

## The Math/CS 466/666 Linux Image in VirtualBox

This document explains how to install the Math/CS 466/666 Linux image onto VirtualBox to obtain a programming environment on your personal computer or laptop that is nearly identical to the one used in class. The only thing that will be missing is the Maple computer algebra system licensed for use only on computers owned by the University of Nevada Reno.

Before starting, it is useful to know how much RAM memory your computer has. In Microsoft Windows, go to the *Start Menu*, open the *Control Panel* and follow the menus

*Start Menu* → *Control Panel* → *System and Security* → *System*

to arrive at the system information display. In MacOS X use the menus

*Apple Menu* → *About This Mac*

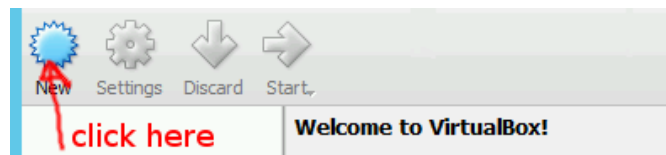
to get similar information. If your computer has 1 GB or less RAM, VirtualBox will not run well and the only alternative is to install Linux directly to the hardware. In this case the minimum hardware requirements can be relaxed to 512 MB RAM and 12 GB disk space. If you have such a machine that you would like to devote to exclusively running the Math/CS 466/666 Linux image, please let me know.

Assuming your computer has 2 GB RAM or more, download and install the version of VirtualBox suitable for your computer from the website

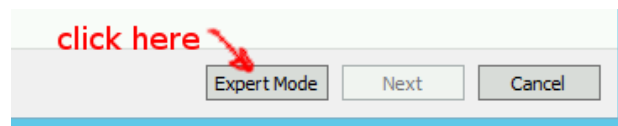
<https://www.virtualbox.org/wiki/Downloads>

There is no need to install any of the special network drivers or tools. The minimal install is sufficient. After installing VirtualBox, we need to create a virtual machine.

Launch the VirtualBox application and create a new virtual machine by clicking on *New* from the welcome page



and then clicking on *Expert Mode*.

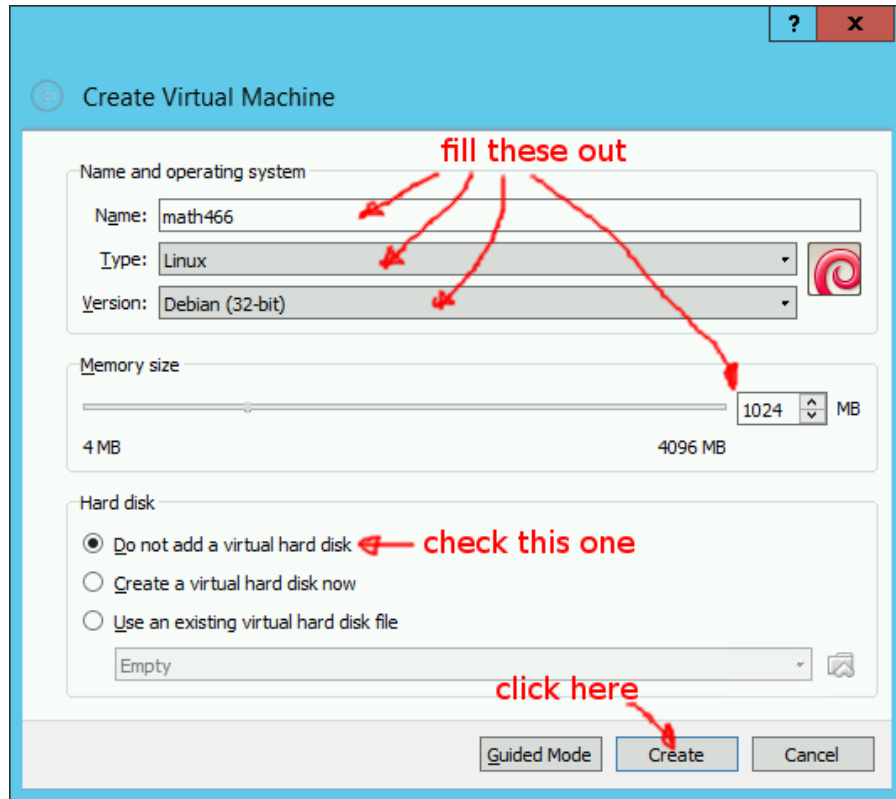


Note that expert mode makes it possible to describe all the settings for the virtual machine on one page, which is easier for the purposes of this tutorial.

