

Computer Systems Virtual Machines



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1 Virtualization

Virtualization is the creation of some technological resource, such as: a computer, an operating system, a storage device, etc... This resource can be created by specialized software or set of them.

Virtual machines are emulated hardware. This emulation is made by specialized software; and its resources are provided for the computer. So, the real computer is called the host, and the virtual machine is called the guest. This emulated device will work as a real computer. The main benefit for using virtualization, is that if something goes wrong, you can get rid of it without affecting your real computer.

Some virtualization software is Virtual Box, VmWare, Virtual PC, Parallels, JavaVM...

Benefits of virtualization:

- Cost reduction: Save energy, resources, space, emulating old computers.
- Better security: Try an OS before installing it in a real machine, easy to backup
- Use several OS at the same time.
- Emulate a different kind of computer (with another set of instructions).

Drawbacks of virtualization

- Cost increases at the beginning
- Lower performance

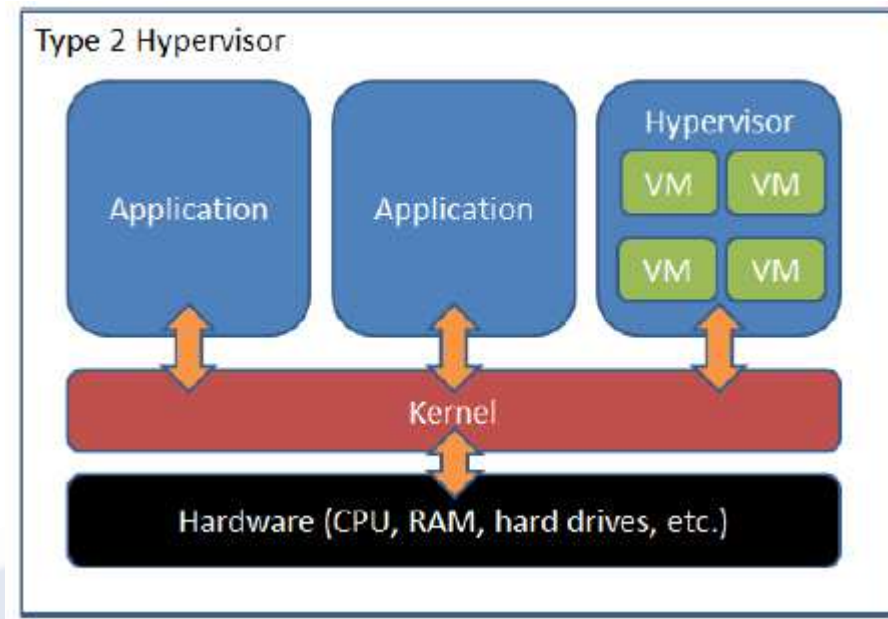
2 Kinds of Virtual machines

There are 2 kinds of virtual machines according to their functionality:

- System Virtual Machines (SVM): each virtual machine executes an operating system on a hardware replica of the real computer. This way several virtual machines with different operating systems can work together. The software in which it allows virtualization is called hypervisor. There are two kinds of hypervisor a:

The first hypervisor runs directly on hardware

The second hypervisor runs as an application on the OS host. We are going to use this kind of hypervisor with the Virtual Box program.



- Process Virtual Machines (PVM): this kind of virtual machine is executed as an application. The main example of this kind of virtual machine is known as the Java virtual machine.

3 Virtual Box

Virtual Box is a powerful free tool in order to virtualize. Furthermore, it is an easy tool to set up in Windows, GNU/Linux, IOS, etc. Additionally, Virtual Box is a software supported by Sun Microsystems and they offer frequent updates.



3.1 Download and installation

In order to get Virtual Box, you can access the web site <https://www.virtualbox.org/wiki/Downloads>. You must choose the package depending on your platform. This includes perform, windows, GNU/Linux, IOS, Solaris, etc.

VirtualBox 6.0.12 platform packages

- [Windows hosts](#)
- [OS X hosts](#)
- [Linux distributions](#)
- [Solaris hosts](#)

