

WINDOWS 11 INSTALLATION WITHOUT TPM IN VIRTUAL BOX + CREATION OF RAIDs



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1. Introduction

The aim of the assignment is to install Windows 11 in a VirtualBox machine and try different features, following two important requirements before installing Windows 11:

- Update VirtualBox to the last version.
- Windows 11 installation requires at least 4 GB of RAM memory and a feature TPM. It is crucial to research about how to skip “TPM” in VirtualBox to install Windows 11.

Once Windows 11 is installed, we are going to try the following tools:

- Create a RAID-0 (Striped volume) using two virtual disks.
- Create a RAID-0 (Striped volume) using two virtual disks.
- Create a RAID-0 (Striped volume) using three virtual disks and the tool “Storage spaces”.
- Search about a new feature of Windows 11. Explain how the tool chosen works as much detailed as possible.

2. VirtualBox

A. Brief introduction



The first thing you must do is to set up the last version of Virtual Box (in this case 6.1.32), 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. Update VirtualBox to the last version

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.

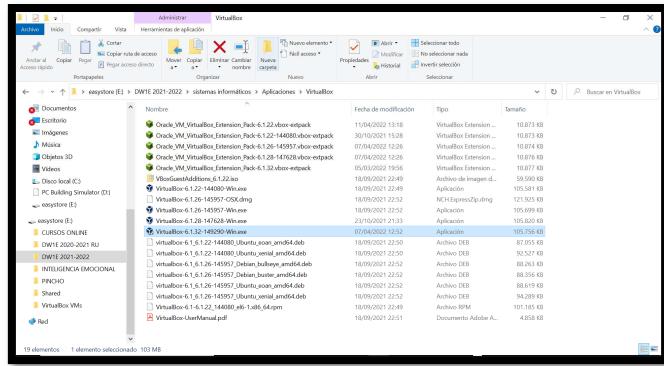
The first benefit that VirtualBox gives us is the possibility of installing almost any Operating System, which gives us the ability to test, know and study everything about Computer Systems.

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.

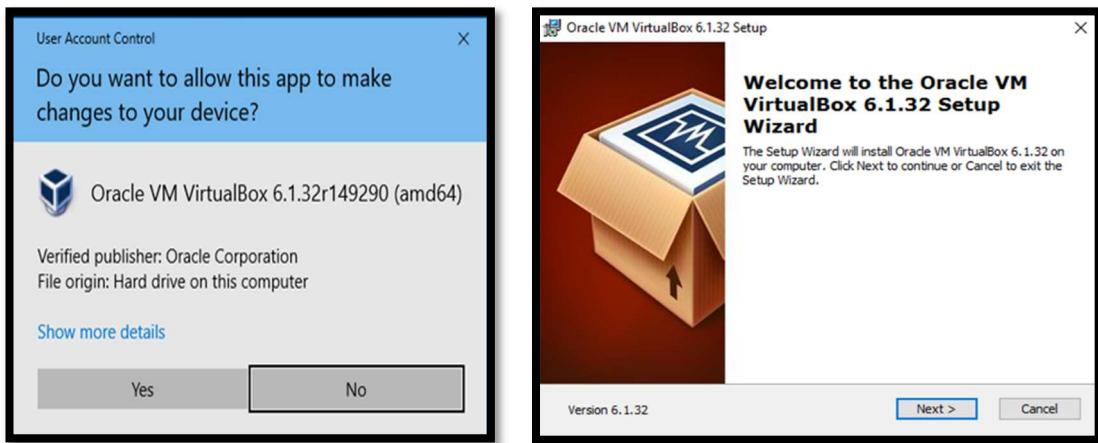
Now, update VirtualBox to the last version, opening it and go to the menu: File -> Check for updates:



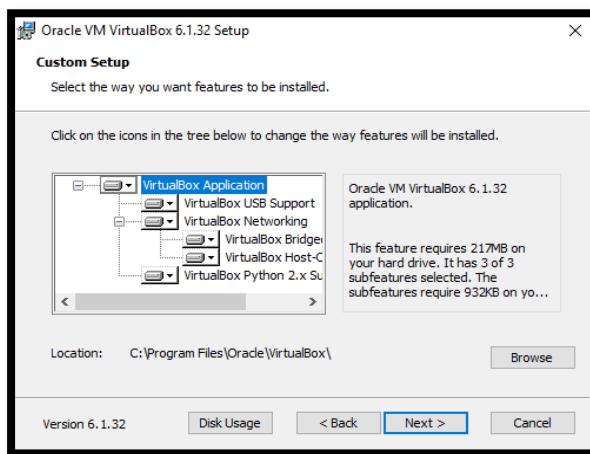
If there is an update, we will see it there available. To update VirtualBox, we click on the link to download it. We save it locally and check the downloaded file.



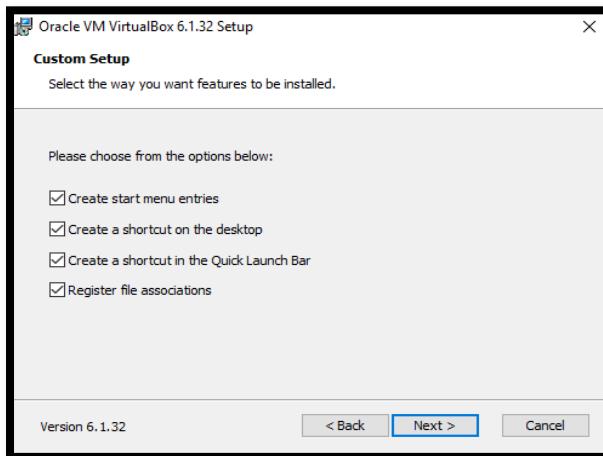
Start the VirtualBox installation by allowing this app to make changes to your device and then, in the VirtualBox Welcome window click on “**Next**” button.



In Custom Setup where you can select the features to install. You leave them as they are and click on “**Next**” button.



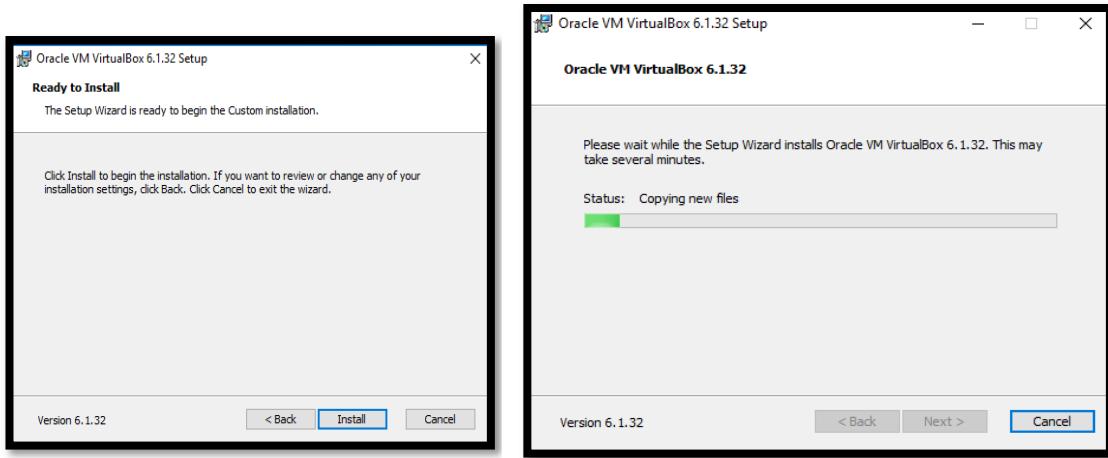
In the next window you select the shortcuts options.



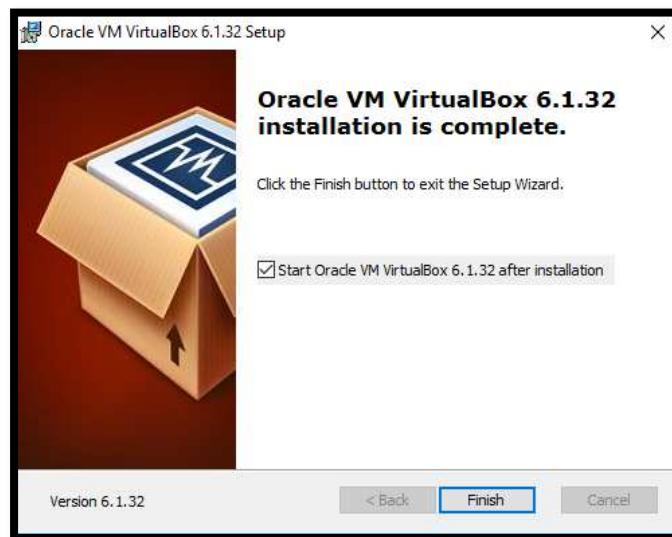
Now you should know that when you install VirtualBox the Internet connection will be interrupted, keep it in mind in case you are in the middle of a download. Then, click on **"Yes"** button.



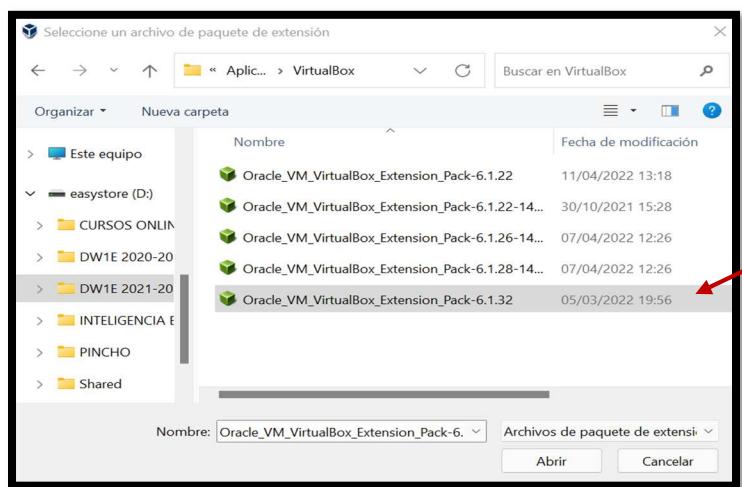
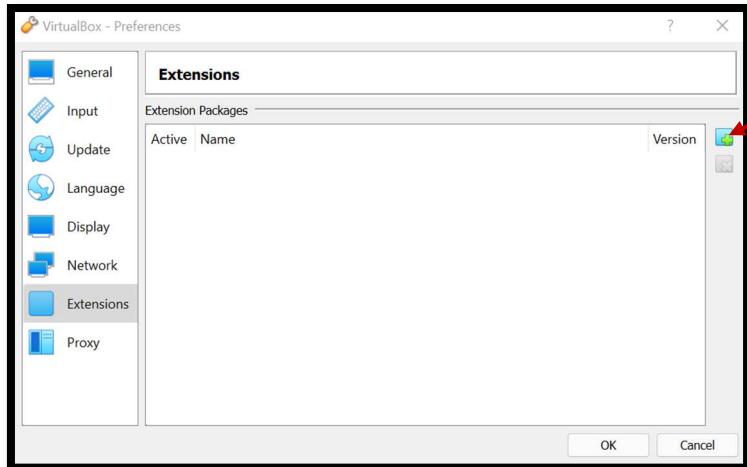
Now click on **"Install"** button and you give it admin permissions.



At the end of the process, you will see the following. Finally click on "**Finish**" button to close the wizard and run VirtualBox.

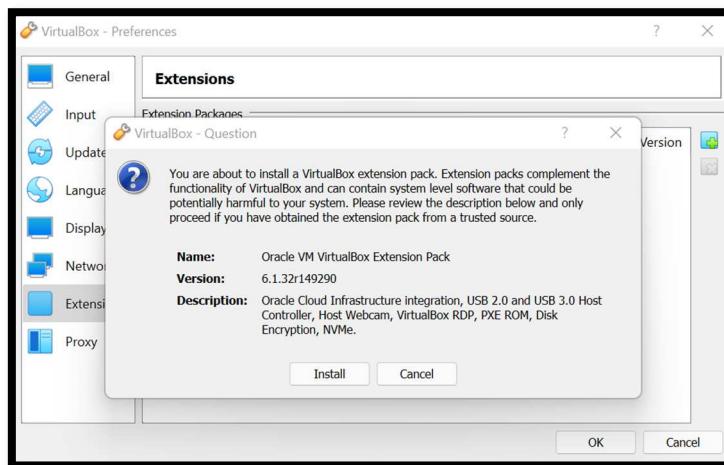


- You will automatically see that it is possible to update the VirtualBox Extension Pack. Download and install it from VirtualBox website. In the new page we will have to go to the section of "VirtualBox <version> Oracle VM VirtualBox Extension Pack" or from your computer.

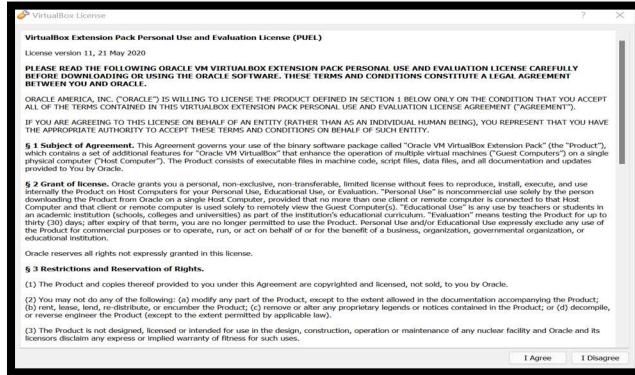


The installer will immediately appear and start VirtualBox. If we have an older pack installed it will notify us if we want to update it to the most recently downloaded.

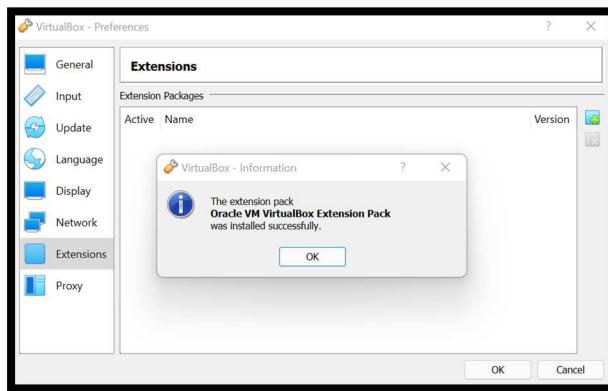
What you will need to do is click on "**Install**" button to get the installation process started



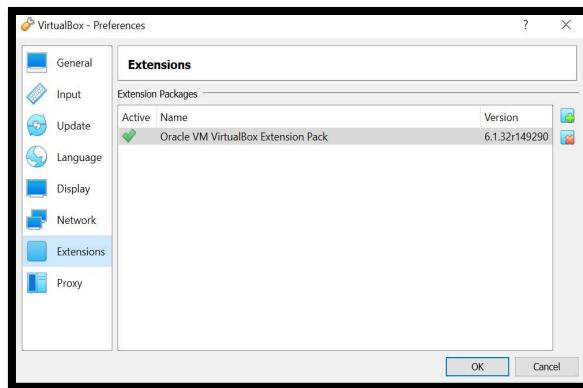
Then, you download the license information down the right scroll bar with the mouse to accept the terms and click on "**I Agree**" button.



It will be installed immediately and the process will be completed and click on "**OK**" button.

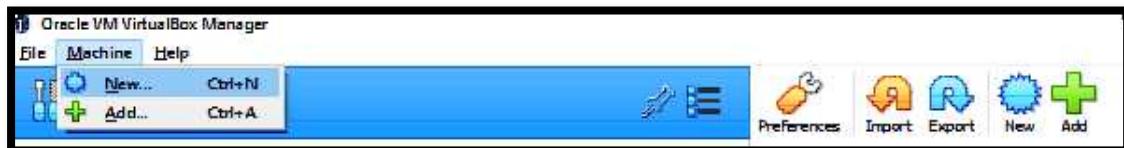


Finished process and then back to VirtualBox homepage.



After that, at the top of the screen there are two menus, and you can choose between two options to create a new virtual machine from the left side of the screen:
a) Menu-> click on “Machine -> New” or from the right side of the screen: b) Menu-> click on “New icon” .

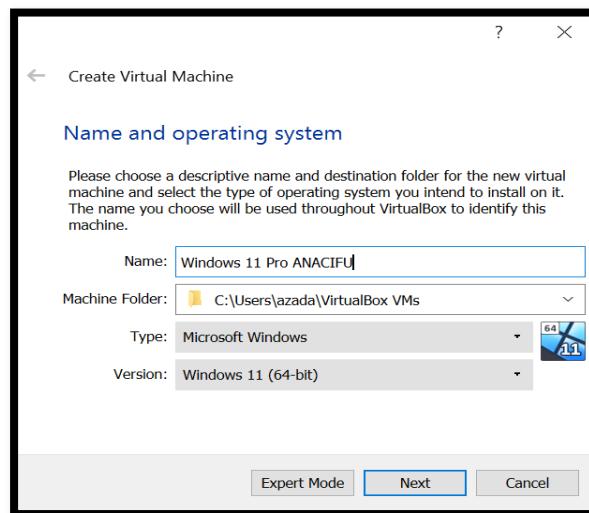
a)



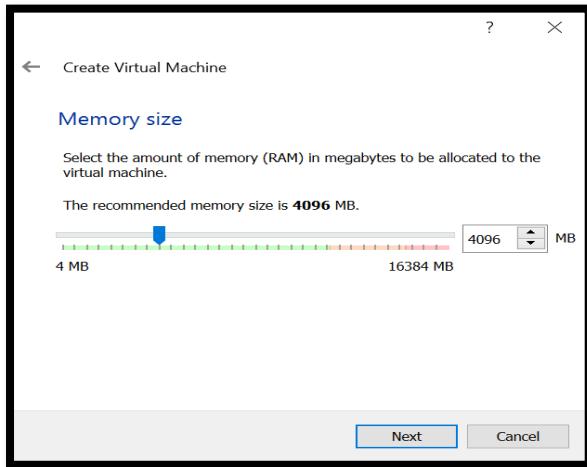
b)



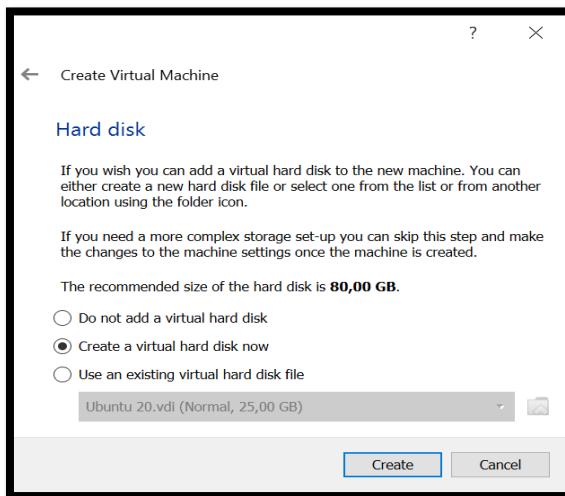
Then you select the Operating System (OS) following these steps: write the name that helps identify the user who has performed the exercise, choose the Machine Folder (in this example it is shown the default folder), OS Type and the corresponding SO Version by clicking on the arrow inside each label. Then click on “Next” button.



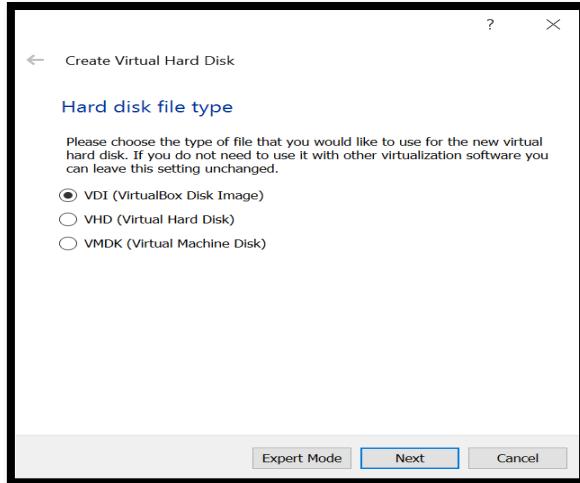
This screen below shows the RAM memory size that it can be chosen. By default, you see the recommended memory size (4096MB) that is the one you need. Then click on “**Next**” button:



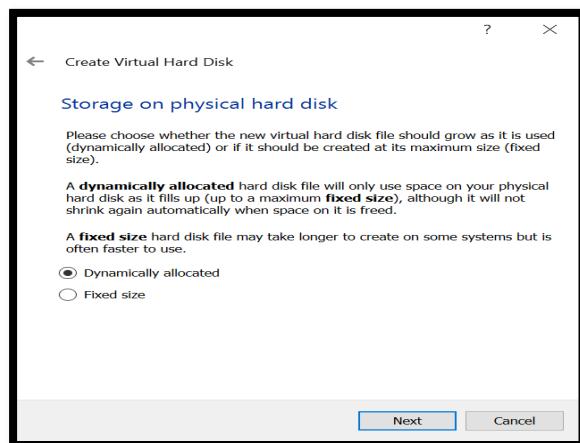
Next step is to create a virtual hard disk because you do not have any. You want to choose 80,00 GB that is also the recommended size of the hard drive. Then click on “**Create**” button.



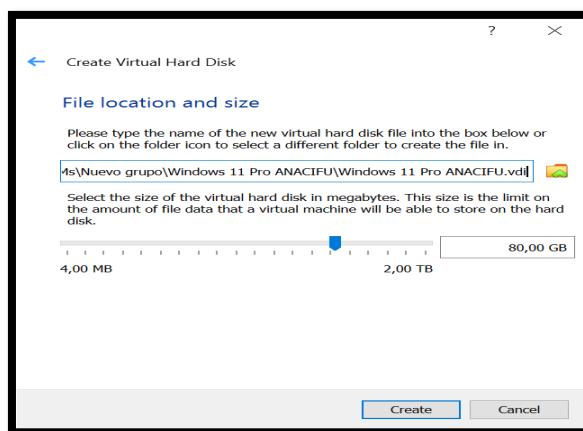
After that, you need to create an **image of the virtual hard disk** virtual machine (VDI). In addition, the VDI file is used to copy, create or restore the contents of the disk drive to a new virtual machine. Then click on “**Next**” button.