The optimal size for the virtual machine depends on how much RAM your computer has and how much you plan use Microsoft Windows while VirtualBox is active. My recommendation is to set the virtual machine

$$\text{Memory size} = \begin{cases} 1024 \text{ MB} & \text{if RAM} < 3 \text{ GB} \\ 2048 \text{ MB} & \text{if RAM} \geq 3 \text{ GB}. \end{cases}$$

With this in mind please fill out the *Create Virtual Machine* dialogue as shown in



Note that we have named the virtual machine `math466` in this example. Any other name of your preference will work just as well after making the necessary changes below.

There should now be the directory

`C:\Users\\VirtualBox VMs\math466`

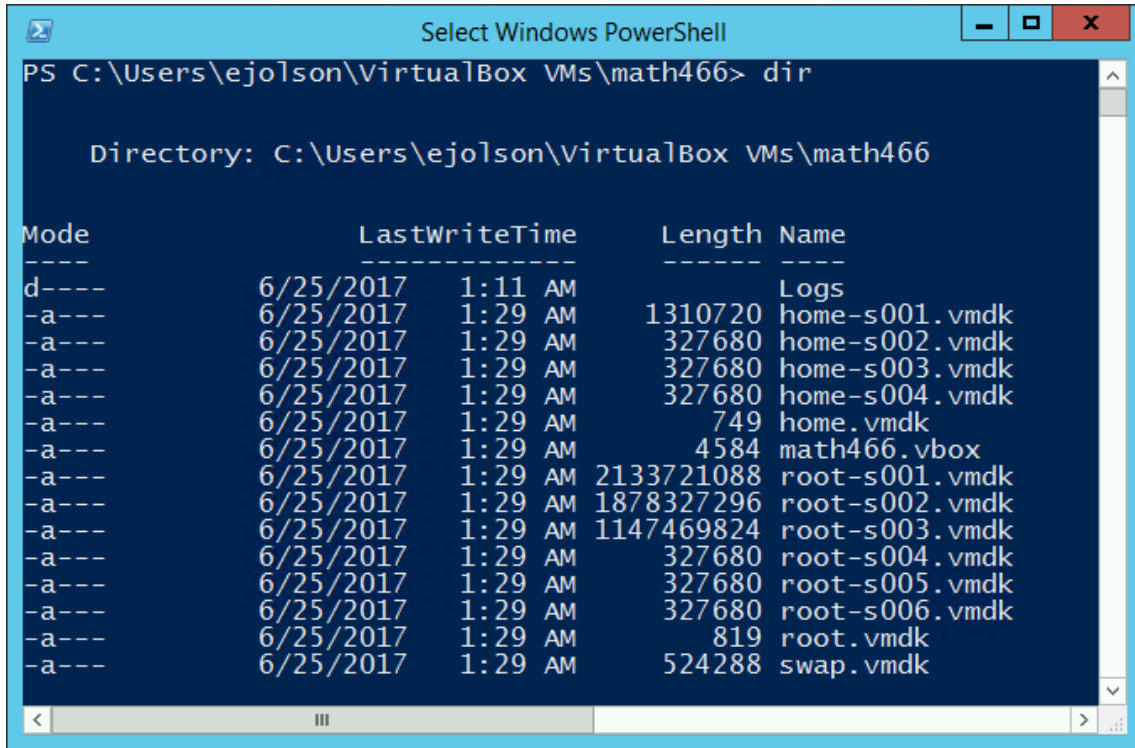
where `<username>` is your login name. Note that if you are installing VirtualBox on MacOS X the directory name will be slightly different. Since no virtual disk was added when the virtual machine was created, we now download three prebuilt virtual disks to the above directory from the class website.