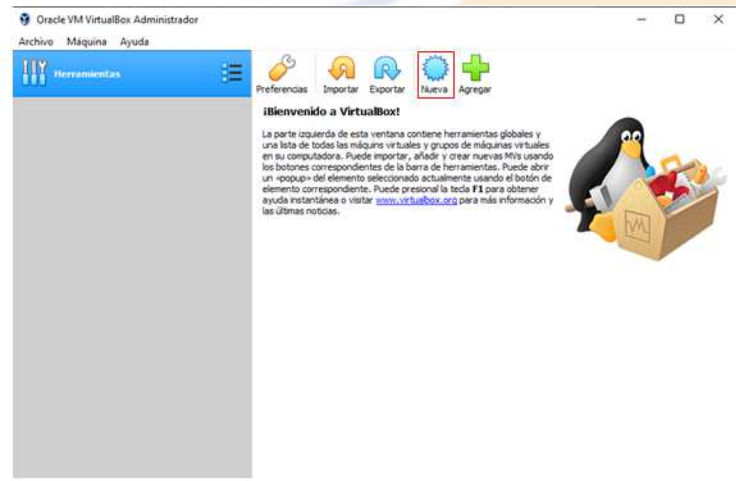
Once downloaded and set up, you must download 'Extension Pack'. This package helps in order to provide a good integration of the USB in your virtual machine.

VirtualBox 6.0.12 Oracle VM VirtualBox Extension Pack

- ➡ **All supported platforms**

3.2 Creating a Virtual machine

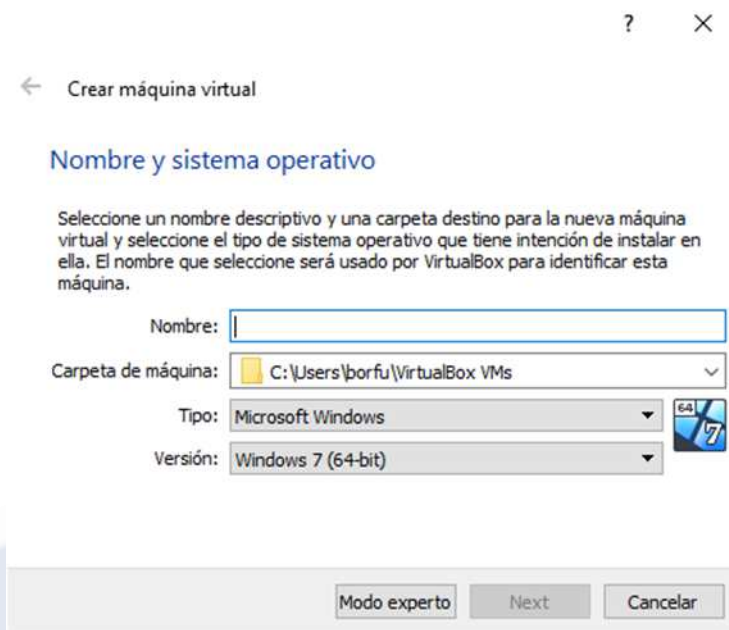
When Virtual box is started, we can watch one aspect of it as the following picture indicates:



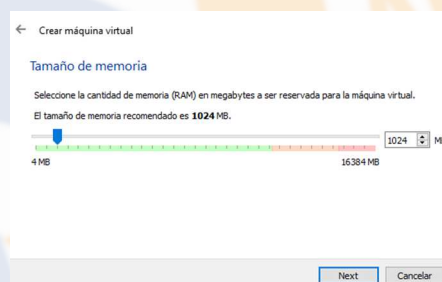
In order to make a new Virtual machine, you can push the icon in the red square, or you can go to the top menu and push 'Máquina' in order to select New... as well. So, once you choose this option, a wizard will be introduced. From there you follow the given steps to build your virtual computer.

In the first step you must:

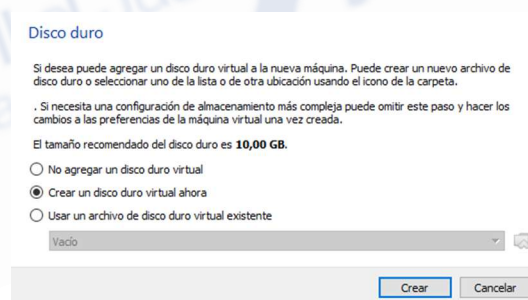
- Choose a name for your virtual machine
- Choose the destination of all the files of your virtual computer
- What kind of operating System is going to be set up
- Version of this operating System.



We will move onto the second step in which it describes memory features. First, we must make sure about the requirements of the Operating system which is going to be set up.

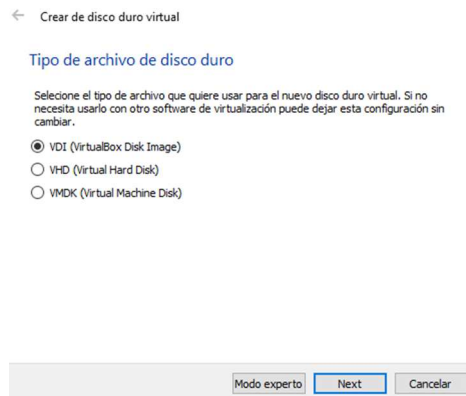


In the next step, we will choose what hard disk is going to be used. We can choose either one. You can make a disk at this time or choose to create one later. Normally, we can choose the second option.



