

Installing & Using the APS105 Virtual Machine

APS 105S - Computer Fundamentals

Winter 2018

I. VIRTUAL MACHINES

This document will show you how to install software on your home computer/laptop that will be very similar to the software you'll use in the course labs, on the Engineering Computing Facility (ECF) machines. We've put together a package of software that contains all of the software and tools that you will be using on the ECF machines. All this software is wrapped in what is called a *Virtual Machine*. Which is another kind of software that pretends it is running on separate physical computer. That separate computer can actually run a different *Operating System*; you are probably familiar with Windows 7, 8 or 10 operating system or the Mac OS X operating system. In this case, you'll be running the Linux operating system on a separate window on your computer, regardless as to whether your computer's home operating system is Windows or Mac.

Once you've installed this software your computer will be able to (temporarily, when you need it) look and feel almost exactly like the ECF machines in the labs. Figure 1 shows a screenshot of a Windows computer running a Linux virtual machine - a computer within a computer!

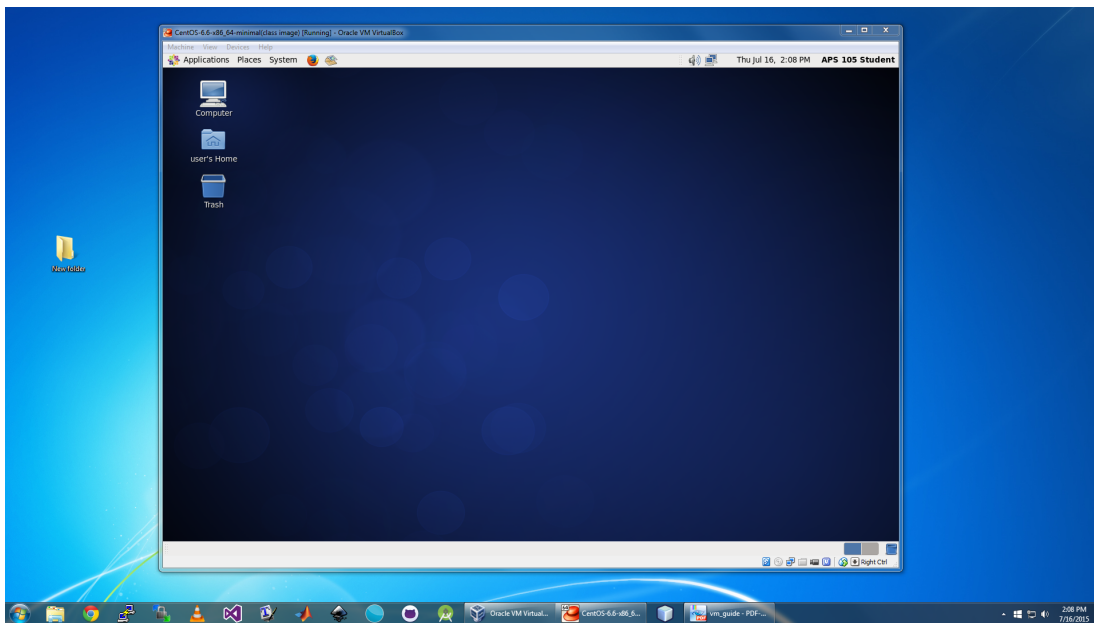


Fig. 1: The APS105 Linux virtual machine running on a (real!) Windows machine.

There are two pieces of software required for you to get this all working. (We will call the final working system, the *APS105 virtual machine*. The first is a program called VirtualBox, which can

load and run virtual machines. The second is the specific virtual machine that we have created for this course, which we will load and run using VirtualBox. The following sections will show you how to get started.

II. STEP 1: INSTALLING VIRTUALBOX

Download and run the VirtualBox installer for your machine:

- For Windows or Mac:

<http://www.oracle.com/technetwork/server-storage/virtualbox/downloads/index.html>

You should use all the default settings when going through the steps of the installer program. Follow the next step before running the VirtualBox application.