<http://fractal.math.unr.edu/~ejolson/466-17/images/>

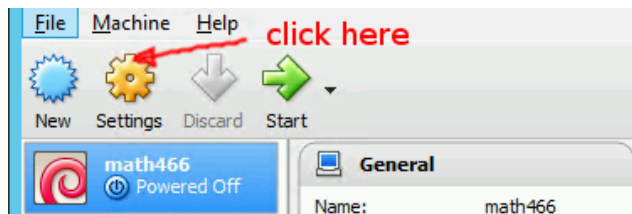
Note that the image has been broken down into multiple pieces each of which are under 2 GB in order to be compatible with 32-bit filesystems such as a Microsoft FAT formatted disk. The virtual disks are named `root.vmdk`, `swap.vmdk` and `home.vmdk` and consist of many numbered parts.

Once you have finished downloading the files, please check they are in the right place, for example, by using *Windows PowerShell* or the equivalent in MacOS X. The virtual

machine directory should now look like this



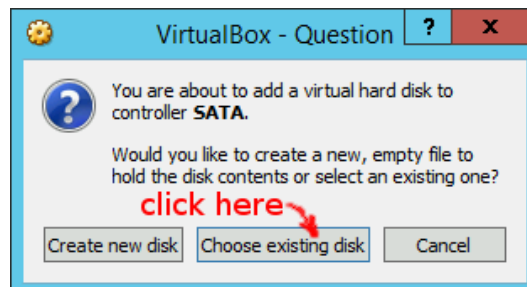
Note that the exact sizes of the `root-s00?.vmdk` files will vary slightly as the system is updated. We now add the root virtual disk to the virtual machine by selecting



and then

*Settings* → *Storage* → *Controller: SATA* →  *at bottom* → *Add Hard Disk*

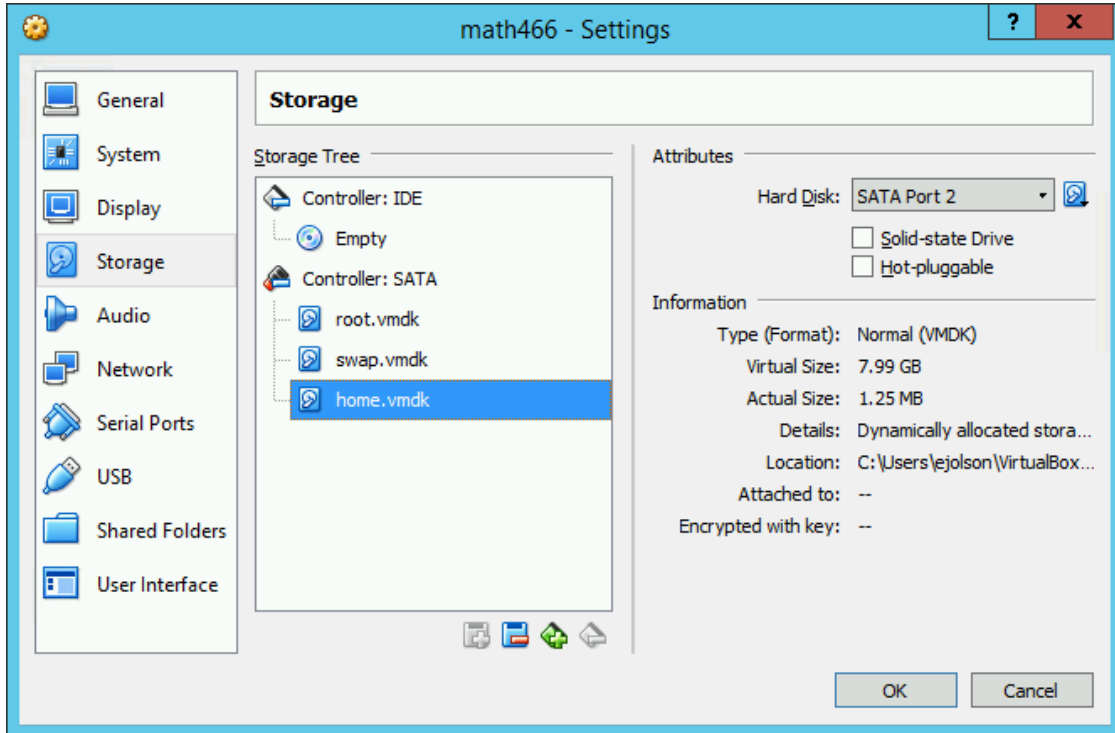
Finally select *Choose existing disk* in the dialogue