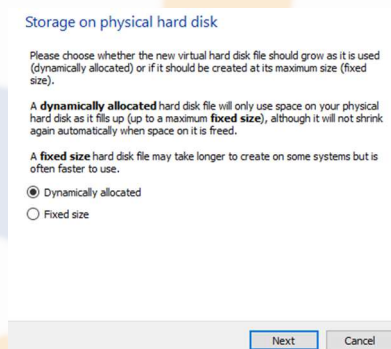
The following Virtual Box step give us the possibility to choose what kind of disk we have:

- The first possibility (VDI), is the extension if you are going to use this hard disk just for Virtual Box
- Second one, (VHD), this format was created by Microsoft Virtual PC
- Third one, (VMDK), is used in other software in order to virtualize it as VMware.

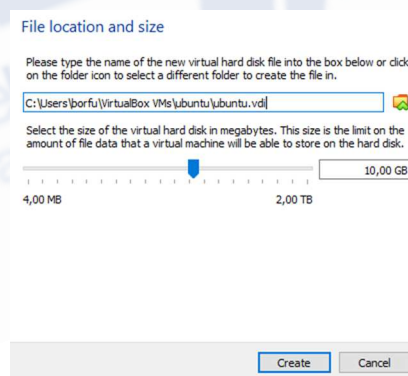


Once this kind of hard disk is chosen, we have to choose how the hard disk is going to be stored in our computer. We have 2 possibilities:

- Dynamically allocated: just use the virtual disk space in your computer as it fills.
- Fixed Size: fixed size of disk books in your computer. It may be faster to use.

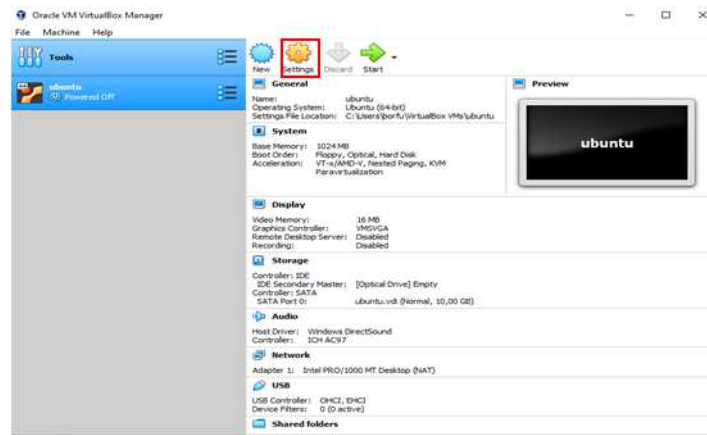


Eventually, in the last step we will choose the size of our hard disk. We always have to bear in mind the requirements of the operating system that we want to set up.



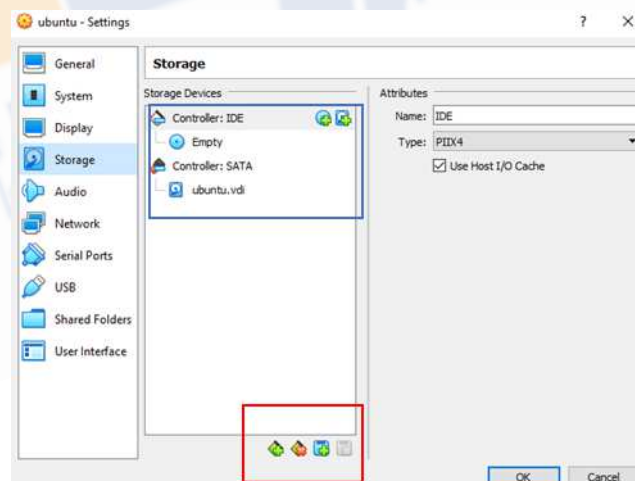
3.3 Settings of the virtual machine

After creating our virtual machine, we just have a machine with the features of memory, hard disk and the like. But it is interesting to know that we can change some hardware features. In order to do this, we must press the button shown, which is in the next picture with a red square.



