EXERCISES ABOUT OS INSTALLATIONS

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1.- VirtualBox installation

A. Brief Introduction

The first thing you must do is to set up Virtual Box, in order to install several operating systems (LINUX, WINDOWS, MACINTOSH, SOLARIS) inside the same computer. VB is distributed at NO COST under the term of version 2 of the GNU (General Public License), available for 32-bit platform and 64-bit platform.

In addition to this, you must install additional software called **Guest additions** (drivers and applications) and **Extension packs** (additional functionalities, to use USB 2.0 or 3.0, webcam, etc.) as you will see later.

B. First step: VirtualBox Installation

The purpose of VirtualBox is the creation of virtual machines, these in turn can be organized in networks and this opens up a wide range of possibilities.

The first benefit that VirtualBox gives us is the possibility of installing almost any Operating System, which gives us the ability to test, know and study everything about Computer Systems.

The second benefit provided by VirtualBox is linked to the second feature we mentioned, the creation of Computer Networks, and it is thanks to this that you can build a network with an enterprise structure.

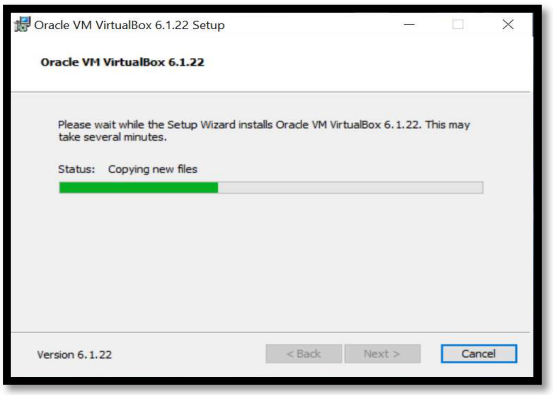
VirtualBox download from https://www.virtualbox.org/wiki/Downloads?ProyectoByte (What it says: Windows Hosts).

Start the VirtualBox installer and in the Welcome window click on **"Next"** button.

In Custom Setup there are 2 windows and in the 2 click on **"Next"** button.

Now you should know that when you install VirtualBox the Internet connection will be interrupted, keep it in mind in case you are in the middle of a download. click on **"Yes"** button.

Now click Install and you give it admin permissions.



Finally click on **"Finish"** button and you have installed your VirtualBox.

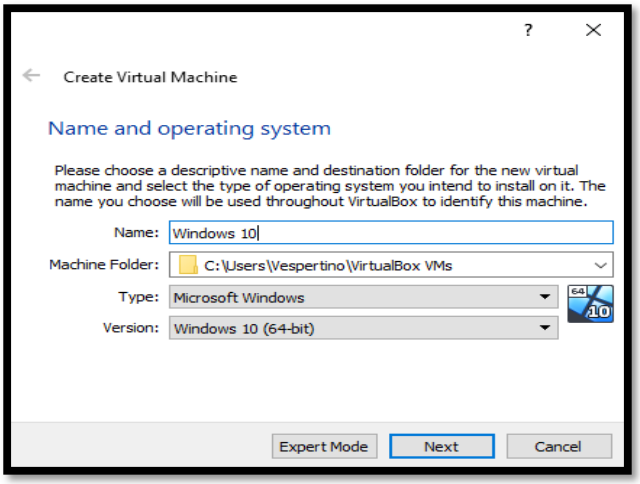
C. Second step: Choose 2 GB of RAM memory. At the top of the screen there are two menus, and you can choose between to options to create a new virtual machine from the left side of the screen: **a) Menu-> click "Machine -> New"** or from the right side of the screen: **b) Menu-> click "New icon"** 

:

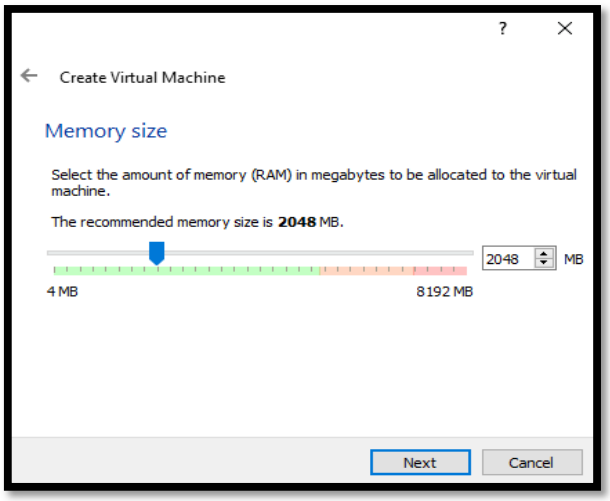
a)

b)

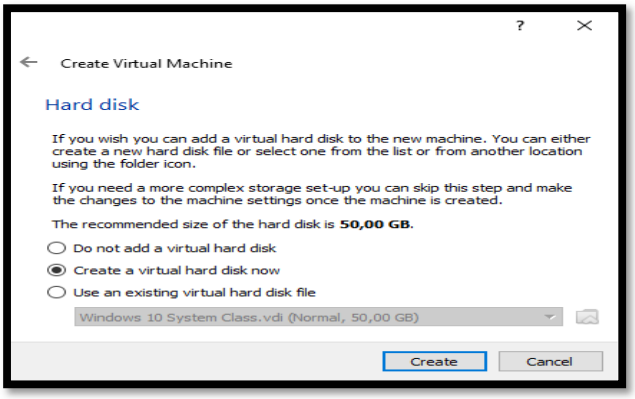
Then you select the Operating System (OS) following these steps: write the Name, choose the Machine Folder (in this example it is shown the default folder), OS Type and the corresponding SO Version by clicking on the arrow inside each label. Then **click "Next"** button:



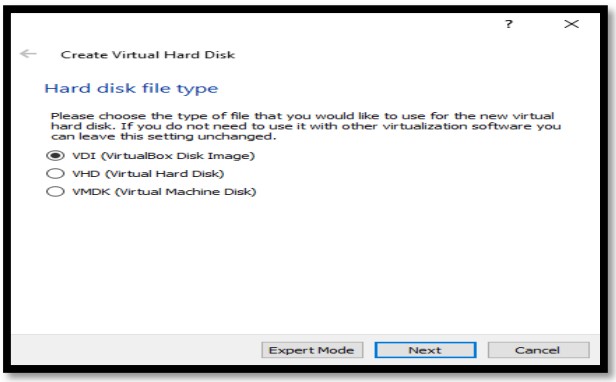
This screen below shows the RAM memory size that it can be chosen. By default, you see the recommended memory size (2048MB) that is the one you need. Then **click "Next"** button:



Next step is to create a virtual hard disk because you do not have any. You want to choose 50,00 GB that is also the recommended size of the hard drive. Then **click "Create"** button:

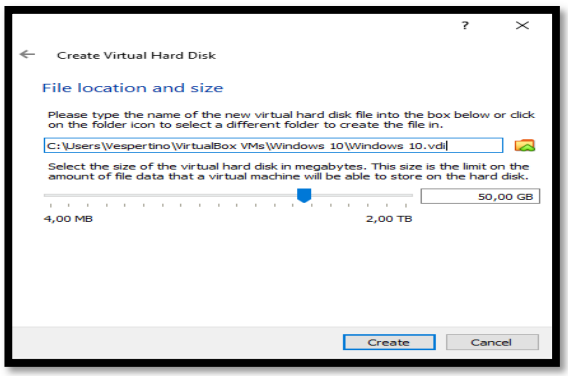


After that, you need to create an **image of the virtual hard disk** virtual machine (VDI). In addition, the VDI file is used to copy, create or restore the contents of the disk drive to a new virtual machine. Then **click "Next"** button:

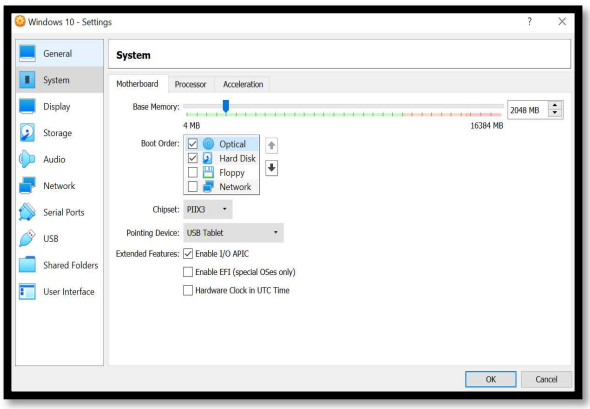


… And "dynamically allocated" in order not to waste storage:

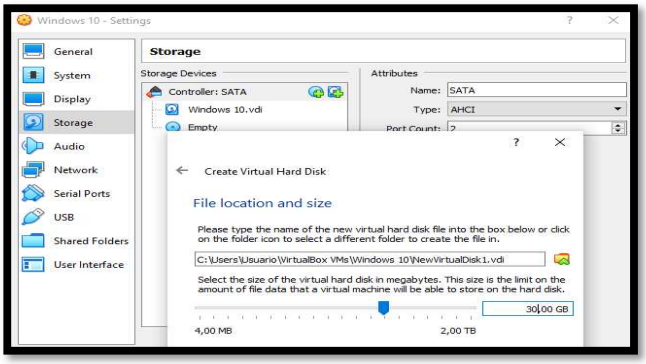
And finally, you want to install a hard drive with 50GB:



D.- Third step: Boot order (CD and Hard Disk). Once created the virtual machine, you can change the boot order from settings like in the screen below by **clicking on Boot Order "System" tab:**



E.- Fourth step: Two hard drives. Finally, you must add another hard disk with 30GB empty and dynamically allocated, choosing at the menu **Storage->Controller: SATA->click "Add hard disk"**  button so this way you can create the new hard drive and its size, then click "Next" button.

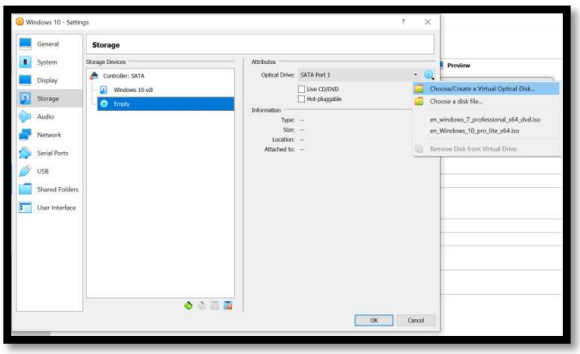


2.- Windows 10 installation.

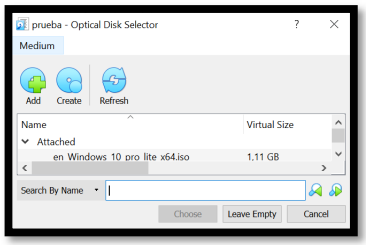
A. Brief introduction.

First of all, it is necessary to install Windows 10 in our computer (64 bits, or 32 if you do not have enough RAM memory in your physical computer) inside the virtual machine, choosing an empty virtual machine and after that, set up some settings:

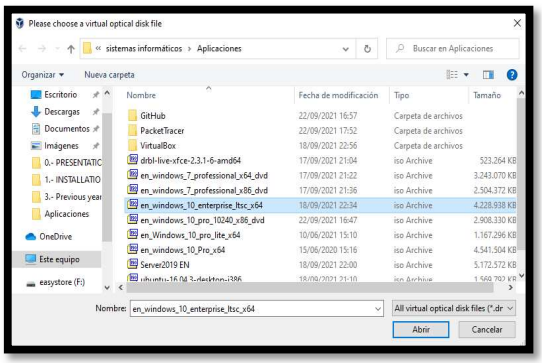
Once you set up Virtual Box, you want to install a virtual machine with Windows 10 OS. In order to do this in our virtual machine, you choose from the menu the Optical Drive empty from Storage Devices, then in **Attributes->click Optical->" Choose/Create a Virtual Optical Disk"**:

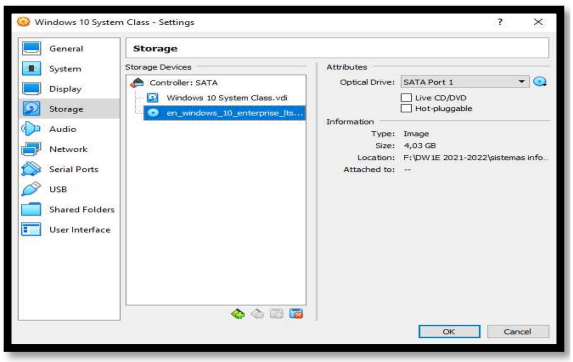


After that in the next screen **click "Add"** button:



Immediately opens the folder where our ISOs are, you click on the one you need, then click "Abrir" button and our OS is ready to run.