drill back down to the directory

C:\Users\\VirtualBox VMs\math466

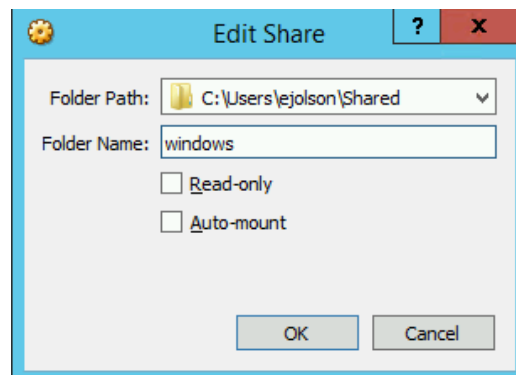
select `root.vmdk` and then click on *Open*. Now repeat the same sequence to add the virtual disks for `swap.vmdk` and the `home.vmdk` filesystems. The resulting *Settings* dialogue should now look like



Finally, configure a *Shared Folder* to allow easy exchange of data between Microsoft Windows and the Linux virtual machine. To do this go to

*Settings* → *Shared Folders* →  at far right

Any folder name is fine for the share; however, the export should be named *windows* because this is what the Math/CS 466/666 Linux image will look for. A example is

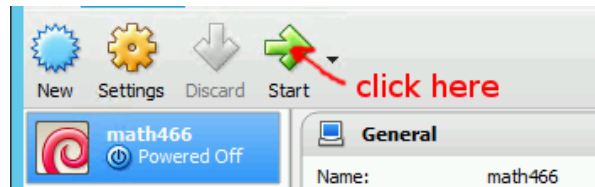


Before booting, change one more setting so it is possible to copy and paste between Microsoft Windows and the Linux virtual machine. To do this select

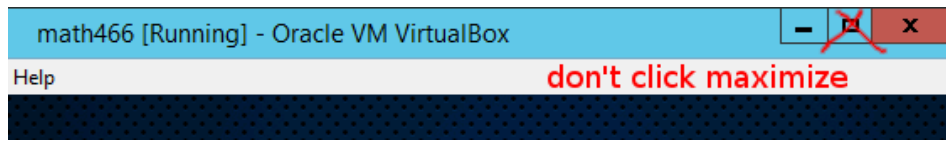
*Settings* → *General* → *Advanced* → *Shared Clipboard*

and change the option to *Bidirectional*. Then click *OK*.

It is now time to boot the virtual machine for the first time. Select the *math466* virtual machine and click *Start*.



After a number of diagnostic messages, the graphical login window will appear. Before logging in, it is reasonable to resize the virtual machine window. To make the virtual machine easiest to use it is convenient to resize the window so it fills the screen. To do this don't click maximize

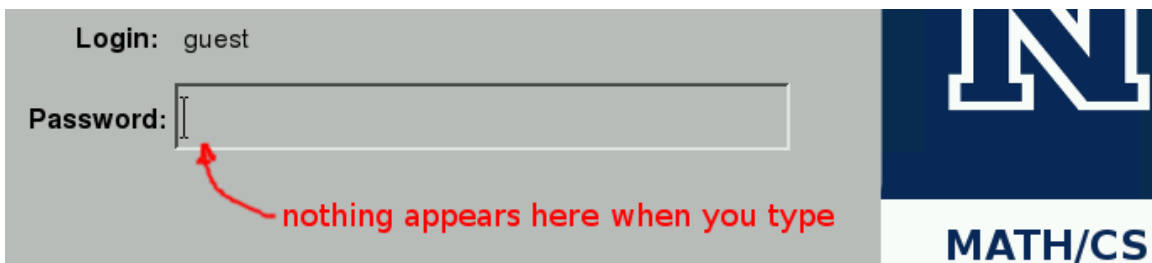


Instead, press

$\langle right-ctrl \rangle + F$

to set the virtual machine window to full screen mode. Note that  $\langle right-ctrl \rangle$  is the control key on the right side of the keyboard—the control key on the left side of the keyboard will send the corresponding control sequence directly as input to the running Linux instance instead. Also note that if the UNR Wolfpack background of the login window doesn't resize to fill the entire screen try pressing the  $\langle right-ctrl \rangle + F$  twice more until it does.