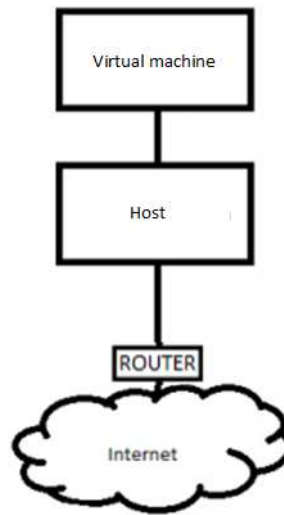
Then, a new window is opened. Some of the most interesting options are:

- General: you can find some information about your virtual machine; such as name, operating system, and the version of it. Besides, you can set up the snapshots of your virtual machine in the next tab. Snapshots allow you to save a particular state of a VM. This can be handy when you want to test something, or you're about to make a change to that VM and you need to be able to go back to a working instance. Not only does this save you a lot of headaches, but it can be a serious time-saver.
- System: you can set up features of your system including memory, boot order, chipset, processor...
- Display: in order to choose and set up features of your video memory, graphics controller...
- Storage: in this option, it is possible to add another hard disk or even an optical drive. As you can see in the next picture, you can add new optical storage, hard disk or controller with the options pointed out in the red square. The blue square points out your drives you're using.

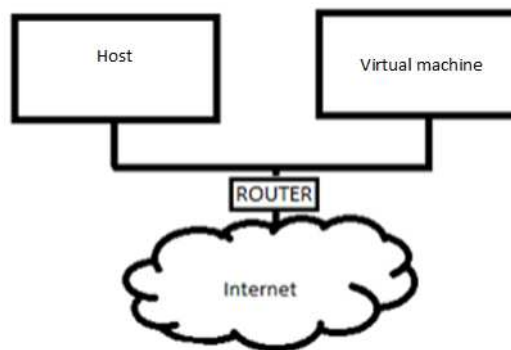


- Network: here, it is possible to choose the kind of network connection for your virtual machine. The available possibilities are:
 - Non-attached: in this mode, VirtualBox reports to the guest that a network card is present, but that there is no connection

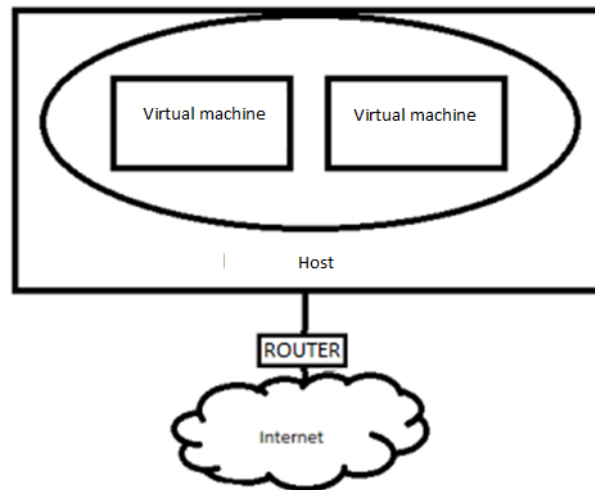
- NAT: it enables a basic connection. As a general rule, NAT (Network Address Translation), was created to solve the limitation IP problem. So, the virtual machine will receive an address from a virtual server. However, it is the virtual firewall who establishes the connection. To sum up, it is a basic connection; and eventually the firewall establishes the connection. This connection is enough to surf the Internet, check you mail, and download files.



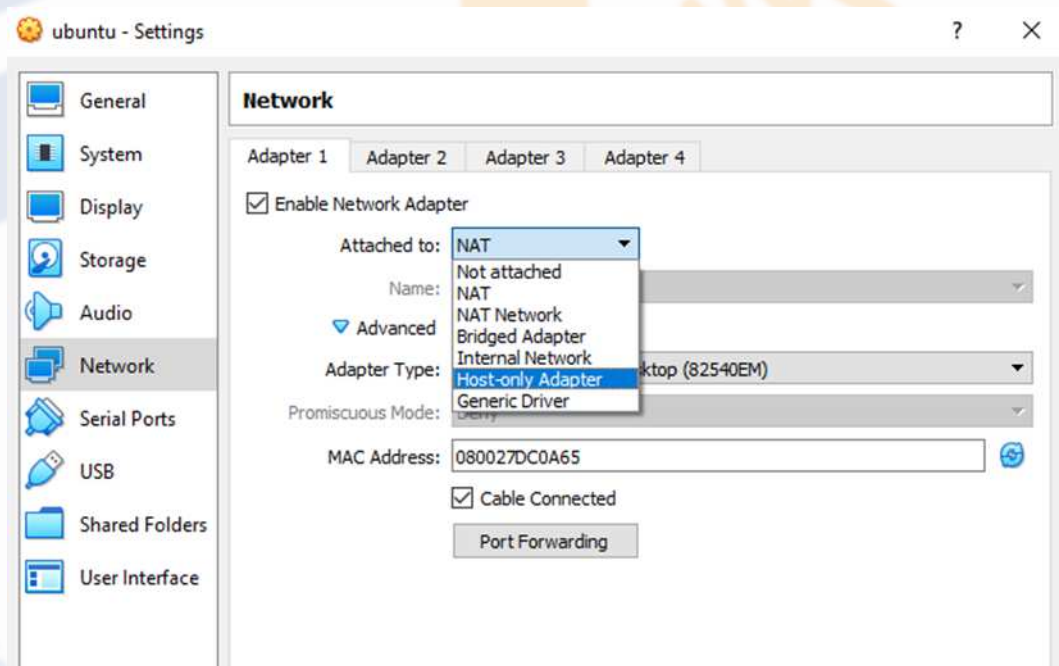
- Bridge Adapter: this is for more advanced networking needs such as network simulations and running servers in a guest. When enabled, VirtualBox connects to one of your installed network cards, and exchanges network packets directly. Therefore, circumventing your host operating system's network stack.