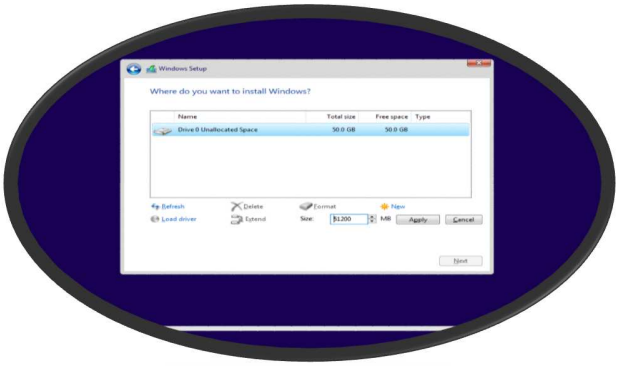




Then, you **click "Start"**  button to run Windows 10.

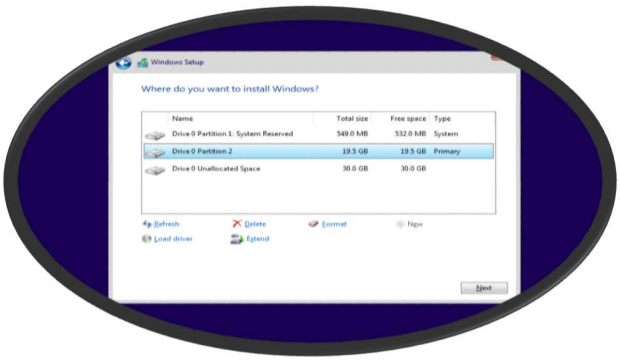
B. First step: Windows 10 installation. You start choosing the language you want to install, although actually set three parameters: The language itself, the format of time, date and currency, and the type of keyboard you will use. You need to install Spanish keyboard in order to use our letters and special characters. Then **click "Next"** button.

The next screen of the installation wizard interface shows the hard disk partitions and which you want to install. In this case, I only want the Primary partition that is where both the OS and other data can be stored, and it is the only partition that can be set active, because I do not how many partitions are going to use, and I choose to allocate all hard drive space for Windows 10 installation. If you want to use more than one hard disk partitions, you must **click on "New"** button and choose the size of each of them. Besides, you can remove any of them at this point. Then **click "Next"** button.



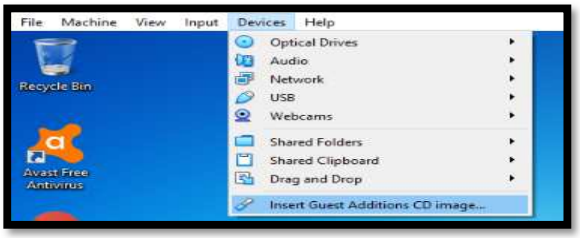
In case you choose to add the other recommended partition, as you will see, the system automatically creates: **"System reserved"** whose size is calculated by the system (between 500MB – 1GB) which includes the boot loader and Windows startup configuration data. You need for this partition 20GB and the rest of this partition is used by OS and data. The default partitions are created as **primary ones**. You need

additional software to use logical partitions, but you will add that partitions later int **"Disk Management"**. Then **click "Next"** button.

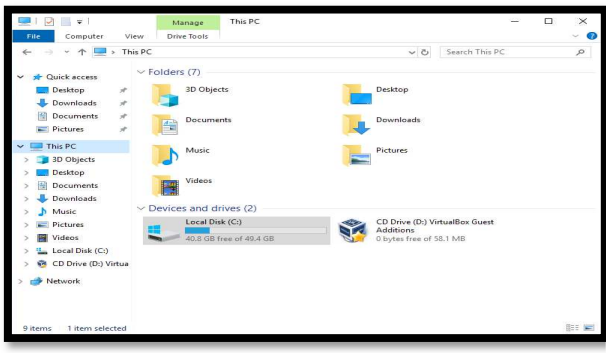


Another important screen you should consider is the one on which you can choose **user** and **password** which is requested in duplicate to ensure that you do not make typographical errors, in case you are not able to write and log in.

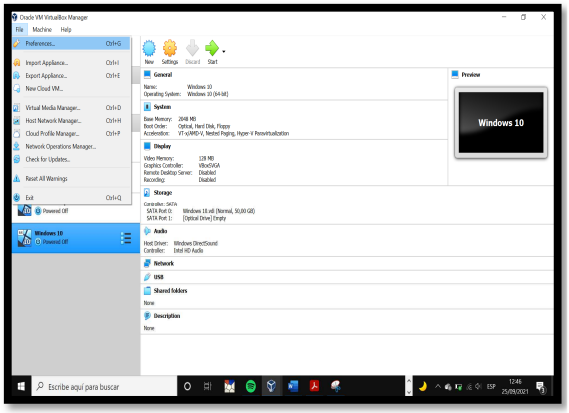
Once installed Windows 10, it is necessary to setup **"Guest additions"** to enable the clipboard, USB devices (2.0 and 3.0) and shared folders in **Menu->Devices->Insert Guest Additions CD image .iso file**.

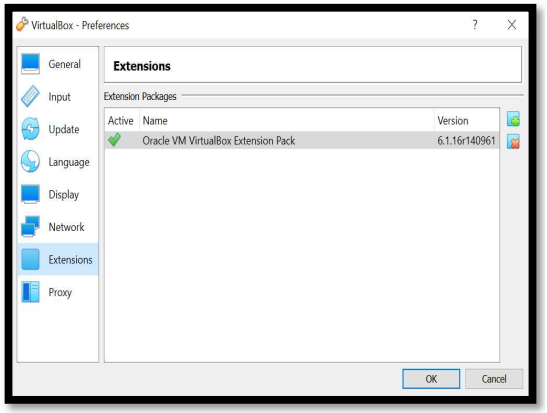


After installed, you can setup these tools from this menu and **click on D partition** to run the installation wizard.

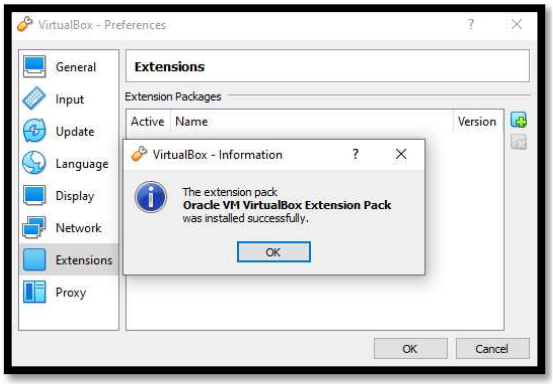


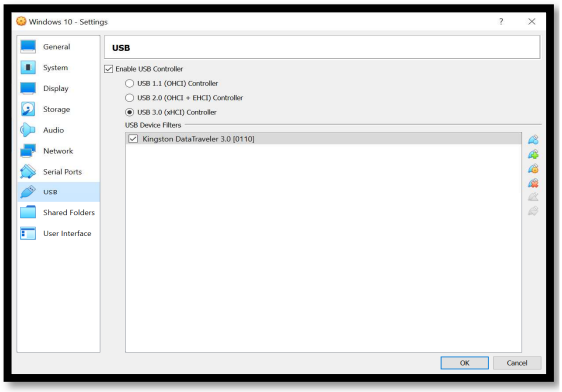
C. Second step: USB 3.0 support. Now you must use a USB device, in this case 3.0 (this supports all USB speeds) and you first need to install the **"Extension packs"** as explained before in the **"VirtualBox Brief introduction step".** Then you **click on "File - Preferences-> Extensions"** in the VirtualBox main menu. After that you can choose as many USB adapters as you need, clicking on **"Menu->Settings->USB->Add new USB"** button. Be careful with USB devices that are currently in use on the host. For example, if you allow your guest to connect to your USB hard disk that is currently mounted on the host, when the guest is activated, it will be disconnected from the host without a proper shutdown. This may cause data loss.



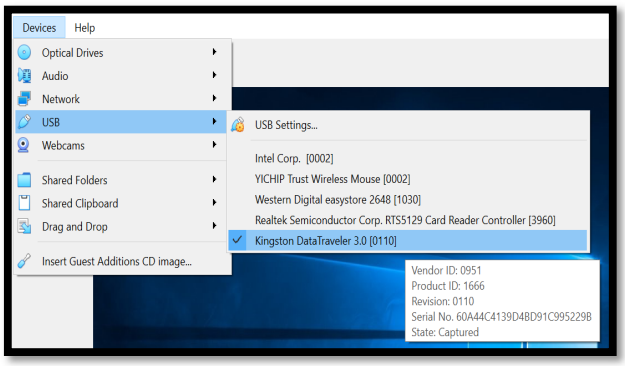


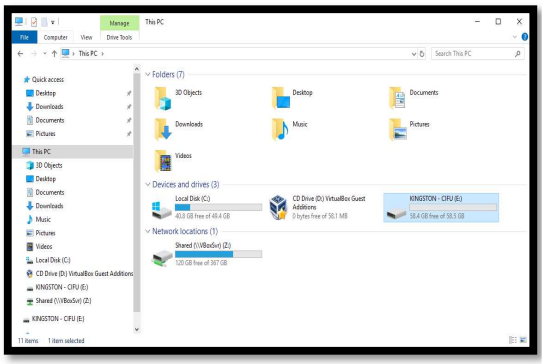
In this case, only one USB device will be chosen.

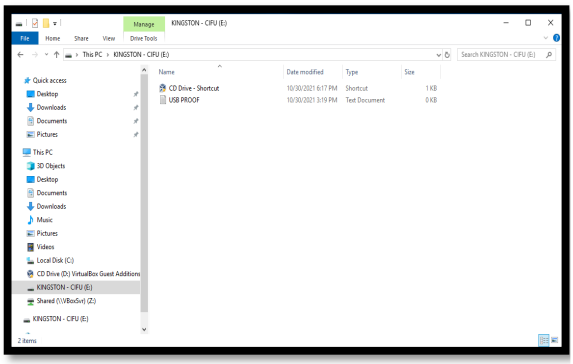




After that, you choose from Virtual Box: **Menu->Devices->USB** the device required and **clicking on Start->This PC** is showed the different enable units. In order to prove that the USB adapter is working, doble click on unit E: and the information of the device will be showed. USB devices with a matching filter will be automatically passed to the guest once they are attached to the host.

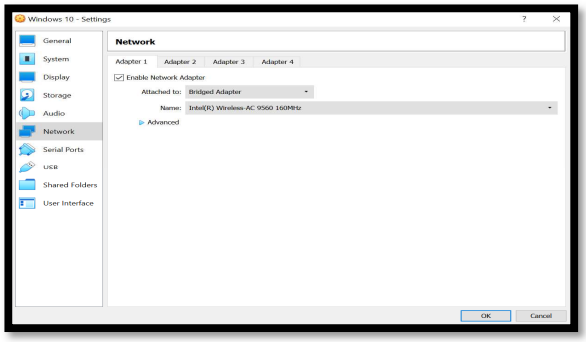




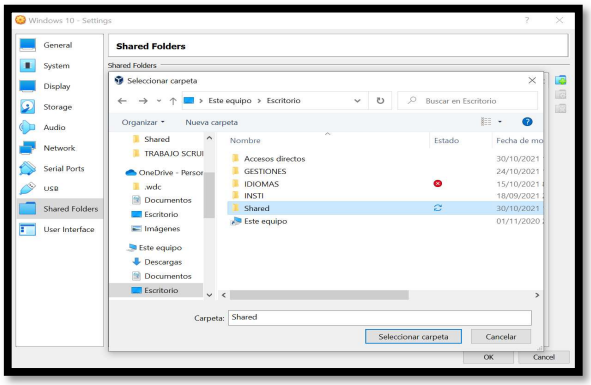


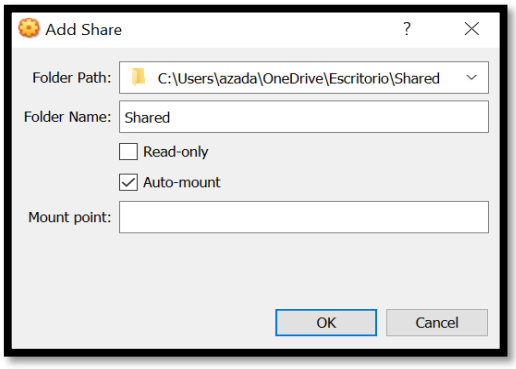
D. Third step: Internet connection. Including access to the rest of computers of the network. Finally, selecting in the left panel the Network category, you can configure the way in which VirtualBox presents the virtual network cards to the virtual machine that you are defining.

