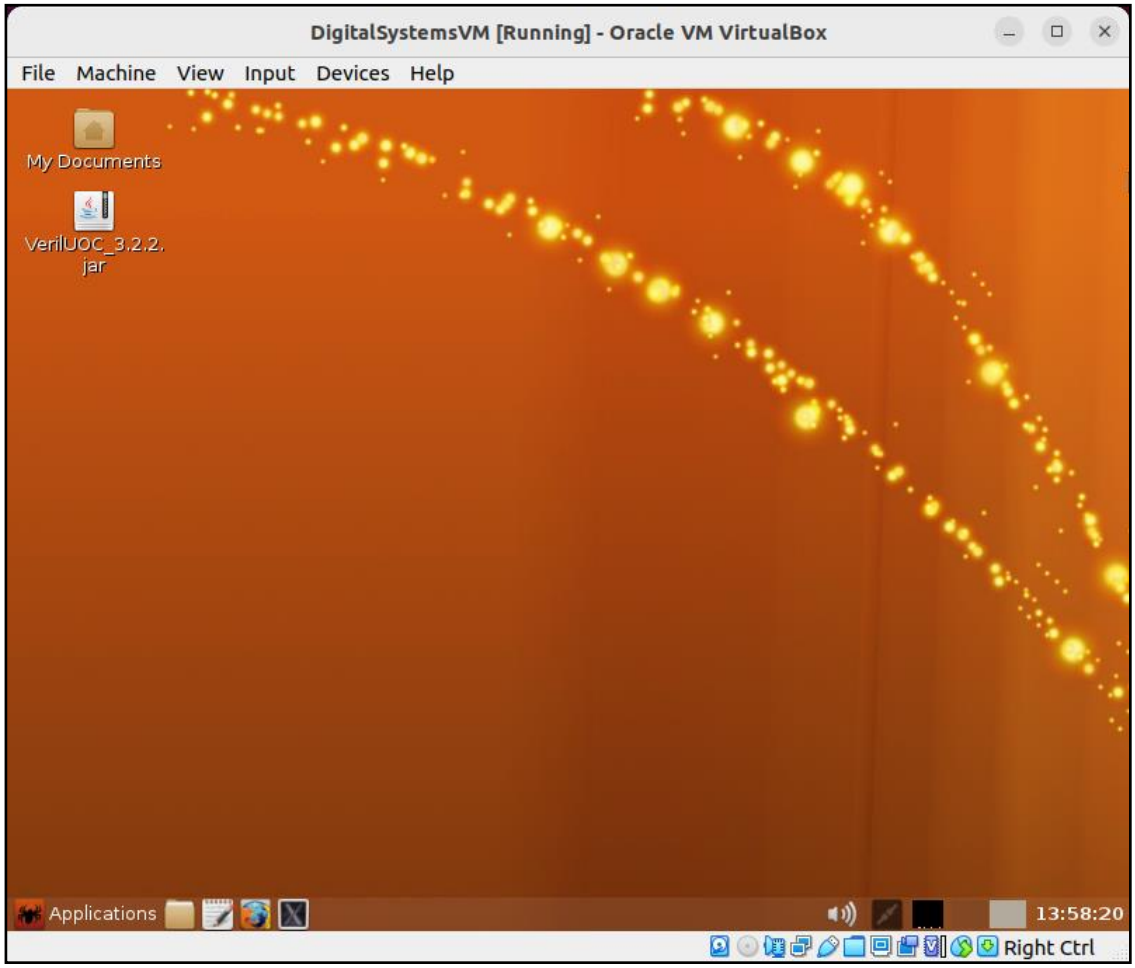
During booting several windows will appear to inform you that the keyboard and mouse may be used directly from the virtual machine. Close these windows by pressing . You may also press to stop these windows from popping in the future.





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After booting the **DigitalSystemsVM** virtual machine, it will be displayed in a different window. DigitalSystemsVM is configured to login directly with the **mooccf** user account, with the password **mooccf**. You will be using this account to solve the problems of this course. The following picture shows the desktop of the **mooccf** account with the **VerilUOC_Desktop** application that you will use to complete the course exercises.



Before using the virtual machine you may need to change some part of the configuration from within the virtual machine.

The virtual machine has the "es - qwerty" Spanish keyboard selected by default. If you want to switch to another keyboard (for instance, the English keyboard), click on the X icon located in the bottom panel of the DigitalSystemsVM virtual machine to open a terminal.