... And “dynamically allocated” in order not to waste storage. Click on “**Next**” button.



Finally, you have to choose the file location and hard disk size. Click on “**Next**” button.



3. Windows 11 installation



Windows 11 was officially launched on October 5. It has come as a free update for the original Windows 10 PCs that support it, and in the coming months we will see that the new computers that are released will begin to bring it pre-installed. Its deployment will be gradual, so the update could take time to reach some users while others have already arrived. Microsoft expects everyone to have it by 2022.

B. TPM

TPM: You need support for the Secure Platform Module 2.0 or TPM 2.0, which since 2016 is mandatory for the hardware of any Windows computer. We have written you how to check if you have a TPM chip on your computer, as it will be the hardest requirement to meet.

The acronym TPM comes from the name Trusted Platform Module, which in Spanish means Trusted Platform Module. This is a small chip that must be installed on the motherboard of your computer. This chip is a secure cryptoprocessor, which serves to store Windows encryption keys and thus protect the privacy of your most sensitive files.

It is a chip that comes installed in passive state in some computers, although not in all. With installed in passive state means that it is deactivated from factory, and that you will have to activate it manually through the software of UEFI or the own operating system that you have in your computer.

One of its main features is that it only communicates with the processor of your computer, so that no other component of the computer can access your data without the permission of the processor itself. This makes it more difficult for a virus that is installed on your hard drive to access your cryptographic keys, as it will not have direct contact with the chip.

C. Installation without TPM

Technical requirements that you must meet:

Processor: 2 or more cores at 1 GHz with 64 bits

RAM memory: 4 GB at least

Storage: 64 GB free or more, can be SATA or NVMe styled GPT partitions

Graphics card: compatible with DirectX 12 or later, and with WDDM 2.0 controller

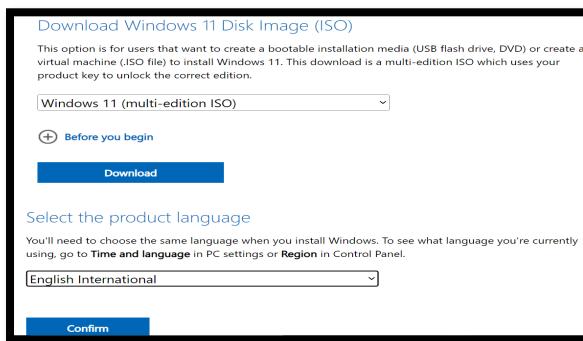
System firmware: UEFI BIOS with Safe Boot mode

TPM: Secure Platform Module (TPM) version 2.0 enabled

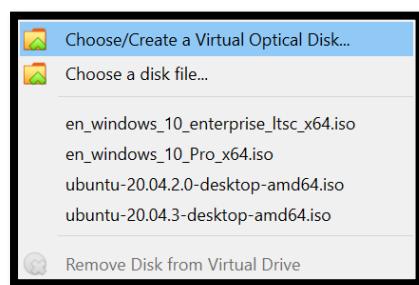
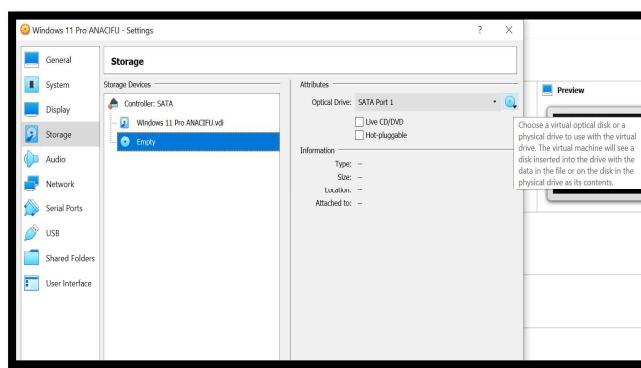
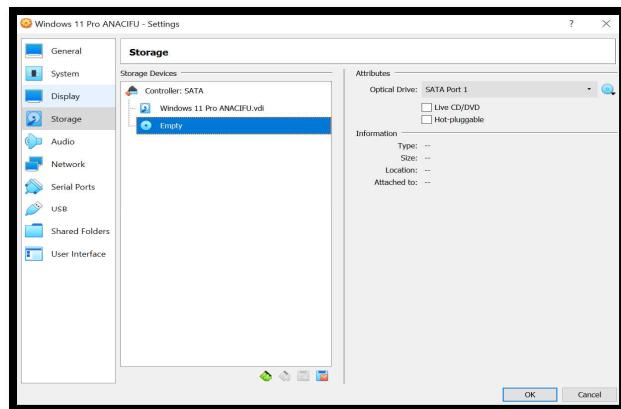
Display: screen with more than 9 inches, 720p HD resolution and 8 bits of color

Internet connection and Microsoft account: you need to have Microsoft account to log in to the system and internet connection to get updates.

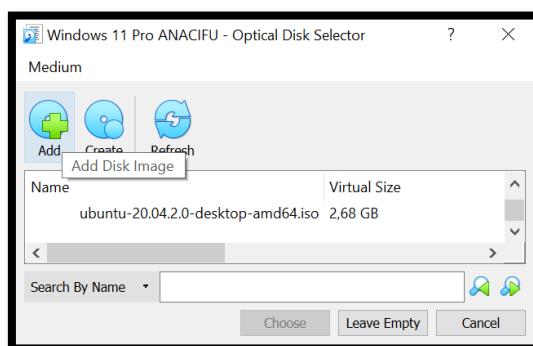
Download the Windows 11 ISO image directly from Microsoft servers. For that, you have to access the web [microsoft.com/software-download/windows11](https://www.microsoft.com/software-download/windows11), which is the official page on which the official Windows 11 installation files are hosted.



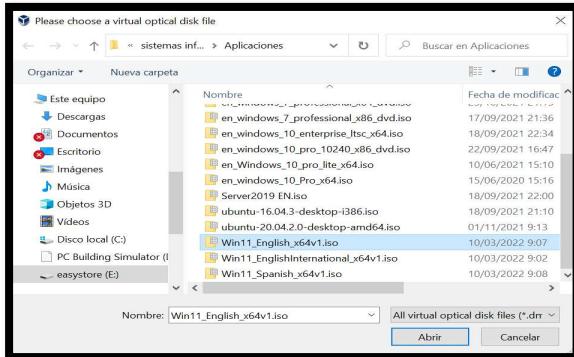
Once you set up Virtual Box and download Windows 11, you have to install a virtual machine with Windows 11 OS. In order to do this in our virtual machine, you choose from the menu the Optical Drive empty from Storage Devices, then in **Attributes->Optical->" Choose/Create a Virtual Optical Disk"**:



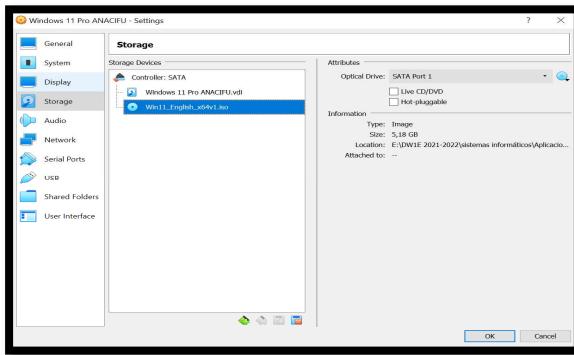
After that in the next screen click on “**Add**” button:



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.

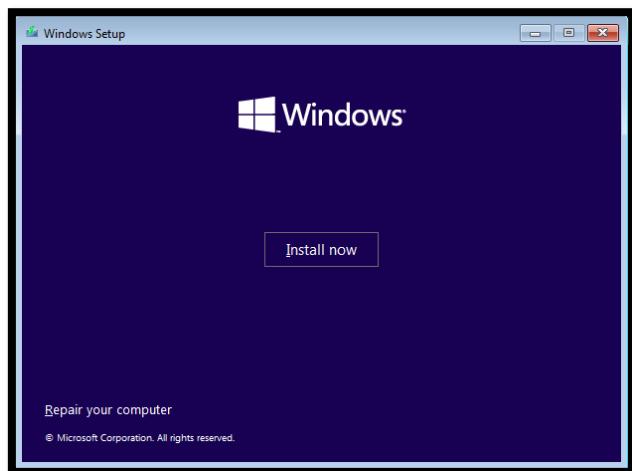


Then, you click on "**Start**" button to run Windows 11.

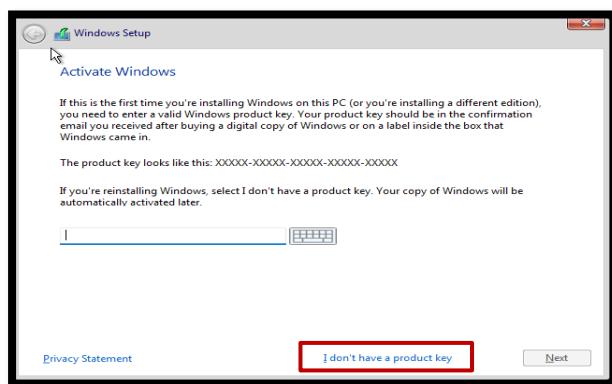


You start choosing the language you want to install, although actually set three parameters: The language itself, the format of time, date and currency, and the type of keyboard you will use. You need to install Spanish keyboard in order to use our letters and special characters. Then click on "**Next**"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

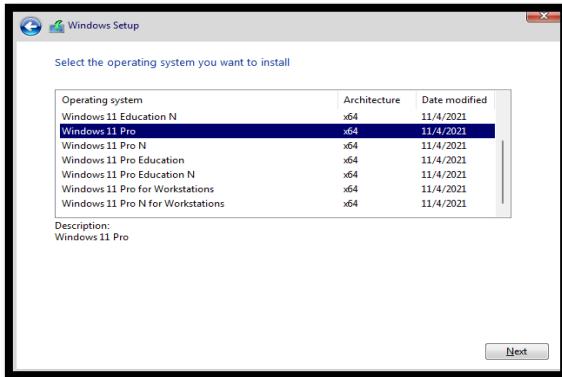




In the next step you will ask us for the license key, which you will leave empty whether or not you have the key, and we will choose "I don't have a product key" and click on "**Next**" button.

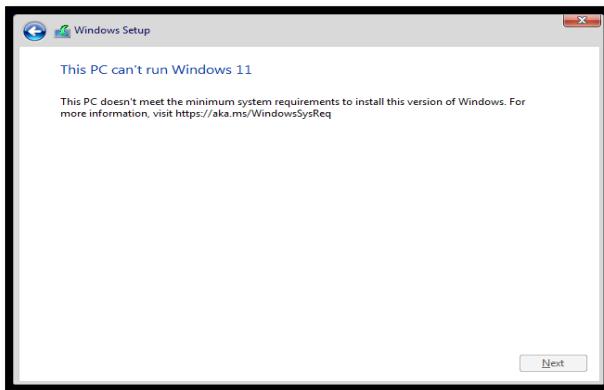


The screen below, it is the window where you requested the version of Windows 11 that we wanted to install and everything will continue.



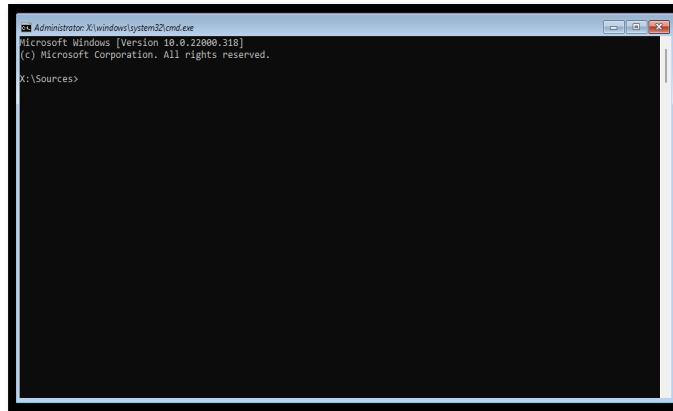
To install Windows 11 without TPM, it has been discovered that Microsoft includes a new registration key called LabConfig with which you can configure settings to remove the requirements of TPM 2.0, 4GB RAM and secure boot.

If at the time your computer shows you the message This PC cannot run Windows 11 that will mean it is not a compatible device.

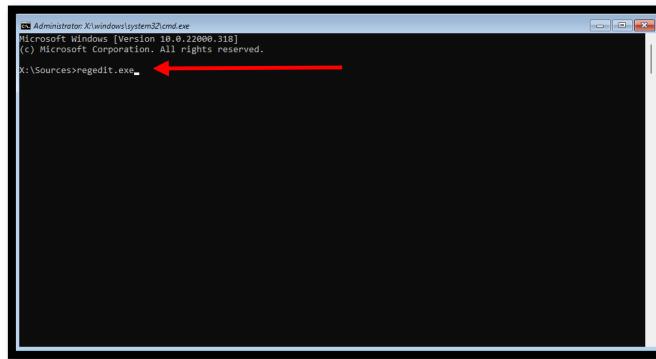


This is when, if your hardware does not meet Microsoft requirements, a warning will appear like the one in the image below. The way to solve it begins by using the key combination Shift + F10 in order to start the Windows Command Prompt.

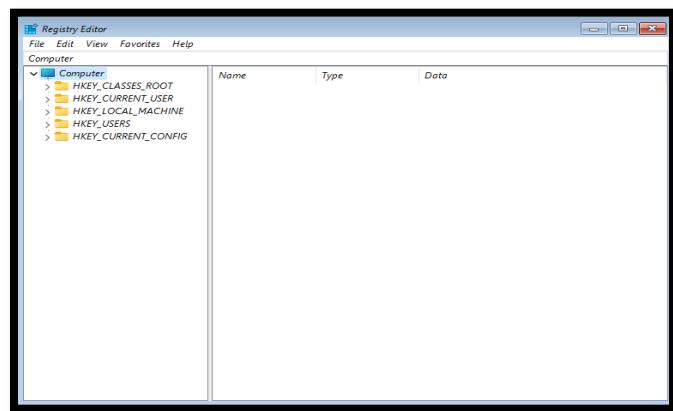
From it, we will open the Registry Editor, something as simple as executing the following command: regedit.exe



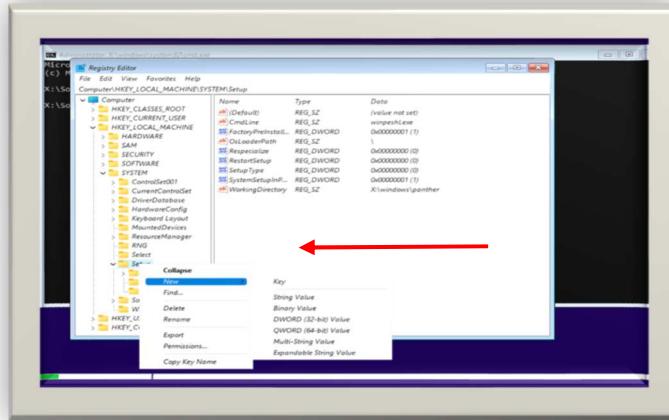
In the Command Prompt we type Regedit and press Enter, at which time the Windows Registry Editor will start.



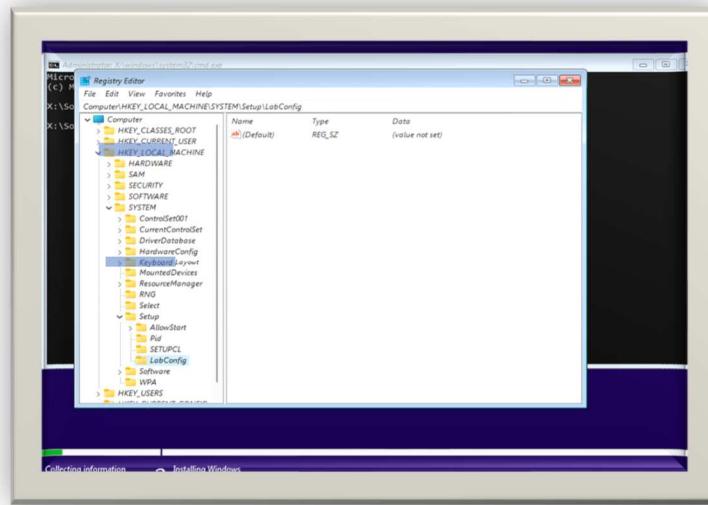
At this moment you must go to the following path on the right side of the Editor:
HKEY_LOCAL_MACHINE-> SYSTEM ->Setup.



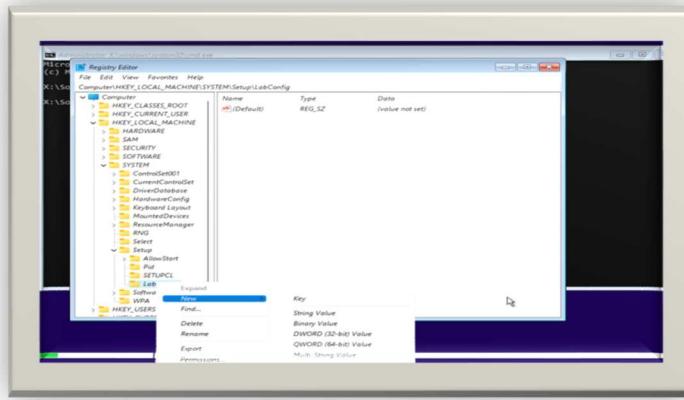
Now you click the right mouse button on the configuration key, select New and then go to Key.



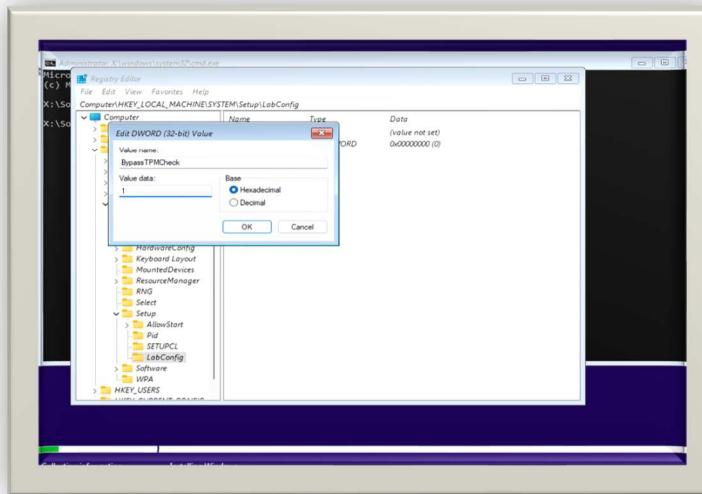
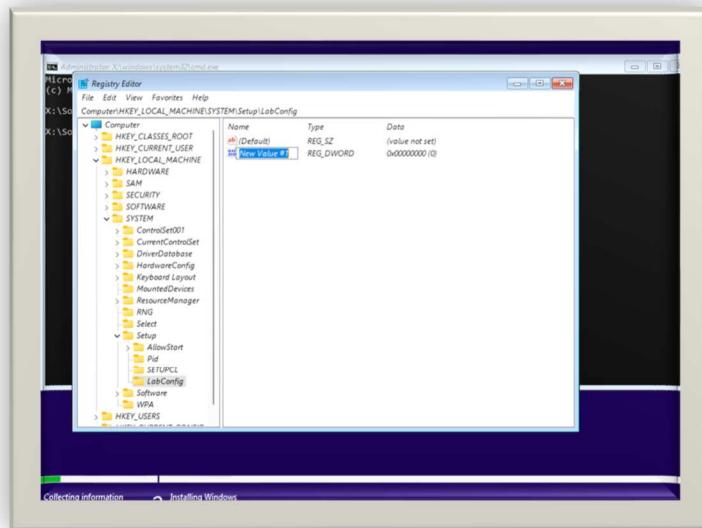
When you ask for the key name, type LabConfig and then press Enter.



Now right-click the newly created LabConfig and select New to then go to DWORD (32-bit) value.

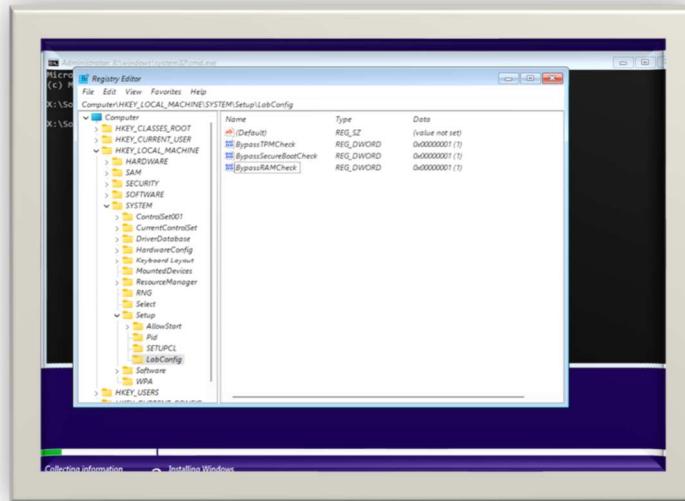


There you create a value that you will call BypassTPMCheck with data in 1.



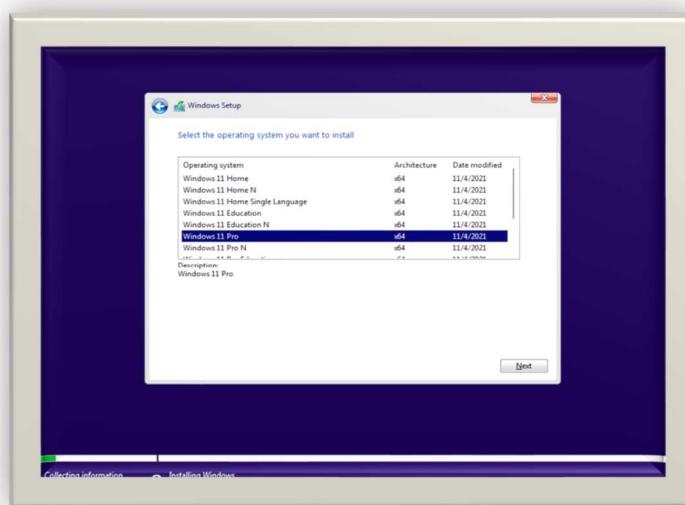
You then create BypassRAMCheck and BypassSecureBootCheck both with value 1.