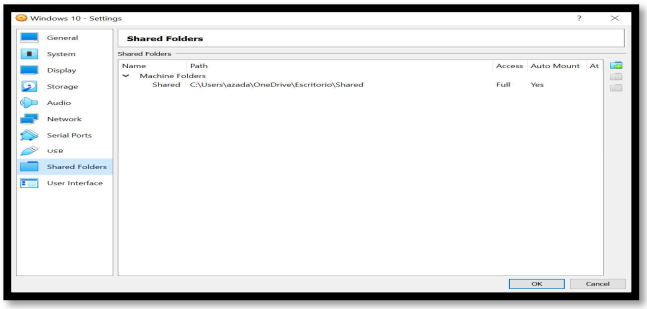
By default, you can see on the first tab of the adapters the network NAT which means it allows you to browse, download files, etc using the host's IP. However, the other computers in the network will not be able to access the virtual machine. In this case you need **"Bridget Adapter"**. This makes the virtual machine behave like any other computer on the network to which the host belongs.



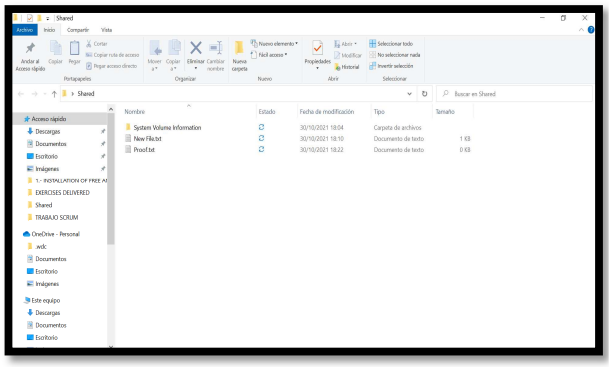
E. Fourth step: Copy and paste from the host to the guest and vice versa. In this step you will share a folder between the host OS (your computer) and the guest OS (VirtualBox – Windows 10). Physically, the shared folder resides in the host, and is shared with guests via a device driver built into the Guest Additions plugin. To do this you need to click on **"Menu -> Settings->Shared Folders"** in the VirtualBox main menu, choose a "Folder Path" (data receiving folder), "Folder Name" (where you want to save the folder) and "Auto-mount" (to make that folder immediately available on the guest operating system). Then click on **"OK"** button.



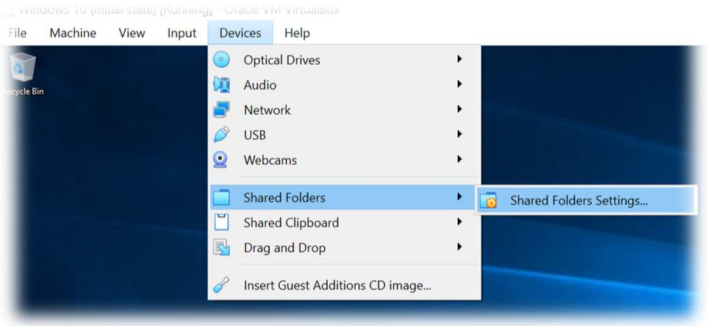


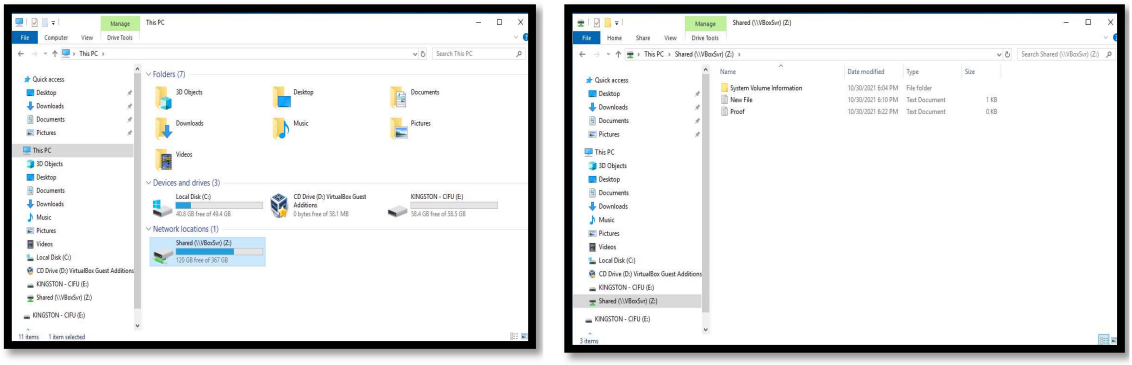


After that you will go to the physical system and proceed to create a central folder in which objects will be shared.



Then, you must do some changes to VirtualBox virtual machine too, choosing **Menu->Devices->Shared Folders->Click here->Doble click on Unit Z:**, and you can see the information shared.





Next step is for the clipboard and copy and paste. In this case the correct option is **bidirectional**. You must click on **Menu->Settings->General->Advanced->Bidirectional,** in order to drag and drop files between systems. By activating this option, you can grab a file on any machine and drag it to the other machine. Making it easier to move data between systems.

In this menu there are four options:

Disabled: Copy and paste between operating systems is not available.

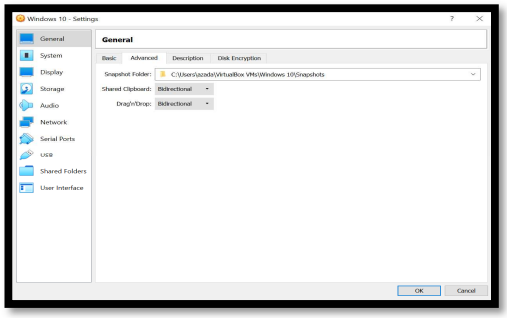
Host to Guest: Data on the host's clipboard can be used as a guest system, but not vice versa.

Guest to host: Data on the guest clipboard can be used on the host, but not the other way around.

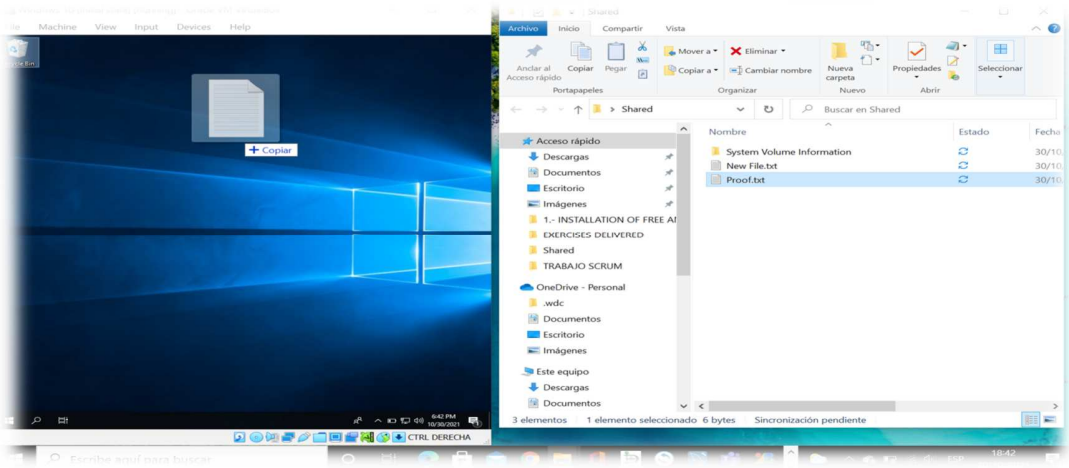
Bidirectional: data from the two clipboards can be shared.

The most useful option is the last one, with which data can be moved in both directions. Now you can simply copy a URL into the host's browser and paste it into the host's browser.

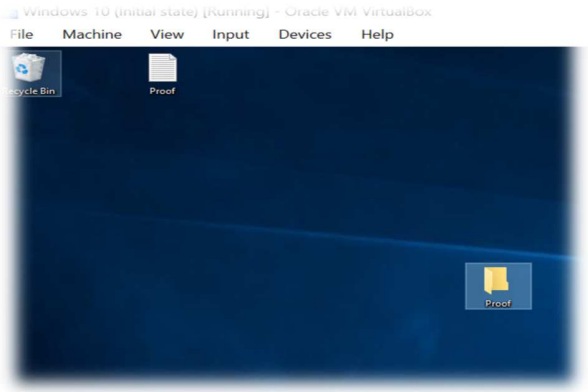
These options can also be modified from the VirtualBox menu. To do this you can go to Devices > Shared Clipboard and select the required option. Then click on **"OK"** button

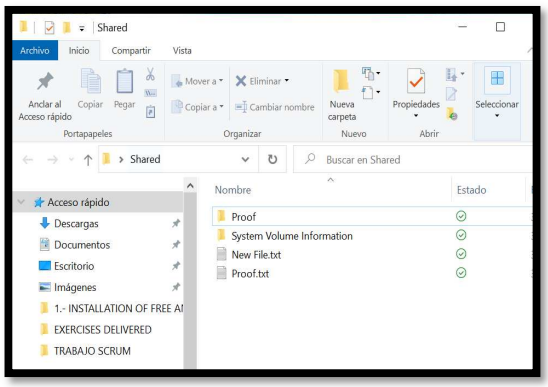


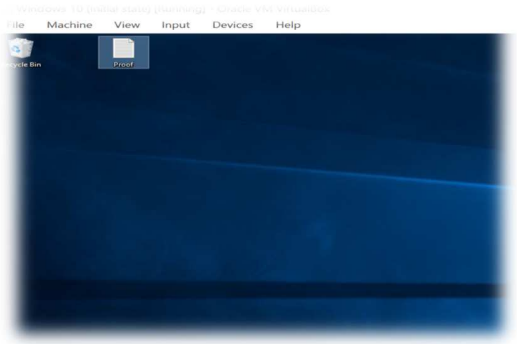
Dragging files or folders from host (your PC) to guest (virtual machine):



Dragging files or folders from guest (virtual machine) to host (your PC):







As you can see in these screens above, it is an easy way to share information from the host to the guest and vice versa.

1.- Linux Ubuntu 20.04 installation.

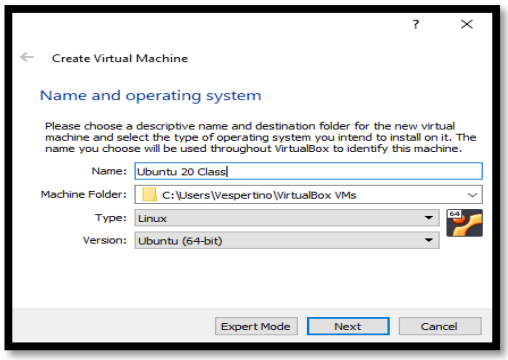
A. Brief Introduction.

Linux Ubuntu is a free and open-source operating system. It is a Debian-based Linux distribution. It can be used on computers and servers. It is targeted at the average user, with a strong focus on ease of use and on improving the user experience. It is composed of multiple software normally distributed under a free or open-source license.