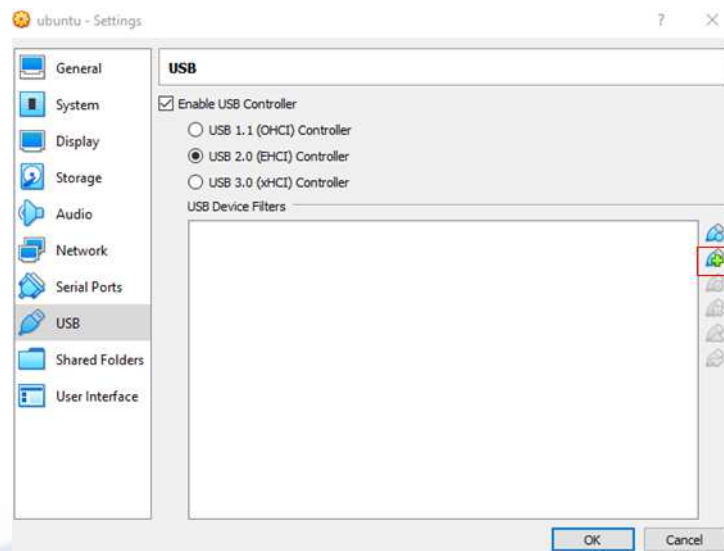
- Internal Network: this can be used to create a different kind of software-based network which is visible to selected virtual machines. However, not to applications running on the host or to the outside world. This connection is used when you wish to create a private net.



- Host only-Adapter: this option points out that the virtual machine has a network card, but it is not connected. This connection is used in virtual machines with a network card already set up.



- USB: in this option, it is possible to add a USB drive to your virtual computer in order to be able to use it in your virtual machine. The icon should be pressed, pointing out with a red square, and the option to select your USB device.