Once we have created those three values in LabConfig it is time to close the Editor and write Exit and click on the Enter in the Command Prompt to close it.



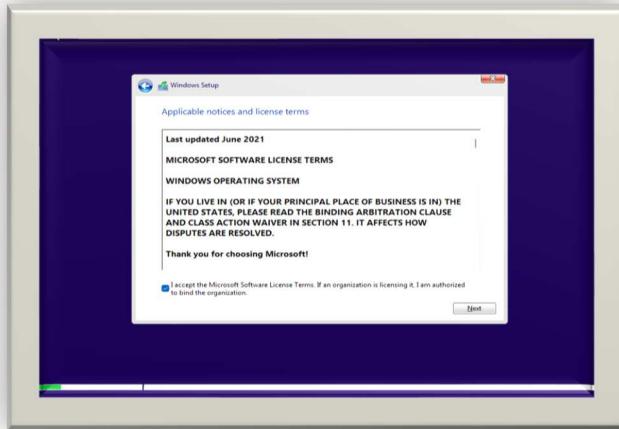
Now we will return to the message we have left open where the Windows 11 installation process told us that we could not continue because we did not meet the requirements and clicked on the arrow in the top right to go back.

Then we go back to the window where you requested the version of Windows 11 that we wanted to install and everything will continue, since the hardware requirements have already been disabled.

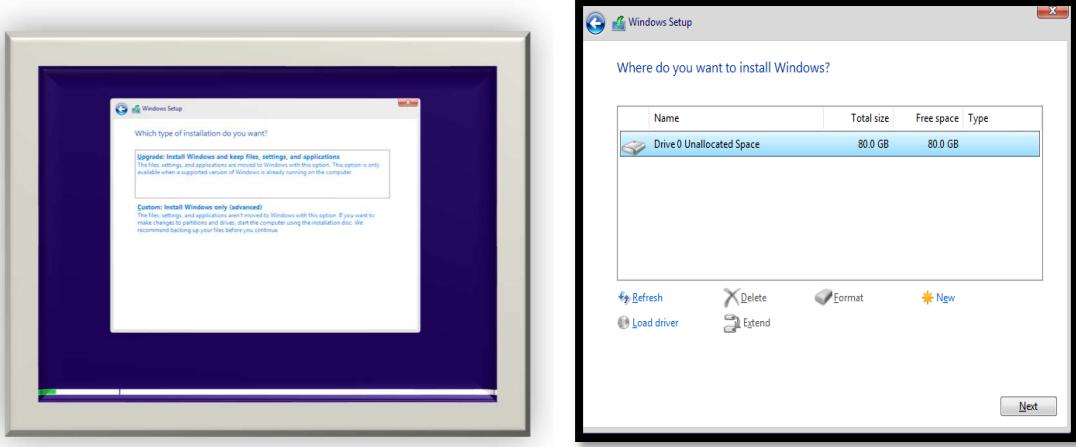


You must keep in mind that disabling these functions can make Windows 11 not work in the desired way, so it is advisable that this system is used in a virtual machine or in a test that you are doing with the new operating system of Microsoft.

Even so this is the demonstration that you can have Windows 11 without using the TPM 2.0 chip, the bad thing is that security will be seriously compromised by not having this valuable ally.



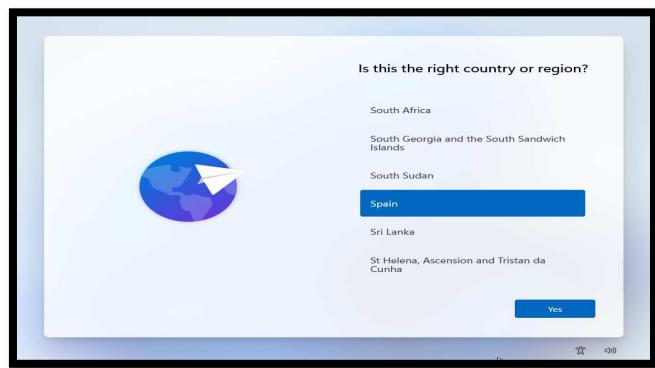
The next screen of the installation wizard interface shows the hard disk partitions and which you want to install. In this case, you only want the Primary partition that is where both the OS and other data can be stored, and it is the only partition that can be set active, because you do not know how many partitions are going to use, and you have to choose to allocate all hard drive space for Windows 11 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.



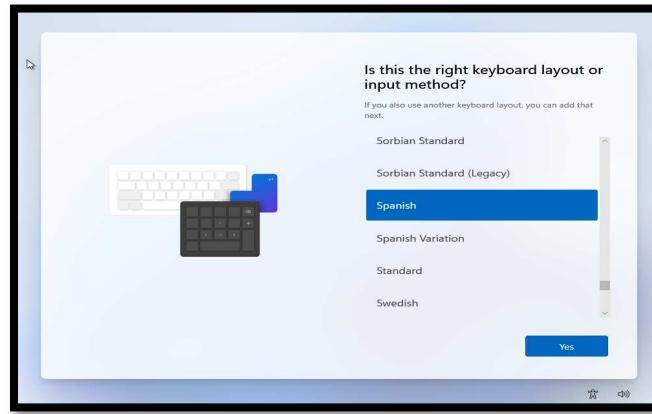
And now the installation process has begun.



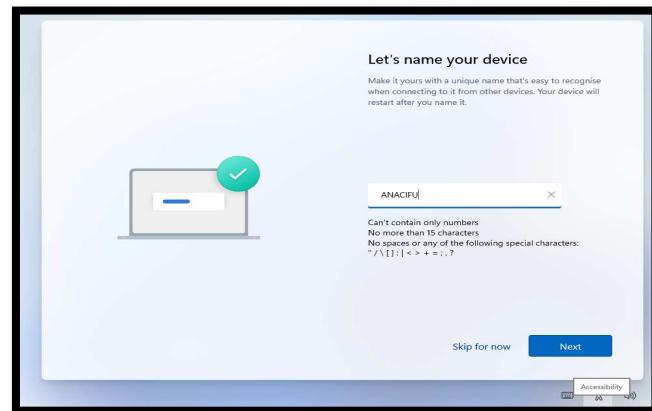
Now, you have to choose your region and click on “**Yes**” button.



Then, you have to choose your keyboard layout and you can also choose another one and click on “**Yes**” button.



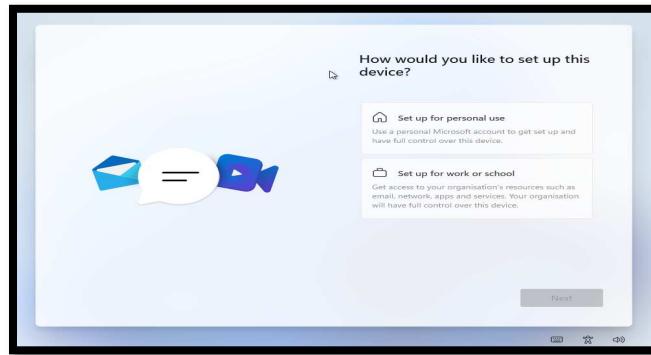
After that, you have to write the name of your device and click on “**Next**” button.



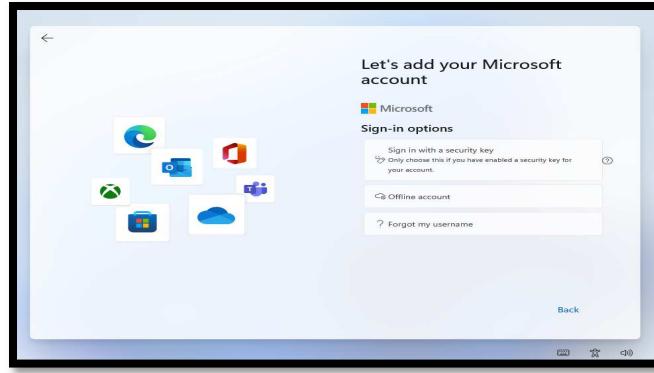
Then the computer Restart itself.



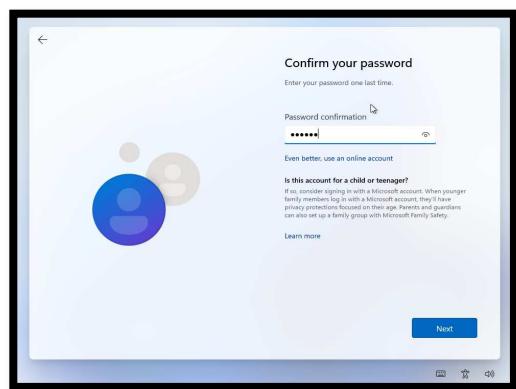
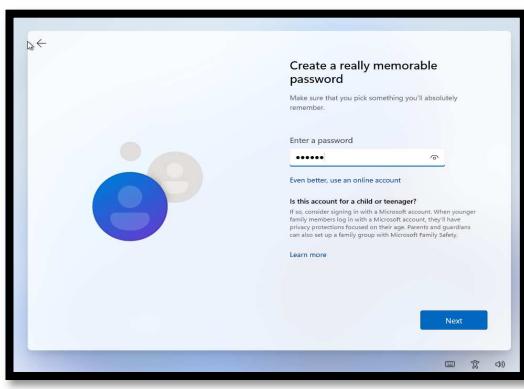
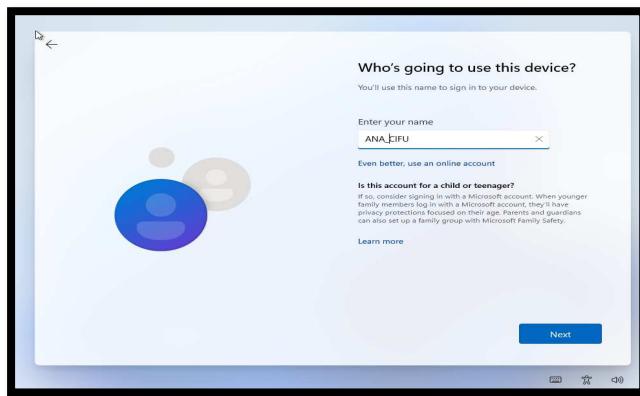
There is another additional step after registration, which will be to configure the computer according to the use we will give it. It will be optional of course, but it doesn't hurt to complete the installation.

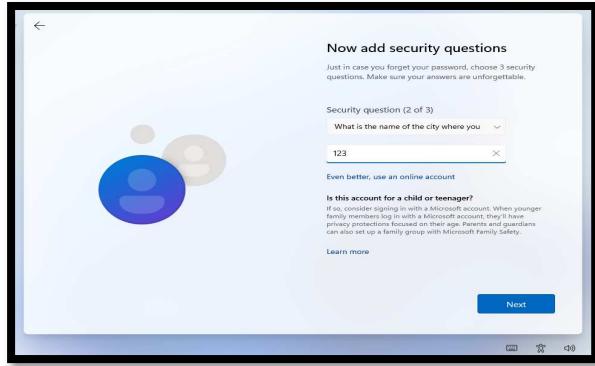


The most convenient thing is to add a Microsoft account to associate Windows with our user identity in the cloud, but we can also install locally without cloud connectivity. In this case, you have to choose "**Offline account**".

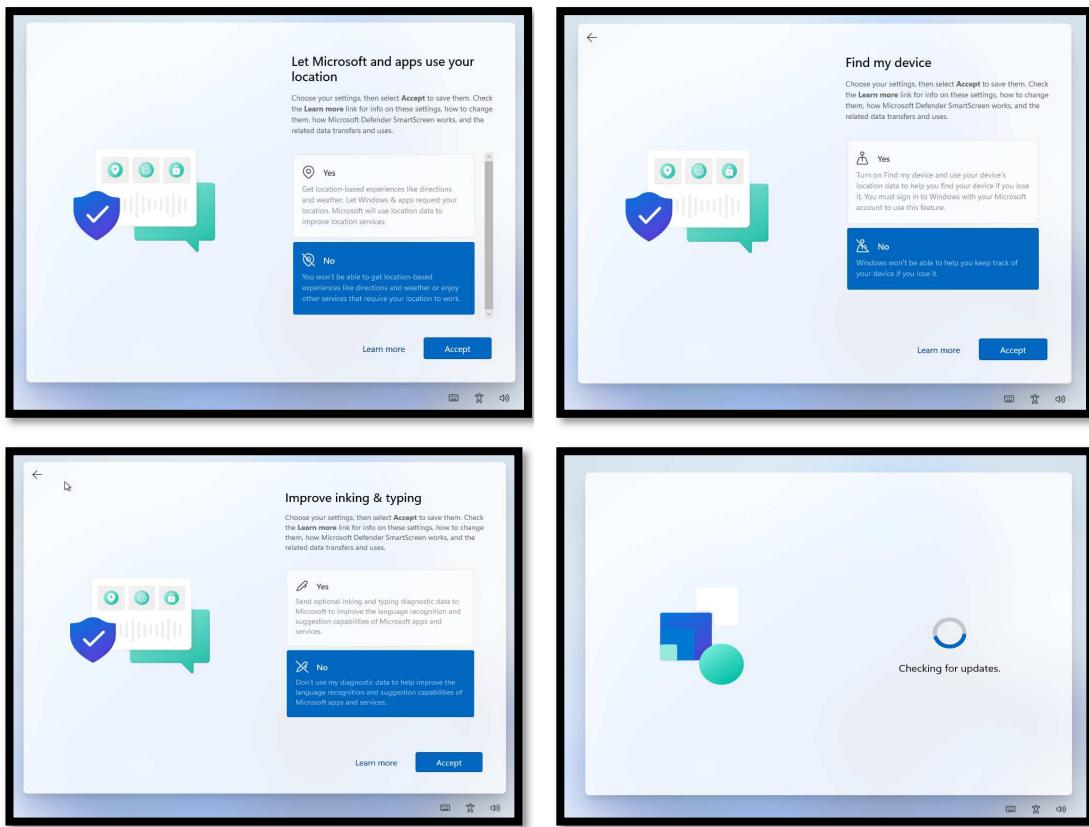


Another important screen you should consider is the one on which you can choose **user** and **password** which is requested in duplicate to ensure that you do not make typographical errors, in case you are not able to write and log in.





There is not much more to do, as the process of installing Windows 11 will be finished. The next steps would be to install the relevant drivers, with special importance for the GPU drivers and board to take advantage of DirectStorage.

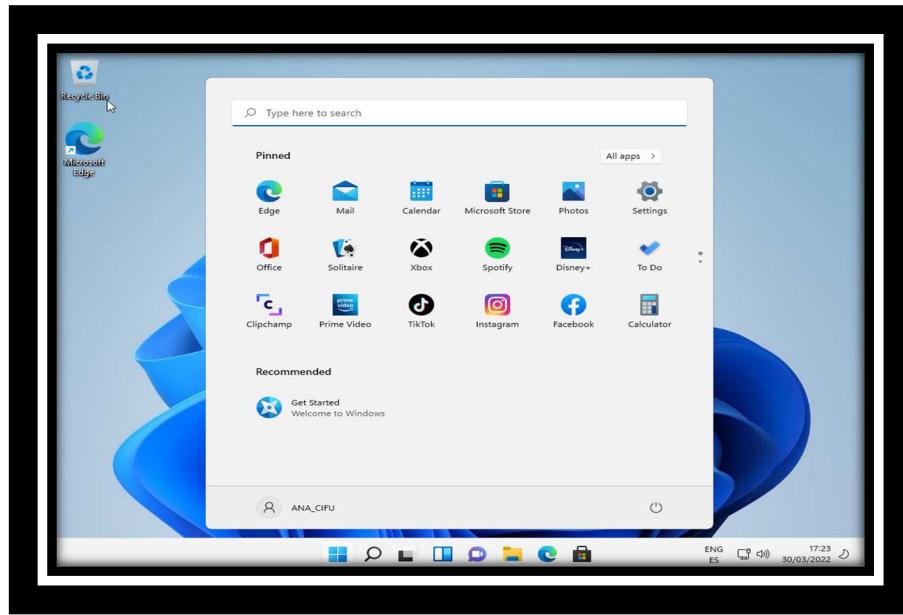




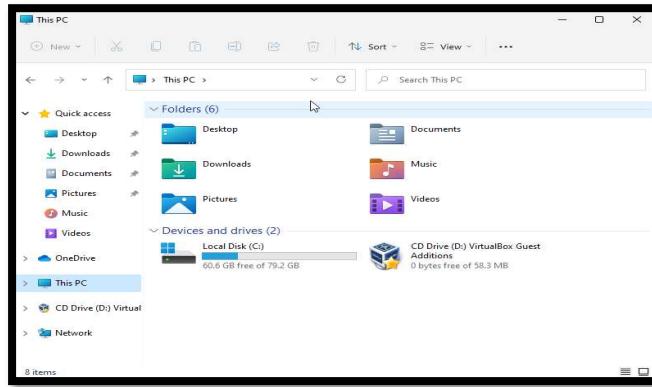
...and this is the Desktop screen.



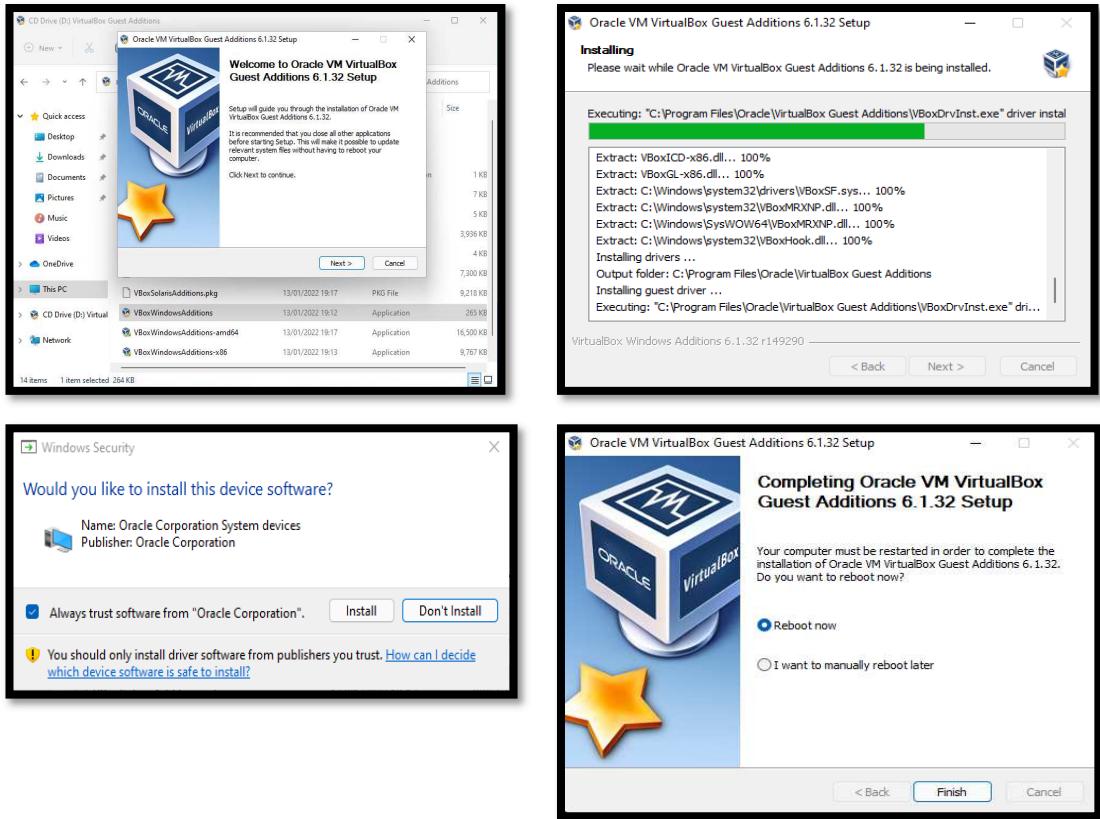
Start menu completely renewed and redistributed, giving you a tablet style with application panel and another for recommendations or recently used files.



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 installed, you can setup these tools from this menu and [click on D partition](#) to run the installation wizard.



Your computer reboot and welcome to the new Windows 11.



4. Creation of RAIDs

A. Brief introduction

Surely we have all heard about the configuration of disks in RAID and we have related it to large companies, where the need to have the data replicated and available is paramount. But today, practically all our desktop PC motherboards have the possibility to create our own RAID. The term RAID comes from "Redundant Array of Independent Disks" is to create a system for data storage using multiple storage drives between which data is distributed or replicated. These storage drives can be either HDD or mechanical hard drives, SSD or solid state drives.

The RAID technology is divided into configurations called levels, through which we will be able to obtain different results in terms of possibilities of storage of information. For practical purposes, we are going to see a RAID as a single data store, as if it were a single logical drive, even though there are several physically independent hard drives within it.

The ultimate goal of RAID is to provide the user with greater storage capacity, data redundancy to prevent data loss and provide higher data read and write speed than if we only had a hard drive. Obviously these features will be enhanced independently depending on what level of RAID we want to implement.

Advantages of a RAID

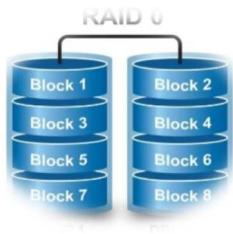
High fault tolerance: With a RAID we can get a fault tolerance much better than if we only have one hard disk. This will be conditioned by the RAID configurations that we adopt, since some are oriented to provide redundancy and others simply to get access speed.

Read and write performance improvements: As in the previous case, there are systems oriented to improve performance, by dividing blocks of data into several units, to make them work in parallel.

Possibility to combine the above two properties: RAID levels can be combined. In this way we will be able to take advantage of the speed of access of some and the redundancy of data of another.