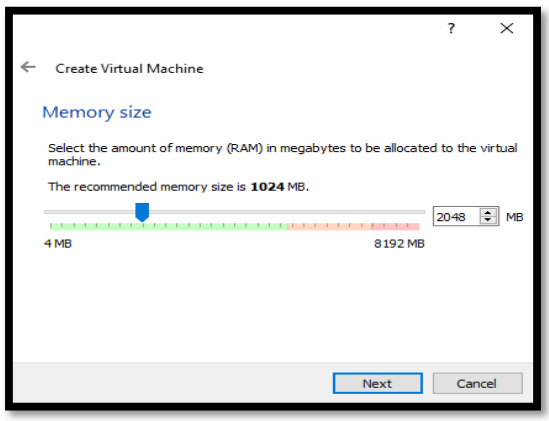
It has many options instead of using Microsoft among other options, for example that Linux does not have virus problems, there is no reason to have an antivirus, so it makes use of your resources, you can manage the system from the command line without having a graphical interface or that you do not have to buy a license.

B.- First step: Ubuntu 20.04. Now you will install Ubuntu 20.04 in the VirtualBox of your computer, following the same steps as in Windows 10 installation carried out in

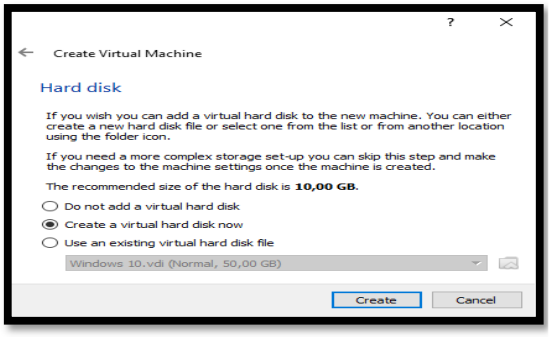
Exercise 2.

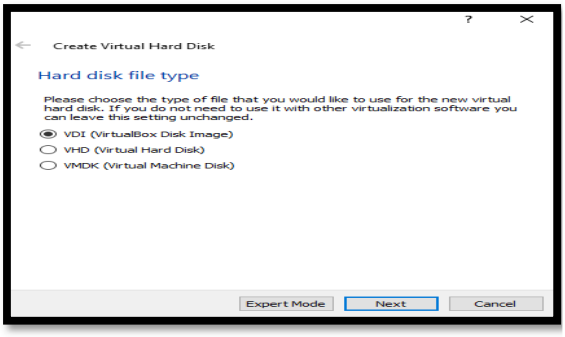


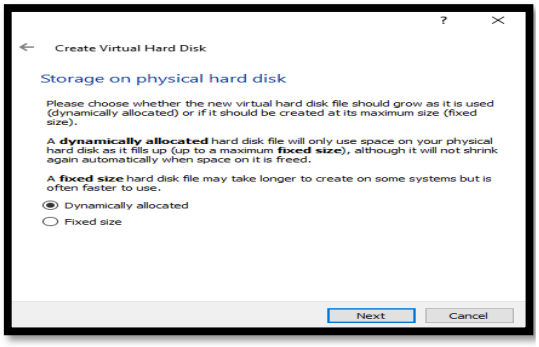
C.- Second step: 2GB of RAM memory. You must choose 2GB RAM memory.

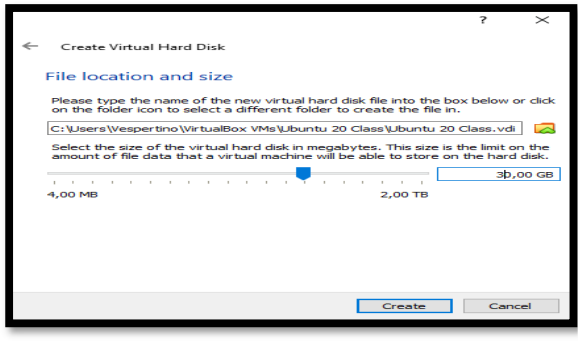


D. Third step: Just one disk of 30 GB. You must create only a 30 GB hard disk, dynamically allocated.



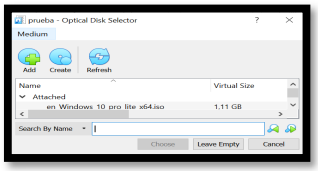


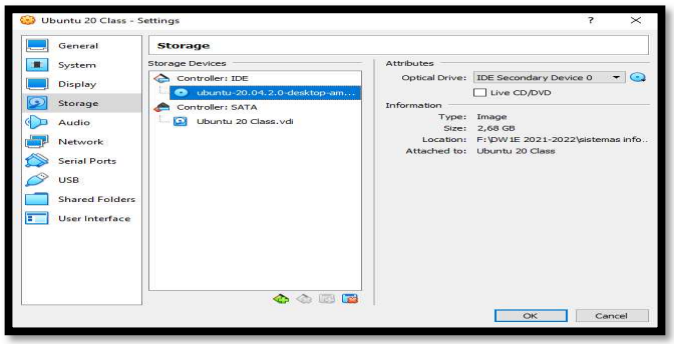




E.- Fourth step: Ubuntu 20.04 installation. Now, you choose to install a virtual machine with Ubuntu 20.04 OS. In order to do this in our virtual machine, you choose from the menu the Optical Drive empty from Storage Devices, then in **Storage->Attributes->click Optical->" Choose/Create a Virtual Optical Disk"**:

Before that in the next screen **click "Add"** button. Then click on "Start" button to run Ubuntu.

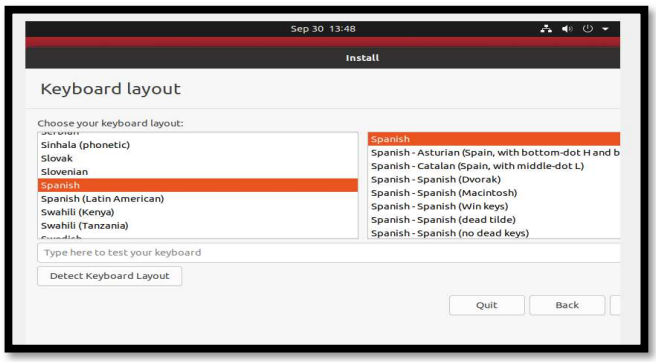




As you can see below, this is the first screen of the system installer, where you can choose the language (in this case English). Ubuntu offers the possibility to test the system without installing it on disk and without affecting any other OS you have

installed. If you choose **“Try Ubuntu”** the desktop will start, from where you can continue the installation. You choose **“Install Ubuntu”** to start the installation from zero.

After that you must configure the keyboard layout, which should be set automatically according to the language chosen. As it is in Spanish by default, just press **“Continue”** button.



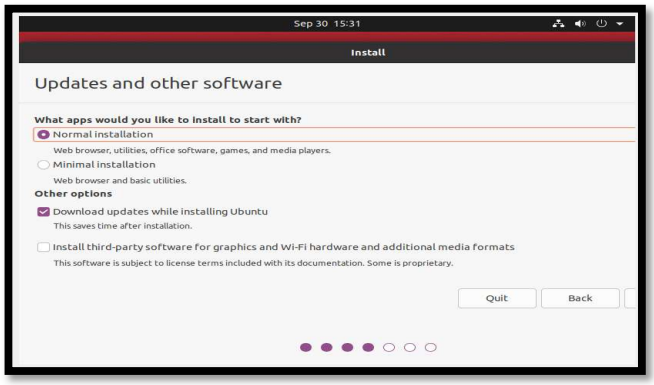
n

The screen below shows the type of installation, with several options regarding the packages to be installed. The difference between **“Normal installation”** and **“Minimal installation”** is that Minimal installation removes about 80 packages (are mostly dependencies of the disappearing applications, some as prominent as LibreOffice or Thunderbird) from the ordinary installation, including applications, as well as the sample content they put in the home directory. However, the saved disk size is minimum (just over 500MB) so you should choose Normal installation.

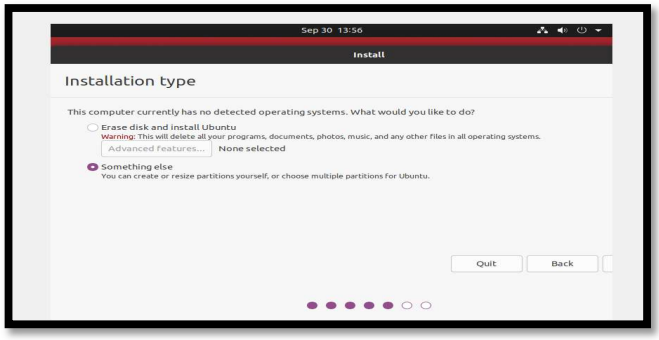
Download updates when installing Ubuntu is recommended only if it has been a short time since the installation image came out and you have a good internet connection.

Install third-party software for graphics and WI-FI hardware and additional media

formats is advisable in all cases to improve the user experience (install graphics card drivers, network card drivers, video codec, etc.). You choose the ones you see marked and click on **“Continue”** button.



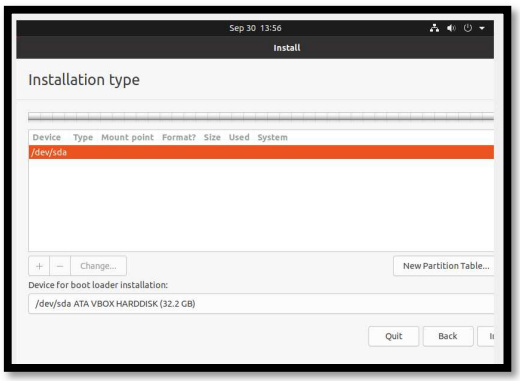
This is the most complex step of the installation, as the configuration varies from installing on an empty disk, installing next to another operating system, creating or modifying partitions, etc.; and information may be lost if not done correctly. Once you have configured this section and agree to continue the installation, changes will be written to the disc. Until then you can cancel the installation without affecting anything already installed on your computer. Then press **“Install”** button.

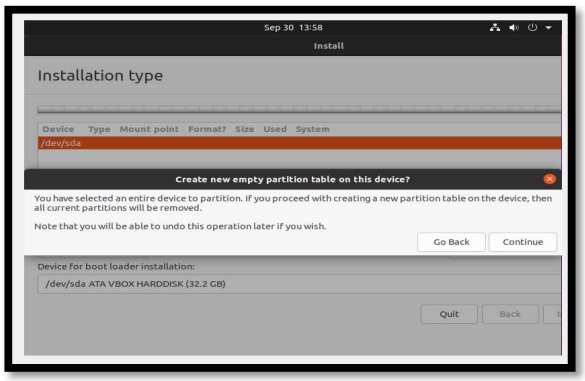


The device called **"/dev/sda"** corresponds to the hard drive. If more disks were connected, their name would follow the order «/dev/sdb», «/dev/sdc», etc.

By choosing **"New Partition Table"** button you will access the system partitioner, where you can configure everything to the smallest detail, including the encryption of partitions, mount points, etc.

On Unix/Linux operating systems there is only one directory tree where files are organized. ... Such a tree can be integrated into the single Unix tree using a **mount point**. The **“mount point”** is any directory from which the mounted file system will be displayed. Then press **“Continue”** button.





Once the partition table is created, the free disk space will be displayed.
To add a partition, press the "+" button or double-click on the "free space" selection.

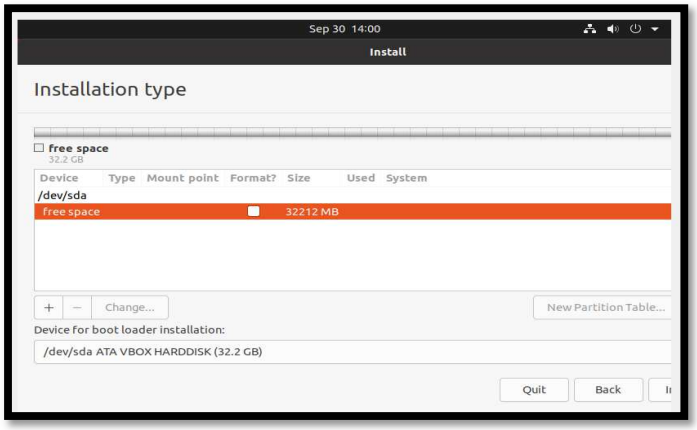
The size is shown in MB (megabytes), so you will have to divide the total by 1,000 to have an estimate of the GB (gigabytes) available.