III. STEP 2: DOWNLOADING AND INSTALLING THE VIRTUAL MACHINE IMAGE

- 1) You will need to download a *virtual machine image*), that is used by the VirtualBox software. Note that this is a very large file - about 2.6 GBytes - and so you'll either need a good internet connection, or you'll need to use the lab computers to download this file into a USB key using a browser. Save the file in a safe place on your computer, and remember where that is:

<http://www.comm.utoronto.ca/~bkf/vmimage>

NOTE - this image is for 64-bit computers only. If you know that your computer is a 32-bit machine, or if you encounter either one of the following two errors when you try to start the machine as described below, you'll not be able to use the VM.

- "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," or
- "This kernel requires an x86-64 CPU, but only detected an i686 CPU. Unable to boot - please use a kernel appropriate for your CPU."

Note that you can *still* download and use the CodeLite IDE on your machine, as described in the document *Getting Started with the CodeLite Environment*. The only restriction mentioned above relates to the Linux kernel used on the virtual machine.

- 2) Now, run the VirtualBox program you installed above, and in the screen that appears, select **File > Import Appliance**. See Figure 2 for a screenshot of this step.

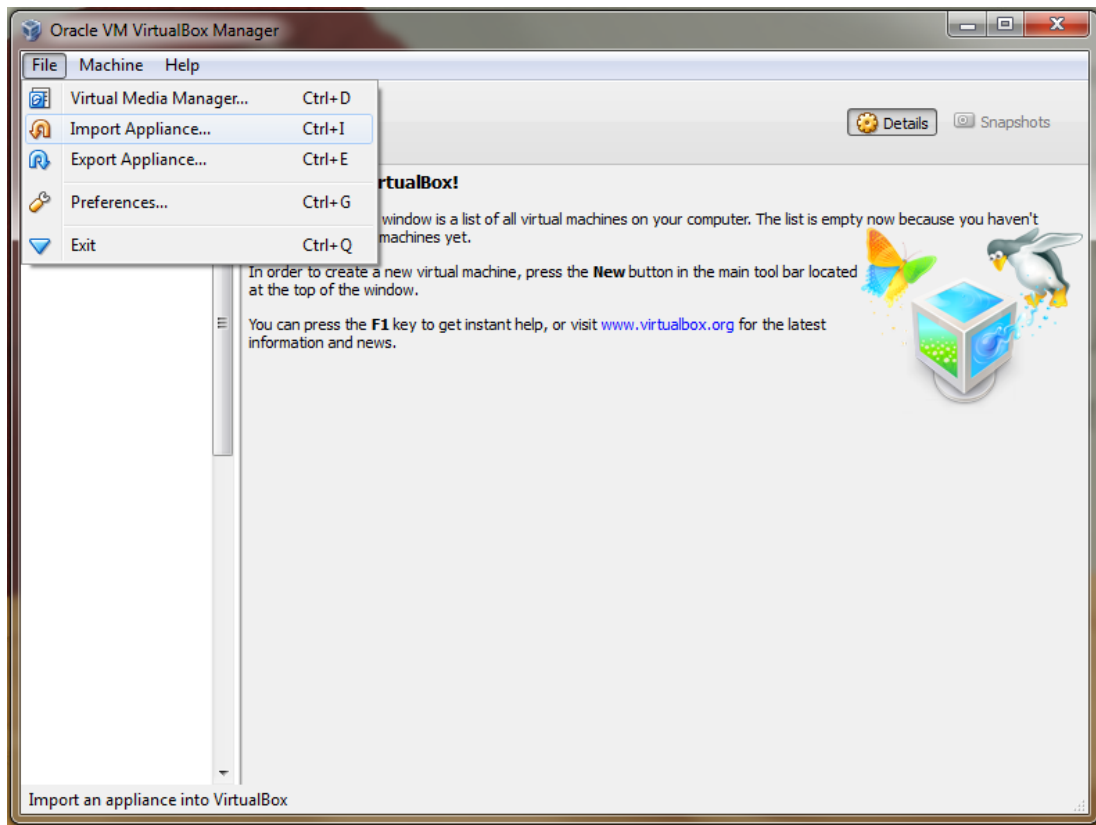


Fig. 2: Importing the virtual machine image into VirtualBox.

- 3) In the window that appears, click the icon of the folder with a green arrow on it and select the file that you downloaded in the previous step as the appliance to import (aps105_system.ova), and then click “Next”. See Figure 3 for a screenshot of this step (note that the exact location of your file won’t match what appears in the screenshot).

