

Using VirtualBox Virtual Machines for COMP Courses

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What is a Virtual Machine?

A **Virtual Machine** is simply an installation of an Operating System (Such as Windows, Linux, Mac OS) onto what is called a Virtual Host. A Virtual Host (in our case our Windows lab machines) is a real physical computer running a piece of software (in our case, VirtualBox) that *pretends* to be a physical computer. It provides *virtual* processors, (CPUs), RAM, Hard Drives, Network Cards, Networks, and even DVD Drives etc, just a like a real physical computer would. The installed operating system does not even know it is running on a *virtual* computer.

The great advantage of this is you can run many *virtual machines* (VMs), on a single real physical computer – which has many benefits, including these few examples:

- You can play with many operating systems safely on your single computer. And the VM has no impact on the physical machine on which it is running. Even a catastrophic failure has no impact on your real computer's operating system.
- You can run a whole lab of VMs on a virtual network to perform network related testing without actually risking the real network.
- You can offer many customized VMs to run different operating system with different services... Hey! That's exactly what we are doing in the SCS labs. By using VMs specialized for particular courses, we can provide an optimal learning environment, without over-loading the main Windows operating system (real physical computer) with huge numbers of potentially conflicting applications. It also allows courses to use any operating system that is most suitable (many of our VMs use the Ubuntu Linux distribution)

Instructions for working in the SCS Computer Labs

These instructions explain how to access the Virtual Machine (VM) for your particular course

1. Login to any scs lab computer with your student account
2. Open Virtual Box by:
 1. Going to the **Start Menu** and start typing *VirtualBox* in the **Search Box**
 2. Browse for VirtualBox in the Start Menu's **Programs** folder
Going to the Start Menu -> Programs ->
3. In VirtualBox you will see a large list of VM for different courses. Click on the COMPXXXX course that applies to you. The Start Icon (Green Arrow) will now become active, and you can click it to start the VM
4. You can now login with the account provided by your instructor for the particular course.

NOTE: some of the VMs login automatically, so you do not have to worry about this.

NOTE: all the of the Ubuntu VMs have a default student account:

username: student
password: tneduts!

However, this default account may not be optimally setup, so please use the account provided by your instructor where applicable.

These instructions explain how to use the VM

- **IMPORTANT** – the VMs in the scs computer labs are *immutable*. This means when you shut the VM down, any changes, files created, etc **WILL BE LOST**. This includes even what you save on the desktop or in your *home* directory.

Obviously, it may be necessary to save some of your work, particularly code, notes, etc. To facilitate this, there are two shared folders (that can be found in the **SharedFolders** directory on the **Desktop**).

Z_DRIVE – provides a link to your Z:\ network drive on the scs computer network. This drive appears on any computer you login to on our scs windows domain. It has space limits and transfer over the network can be slow.

Temp – Provides a link to D:\Temp, a folder on the large D:\ drive partition that provides ample space to temporarily save data from your work on the Virtual Machine. However, you must remember to backup this data on your own USB device (or something like Dropbox) as it gets cleared periodically. This folder is also only accessible on this particular windows lab computer; your data will not be there when you login to a different computer (as is the case for Z:\ drive, which kindly follows you around).

- In Ubuntu, to open applications, simply click on their icons on the launcher on the left hand side (where icons have been created for commonly used applications for a particular course). Or click on the Ubuntu logo (on the top left of the screen at the top of the launcher), to open a search application that will find matching applications as you type what you want.

Instructions for working on your personal computer

NOTE: You must install an up-to-date version of **VirtualBox** and the **Extension Pack**. See the section below “*Instruction for installing VirtualBox on your personal computer*”

1. Login in to any scs lab computer with your student account
2. Save the Virtual Machine (VM) appliance (.ova file) onto your own computer (you'll need a USB device to get it, as at anywhere from 1 GB to 5 GB, they are a little big to send over the Internet to *DropBox* or something similar)

The VM appliances can be found here on the lab computer's hard drive:

C:\Support\COMPXXXX\COMPXXX.ova
Where **COMPXXXX** is your particular course

Alternatively you can download from this location:

<http://www.scs.carleton.ca/courses/downloads/COMPXXXX/COMPXXXX.ova>
eg: <http://www.scs.carleton.ca/courses/downloads/COMP2401/COMP2401.ova>

3. Copy the VM appliance (.ova file) to your Hard Drive from your USB device.
(Do not try to import or export directly to a USB device if you can avoid it as any communication interruption could cause the import to fail)
4. Open VirtualBox
5. **File -> Import Appliance** (or **CTRL-I**)
6. Browse to the VM appliance (.ova file on your hard drive) and select it
7. The VM will now appear in the VirtualBox list
8. Use the VM just as you would in the lab (see the previous section: *Instructions for working in the SCS Computer Labs*), with a few notable exceptions:
 1. This VM has the shared folders connecting to your Z:\ Network Drive (home drive) and D:\Temp removed. Obviously those shared folders are specific to our labs. You can add your own shared folders if you wish.
 2. You have complete control to modify this VM. In the lab we have to lock it down so that it cannot be damaged by a student and thus render it unusable for everyone else. On your own computer you can do whatever you want! And best of all, if you mess it up, you can simply import it again from the original VM appliance (.ova file) and start over.

The admin account gives you full administrative (windows) / root (linux) privileges:

username: admin
password: nimda!

Instructions for dealing with the “Hardware Virtualization” Error

Some computers may not have hardware virtualization technology turned on by default. This may cause an error to occur:

"VT-x/AMD-V hardware acceleration is not available on your system. Your 64-bit guest will fail to detect a 64-bit CPU and will not be able to boot."

1. Go into your computer's BIOS (by rebooting and pressing the indicated key, such as **F2** or **DEL** immediately – keep pressing it until you can into the BIOS... if you see your operating system starting, you waited too long!)
2. Look for an option in the various menus related to hardware virtualization. Make sure this option is **ENABLED**.

For Intel processors, this is typically called **VT-x** or **VT-d**

For AMD processors, this is typically called **AMD-V** or **SVM**

(or the BIOS may simply say *hardware virtualization* without the fancy acronyms)

3. Exit the BIOS by using the “**Save Settings and Exit**” or equivalent. This will restart your computer.

Instructions for exporting (saving) your Virtual Machine

You may wish to backup your Virtual Machine (VM) for safe keeping, copy it to another computer, or share it with a fellow student. This can be done by performing the reverse of the above import...

1. Ensure the VM is shutdown
2. Export VM appliance:
 1. **File** -> **Export Appliance** (or **CTRL-E**)
 2. Select the one you wish to Export, click **Next**
 3. On the **Appliance Export Settings** window, choose the **path** (location) and **name** for the appliance file. You can leave the various check boxes all *unchecked*.
Click **Next**
 4. A Summary will be displayed
Click **Export** (export will take 1-5 minutes depending on the size of the VM)
3. Backup VM appliance (.ova file) by saving it to a USB key or other location

Instructions for installing VirtualBox on your personal computer

The VirtualBox installation program can be downloaded from this [virtualbox.org](https://www.virtualbox.org/wiki/Downloads) site. Just make sure to download the one for your Operating System (Windows, Mac, Linux):

<https://www.virtualbox.org/wiki/Downloads>

1. The following websites provide clear instructions on installing VirtualBox. However, in principle, you just need to **double-click** the install program (that you downloaded from the website above) and follow the simple instructions.

These instructions will vary somewhat depending on your host computer (Windows, Mac, Linux, etc).

General instructions on the installation and setup of VirtualBox can be found here:

<https://www.virtualbox.org/manual/ch01.html#intro-installing>

With details for individual operating systems found here:

<https://www.virtualbox.org/manual/ch02.html>

2. Once VirtualBox is installed, you have to add the **Oracle VM VirtualBox Extension Pack**

Download it from <http://www.virtualbox.org/wiki/Downloads> (the link is right below the links you used to get VirtualBox itself).

Once downloaded, simply double-click the file and it will launch the installation that will include a couple steps

You can verify it was installed by opening VirtualBox and checking:

File -> **Preferences** -> **Extensions**