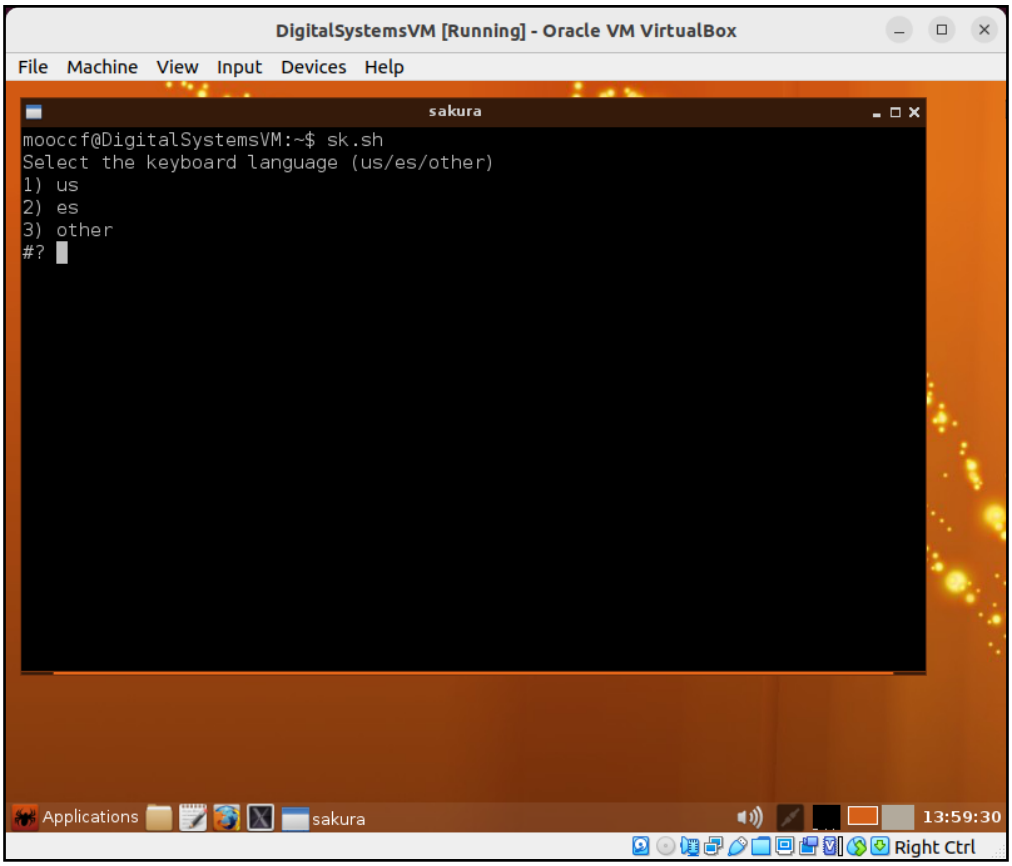


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Execute the following command in the terminal to set up the keyboard:

`sk.sh`

Note: the simplest way to write the above command is to type the characters **sk** and then press the **TAB key** to fill in the rest of the command.



Type **1** in **#?** for an **English** keyboard, **2** for a **Spanish** keyboard, **3** for **any other**, and then click on **`Return`**. When a 3 has been selected a new question appears on the screen asking for the identifier of the keyboard you are using. Consult the codes in http://wiki.laptop.org/go/Keyboard_layouts and click on **`Return`.**



Finally, run the command:

`exit`

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Step 5: Installing *Guest Additions*

The **Guest Additions** of VirtualBox are a set of device drivers and system applications designed to simplify the use of a VirtualBox virtual machine and optimize its performance. Next paragraphs describe how to install a specific version of the Guest Additions on the virtual machine DigitalSystemsVM. Let us note that this is a different version to which would correspond to the VirtualBox 6.1.X version.

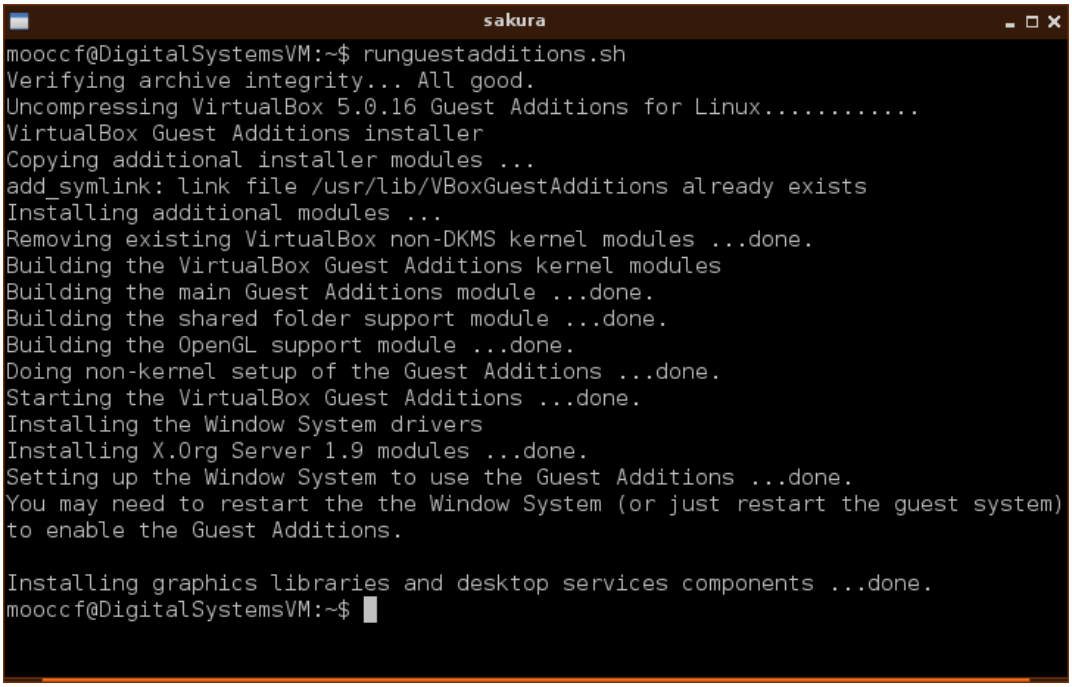
Open a terminal in the DigitalSystemsVM virtual machine by clicking on the icon with an "X" in the lower panel.