The system creates by default two mounting points:

1. Root (/): At least 10 GB, although the more gigabytes the better to reserve space for software and system updates.
2. Swap area: Equals or twice the RAM.

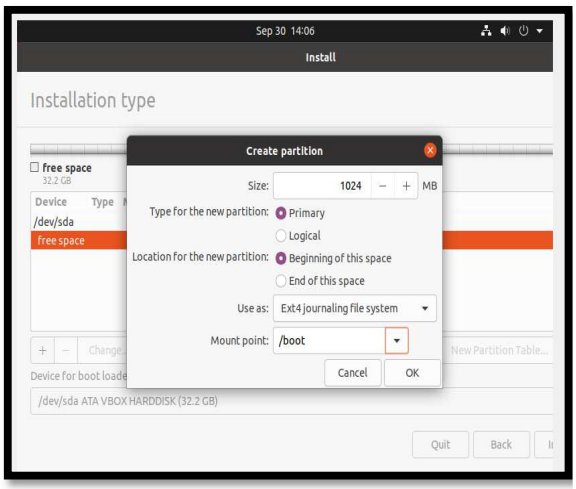
However, it is also recommended to reserve space for:

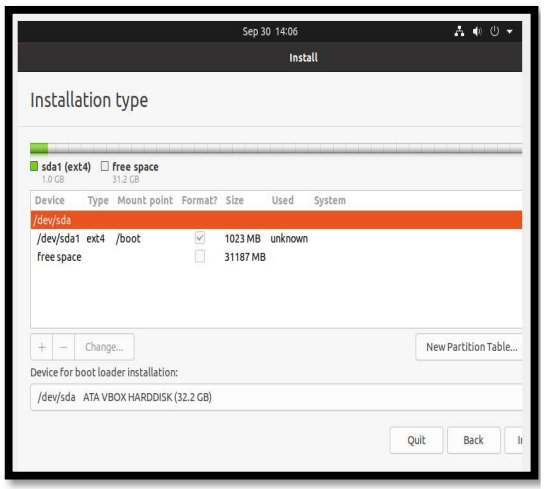
3. Bootloader (/boot): Approximately 1 GB
4. User data (/home): It depends the number of users you want to create. Between 5-10GB or even more.



Size: 1024MB (1GB)
Partition Type: Primary
File System: ext4
Mounting point: /boot

Boot is a static directory and includes all executables and files that are necessary in the system boot process, and that must be used before the kernel starts to give the execution commands of the different modules of the system. It is also where the GRUB boot loader is located. Then press **"OK"** button.

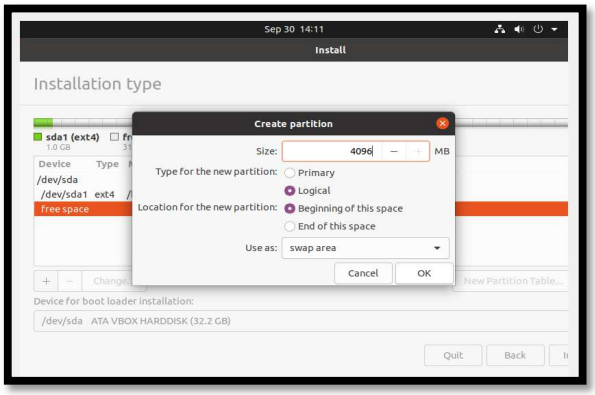


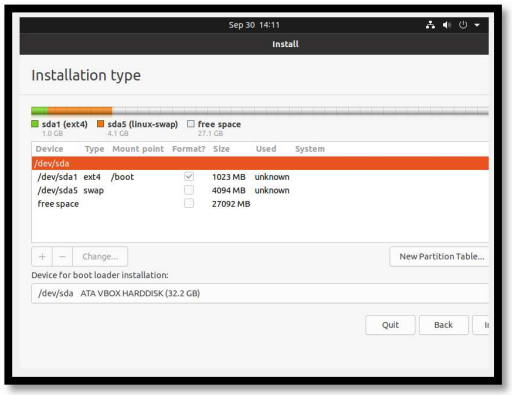


Size: 4096MB (4GB) > Twice the 2GB of RAM on your computer
Partition Type: Logic

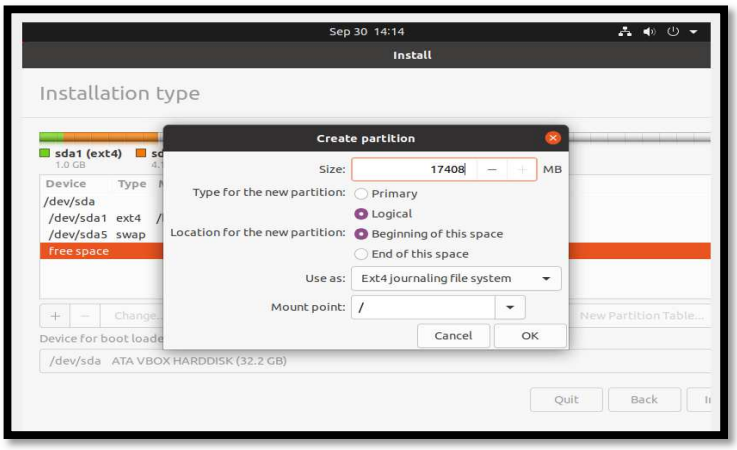
File System: Swap area (Interchange Area)
Mounting point: in this case does not apply

The swap partition is essential to activate the computer's hibernation.
If the system is installed on an SSD drive and a secondary hard drive is available, it is preferable to create the swap on the latter. Then press **"OK"** button.



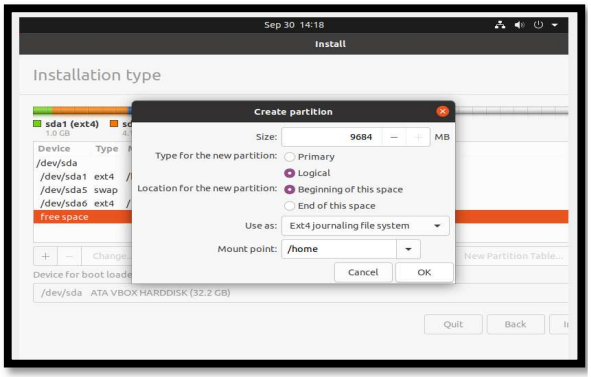


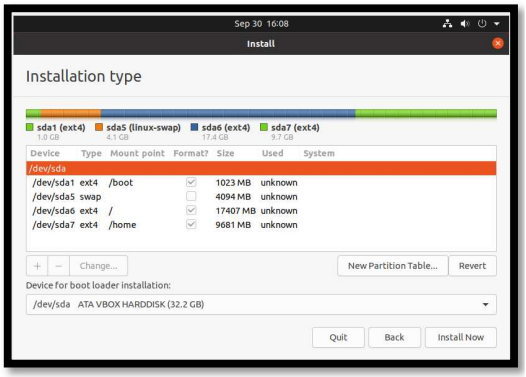
Size: 17408 (17GB) > You have to think about how many applications we are going to install and how we will use it, approximate and adjust this size accordingly.
Partition Type: Logic
File System: ext4
Point of assembly: /
The root partition contains by default all system files, OS, program settings and documents. Then press **"OK"** button.



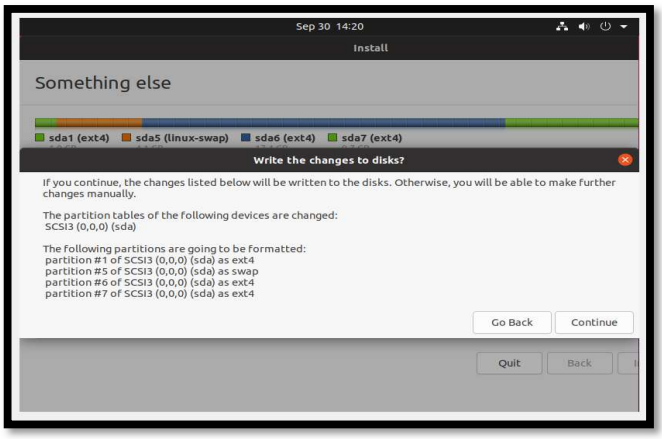
Size: 9684MB (9,5GB) more or less, what's left of the disk
Partition Type: Logic
File System: ext4
Mounting point: /home

The partition for /home, where users usually save torrent downloads, movies, music, thousands of photos, etc. Then press **"OK"** button.





Once partitioned the disk will start the system installation and there will be no going back. Until this point all changes are reversible. Then press **"Continue"** button.

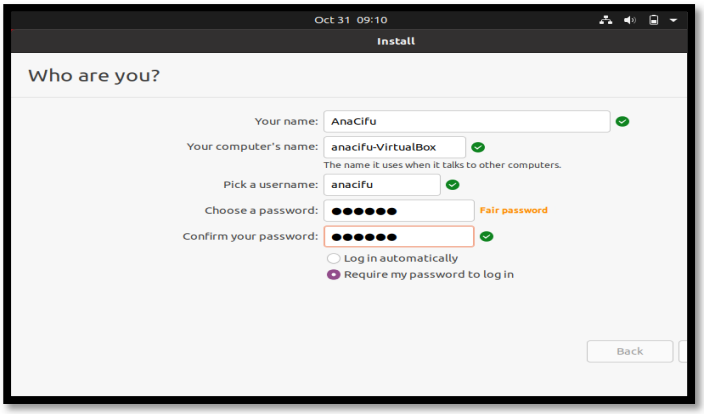


After that, the selection of the geographical area shall set the time zone of the system.

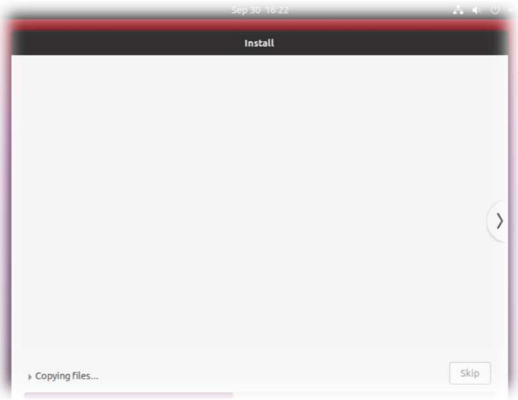
Then press **“Continue”** button.

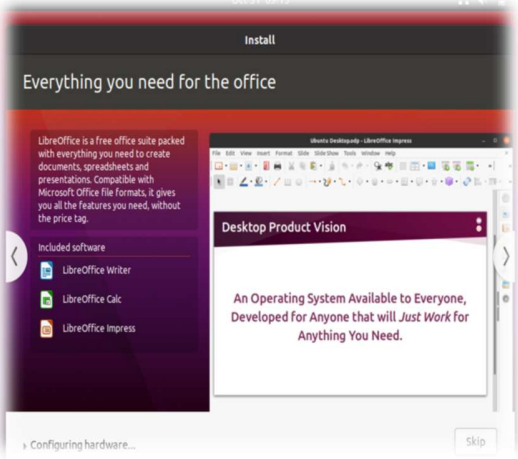
Then creates the user. After filling in the fields you can choose not to insert the password when logging in. This option is totally discouraged on shared computers, as with turning on the PC anyone could access the data it contains.

