

Using VirtualBox Virtual Machines for COMP Courses

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Documented Created and Maintained by

Andrew Pullin
Acting Senior Software Designer
School of Computer Science
Carleton University

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Generic VM Accounts

Most SCS Virtual Machines (VMs) come with two accounts:

username: **student**
password: **tneduts!**

This is a regular user account that you can use for your assignments.

username: **admin**
password: **nimda!**

This is an administrative account that has full privileges (generally accessed via sudo). You can use this to install software, perform updates, enable and disable services, even hack at the kernel! Beware, you can destroy your VM if you are not careful!

NOTE: Some courses will setup their own special user account. Your instructor will give you this information if it applies.

What is a Virtual Machine?

A **Virtual Machine** is simply an installation of an virtual “guest” operating system (such as Windows or Linux) onto what is called a virtual “host”. A virtual host (in our case our Windows lab machines, or often your own personal computer or laptop) is a real physical computer running a piece of software (in our case, VirtualBox) that essentially *pretends* to be a physical computer so far as the virtual “guest” operating system is concerned. It provides *virtual* processors (vCPUs), 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.

This technology allows you to 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 (most of our VMs use the Linux distributions)

Using the Virtual Machine 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 usage and technical details of the VMs (in the SCS computer labs)

- **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 at times.

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 the case of an Ubuntu VM, 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.

Importing (opening) the Virtual Machine 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. Get the VM Appliance file (.ova file) for the VM you wish to import by either:
 1. Logging in to any SCS lab computer with your student account and browse to the following folder and copy the VM (.ova file) to a USB key:
D:\CourseVMs\
 2. Alternatively you can download from this location:
<http://www.scs.carleton.ca/coursevms>
2. Copy the VM appliance (.ova file) to your personal computer hard drive from your USB key
3. Open VirtualBox on your personal computer
4. **File -> Import Appliance** (or **CTRL-I**)
5. Browse to the VM appliance (.ova file) and select it and follow the instructions
6. The VM will now appear in the VirtualBox VM list
7. 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. The SCS VMs in the labs have shared folders connecting to your [Z:\](#) Network Drive (home drive) and [D:\Temp](#). Obviously those shared folders are specific to our labs. You can add your own shared folders if you wish.
 2. In the lab we have to lock down the VM so that it cannot be damaged by a student and thus rendered 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.

Exporting (saving) your Virtual Machine

You may wish to backup your Virtual Machine (VM) for safe keeping, to copy it to another computer, or to 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 the VM appliance (.ova file) by saving it to a USB key or other location

Dealing with the “Hardware Virtualization” Error

This error only occurs with 64-bit Virtual Machines. To avoid this error, SCS is usually only using 32-bit virtual machines, but there may be instances where a class will decide (or need) to use a 64-bit Virtual Machine, or you may decide you want to try one on your own.

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 enter 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.

If your CPU does not support the virtualization technology, you will not be able to run a 64-bit guest Virtual Machine.

Instructions for installing VirtualBox on your personal computer

The VirtualBox installation program can be downloaded from this [virtualbox.org](http://www.virtualbox.org) 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

Networking with the Virtual Machine on an SCS lab computer

If you need to do assignments with a networking component, the Virtual Machines (VMs) have been prepared to support a variety of network connections. Due to restrictions in the lab environment, the VMs are limited to communicating over a select number of ports via their NAT connection.

The NAT (Network Address Translation) allows a VM to connect to the wider network / internet using the network card and IP address of the host machine (in this case, a lab machine). You can determine the IP address of the host by performing the following command on a command prompt:

```
ipconfig | find "IPv4" | find "134.117.28."
```

This will pipe the results from ipconfig through a couple find commands that will grab the IPv4 address on subnet 28.

This firewall on the host machine has been setup to allow connections on the following port range:

TCP and UDP: 60,000 - 60,010

So, if you want to communicate from a VM on one lab computer to the VM on another, you will have to setup your application to communicate with the host's machine IPs on these particular ports.

On your own personal computer, you may wish the VM to accept a wider range of ports. The following website provides details on how to modify the network in a VirtualBox VM:

<http://www.virtualbox.org/manual/ch06.html#natforward>