Good scalability and storage capacity: another of its advantages is that they are systems, usually easily scalable, depending on the configuration we adopt. In addition, we can use discs of different nature, architecture, capacity and age.

B. RAID0 and creation of a mount point



The first RAID we have is the so-called Level 0 or divided set. In this case, we do not have data redundancy, since the function of this level is to distribute the data that is stored between the different hard disks that are connected to the computer.

The objective of implementing a RAID 0 is to provide good access speeds to the data that is stored on hard drives, since the information is equally distributed in them to have simultaneous access to more data with their disks running in parallel.

RAID 0 has no parity information or data redundancy, so if one of the storage drives breaks, we will lose all the data inside, unless we have backups external to this configuration.

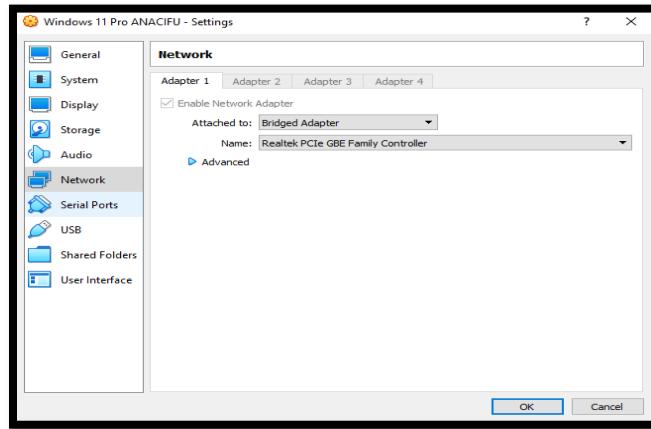
MOUNT POINT

NTFS volume mount points are specialized NTFS file system objects that are used to mount and provide an entry point to other volumes. They are implemented as NTFS analysis points. Mount points can be created in a directory on an NTFS file system, which gives a reference to the root directory of the mounted volume.

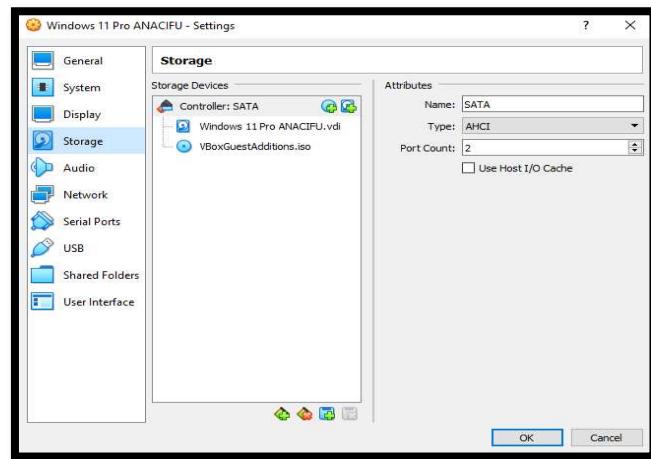
More specifically, a mount point is a directory (usually empty) in the currently accessible file system in which an additional file system is mounted (attached). A file system is a hierarchy of directories, sometimes called a directory tree, to organize files in a computer system.

Mounting is a process by which the operating system makes files and directories of a storage device (such as a hard disk, CD-ROM or a network share) are available for users to access through the computer's file system.

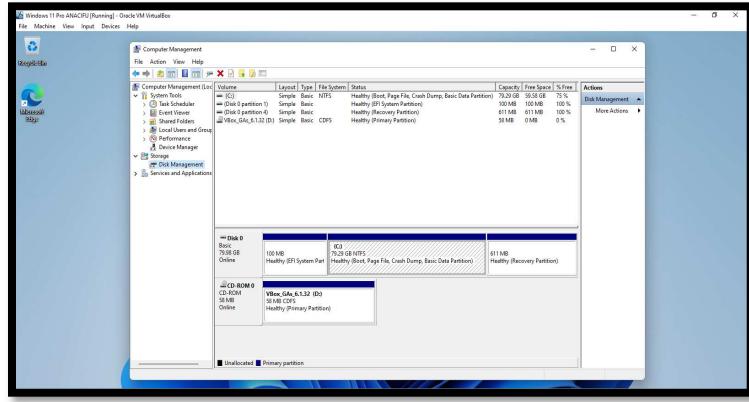
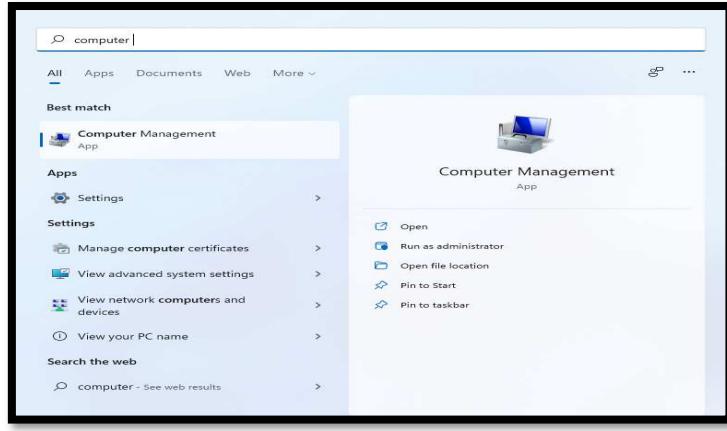
By default, you can see on the first tab of the adapters the network NAT which means it allows you to browse, download files, etc using the host's IP. However, the other computers in the network will not be able to access the virtual machine. In this case you need "**Bridged Adapter**". This makes the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



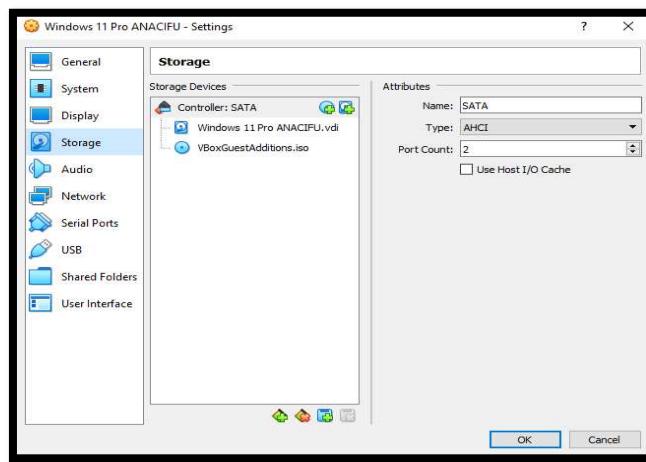
As you can see now in VirtualBox, this is your disk settings.



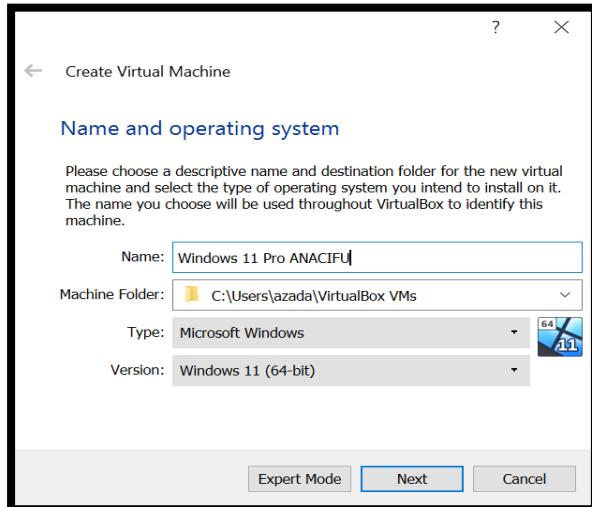
Now in Windows 11 you click on the start search icon and type computer management and see your "**Disk Management**".



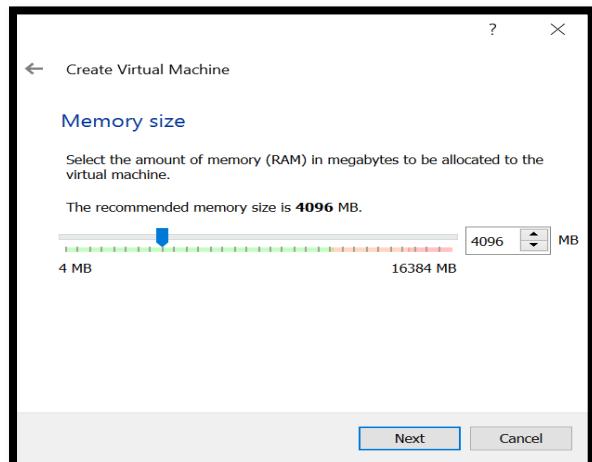
Now, in RAID0 speed is increased but security is not increased. If one of the disks gets corrupted, information is lost. It takes at least two disks, we have one file and it is partitioned into two and each of those partitions is saved to one disk.



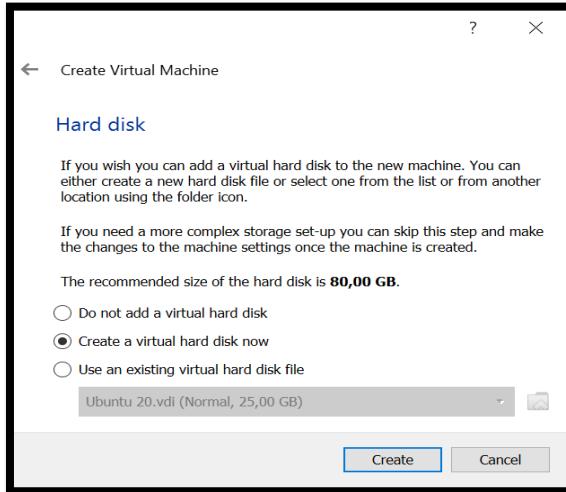
Then you select the Operating System (OS) following these steps: write the name that helps identify the user who has performed the exercise, choose the Machine Folder (in this example it is shown the default folder), OS Type and the corresponding SO Version by clicking on the arrow inside each label. Then click on “**Next**” button.



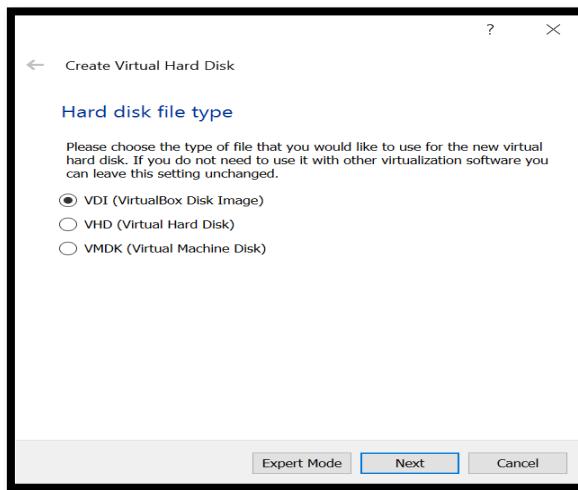
This screen below shows the RAM memory size that it can be chosen. By default, you see the recommended memory size (4096MB) that is the one you need. Then click on “**Next**” button.



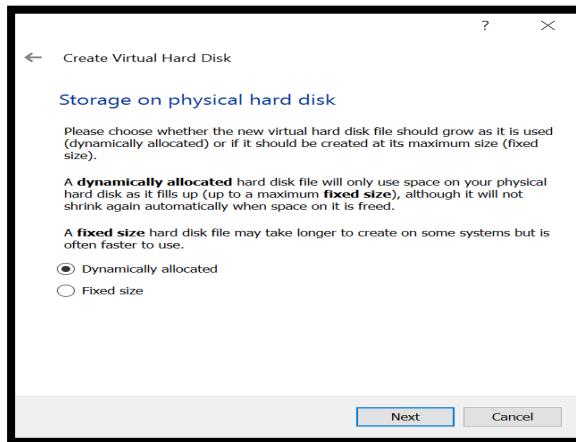
Next step is to create a virtual hard disk because you do not have any. You want to choose 80,00 GB that is also the recommended size of the hard drive. Then click on “Create” button.



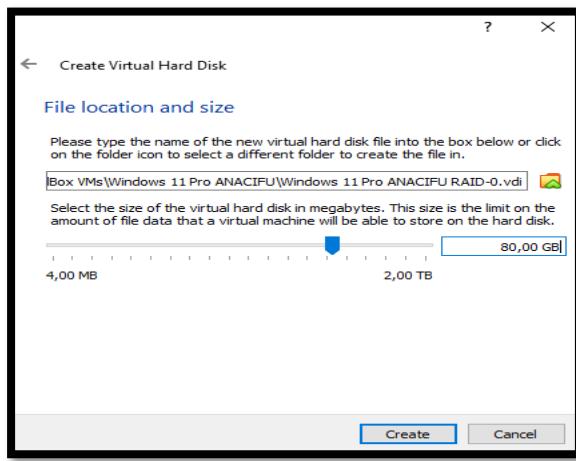
After that, you need to create an **image of the virtual hard disk** virtual machine (VDI). In addition, the VDI file is used to copy, create or restore the contents of the disk drive to a new virtual machine. Then click on “Next” button.



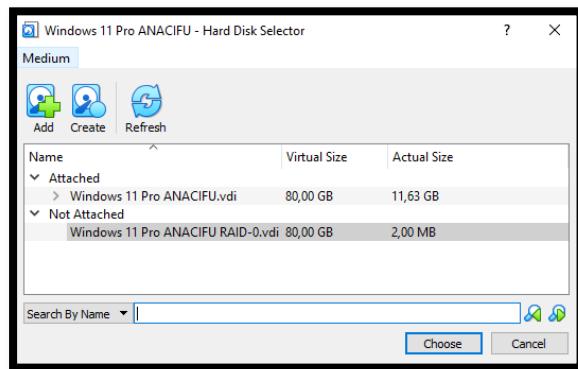
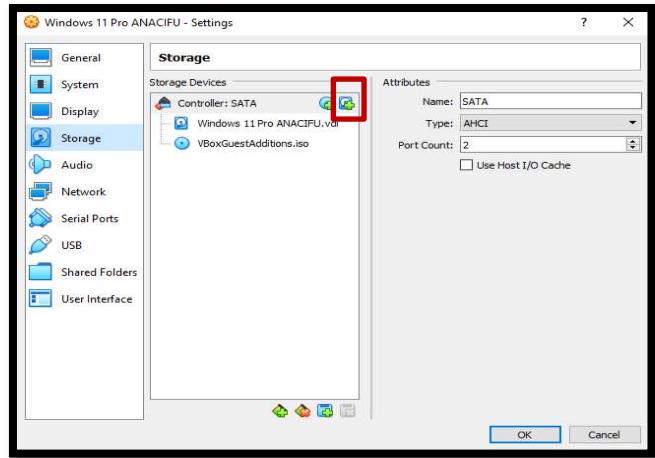
... And “dynamically allocated” in order not to waste storage. Click on “**Next**” button.



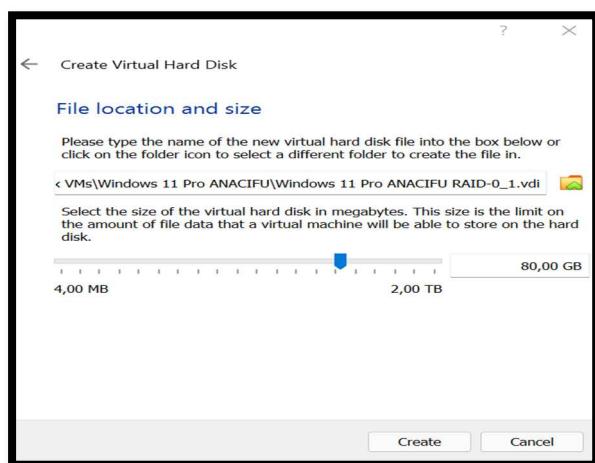
Finally, you have to choose the file location, the name and hard disk size. Click on “**Next**” button.



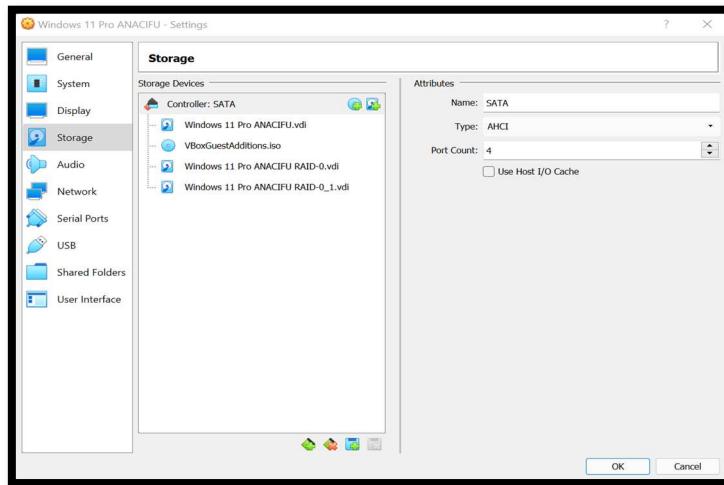
Now, in **Settings->Storage->Controller Sata->Add Hard Disk**, we create a new hard disk and do the same with the second hard disk.



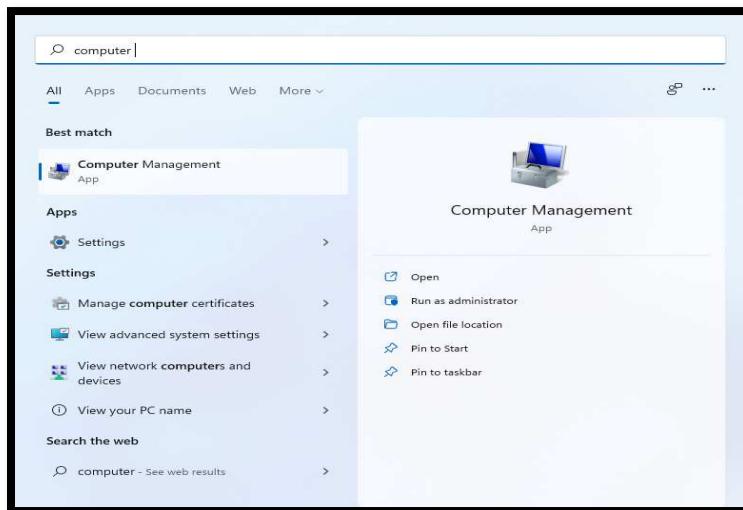
This is the second one, click on “Create” button.



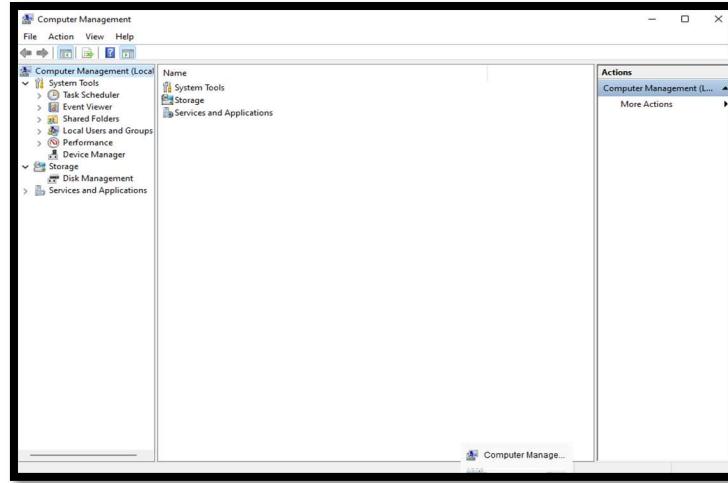
This is how the storage of our virtual machine is now shown.



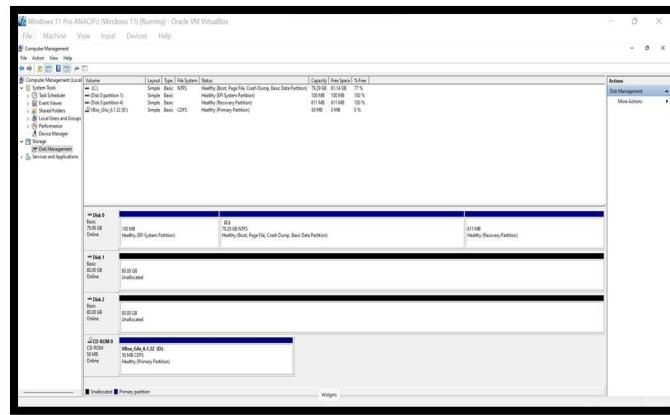
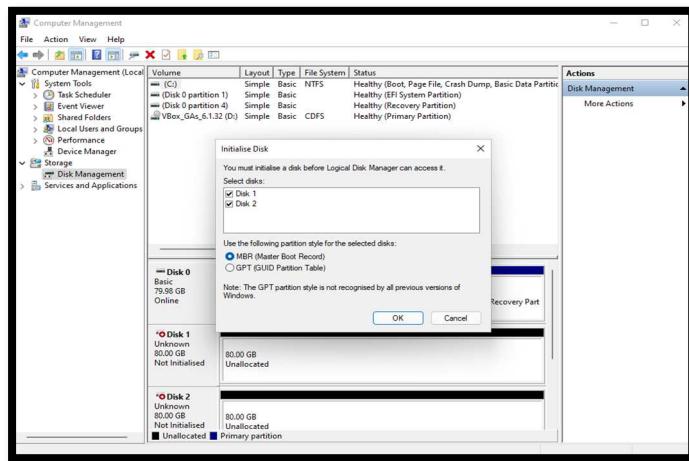
Once the machine is started, you access to the “**Computer Management**” by clicking on the Windows 11 **menu->search**.



When you open the computer management, you have to choose the storage option and then “**Disk Management**” to view the disks.



Then, you have to initialise both Logical Disk Manager can access then and click on "OK" button.