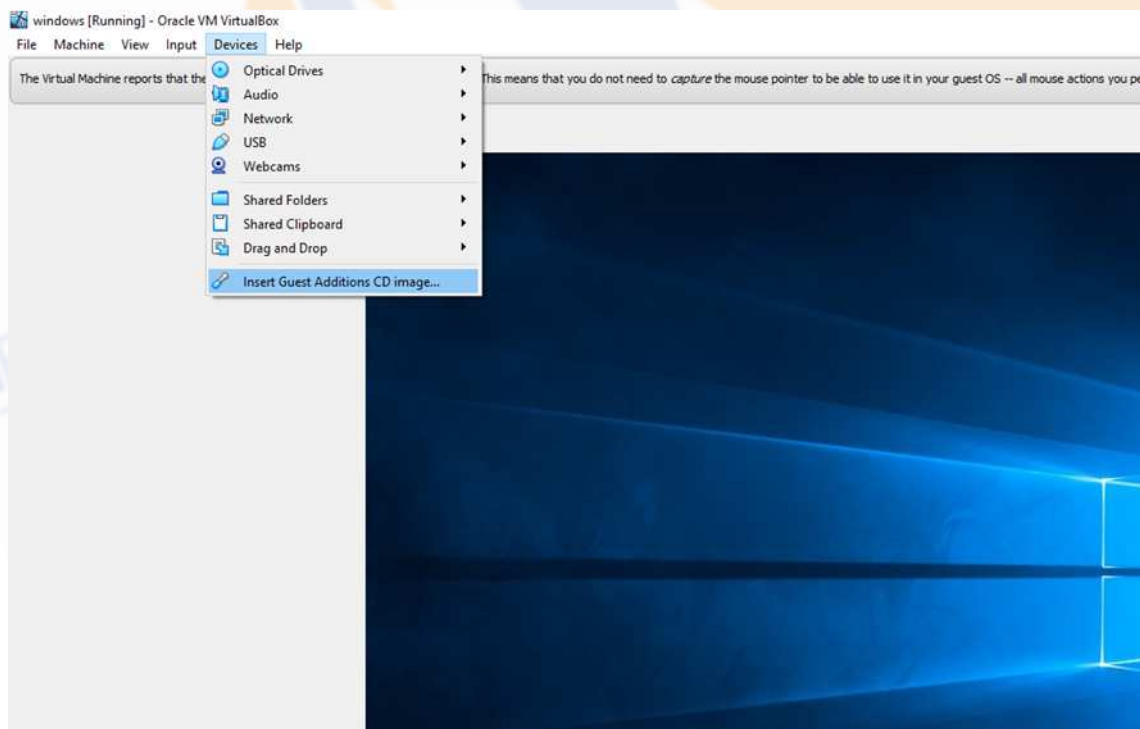


3.4 Guest additions

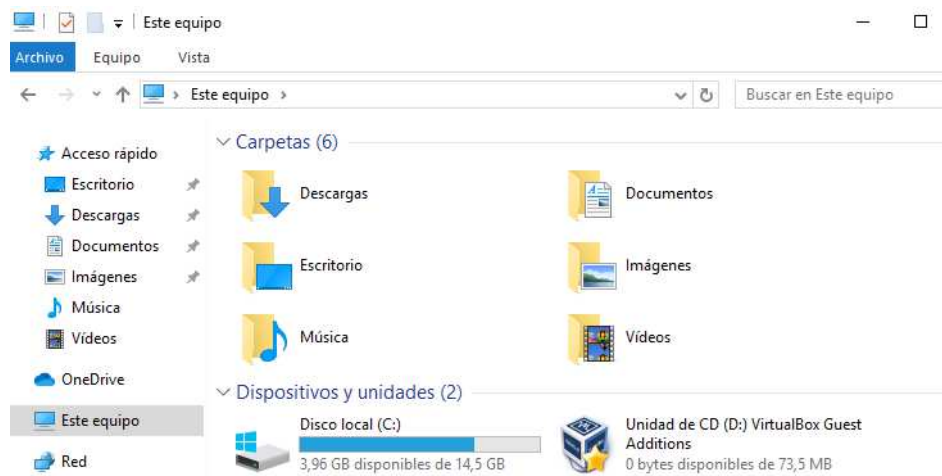
The Guest Additions are designed to be installed inside a virtual machine after the guest operating system has been installed. They consist of device drivers and system applications that optimize the guest operating system for better performance and usability.

For any serious and interactive use, the VirtualBox Guest Additions will make your life much easier by providing closer integration between host and guest; and improving the interactive performance of guest systems. The Guest Additions offer better video support, shared folders, mouse pointer integrations, etc.

In order to install guest additions in your virtual machine, you have to click in the upper menu of the Virtual Box software. Device \Rightarrow Insert Guest Addition CD image.



Then you must execute the virtual drive mounted of guest additions in your virtual machine.



3.5 Import and Export virtual machines

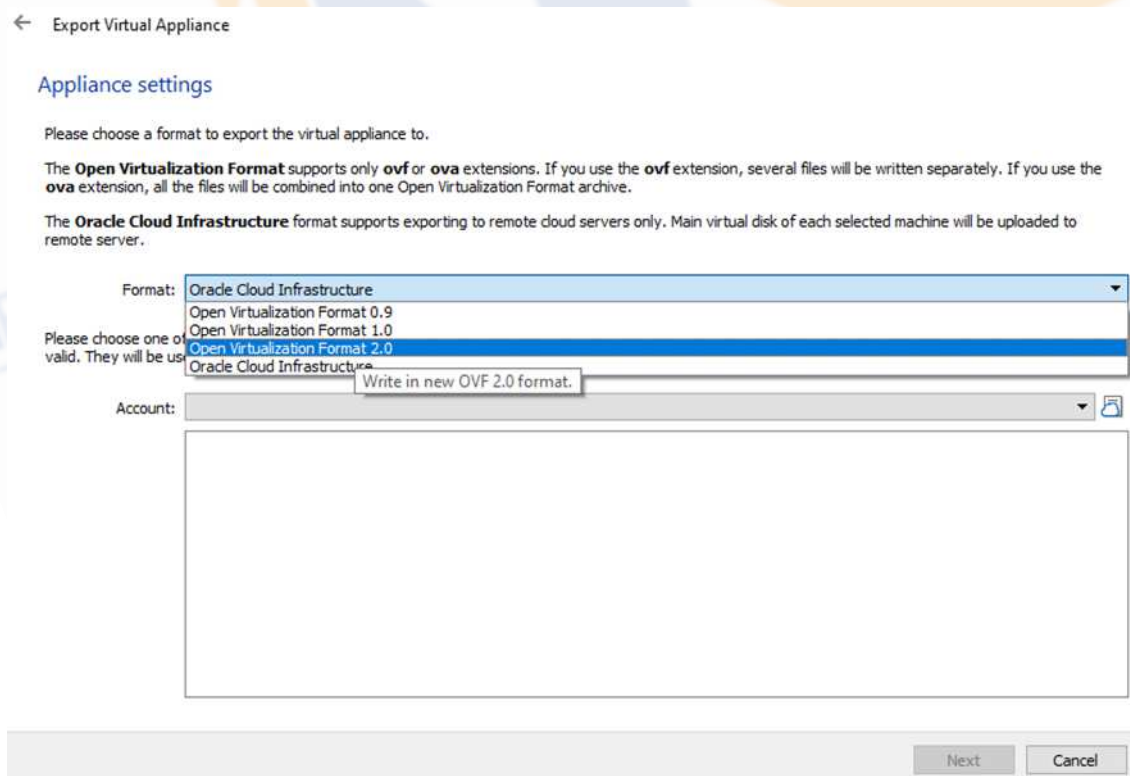
Exporting virtual machines is a tool in order to move virtual machines between the computer in an easy way. This is an exact copy of the virtual machine. One of the benefits of this tool is that you have the same configuration of this virtual machine. The file created is with ova extension.