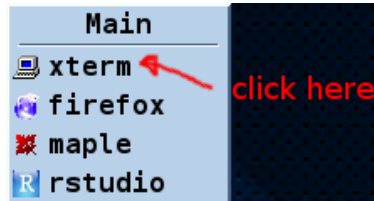
The newly installed system has two accounts *guest* and *root* both with the password *math467*. To finish configuring the system, log in as *guest*. For security there is no indication of how many characters you type while entering the password.



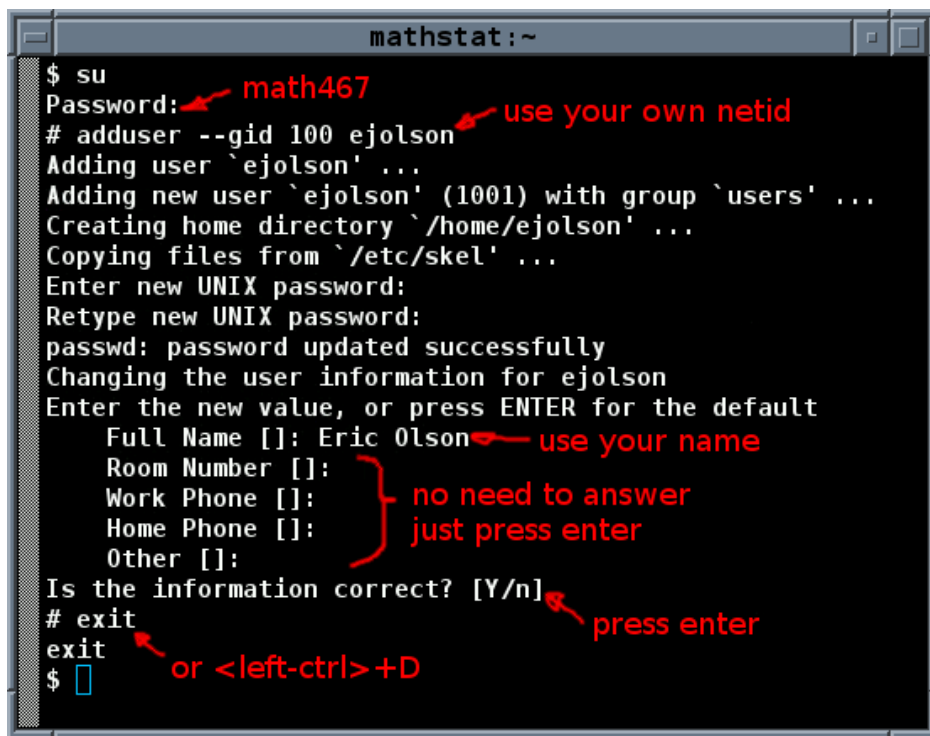
After entering the password and pressing  $\langle enter \rangle$  you will be logged in. The X Window system is configured exactly the same as in the student labs. Logging out should be done

by typing `exit` or  $\langle \text{left-ctrl} \rangle + D$  in the transparent console window in the top right corner of the screen. Type  $\langle \text{right-ctrl} \rangle + H$  to shut down the entire virtual machine.

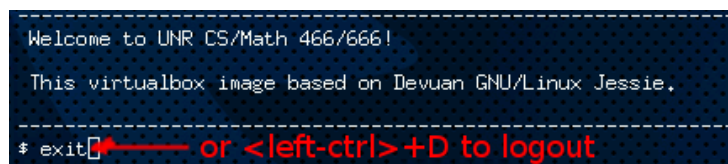
Now create a new user. In the open space in the desktop right click with the mouse and select `xterm` from the pop up menu.



This should open a terminal window with a `$` prompt at the top. Now perform the system administration task of adding yourself as a new user. It is convenient to use your netid as the username; however, it is better to choose a different password.



Logoff by typing `exit` or  $\langle \text{left-ctrl} \rangle + D$  in the transparent console at the top right.



Now login as yourself and start using the system. When you are finished press  $\langle \text{right-ctrl} \rangle + H$  to shutdown the virtual machine.