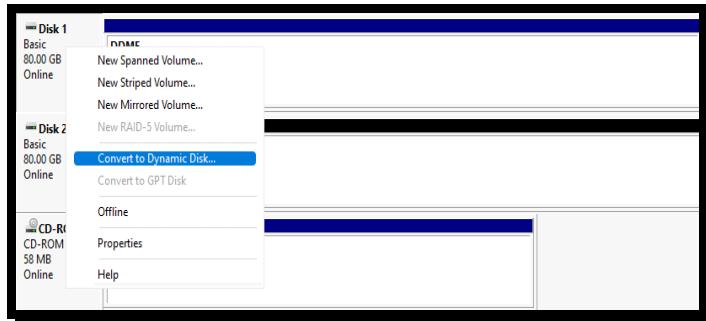


After that, you have to convert the **Basic** disks to **Dynamic** disks, clicking with the right mouse button on the left margin of the hard drive.

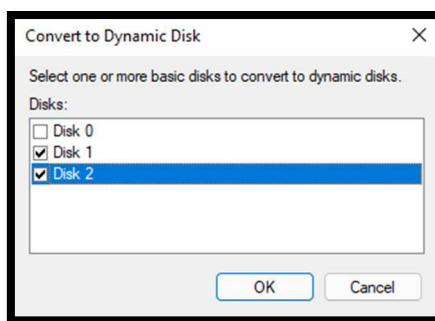
A dynamic disk consists of expanding a storage drive or partition into an extended volume that is capable of encompassing one or more physical hard disks into one. This conversion is possible from the graphical interface of our Windows operating system.

One of the advantages of having or creating a dynamic hard drive is that we don't need two drives to be the same in storage, if they are even of the same type. We can create them between an HDD or an SSD at any time, and the transfer rate will depend on where the data has been stored.

Non-critical applications, such as audio or video processing software, where data must be read and written quickly, benefit from this approach.



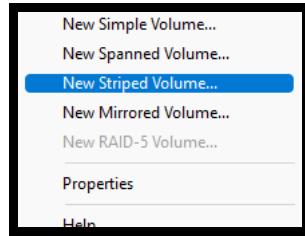
This is the new screen in which you have to select the disks you need to convert, then click on "**OK**" button.



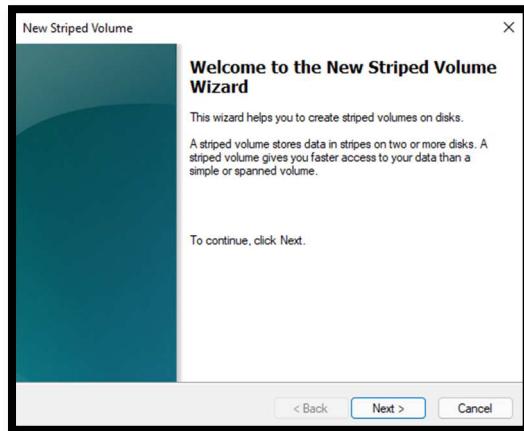
This is the way you see now each disk.



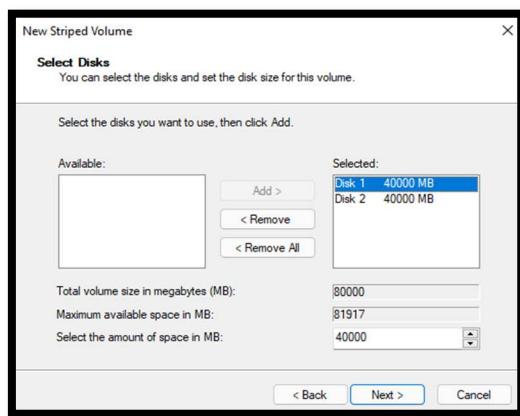
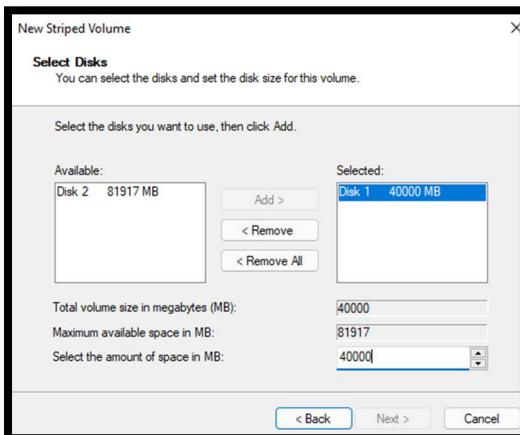
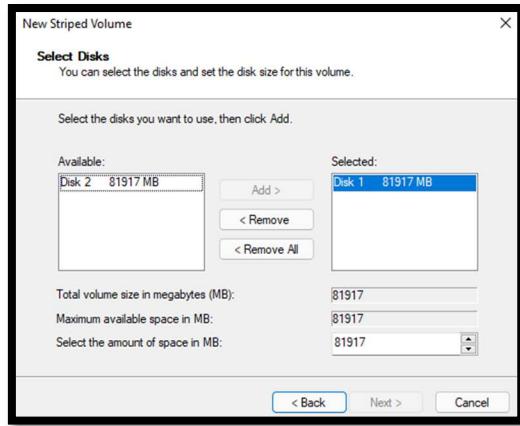
Now, click on the right mouse button on the left margin of the disk. Now, Right-click the unallocated space on one of the dynamic disks where you want to create the striped volume.



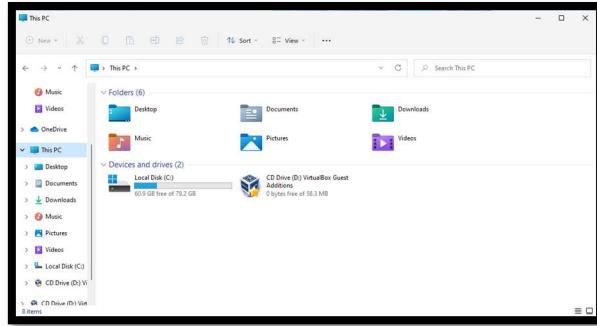
Then, click on “Next” button to start the setup.



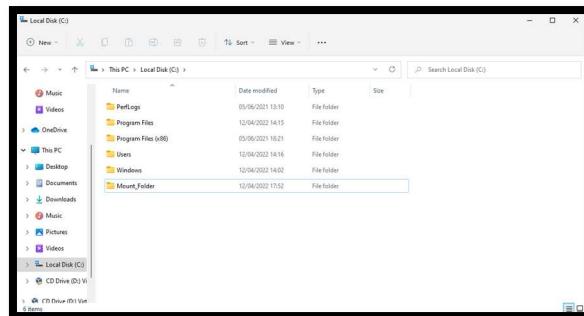
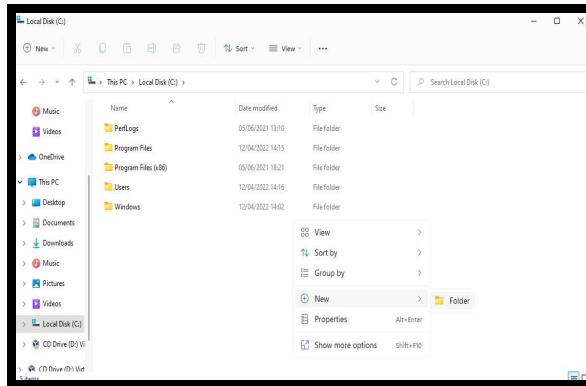
Then, you have to select the disks and set the disk size for this volume. In this case the first one 40000MB and the second one you cannot choose size because both disks must have the same size once you have selected the size.



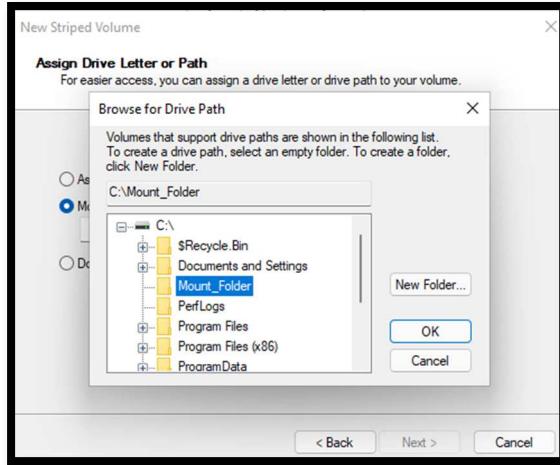
Once it is done, we will create now an assembly point to which we will call Mount_Folder. In This PC->C: Mount_Folder.



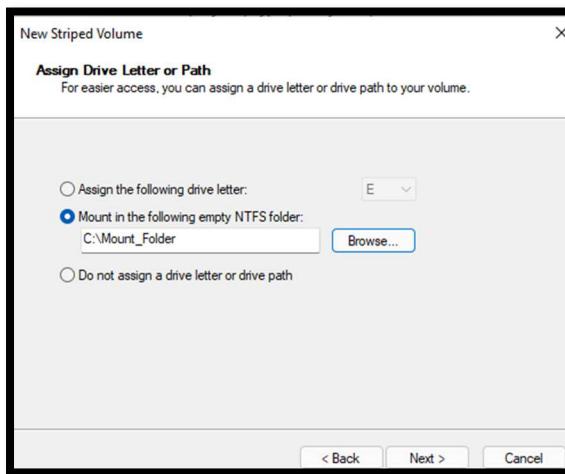
Clicking on the right button of the mouse at any point on the screen then, New->Folder in order to create a mount point.



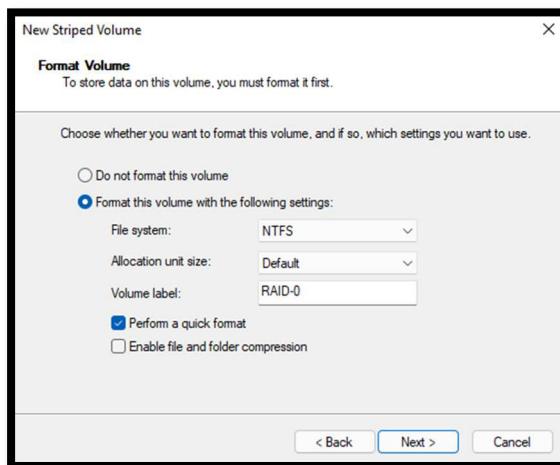
Next screen, you have to choose the mount point folder and click on "**OK**" button.



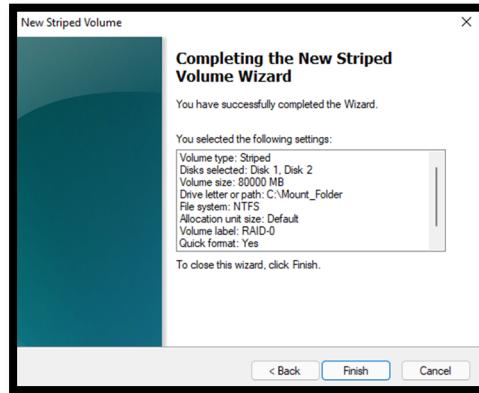
Next screen, click on “**Next**” button to continue.



Now, you have to choose NTFS file system, and change the volume label to **RAID-0** and click on “**Next**” button.



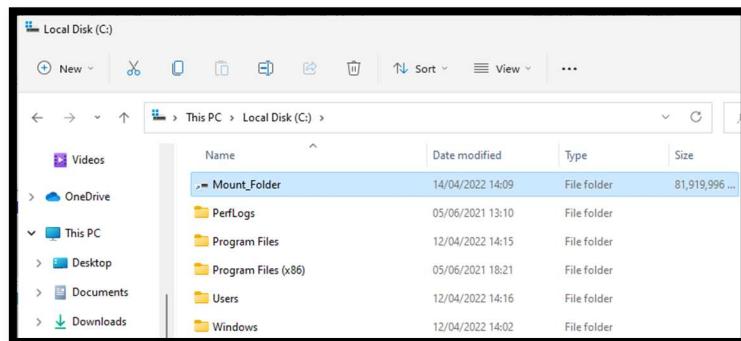
After that, click on “Finish” button to format the chosen part of each disk.



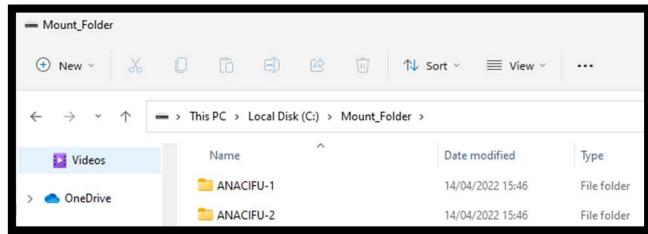
As you can check on This PC, the new volume has not yet been created.



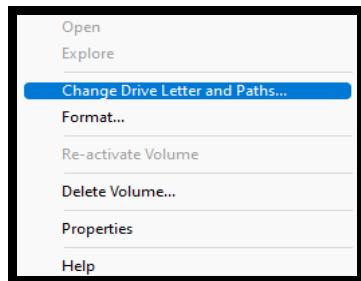
But the mount point has been created on disk C:\



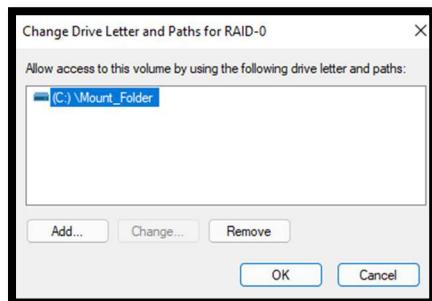
Now, we have to change this point mount to another drive letter (K: in this case) and add two folders into the Mount_Folder folder.



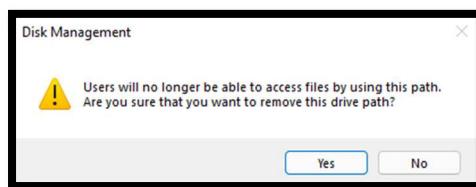
To do that, right-click the unallocated space on one of the dynamic disks where you want to create the new drive letter and choose "**Change Drive Letter and Paths**".



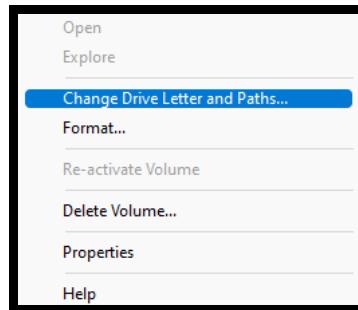
Now, remove the C:\ mount point.



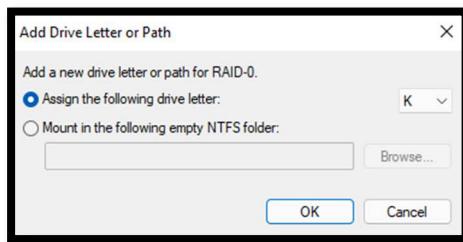
Click on "Yes" button.



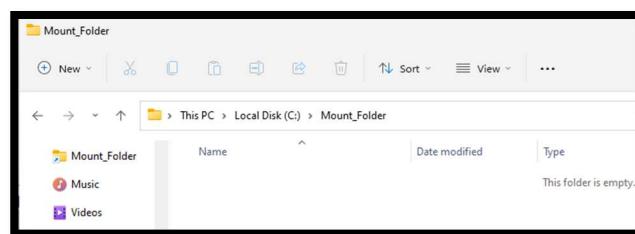
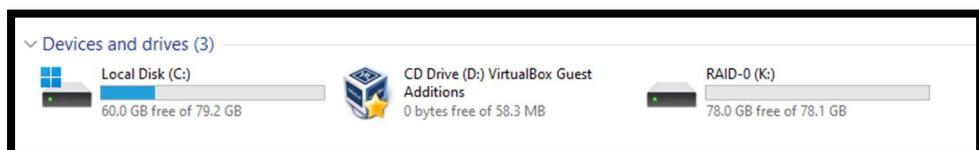
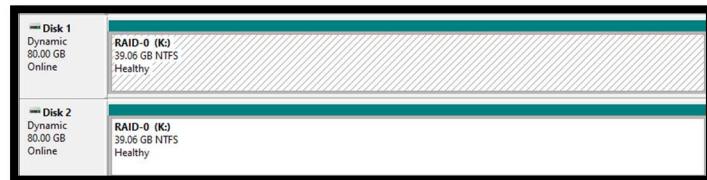
After that, right-click the unallocated space on one of the dynamic disks where you want to create the new drive letter and choose **“Change Drive Letter and Paths”** again.

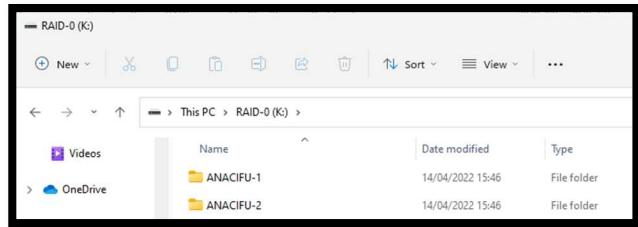


Add and assign the drive letter K: and click on “OK” button.

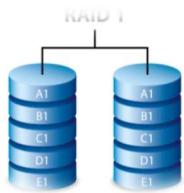


Finally, you can check in the next images that the mount point has changed from drive C: to drive K:. Both disks are formatted and the new volume **RAID-0** is created.





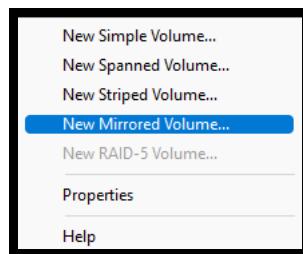
C. RAID-1



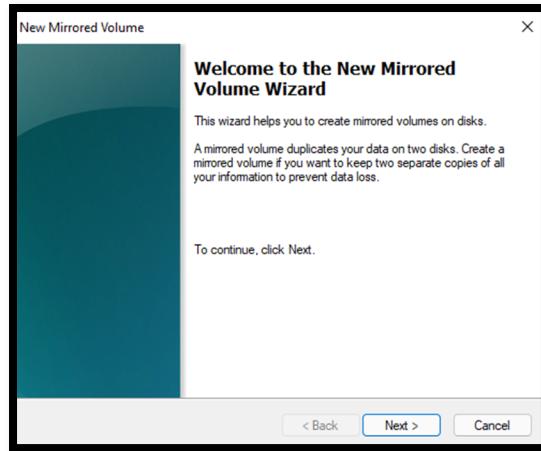
This configuration is also called mirror or "mirroring" and is one of the most commonly used to provide data redundancy and good fault tolerance. In this case, what we're doing is creating a store with duplicate information on two hard drives, or two sets of hard drives. When we store a data, it is immediately replicated in its mirror drive to have the same data stored twice.

In the eyes of the operating system, we only have one storage unit, which we access to read the data inside. But in case this fails, the data will be automatically searched on the replicated drive. It is also interesting to increase the speed of reading data, since we will be able to read the information simultaneously of the two mirror units.

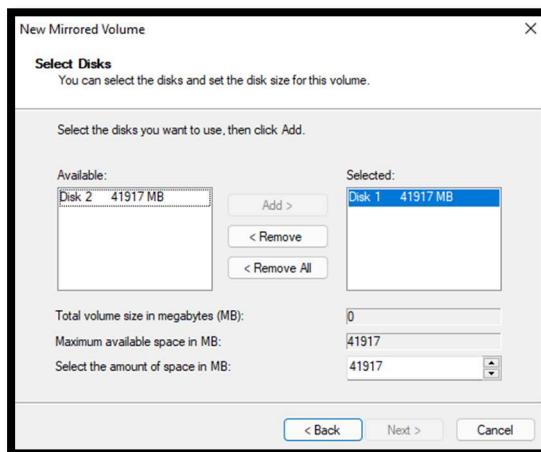
To do that, right-click the unallocated space on one of the dynamic disks where you want to create the new mirrored volume and choose "**New Mirrored Volume**".



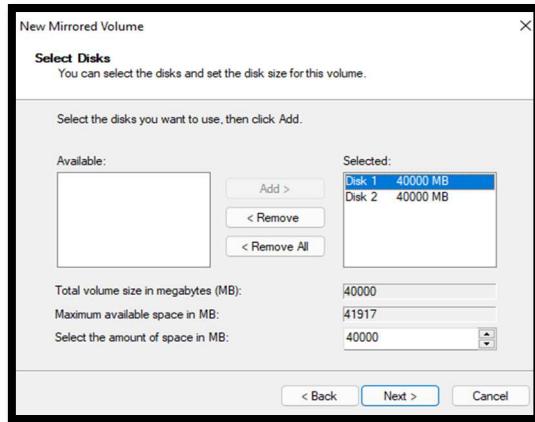
Then, you have to start configuring this volume clicking on "**Next**" button.



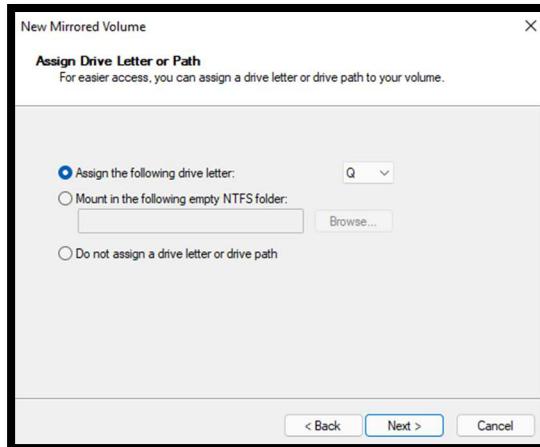
Then, you have to select the disks and set the disk size for this volume in the unallocated space of both disks. In this case the first one 40000MB and the second one you cannot choose size because both disks must have the same size once you have selected the size.



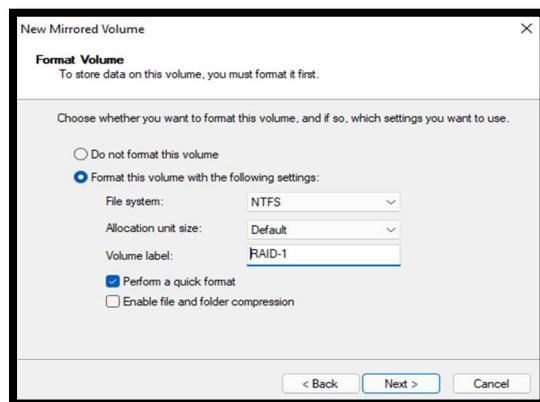
In this case, as well as RAID-0 you only can choose the size of the first disk, the second one must have the same size and it is automatically assigned.