Importing is the opposite process. When you have an ova file, (exported virtual machine), importing will let you execute this virtual machine in the virtual box.

The process is very easy.

3.5.1 Export

Exporting should be made with the virtual machine turned off. From the shortcut menu MV ⇒ Export, and now we choose Open Virtualization Format.



In the next window, Virtual Box offers you a descriptive information of your ova.

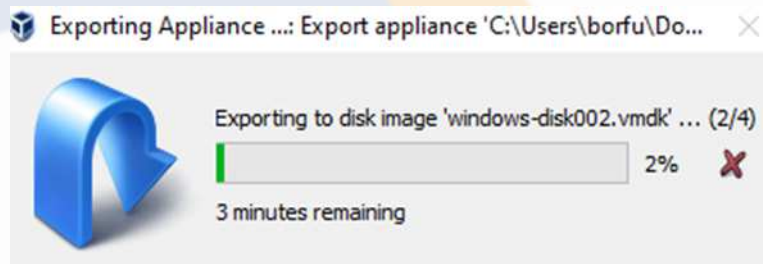
Virtual system settings

This is the descriptive information which will be added to the virtual appliance. You can change it by double clicking on individual lines.

Virtual System 1	
Name	windows
Product	
Product-URL	
Vendor	
Vendor-URL	
Version	
Description	
License	

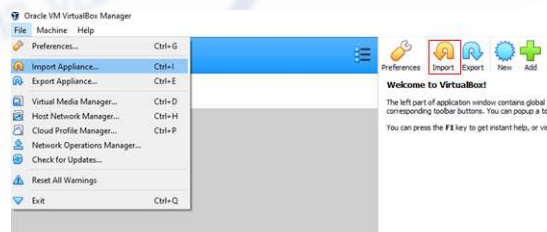
Restore Defaults Export Cancel

The next step shows the progress of the process.