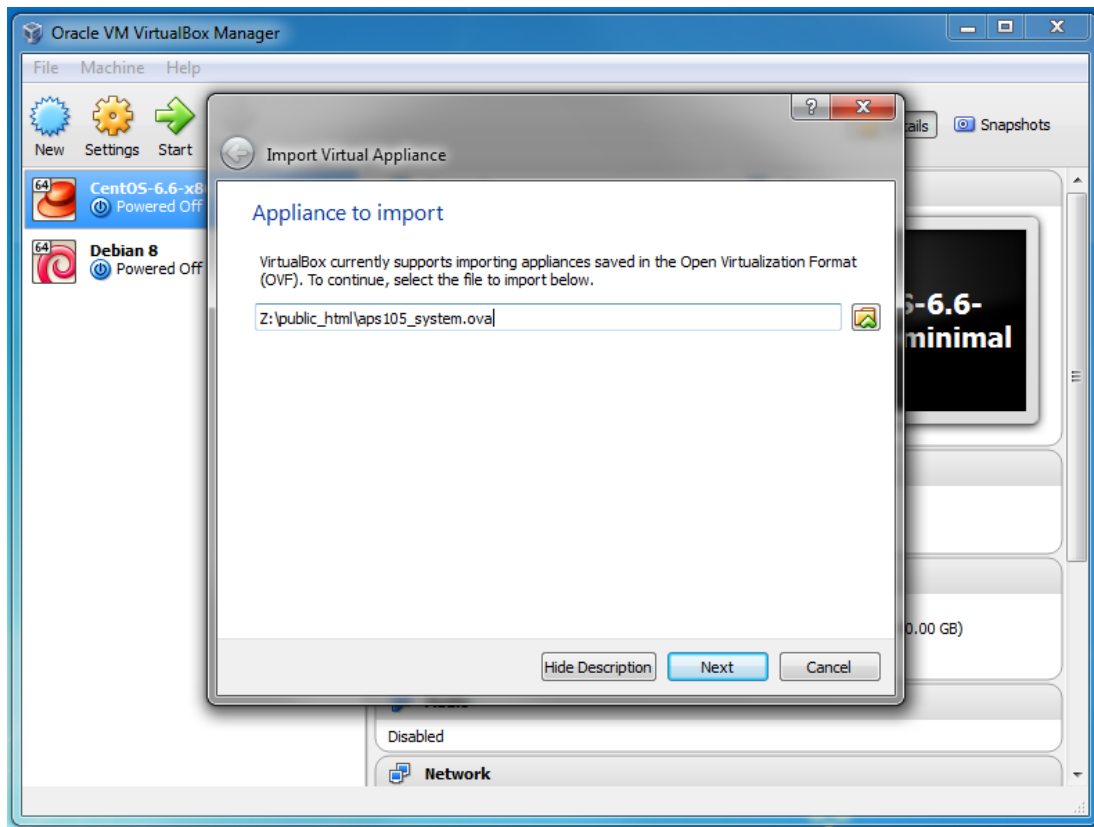


Fig. 3: Selecting the virtual machine image to import into VirtualBox.

- 4) In the Appliance settings window, use all the values and settings that appear by default, and click “Import” to start the import process. This will take several minutes.
- 5) After a few minutes, the image will now be loaded into VirtualBox, and should appear as a Virtual Machine in a list on the left-hand side of the window. We will now “boot” the virtual machine - which means launching the operating system which is what happens when you turn on your mac or pc - but in software. Click on the name of the Virtual Machine (CentOS-6.6-x86_64-minimal) and then click the Start button (green arrow). See Figure 4 for a screenshot of this step.