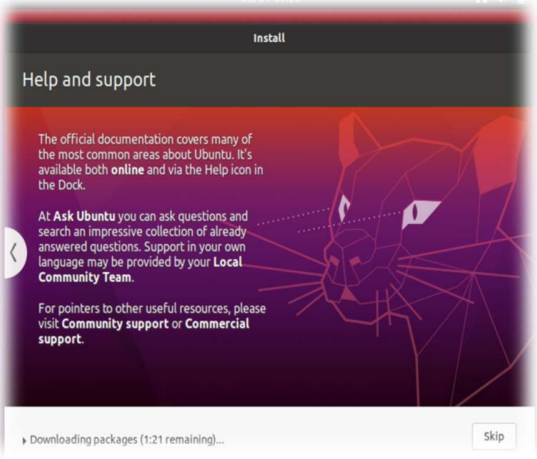
For greater security, the personal folder can be encrypted, so the password to log in would be the one to decrypt the contents of the disk when accessing. Without the password, no one will be able to access the data on disk in an ordinary way, including the original user. It is a practice specially patched on laptops, susceptible to loss or theft. Then press **“Continue”** button.



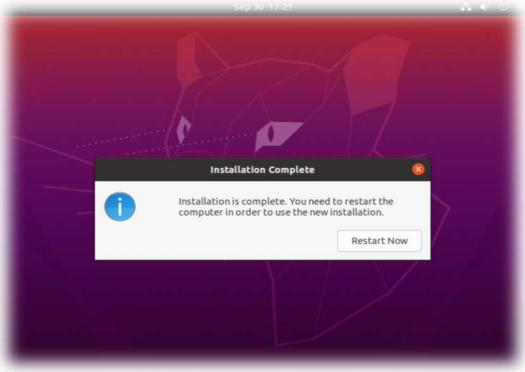
Now begins the installation of the OS.



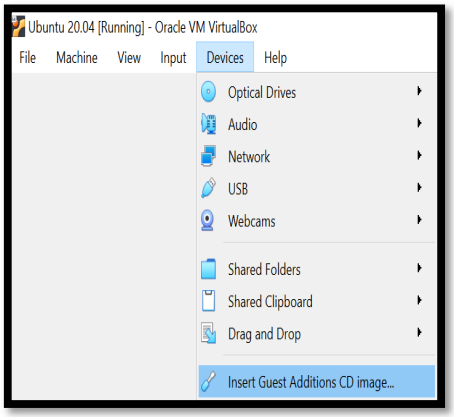


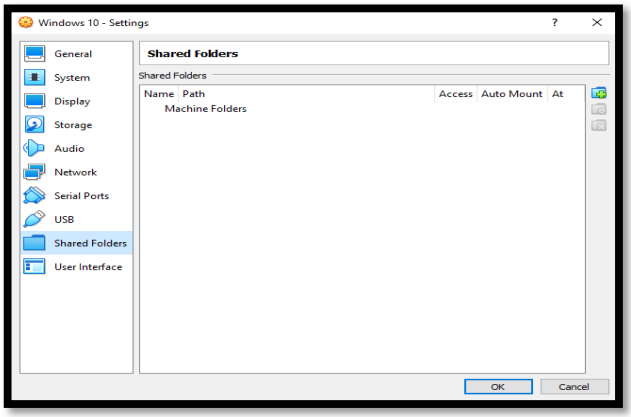


Once the installation is complete, remove the media (CD, DVD or USB) and press the "Enter" key. The computer will restart and you will be able to access Ubuntu.

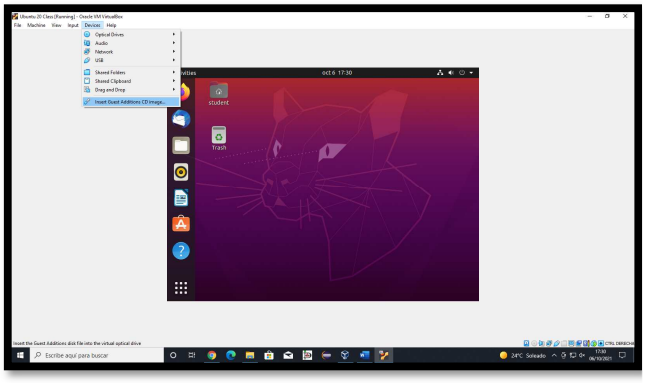


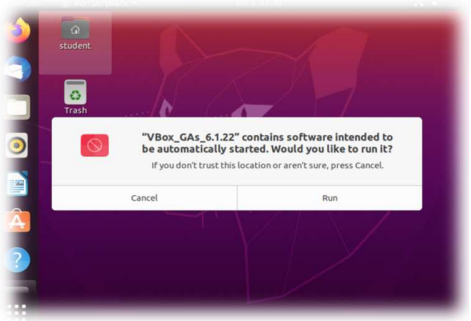
F.- Fifth step: A shared folder to an external disk. In this step I will share a folder between the host OS (your computer) and the guest OS (VirtualBox). Physically, the shared folder resides in the host, and is shared with guests via a device driver built into the Guest Additions plugin. To do this you need to click on **"Menu -> Settings->Shared Folders"** in the VirtualBox main menu, choose a "Folder Path" (data receiving folder), "Folder Name" (where you want to save the folder) and "Auto-mount" (to make that folder immediately available on the guest operating system). Then click on **"OK"** button.

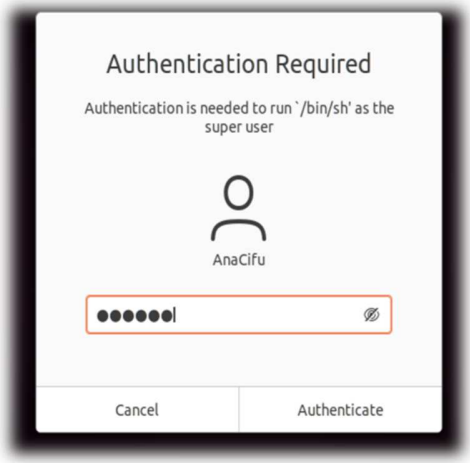


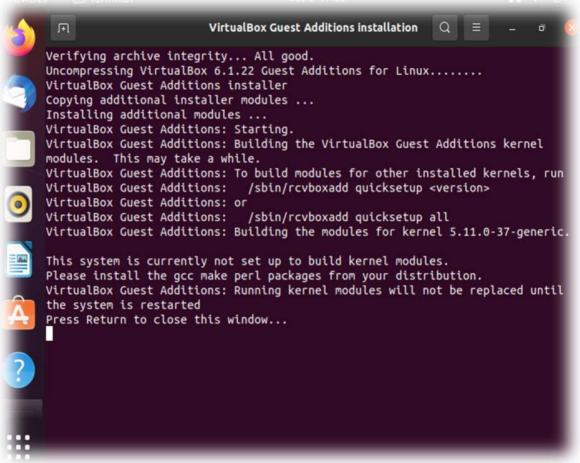


After that, you must start Ubuntu 20.04 and once it is open, you launch a terminal and write this instruction: **sudo adduser anacifu vboxsf** to give you super user permissions to be able to access the shared folder. Then test both parts.

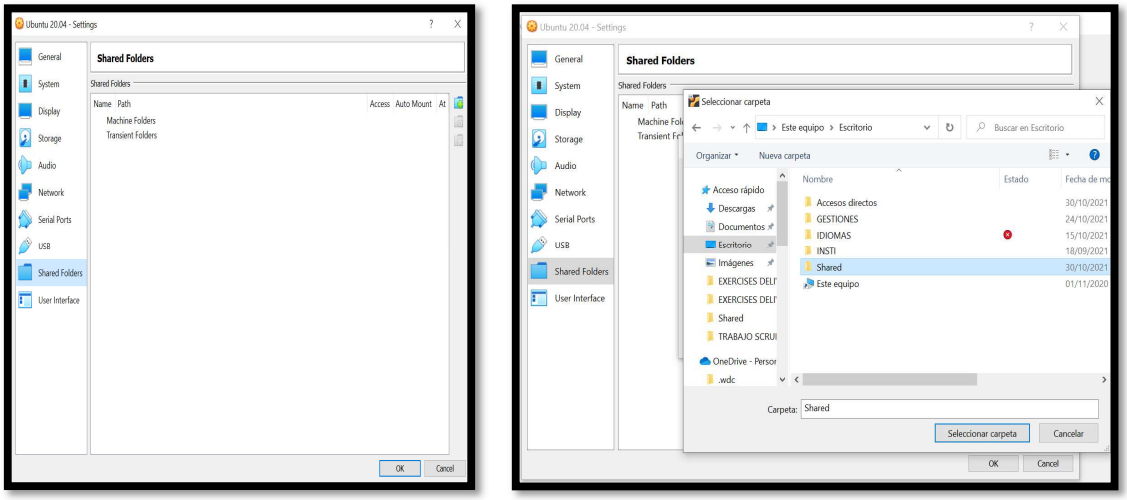


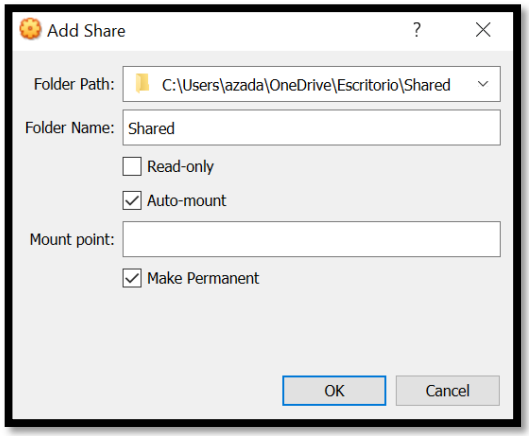






Then you need to click on **"Menu -> Settings->Shared Folders"** in the VirtualBox main menu, choose a **"Folder Path"** (data receiving folder), **"Folder Name"** (where you want to save the folder) and **"Auto-mount"** (to make that folder immediately available on the guest operating system). Then click on **"OK"** button.





In addition to users in Ubuntu, there are also groups. When VirtualBox installed the Ubuntu operating system, it added a group called **"vboxsf"**. Before you can access shared folders, it must be added to the vboxsf group. To do this, press Ctrl + Alt + T to open a Terminal window. Type the following when prompted, replacing "[username]" with your username, and press **“Enter”**.

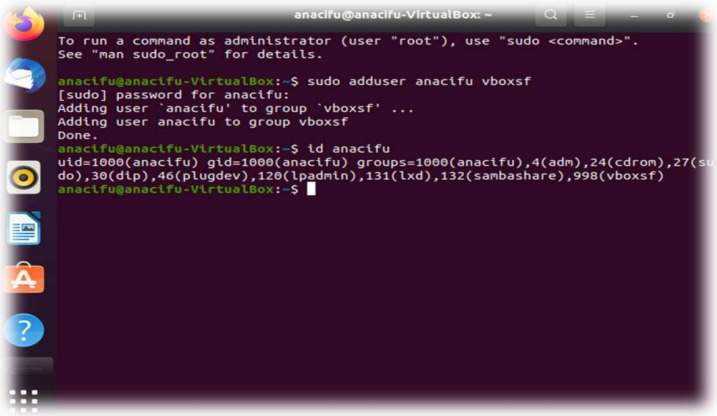
Sudo adduser anacifu vboxsf

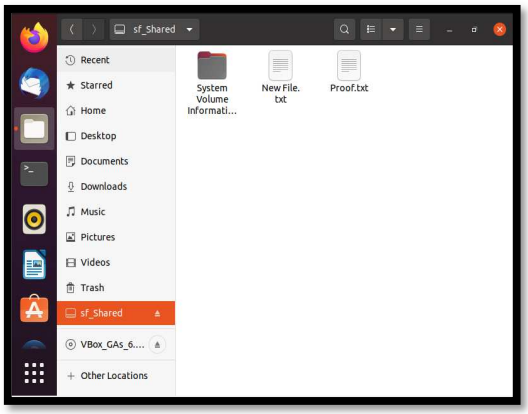
Enter your password when prompted and press Enter again. Messages are displayed as you add it to the group and "Done". shows when the process has been successfully completed. To close the Terminal window, type **"EXIT"** (without quotation marks) in the indicator and press **“Enter”**.