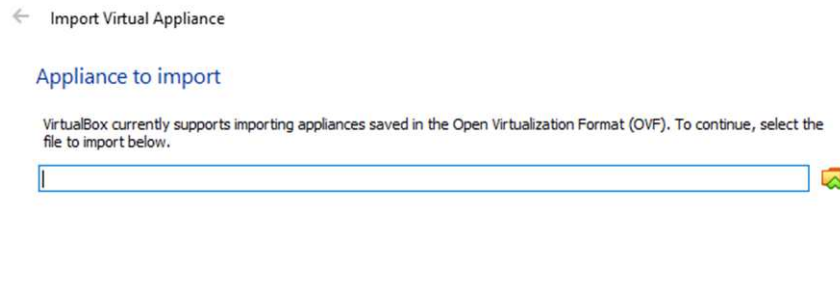


3.5.2 Import

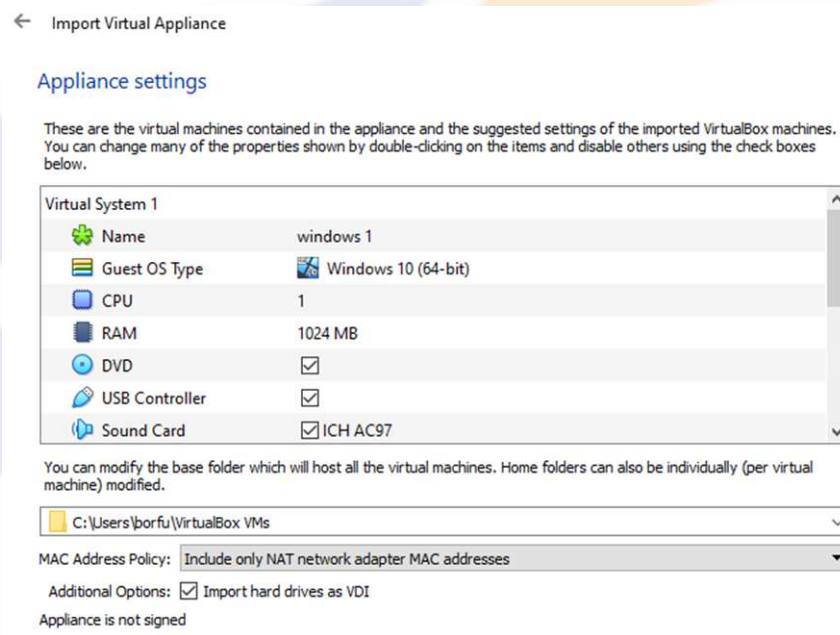
To restore a virtual machine from the ova file, we can choose from the upper file Import Appliance or from the icon with a red square in the picture.



The next step, you should choose the ova file.

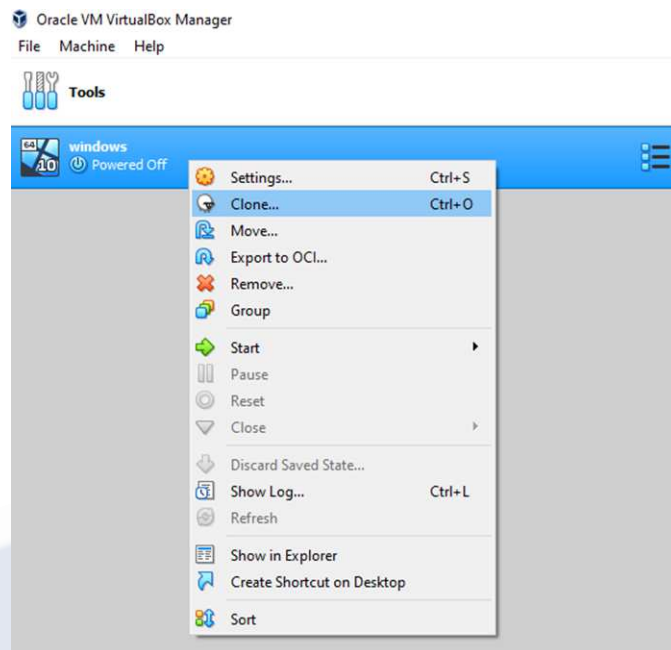


Once the ova file is chosen, a new window is opened in order to choose the properties of this new virtual machine.

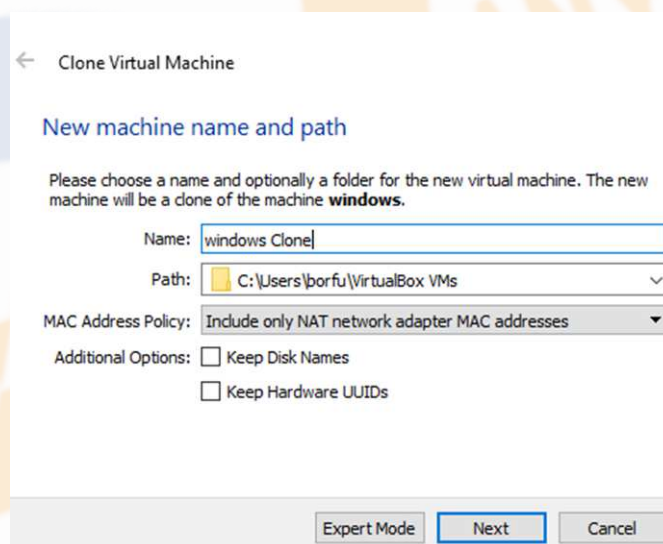


3.5.3 Cloning virtual machines

The aim of cloning in virtual machines is making a new copy of it. The reason behind this is for having a copy of your virtual machine in case your original machine gets bad. The difference between cloning and making a copy is that both machines (original and cloned) could work in the same host. For this reason, when Virtual Box is making a cloned machine, the id numbers of the hard disks are changed. Normally, cloning is made after installing the operating system and guest additions. Cloning should be made with the virtual machine turned off. We can clone from different places. One of them is from the shortcut menu MV \Rightarrow Clone.



A new window is opened in order to give it a name



In the next step we can choose between Full done and linked done. Normally full done is chosen in order to be able to move the new cloned virtual machine to another computer.