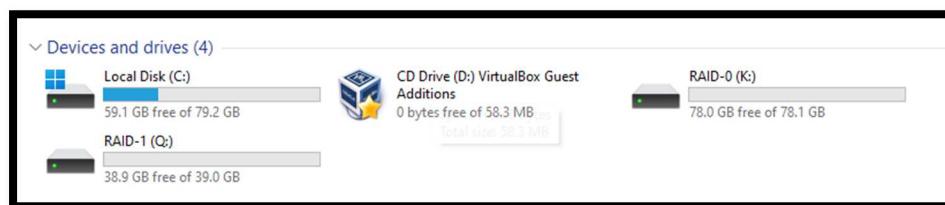
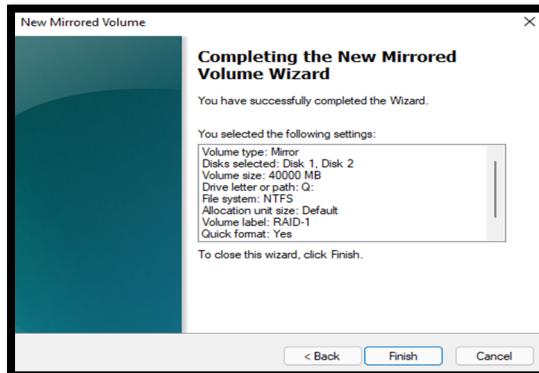
Next step is assigning the drive letter Q:



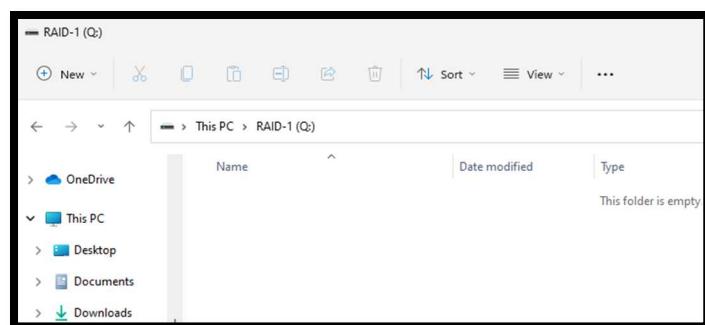
Now, you have to choose NTFS file system, a new volume label RAID-1 in this case and **"Perform a quick format"**. Click on **"Next"** button to continue.

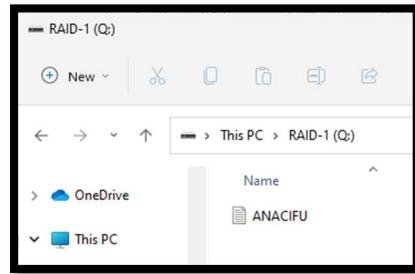
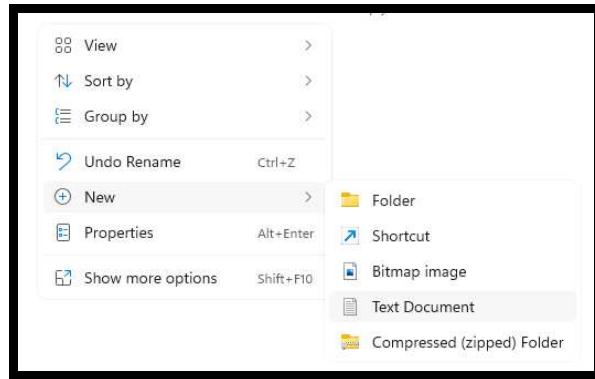


When you click on “Finish” button the formatting will start and the new volume RAID-1 will be created.

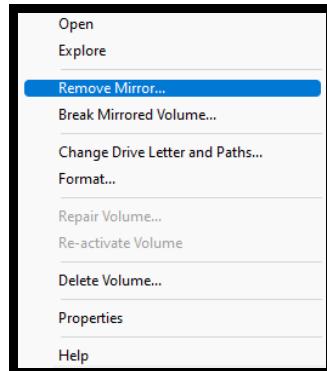


To check how RAID-1 works, let's create a new file on the Q:\ drive.

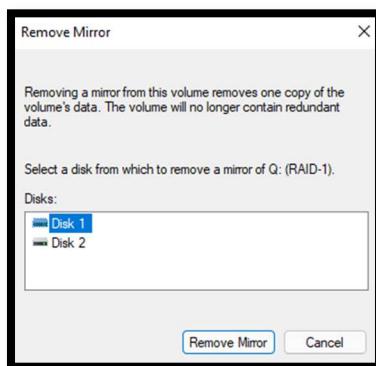




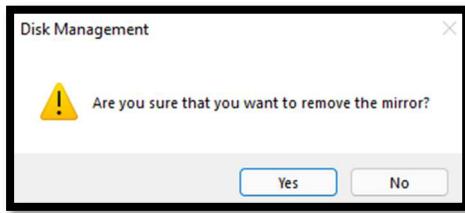
Now, in Disk management click on the left margin of the drive Q:\ with the right mouse button and choose **"Remove Mirror"**.



Then select the disk you want to remove. In this case Disk 1.



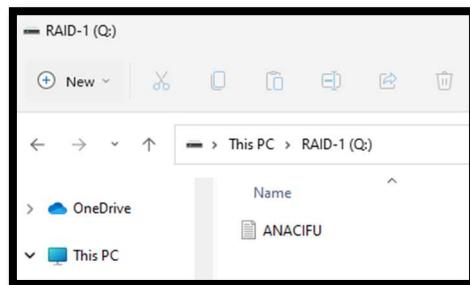
Click on “Yes” button.



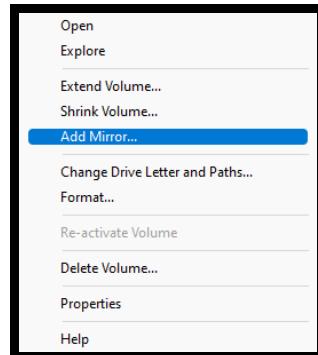
...and this is what it shows.



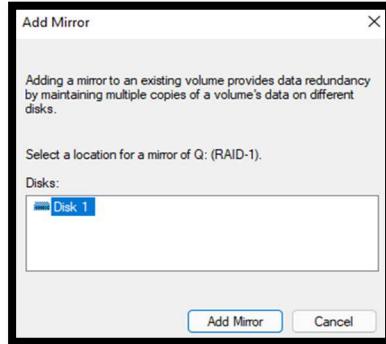
The file we have created is still displayed inside the Q drive: which has not disappeared.



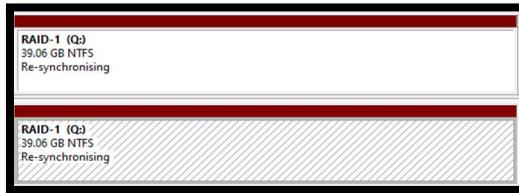
Now, on disk 2 in the space corresponding to RAID-1, click the right button of the mouse and choose **“Add Mirror”**.



Add disk 1 and click on “**Add Mirror**” button.



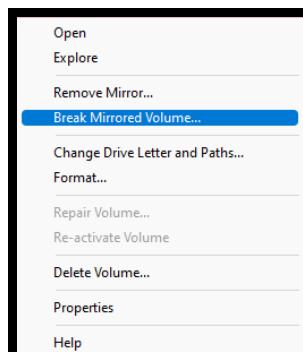
Now, both disks are re-synchronising.

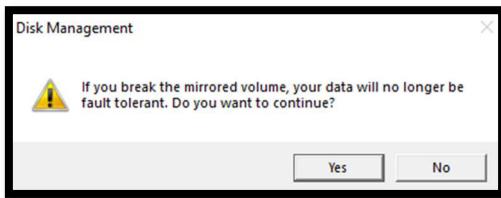


And finally, the mirrored volume is restored.

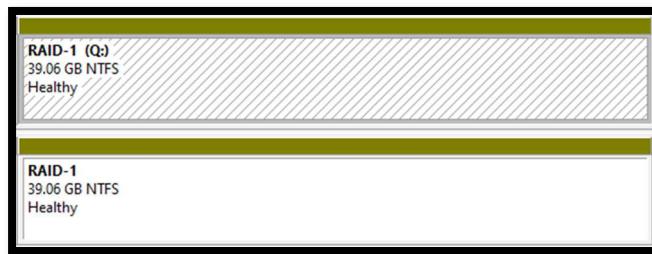


To finish, we are going to divide the mirrored volume into two independent simple volumes. Click on disk 1 with right button of the mouse and choose “**Break Mirrored Volume**”.

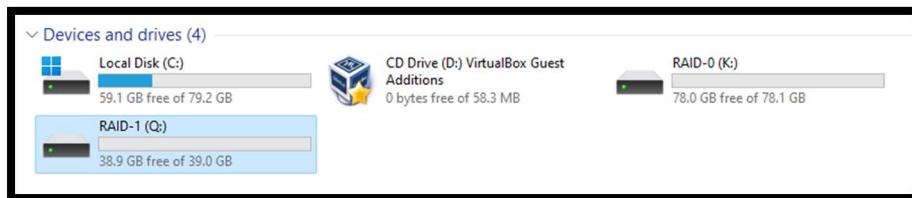




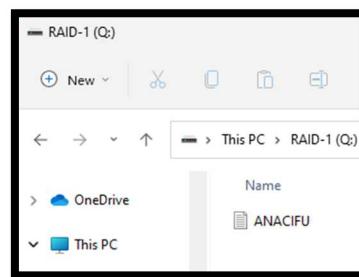
One of the disks is not part of the volume Q:\.



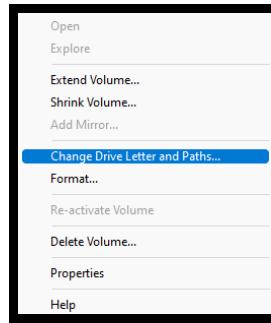
As you can check, the volume Q:\ has not disappeared.



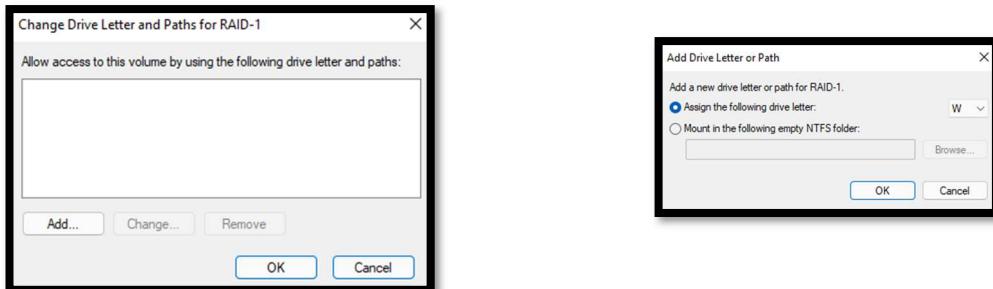
Nor does the created file disappear.



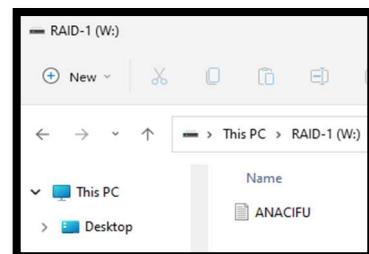
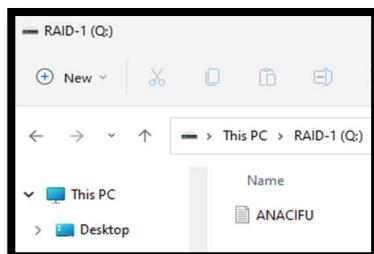
After that, right-click on disk 2 in order to create the new drive letter and choose "**Change Drive Letter and Paths**".



Add the drive letter W:\.

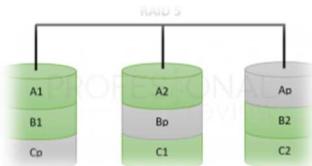


Finally, you can check that you have three volumes and the file appears in Q:\ and W:\ drives.



Disk 1	RAID-0 (K3) 39.06 GB NTFS Healthy	RAID-1 (Q3) 39.06 GB NTFS Healthy	1.87 GB Unallocated
Disk 2	RAID-0 (K3) 39.06 GB NTFS Healthy	RAID-1 (W3) 39.06 GB NTFS Healthy	1.87 GB Unallocated

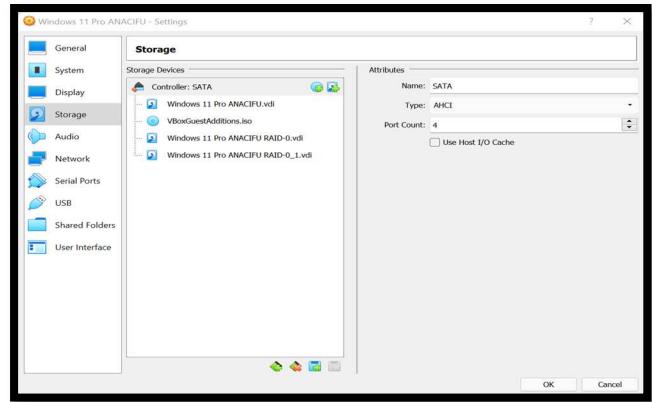
D. RAID-5



Also called the distributed parity system. This one is now used more often specifically on NAS devices. In this case the information is stored in divided blocks that are distributed among the hard disks that form the RAID. But it also generates a parity block to ensure redundancy and to be able to reconstruct the information in case a hard drive gets corrupted. This parity block will be stored in a unit other than the data blocks that are involved in the calculated block, so the parity information will be stored on a disk other than where the data blocks involved are.

In this case, we will also need at least three storage drives to ensure data redundancy with parity, and only one drive at a time will fail. If two are broken simultaneously, we will lose parity information, and at least one of the data blocks involved. There is a RAID 5E variant where a backup hard disk is introduced to minimize data reconstruction time, if one of the main fails.

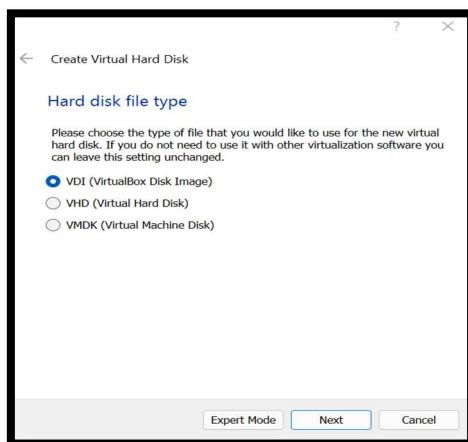
First thing you have to do is add three more disks. Now, in **Settings->Storage->Controller Sata->Add Hard Disk**, we create the hard disk and do the same with the second and third hard disk.



Click on “Create” button.



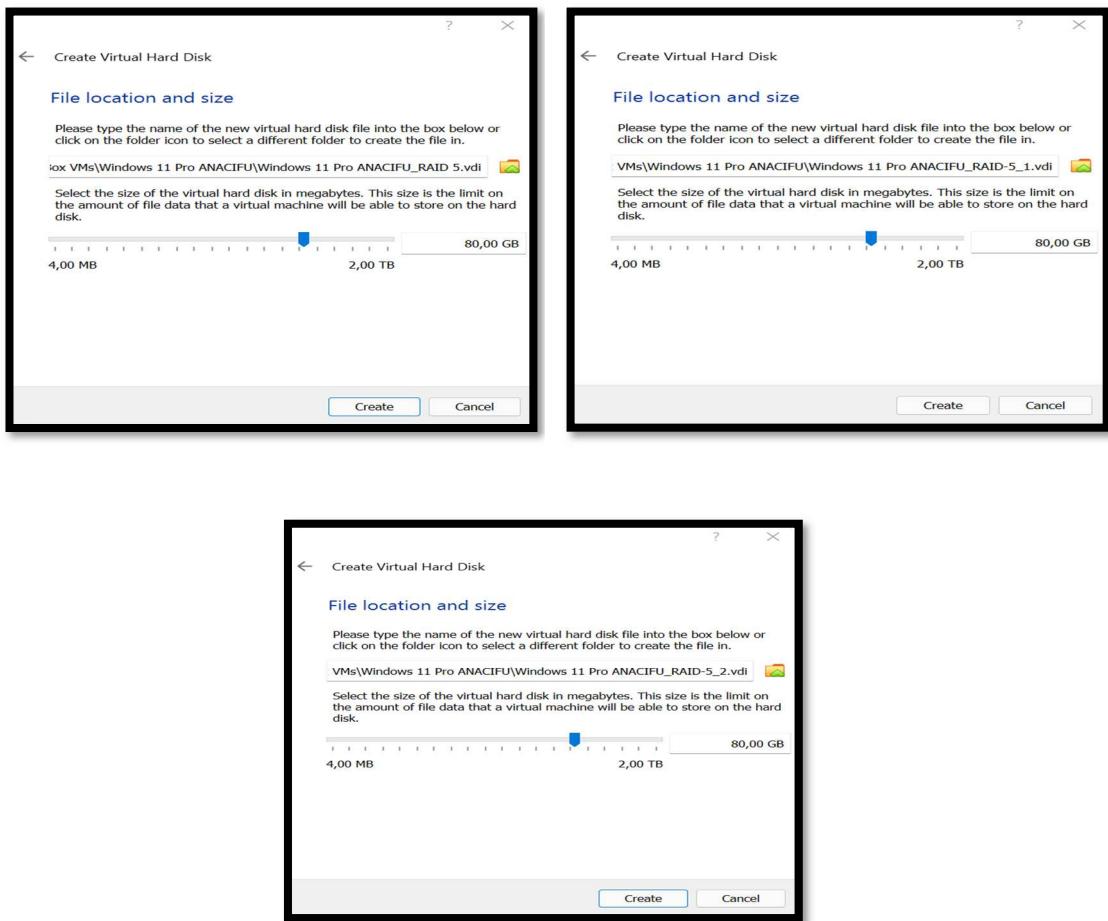
After that, you need to create an image of the virtual hard disk virtual machine (VDI). In addition, the VDI file is used to copy, create or restore the contents of the disk drive to a new virtual machine. Then click on “Next” button.



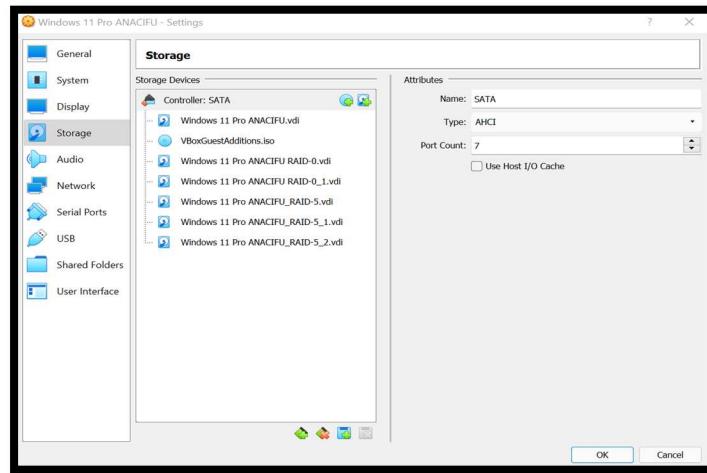
... And “dynamically allocated” in order not to waste storage. Click on “Next” button.



Finally, you have to choose the file location, the name and hard disk size. Click on “Next” button.



This is how the storage of our virtual machine is now shown.



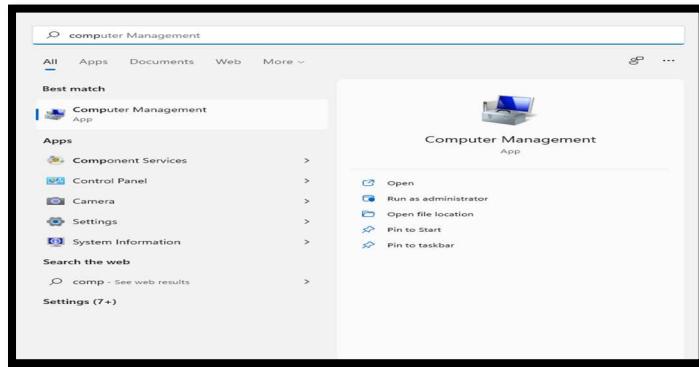
Once the machine is started, you access to the “Computer Management” by clicking on the Windows 11 **menu->search**.



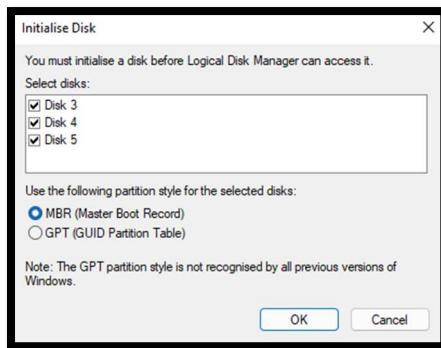
Click on search button and write “Computer management”.



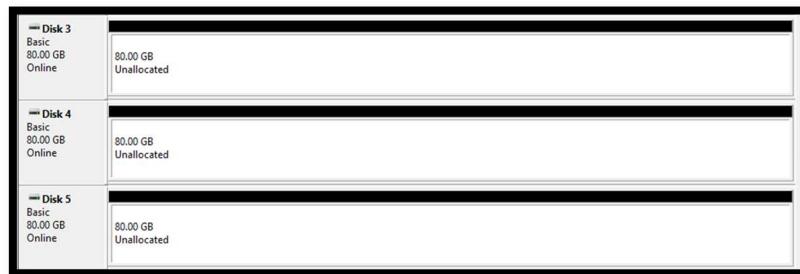
When you open the computer management, you have to choose the storage option and then "Disk Management" to view the disks.