To install the Guest Additions package, type in the terminal the following command:

```
runguestadditions.sh
```

Note: this may take a while. It may even appear to stop for a moment. Please wait patiently until the *prompt* is displayed again in the terminal, as shown in the figure.



In the same terminal, run the commands:

```
runafterguest.sh
```

```
exit
```

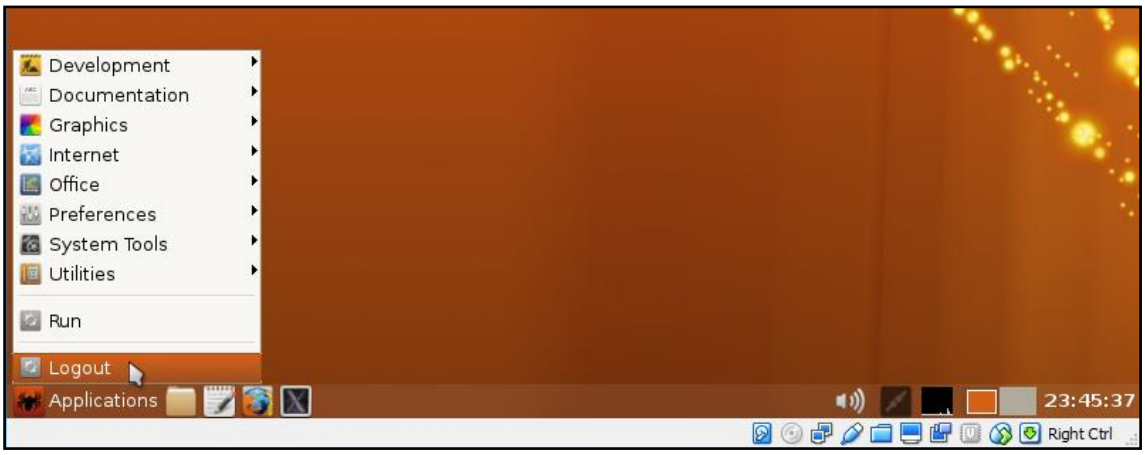
Finally, shut down or reboot the virtual machine as explain below.

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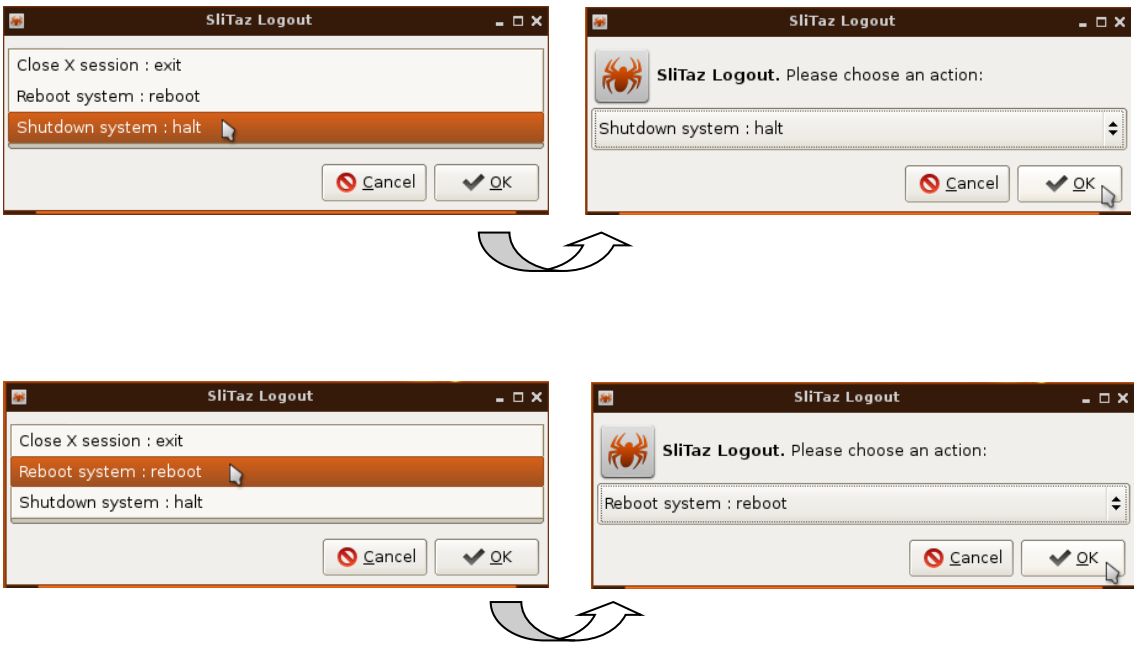
Step 6: Shutting down or rebooting the machine