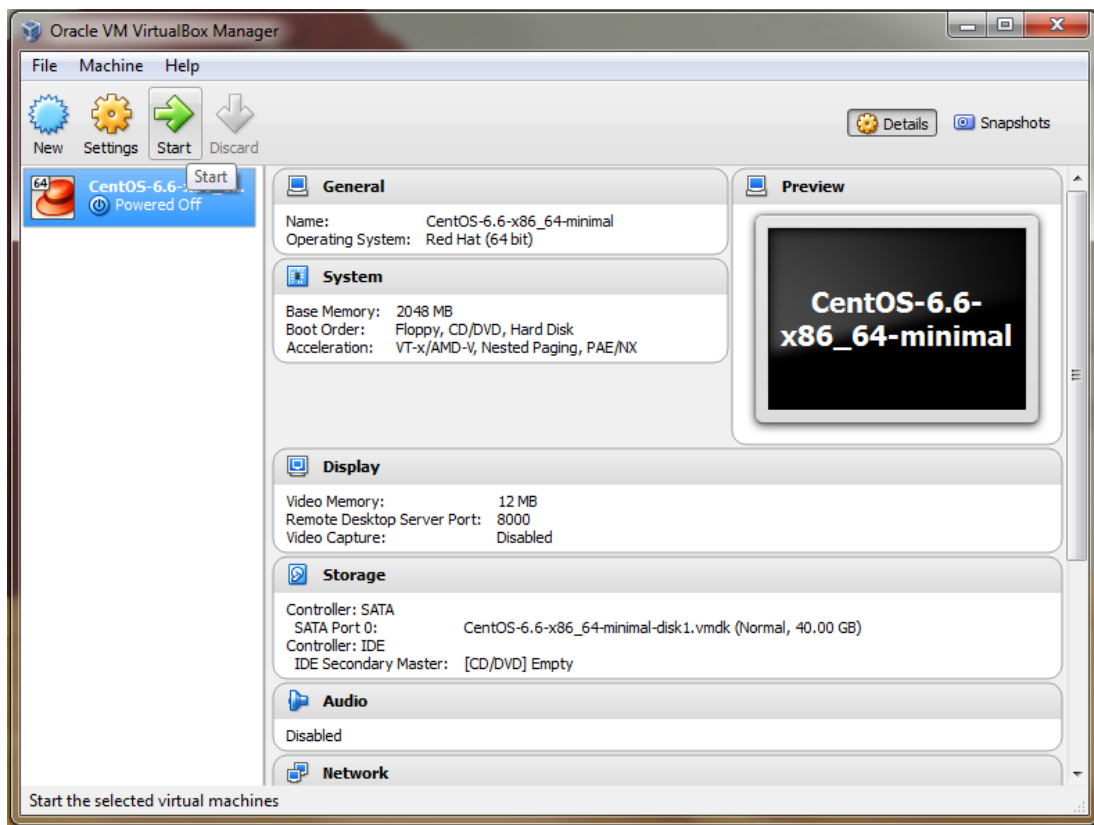


Fig. 4: Starting up the virtual machine.

- 6) During the boot process, you may see some messages at the top of the screen regarding “Auto capture keyboard” or “mouse pointer integration” being on or off, respectively. You can safely ignore these messages and close them once the boot process is done. You will know that the boot process is done when you are presented with a login screen.

IMPORTANT: If you get an error during the boot process, you may have to do one of two things, depending on the error. If the error message mentions “Your 64-bit guest will fail to detect a 64-bit CPU” or “This kernel requires a x86-64 CPU”, then you cannot use this VM image. Again, this does not prevent you from installing and working with CodeLite on your machine, whether it be 32-bit or 64-bit.

- 7) After booting up, you will be presented with a login screen. Click on the name that appears (APS 105 Student), and enter in the password “aps105student”. See Figure 5 for a screenshot of this step.