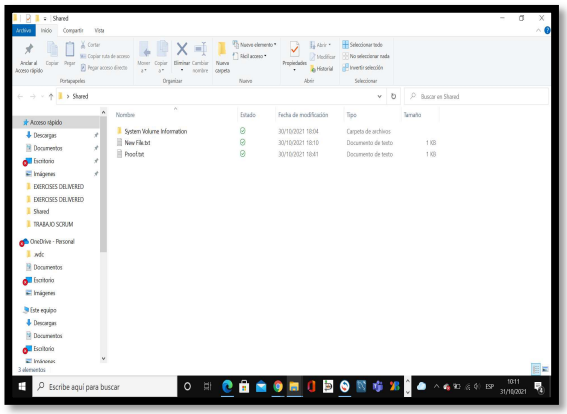
To verify that you are in the vboxsf group, you can type "id [username]" (without the quotes and replace "[username]" with your username) in the indicator and press

"Enter". All groups of which the specified user is a member are displayed.

Now, when you access the shared folder in the Media folder as described above, you should see the files that exist in that folder on the host machine. Then test both parts, **"Shutdown"** the virtual machine and when it starts, it works.

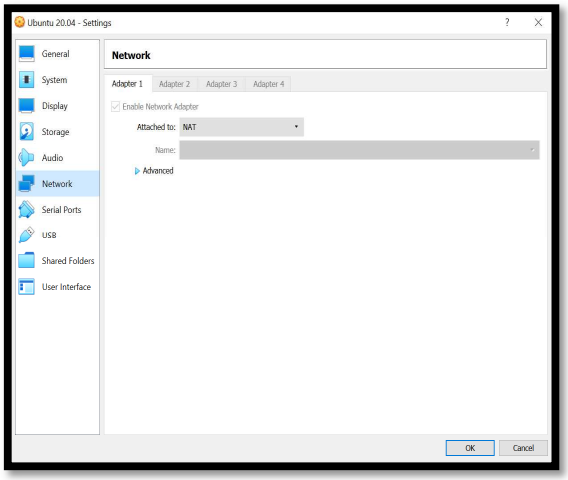


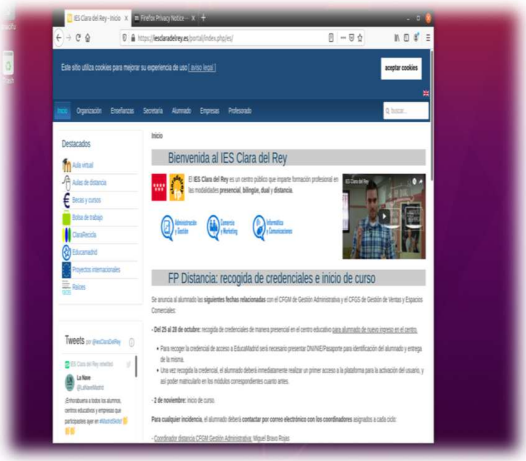




G.- Sixth step: Internet connection. Including access to the rest of computers of the network. Finally, selecting in the left panel the Network category, you can configure the way in which VirtualBox presents the virtual network cards to the virtual machine that you are defining.

By default, you can see on the first tab of the adapters the network NAT which means it allows you to browse, download files, etc using the host's IP and NAT is what you need.

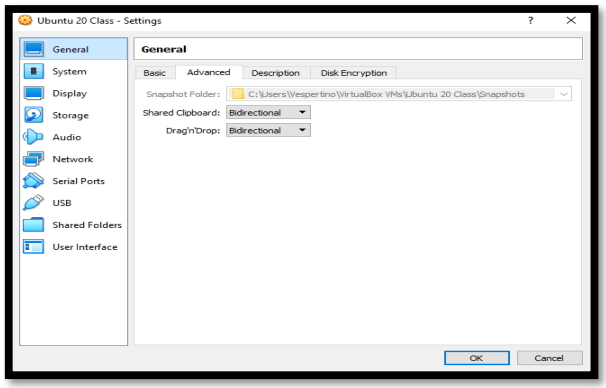




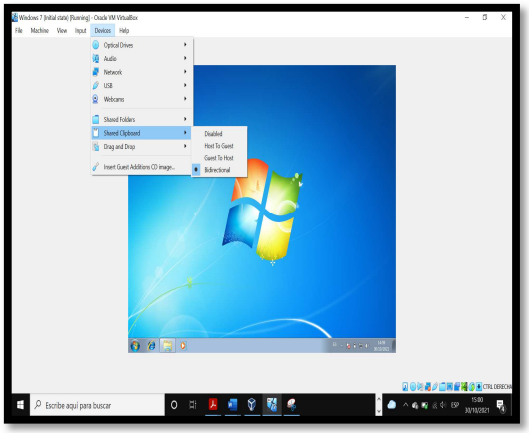
H.- Seventh step: Copy and paste from the host to the guest and vice versa. As we know, the temporary place in Computer Memory (RAM) where all copied text, files, media and any other type of data is stored to transfer between supported applications is called Clipboard.

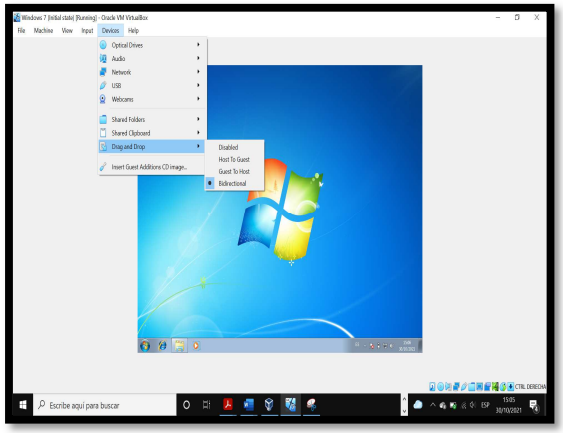
When Clipboard is shared across devices, it is called Shared Clipboard. In this process, data is stored in Network/Internet/Cloud in most of applications. However, as VirtualBox is a device that resides inside Host Operating system, so we do not need to save Clipboard somewhere else. We can simply Copy in Host OS and can Paste in Guest OS or vice versa in VirtualBox.

To enable copy paste in VirtualBox, you can simply enable Shared Clipboard feature. Follow below steps to enable Shared Clipboard. When Machine is powered off, Click on **"Settings"** button of Virtual Machine from VirtualBox Application. In the General section of Settings, click on Advanced tab of settings. Click on **"Shared Clipboard"** dropdown and change it's setting to Bidirectional.



After that, start the virtual machine and change on **Menu->Devices->Shared Clipboard->Bidirectional** and do the same with Drag and Drop.



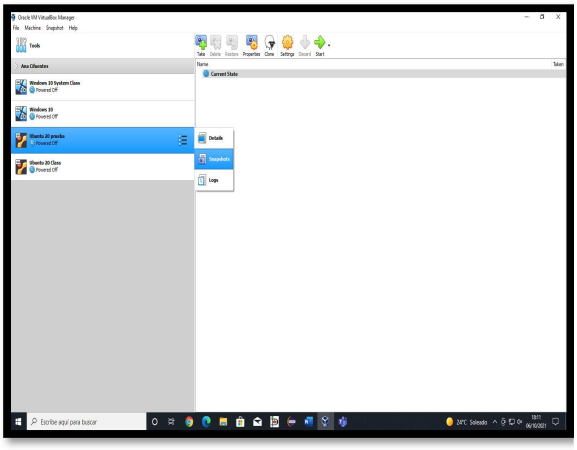


4.- Create the snapshots

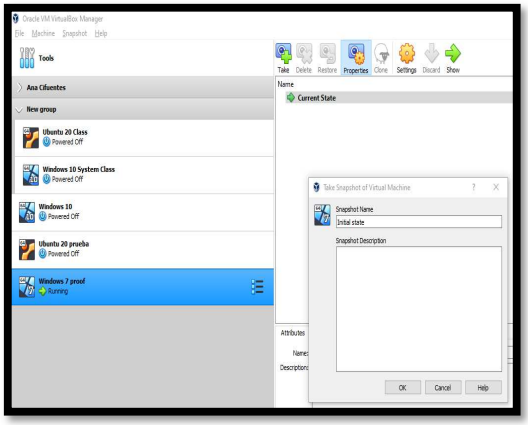
A. Brief introduction

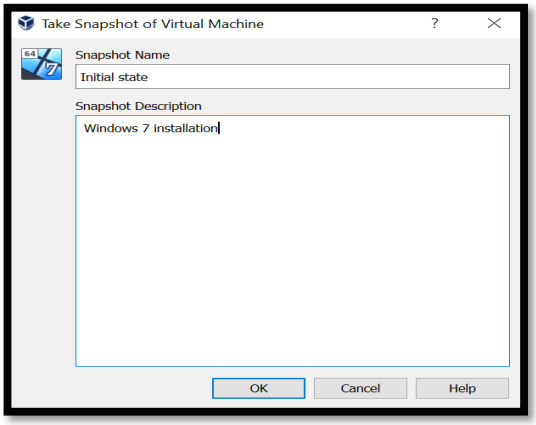
VirtualBox snapshots save the status of a virtual machine and allow it to be retrieved at any time. It is like saving a copy, but without requiring the same disk space. In addition, it is possible to save multiple states of the same virtual machine. Create a snapshot is a very simple process.

B. First step: Create the necessary snapshots for the exercise. To do this you only have to select a virtual machine. In the options button (the one that looks like the icon of a task list) select the Snapshots option. Appearing a menu like the one of the next screenshot in which you only have to select the **"Take"** option from the menu. Before that you must create a new file **("Initial state")** in order to see what happens during the process.

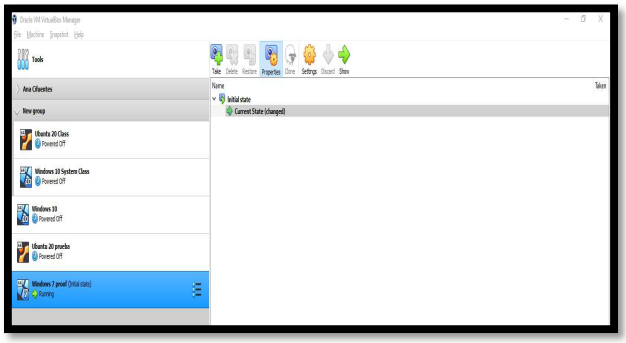


A new window will appear asking for a name **("Initial state")** and description of the snapshot. It is important to complete the name and description because you can take multiple snapshots and do not want to confuse those snapshots; in addition, this allows you to restore to various points in the configuration.

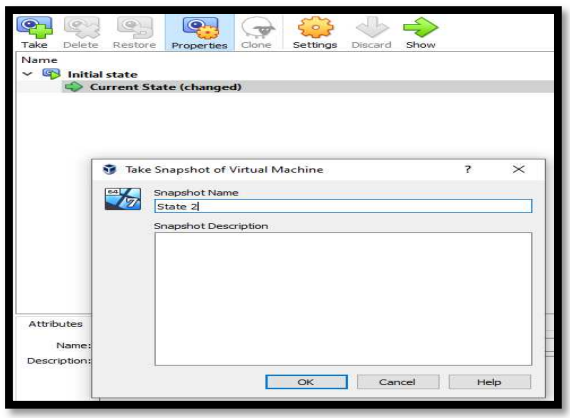


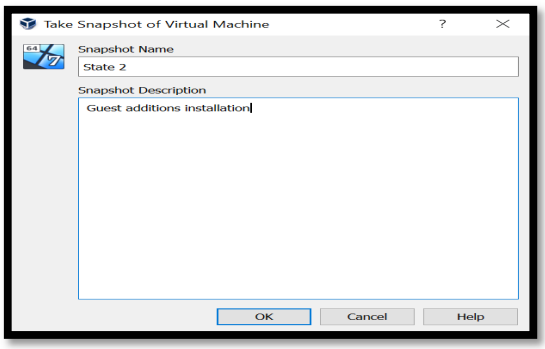


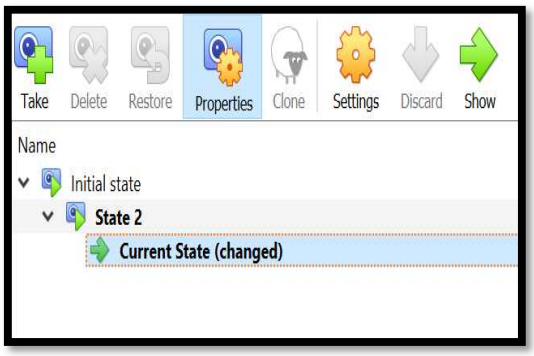
The screen below shows the result.