Run the following command to shut down or reboot the virtual machine:

Applications → Logout



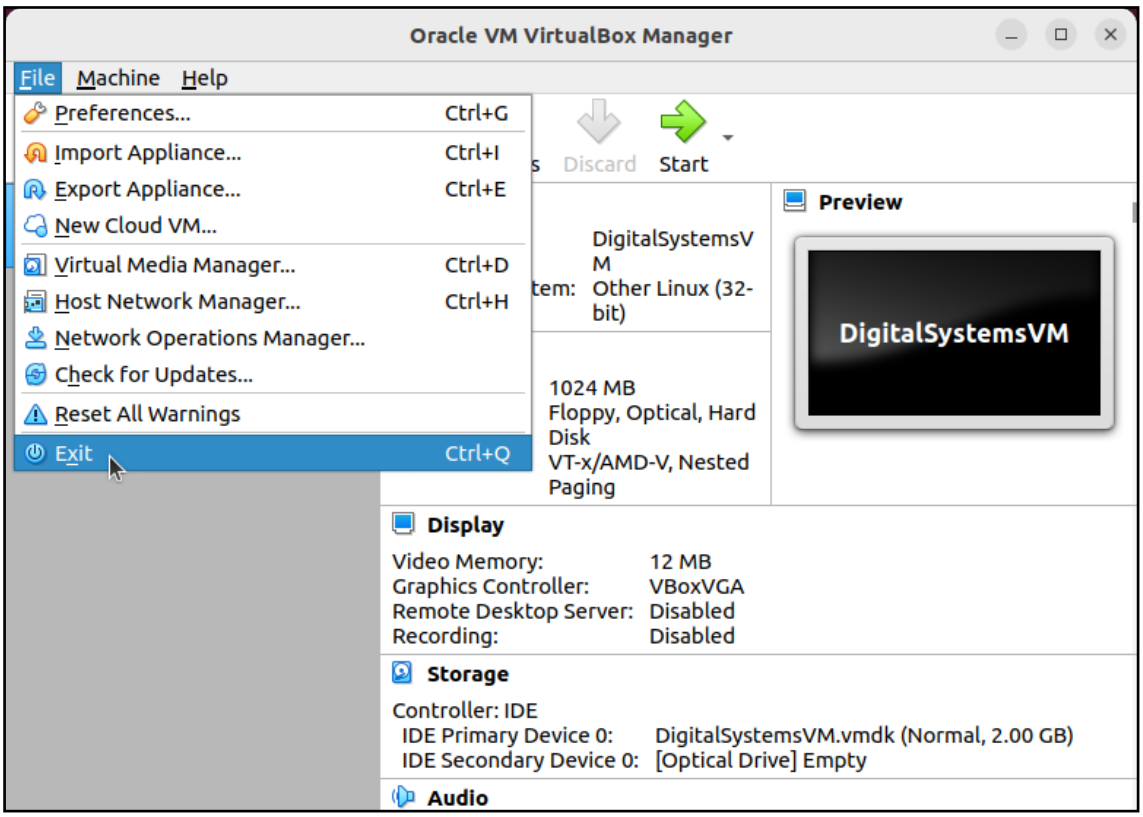
Select **Shutdown system: Halt** or **Reboot system: Reboot** as desired in the new window (see figures) and press **OK.**



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When the virtual machine shuts down, you may close VirtualBox by running the following command in the main window:

`File → Exit`



Additional comments

-We strongly recommend NOT to update the VirtualBox application nor the DigitalSystemsVM virtual machine during the duration of this course.

- The shared folder **Coursera** is mounted in the directory **/media/Coursera** in the virtual machine.

- You may choose to work with the virtual machine using a larger window than the one displayed by default. To do this, you can either resize the window by enlarging it, or simply maximize the window so that it occupies the entire screen.

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