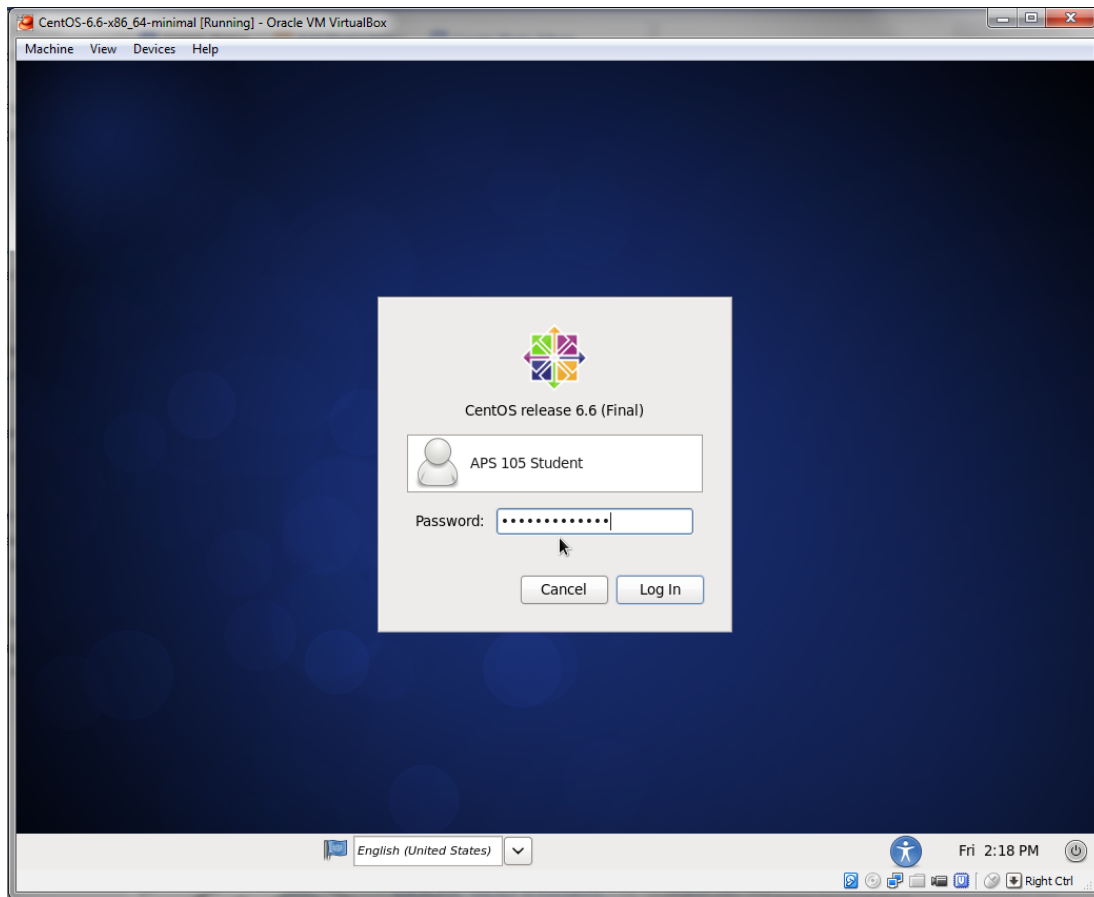


Fig. 5: Logging in to the system.

- 8) You have now booted into a Linux system that you can use to program and run your assignments. In the menu just above the virtual machine, select **View** > **Switch to Fullscreen** to make your virtual machine fullscreen. To leave fullscreen mode, move your mouse cursor to the bottom of the screen to see the “View” menu item again, and select **View** > **Switch to Fullscreen** again to leave full screen mode.
- 9) At the top of the virtual machine’s screen, select **Applications** > **Programming** > **CodeLite** to run CodeLite and get programming! If you want to start using CodeLite, then you should read and do the instructions in the associated document *Getting Started with the CodeLite Environment*, and go right to Section III.
- 10) When you want to stop using the Virtual Machine, you can shut it down just like any other computer. At the top of the screen, select **System** > **Shut Down** and then power down the machine. After a while you will see it shut down and the screen will close automatically. You can then close the VirtualBox application also.
- 11) When you want to use the Virtual Machine again, just run VirtualBox, select the VM that you already imported earlier, and hit Start.

IV. TRANSFERRING YOUR WORK (SOFTWARE) FROM THE VIRTUAL MACHINE TO THE ECF COMPUTER SYSTEM

While the virtual machine looks and feels a bit like the ECF machines, it is not actually the ECF machines at all, it is a separate computer! One of the things you'll be asked to do in the labs on the specific ECF machines, is to run several software programs that we provide - their purpose is for you to pre-test your programs, to submit your programs for marking, and to check the submission and find out the details of the automatic grading. For these programs to work, you will need to run these programs together with the software you make, on the ECF machines. That means you'll have to take the files from your computer and the virtual machine running on it, and get them over to the ECF machines. This section will show you how you can transfer the programs you created on your computer in the APS 105 virtual machine onto the ECF computers and reside in your account there. This will be done over the Internet. Then, when you physically go to the ECF lab and log into your account, your files will exist there for you to get marked and submit.