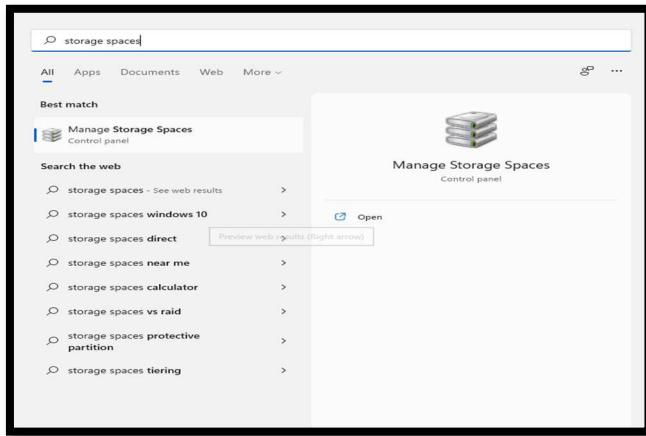
When you are inside of "Disk management" initialise three of new disks and click on "OK" button.



Now, you can check new disks.



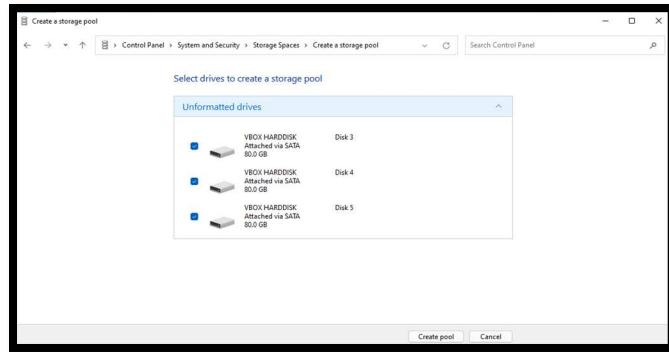
Once the previous steps have been done, we must now access the tool «Manage storage spaces», which we can enter through the Windows Control Panel, or by typing it in the search bar.



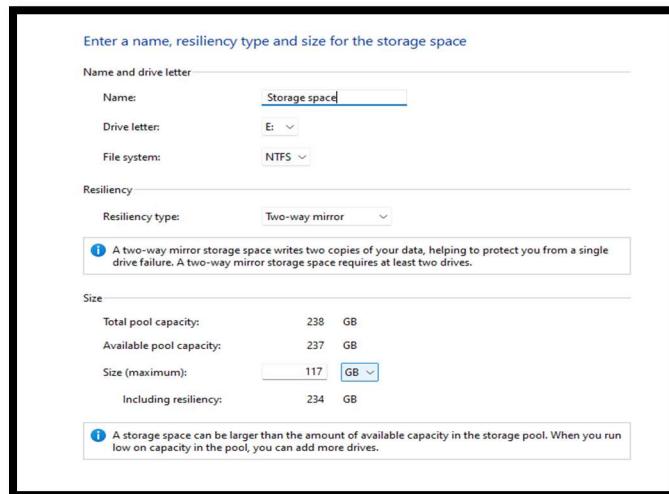
Once inside, click on "**Create a new group and storage spaces**".



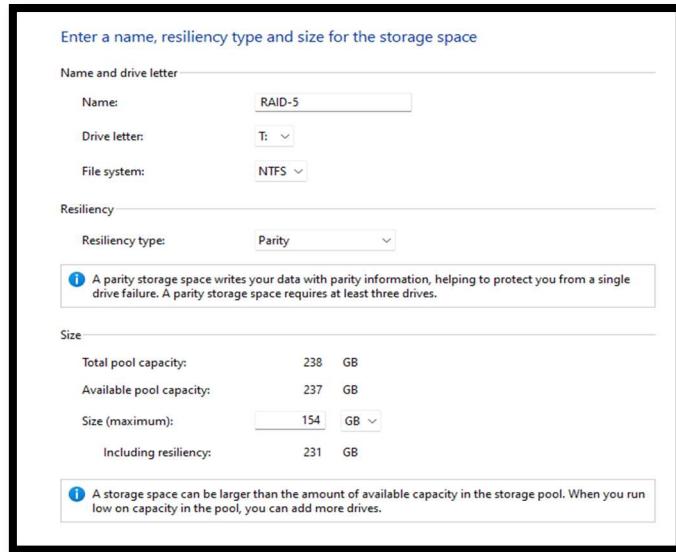
Next, we will get a wizard in which we will have to select the disks that we want to use. Remember that they should be of the same size preferably, although nothing happens if they are of different sizes but in that case, the volume capacity will depend on the size of the smallest.



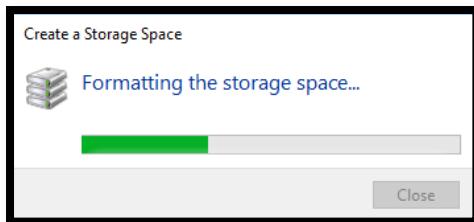
We simply select the disks we want to use and give it to «Create Space». A progress bar will appear indicating that Windows is configuring the storage space, and when it finishes a new window will appear asking us for several data.



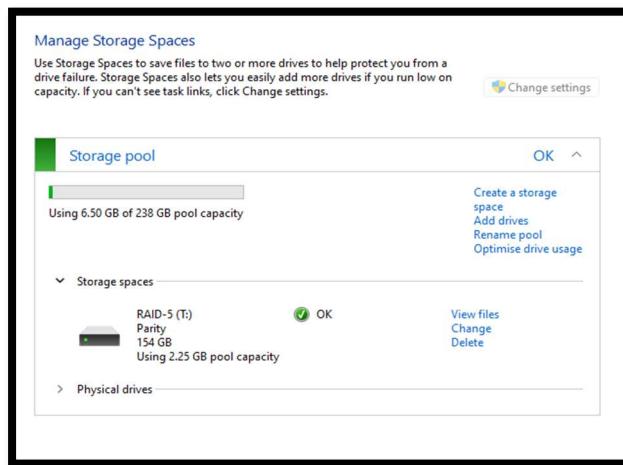
Change the name of the storage, the drive letter and choose NTFS file system. The system choose the amount of available capacity. Once this is done, click on Create storage space and the volume will be ready.



Now, is formatting the storage pool.



Now, you can manage your storage pool.

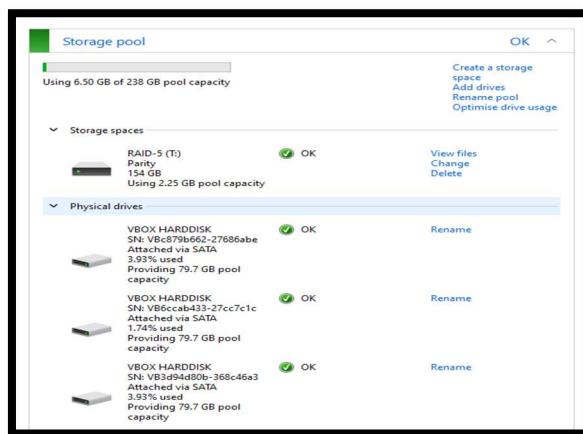




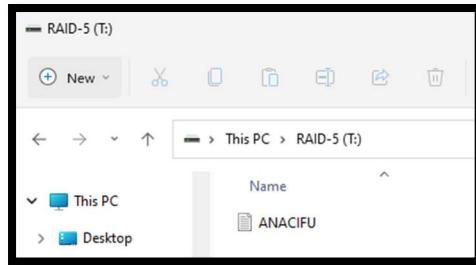
Now you can see in disk management that all three disks are part of one.



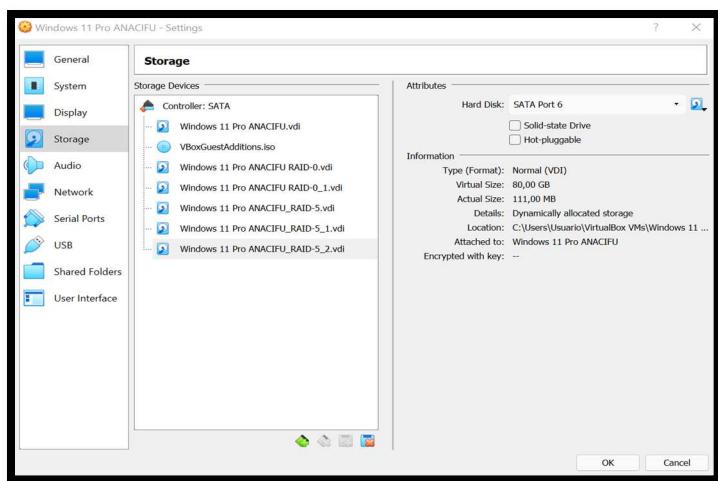
You can see that there are still three disks.



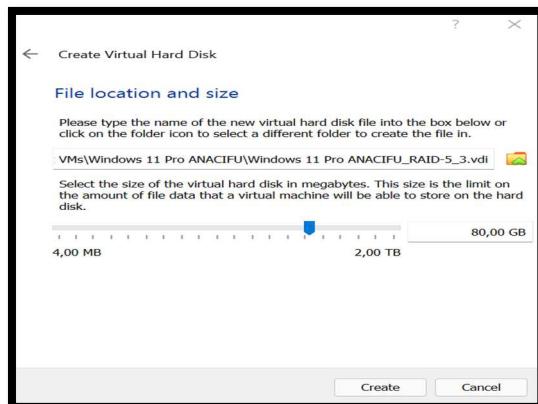
To check how it works we add a file to the Raid-5 volume.

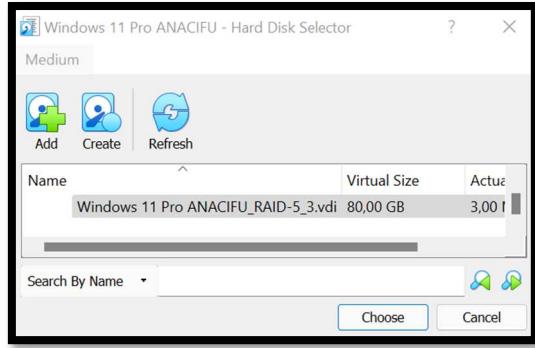


We now create another disk in the same way as explained above at this point in RAID-5.

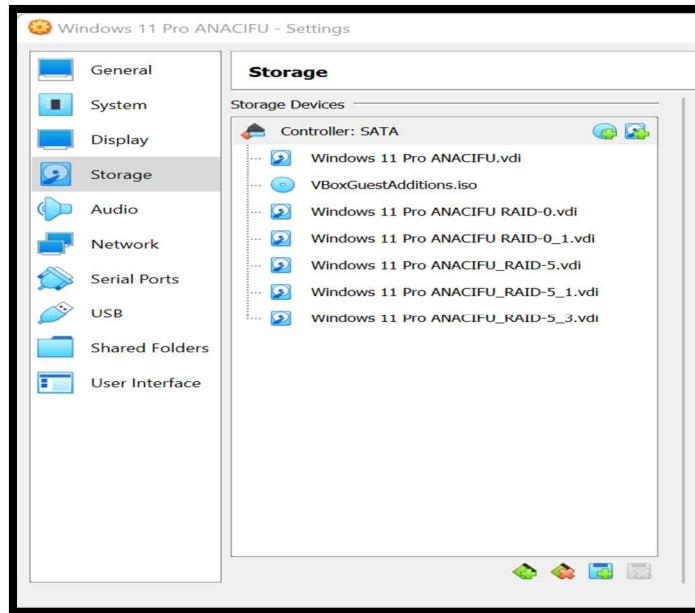


You have to choose the file location, the name and hard disk size. Click on "**Next**" button.





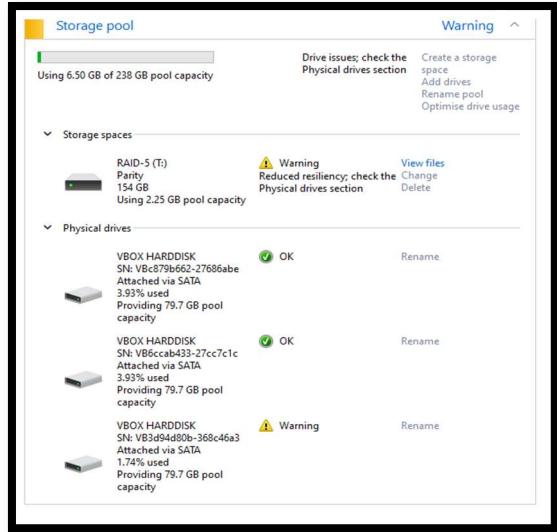
Now, you delete one of them.



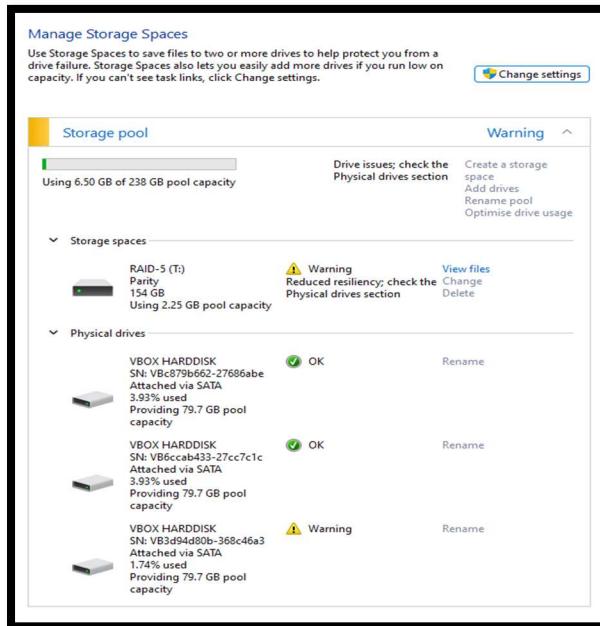
When you restart VirtualBox you can check that your storage pool appears.



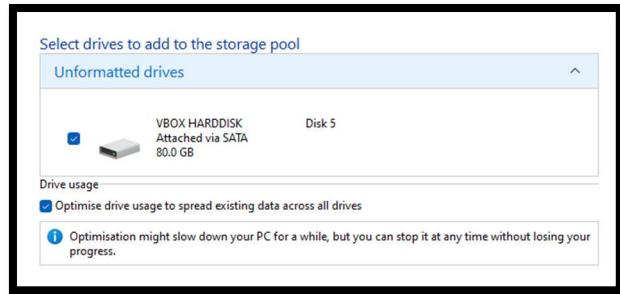
In storage spaces you can check the current situation, one of them is broken.



Now, click on “Change settings” button to make changes as administrator.



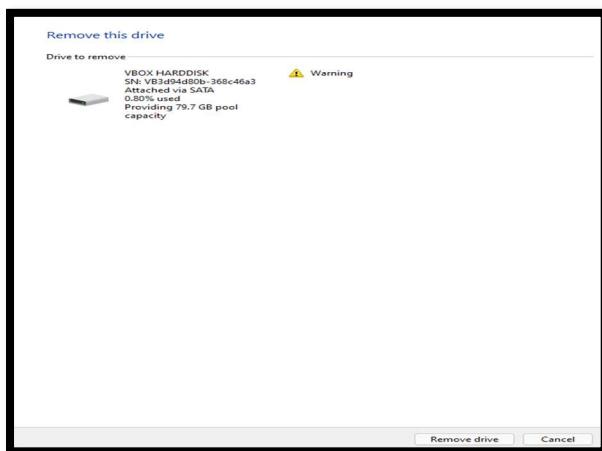
In this step, choose the disk that was ultimately created in order to fix the storage pool.

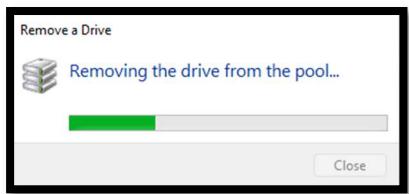


Now, remove the damage disk.

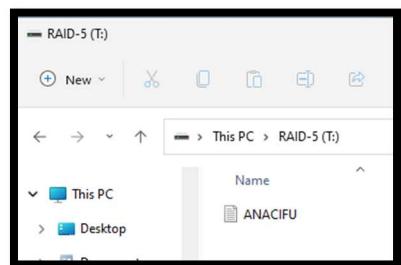
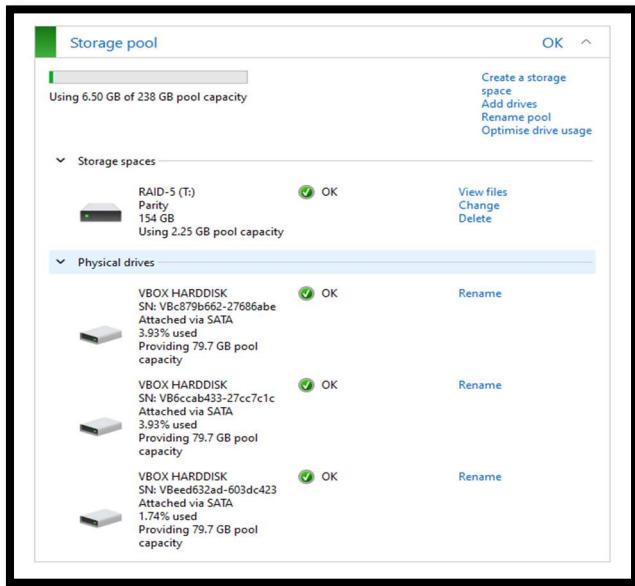
Drive	Status	Action
VBOX HARDDISK 1	OK	Rename
VBOX HARDDISK 2	OK	Rename
VBOX HARDDISK 3	Warning	Remove
VBOX HARDDISK 4	OK	Prepare for removal Rename

Click on "Remove drive" button.





This is your storage pool restored and the file is still in unit T:\.



A. Start menu

The main change to the new Windows 11 start menu is that it is no longer located by default on the left side of the taskbar. Instead, it is placed in the middle, and when you open it, the content is also displayed in the bottom center of the screen. Therefore, the start menu is totally focused on this version.

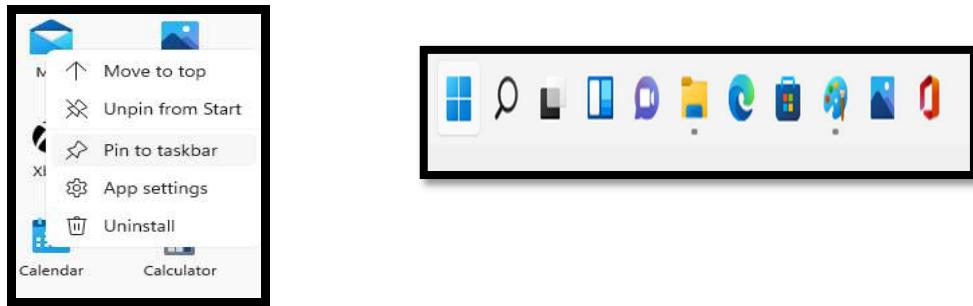


The content of the start menu has also changed completely. On the one hand, there are no application tiles as there were in Windows 8 and Windows 10, and instead we have a series of applications that you will be able to pin or unplug, but in which there is only one icon. This allows the start menu to be somewhat smaller and not occupy the entire screen.

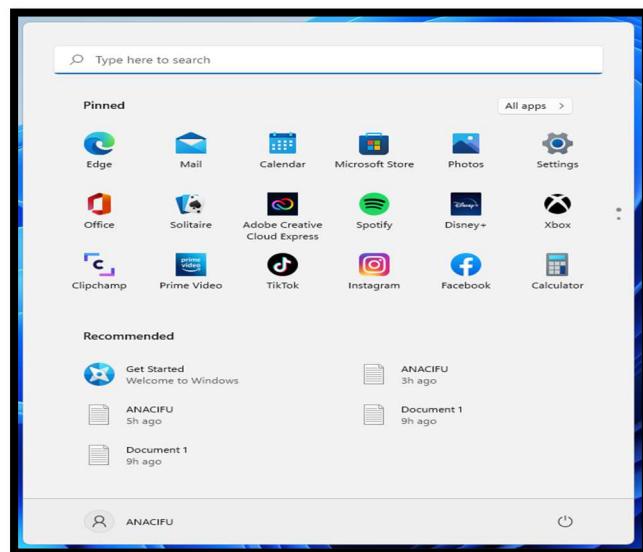
Below the three rows of anchored applications you can have, there is another space where you can have recommended files and documents or that you have recently opened, so that you always have them at hand. Do you remember that row of shortcuts that had the Windows 10 start menu on the side? Do not panic if by default only appears the button off, because these you will also be able to add.

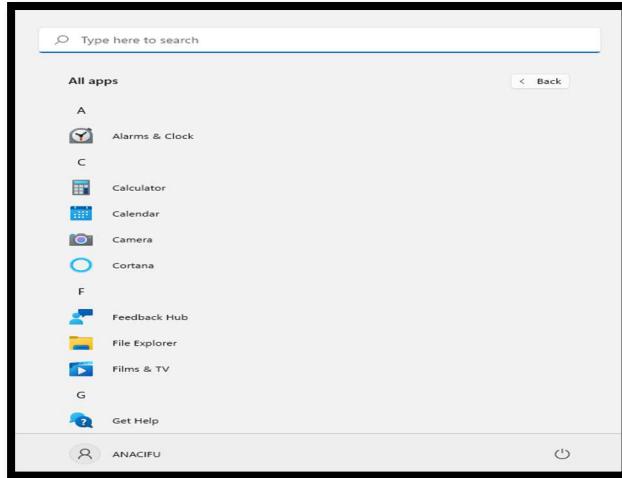


Right button on app, marking taskbar and anchored directly the icon to the taskbar.

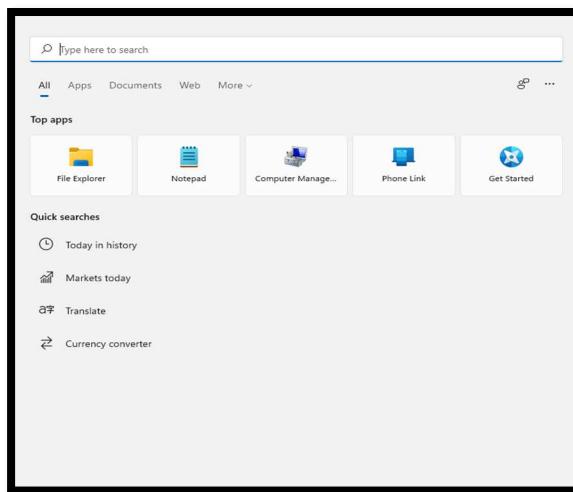


At the top left in the start menu you have the option of All applications. This will open the typical list with all icons of installed applications. In Windows 11 it is not always visible as in Windows 10, but the anchored applications are prioritized, and the rest is on that button.