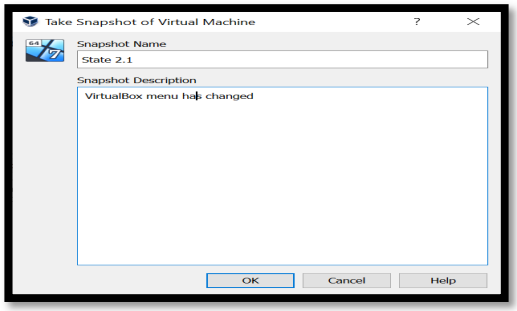
Then, install something new like **“Guest Additions”** (you can see how to install this in part 1 of this exercises), create a new file named **“State 2”**. In order to see what happens during the process. Now as in the previous step a new window will appear asking for a name and description of the snapshot.

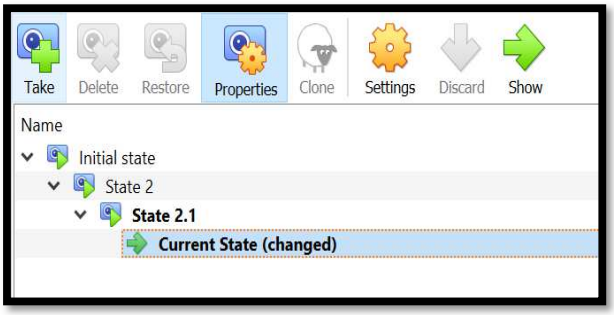




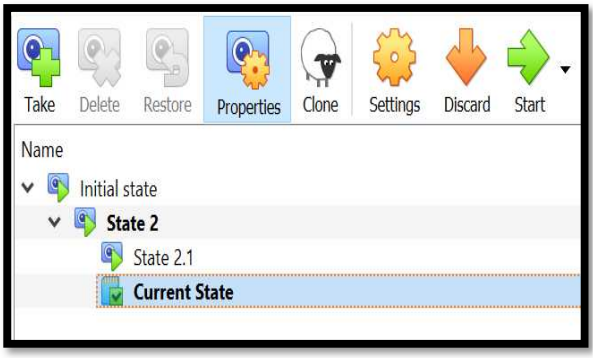


After that, to create a new snapshot named **“State 2.1”** in order to see what happens during the process. Now as in the previous step a new window will appear asking for a name and description of the snapshot. To do this, select the virtual machine in the left panel, click the Snapshots button in the top right corner, select **“Current status”** and click on the **“Snapshots”** button.



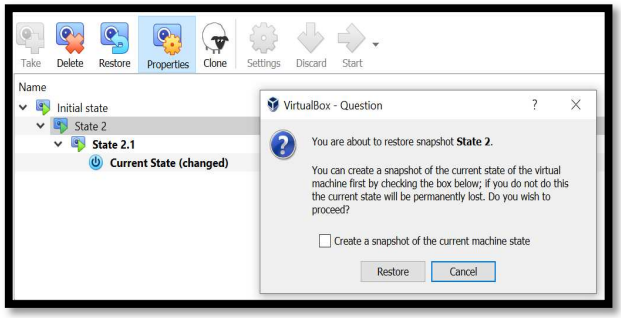


Then, to create a new snapshot on the same level as **"State 2.1"** you must leave the virtual machine in pause or off state. To do this, select the virtual machine in the left panel, click the Snapshots button in the top right corner, select Current status and click the Snapshots button.



C. Second step: Restore state 2. Restoring a Snapshot: You are working on your virtual machine and you make a change that breaks the system. First, the virtual machine you want to work with should not be running. You can restore a snapshot if the virtual machine is in a saved or off state. To restore a state, do the following.

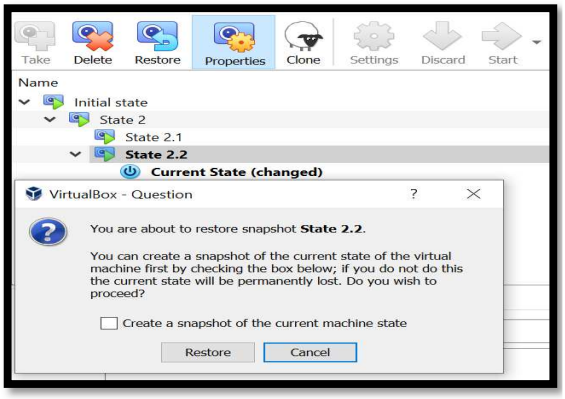
1. Select the virtual machine you want to work with in the left pane of the main window.
2. Click the Snapshots button in the upper right corner.
3. Right-click on the snapshot you want to restore, in this case **"State 2"**.
4. Click **"Restore Snapshot"**.
5. In the resulting window, uncheck the Create a snapshot of the current state of your computer.
6. Click on **"Restore"** button.
7. Allow the restoration to be completed.

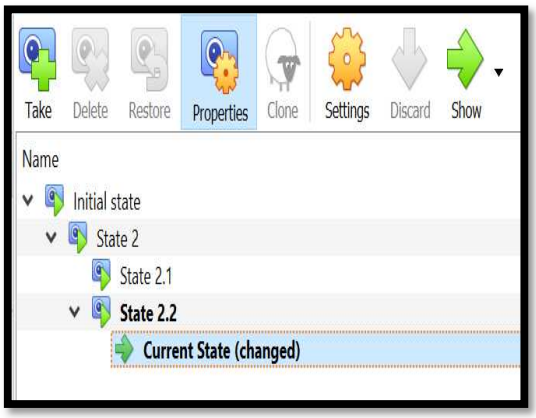


The reason why you uncheck the box for **"Create a snapshot of the current machine state"** is because, most likely, you won't want to take a snapshot of a broken state; instead, you'll want that broken state to go away. If you do want to save that broken state (or whatever state the VM is in to make you want to restore a previous instance), you can leave the box checked. You will get the chance to name that current state and give it a description. That means it's not actually overwriting your current saved state.

Then, start the virtual machine and you can see there are only two files the same as when you created the **"State 2"**.

In this step you will create the file **"State 2.2"** and create a new snapshot called **"State 2.2"** at the same level as **"State 2.1"**. This way you have all the snapshots you need.



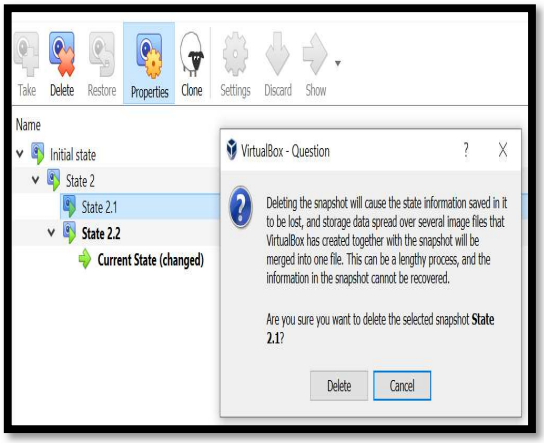


D. Third step: Delete state 2.1 and explain what happens. Deleting a snapshot and discarding a saved state. It is possible to delete a snapshot or to discard a saved state. To delete a snapshot, do the following.

1. Open VirtualBox.
2. Select the VM in the left pane.
3. Click the Snapshots button in the upper right corner.
4. Right-click the snapshot you wish to delete, in this case **"State 2.1"**.
5. Click Delete Snapshot.
6. When prompted, click **"Delete"** button.

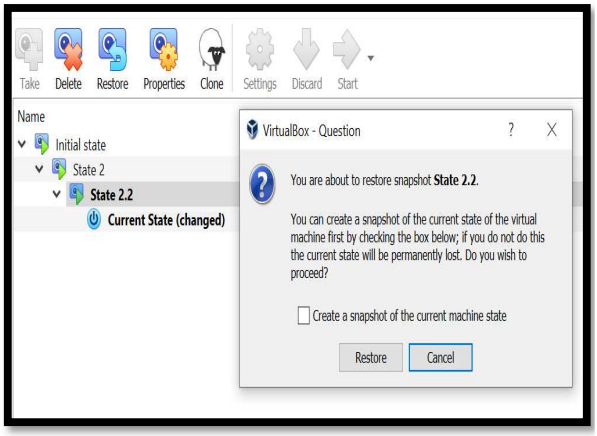
What happens in this case is that the file created in **"State 2.1"** has disappeared.

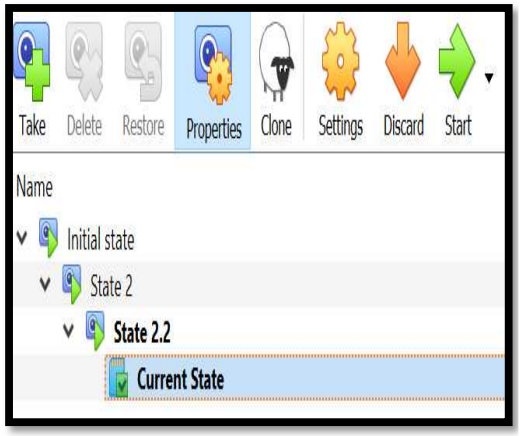
This happens because they are not in the same branch than **"State 2"** and therefore the modifications are not saved. They have to be in the form of a tree.



E. Fourth step: Restore state 2.2. The next step is to restore **"State 2.2"** and after that you are going to delete **"State 2.2"** and see what happens. Once this state is restored, you can see that the new snapshot and its corresponding **"current status"** are now shown in bold and you can also see that the **"current status"** does not have the **"modified"** legend, because at the precise moment of snapshot change, the **"current status"** and the snapshot are exactly the same.

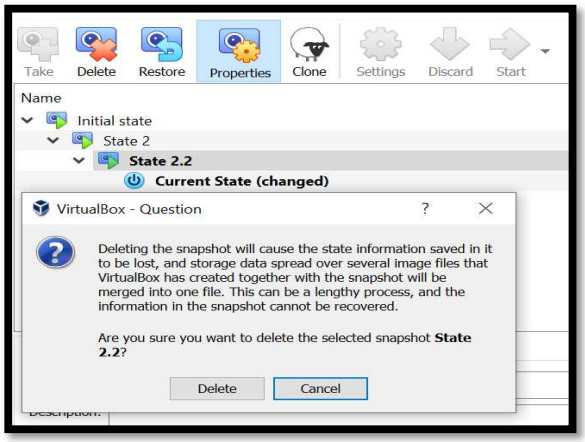
When you **"Start"** the virtual machine, the file **"State 2.1.txt"** is still missing.





What happens in this case is that the file created in **"State 2.2"** has not been deleted, it was combine. This is the way VirtualBox works. Snapshots only merge if they are on the same branch and depend on each other.

F. Fifth step: Delete state 2.2 and explain what happens. If you delete **"State 2.2"** and **"Start"** the virtual machine, you will see that the file created in **"State 2.2"** has not been deleted. This happens because VirtualBox combines states as much as possible and snapshots merge if they are in the same branch and as long as they depend on each other. As the one immediately above is **"State 2"** and is in the same branch, they merge.



Any snapshot can be removed at any time from its context menu, and all snapshots hanging from it will now hang from the level from which the one we are deleting hung.

This process can take quite a long time, as all the changes that would have been on the disk of the snapshot that is erased must be copied on the disks of the snapshot daughters, since otherwise they could not be started, as what is saved in the disks of the snapshots are the changes produced from the snapshot from which it started. Making a familiar simile, they copy in the snapshots daughters, the changes that occurred from the snapshot grandfather to the snapshot father, which is the one that is erased.

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- How to access shared folders in Ubuntu: https://www.howtogeek.com/187703/how-to-access-folders-on-your-host-machine-from-an-ubuntu-virtual-machine-in-virtualbox/
- TechRepublic: https://www.techrepublic.com/article/how-to-use-snapshots-in-virtualbox/
- Snaphots: https://www.fpgenred.es/VirtualBox/instantneas_snapshot.html