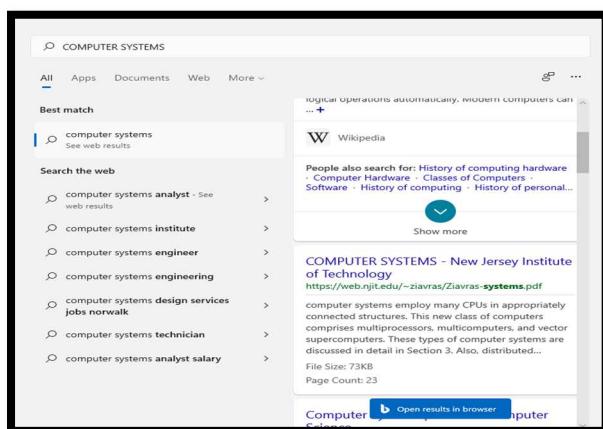


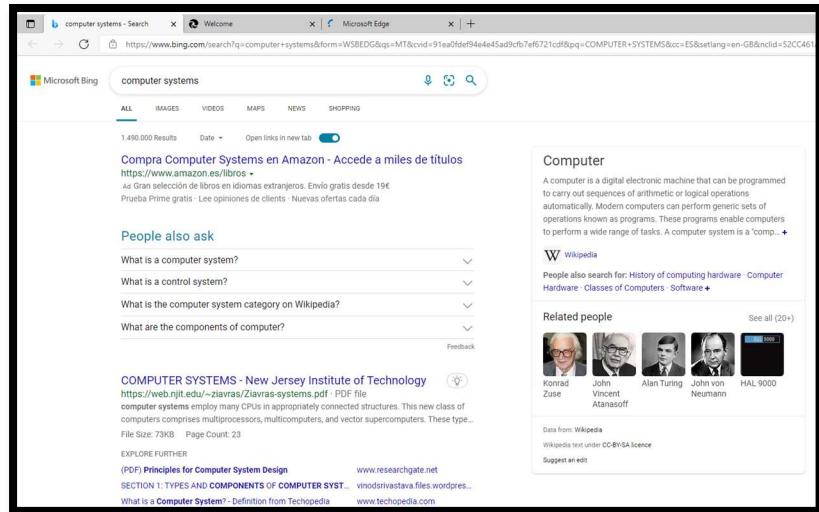


When you click on the search, it shows you this screen.



Once the search has been done, it shows you within that search the websites. Then, choose the website and Edge browser will open.

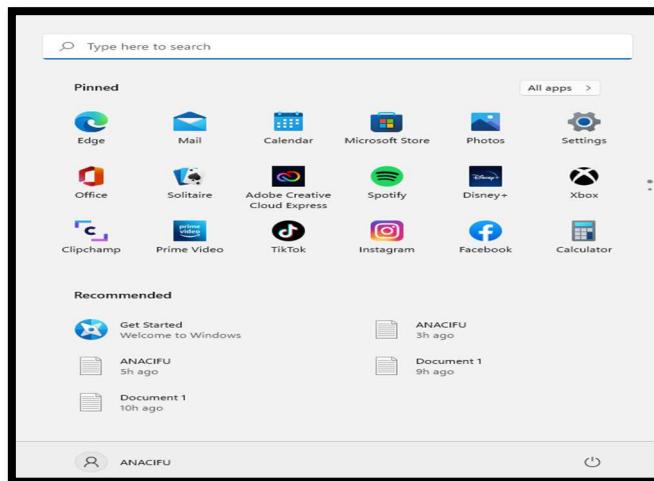


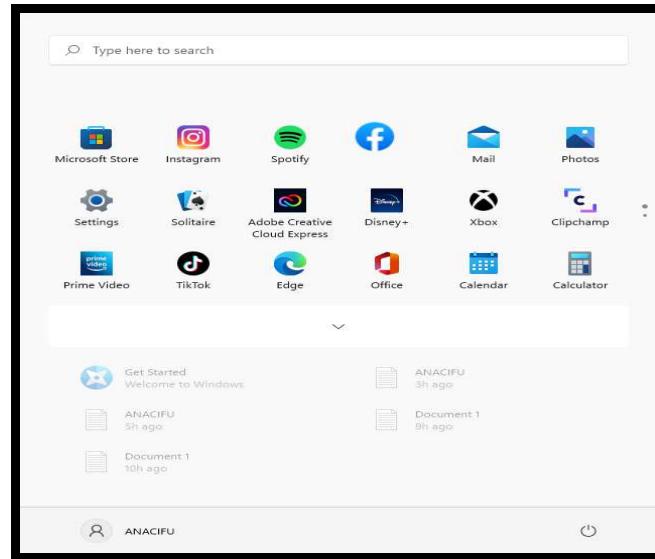


Otherwise, the start menu still includes the Windows browser. This means that if you press the Windows key on the computer keyboard, and immediately start typing, you will automatically go to the search function to find matches with what you type.

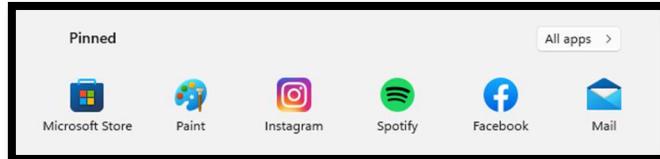
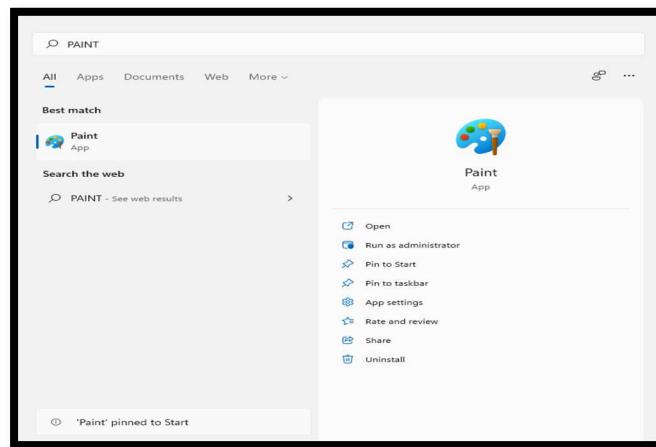
How to customize the Windows 11 start menu.

There are several ways in which you can customize the start menu to suit your taste. First, you can drag the anchored apps to place them in the order you want. With this you have total freedom, so that you can put first the ones you use most, or set the order you want.

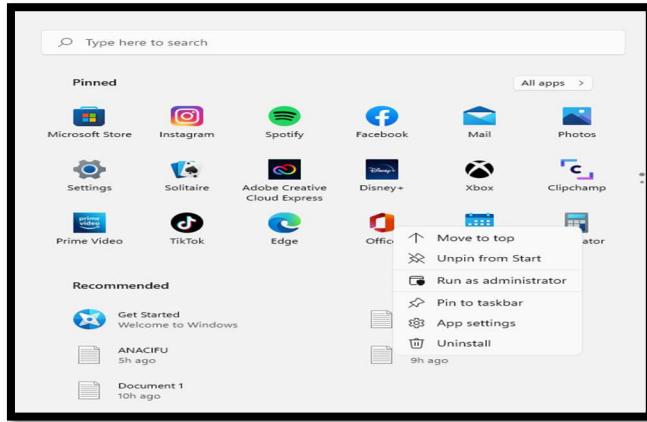




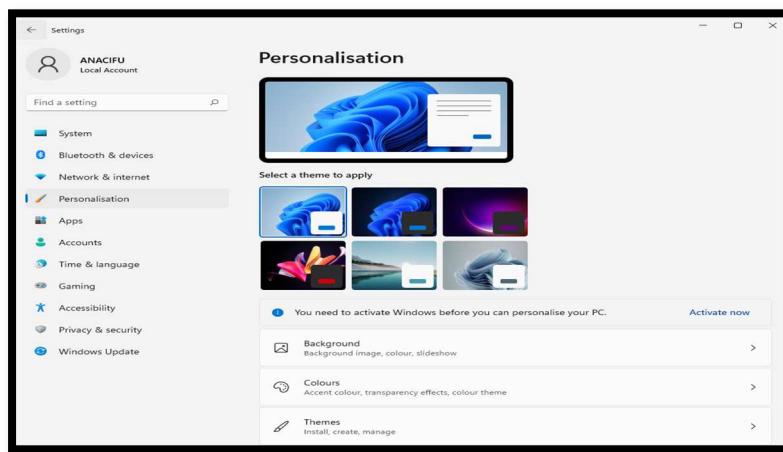
To add more, right-click on one of the apps in the All Apps list, and you'll see the Pin at startup option. With this option is how you can add applications from the list to those that appear anchored in the start menu.



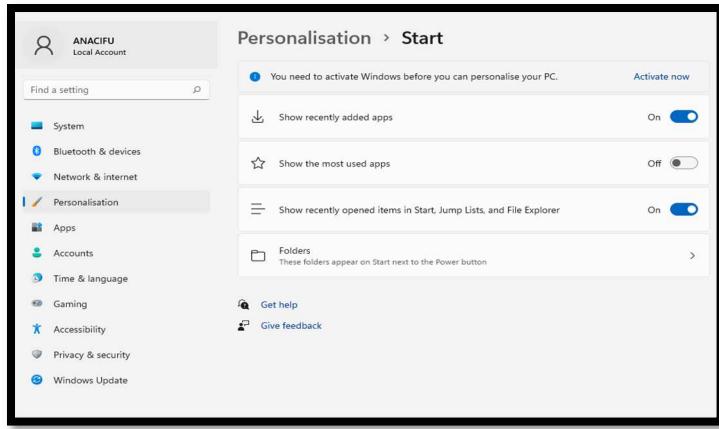
Also, if you right-click on one of the anchored apps, you'll see a context menu with other options. There are options to customize the menu, such as undoing them from the beginning or moving them to the top. However, you can also uninstall them to configure them or run them as a system administrator. You'll also be able to put them down on the taskbar to make them even more accessible.



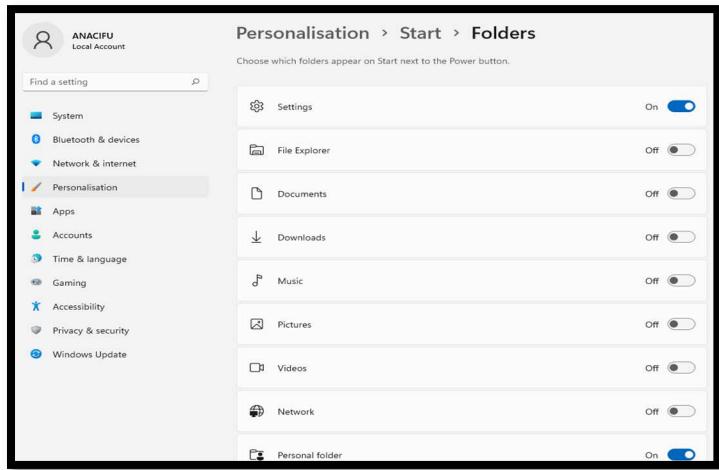
There are two other details that you will be able to configure from the start menu, although for this you will have to open the Windows configuration. Inside, click on the Personalization section (1), and once inside, click on the Start section (2). With this, you will enter the settings related to the start menu



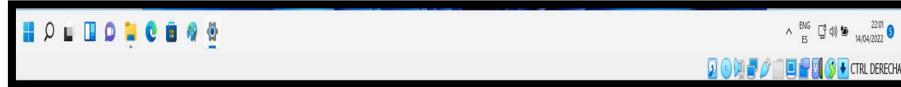
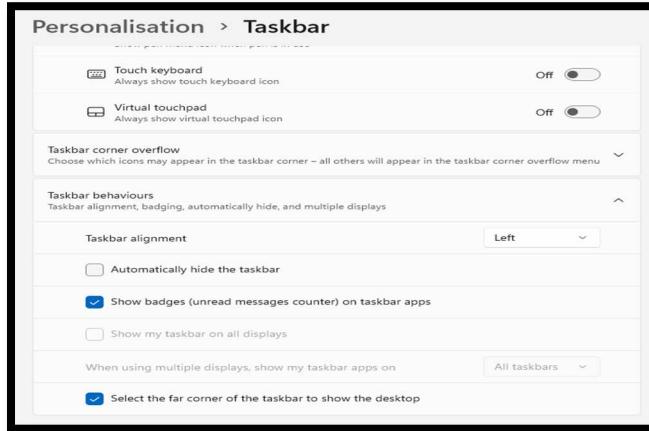
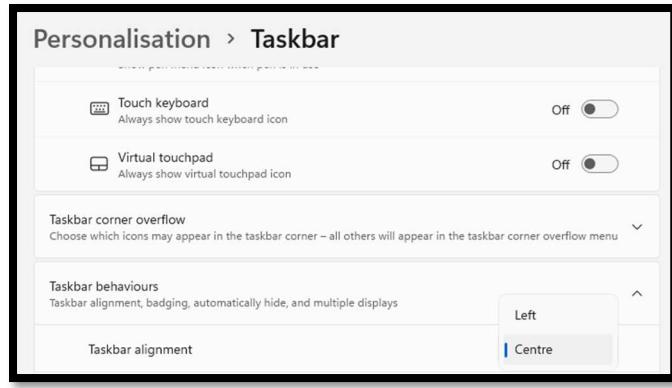
First of all, as soon as you enter the Start options, you can turn on or off the content you want to appear in addition to the applications that you have anchored. There are three types of content, from the most used applications to the recently opened elements. There is also a Folders section you can enter.



If you enter the Folders section, you can customize the items that you want to appear next to the Shut Down Windows button. You can put buttons for direct access to the settings, the file explorer, or folders such as music or images.



Finally, you can put the start menu on the left side of the taskbar. To do this, within the Customization section of the Windows configuration, you will need to enter the Taskbar section. There, open the Taskbar Alignment options, and you can choose between centered or left. Unfortunately, at the moment you can only hold those two positions.

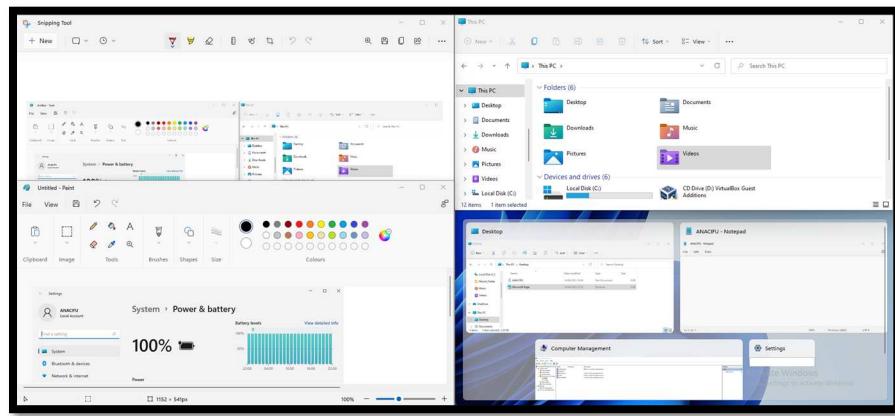
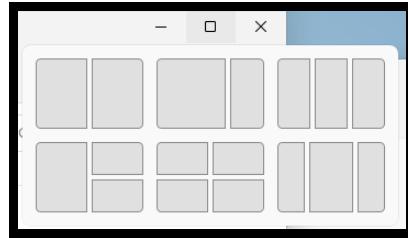


B. Split-screen

SPLIT-SCREEN SYSTEM WHEN YOU STAND ON THE TOP SQUARE OF A PAGE OPEN THE OPTIONS WITH DIFFERENT CONFIGURATIONS.

Windows has always been about helping you work how you want, by offering flexibility of multiple windows and the ability to snap apps side by side. New in Windows 11, we're introducing Snap Layouts, Snap Groups and Desktops to provide an even more powerful way to multitask and stay on top of what you need to get done. These are new features designed to help you organize your windows and optimize your screen real estate so you can see what you need just the way you want in a layout that's visually clean. You can also create separate Desktops for each

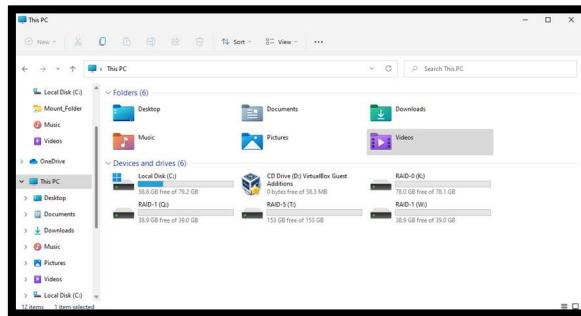
part of your life and customize them to your liking – imagine having a Desktop for work, gaming or school.



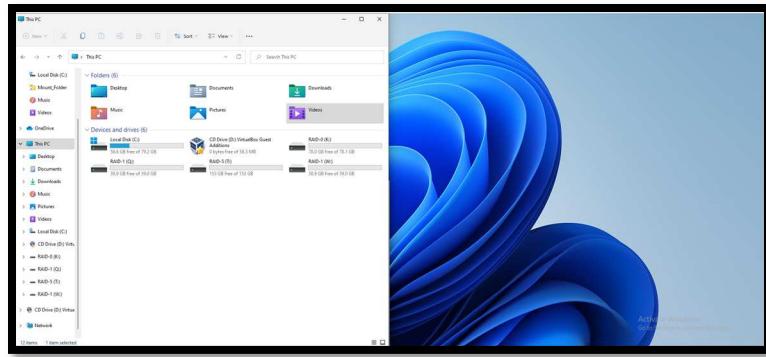
WINDOWS + M minimizes the screens. WINDOWS + MAY + M restores the screens.



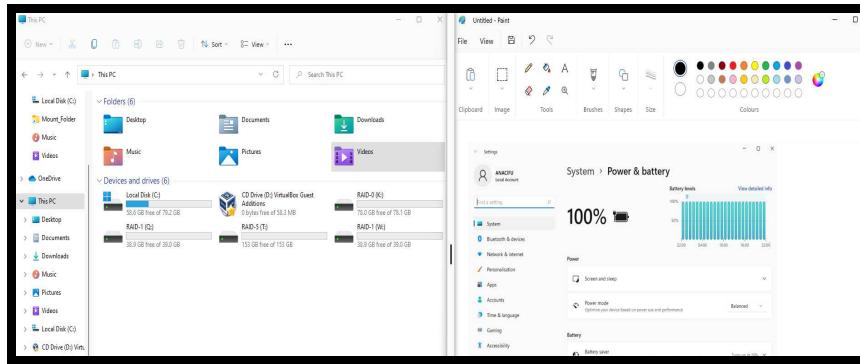
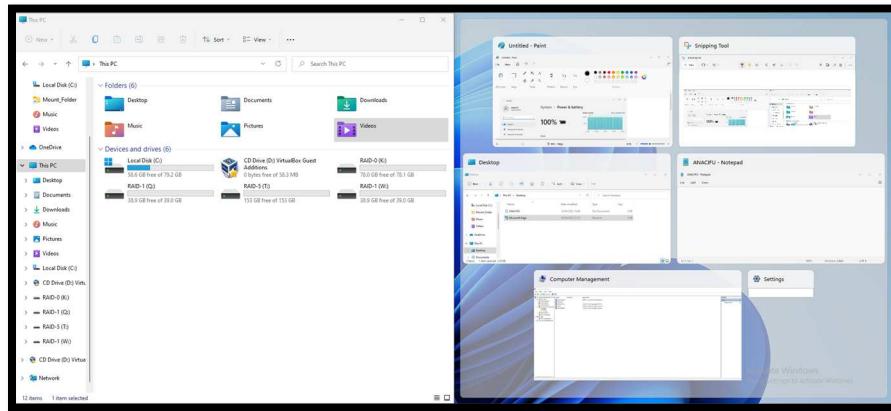
IF I MOVE IT TO THE UPPER MARGIN IT OCCUPIES THE ENTIRE SCREEN.

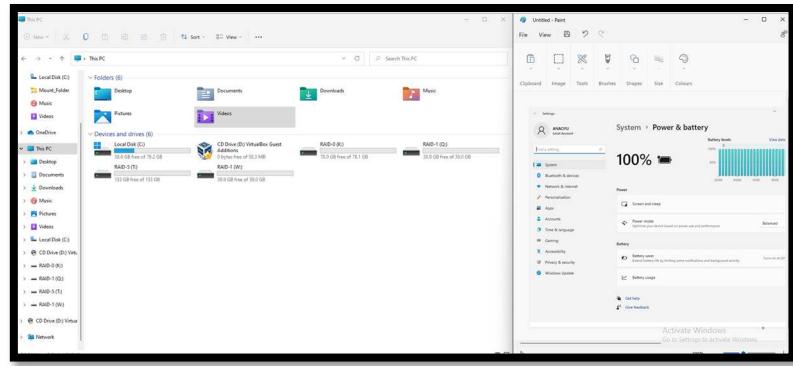


IF I MOVE IT TO THE MARGIN DCHO REOPENS THE SCREEN SELECTIONS.



IT SPLITS THE SCREEN IN TWO AND OCCUPIES THE ENTIRE SCREEN, AND THE DIVISION MOVES TO BOTH SIDES AND HOLDS THAT DIVISION WHILE YOU'RE WORKING WITH THAT SEPARATION.





Bibliography

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<https://www.profesionalreview.com/2019/01/24/tecnologia-raid/>
<https://www.ontrack.com/en-us/data-recovery/raid/raid0>
- Windows 11: <https://www.microsoft.com/software-download/windows11>
https://en.wikipedia.org/wiki/Windows_11
<https://blogs.windows.com/windowsexperience/2021/06/24/introducing-windows-11/>