- 1) First, you need to know where your ECF account's home folder exists in the ECF file system, and so we will have you connect from your computer to the ECF computer systems over the internet. First, open up a terminal by selecting (from the top of the screen) **Applications > System Tools > Terminal**. In the terminal, enter in the command (type it manually, do not copy-paste it from this document - it will not work!):

```
ssh ECFusername@remote.ecf.utoronto.ca " echo ~ECFusername"
```

where **ECFusername** should be replaced with your actual ECF username. (See the document "Getting Started with Linux and ECF", section 2, to find out what your ECF username and password is). Enter your ECF password when asked for a password (**Note:** Your password will not appear when you type it in, not even as dots). Finally, the terminal will print out the path to your home directory; record this. Figure 6 shows an example screenshot of this step - remember to replace the username with your own!

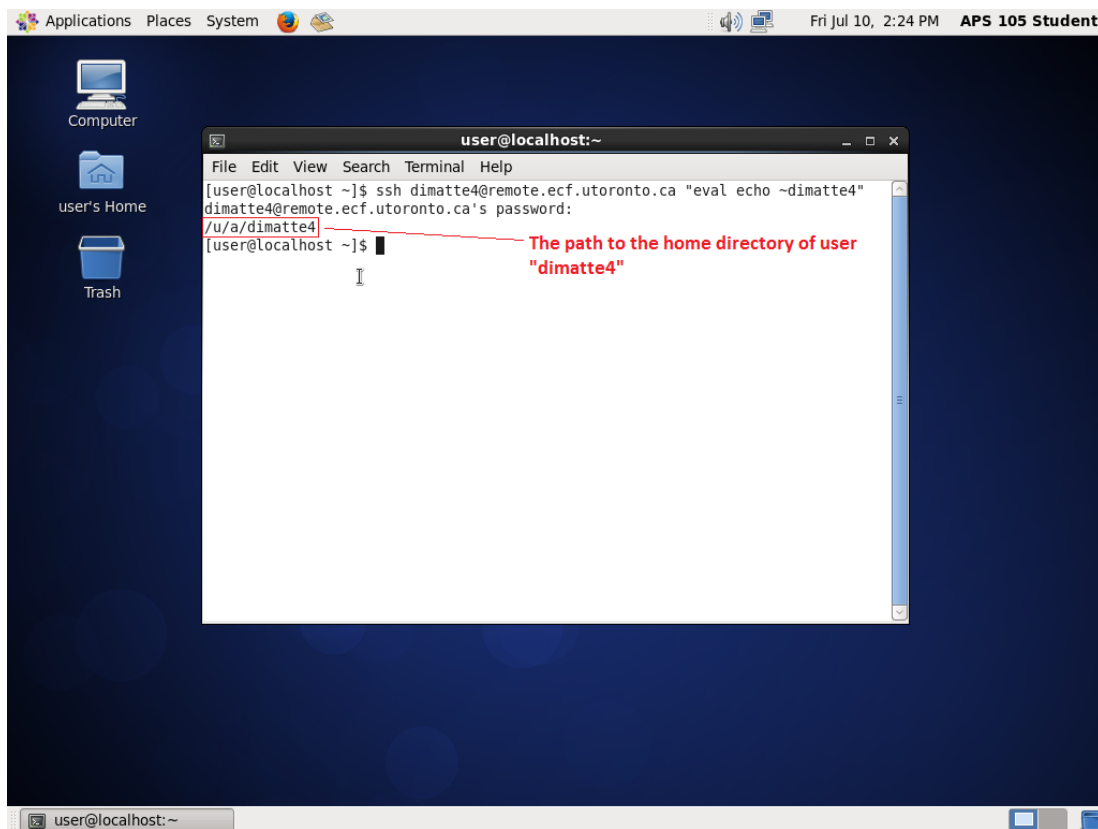


Fig. 6: Finding the path to your ECF home directory.

- 2) At the top of the screen, select **Places > Connect to Server**, and enter in the following:
- Service type: select "SSH"
 - Server: `remote.ecf.utoronto.ca`
 - Folder: enter in the path to your home directory you found in the previous step
 - User name: your ECF user name
 - Check Add bookmark, and name the bookmark ECF. This will make it quicker to open up this connection in the future with just one click.

See Figure 7 shows an example screenshot of this step - remember to replace the folder and username fields with your own information!

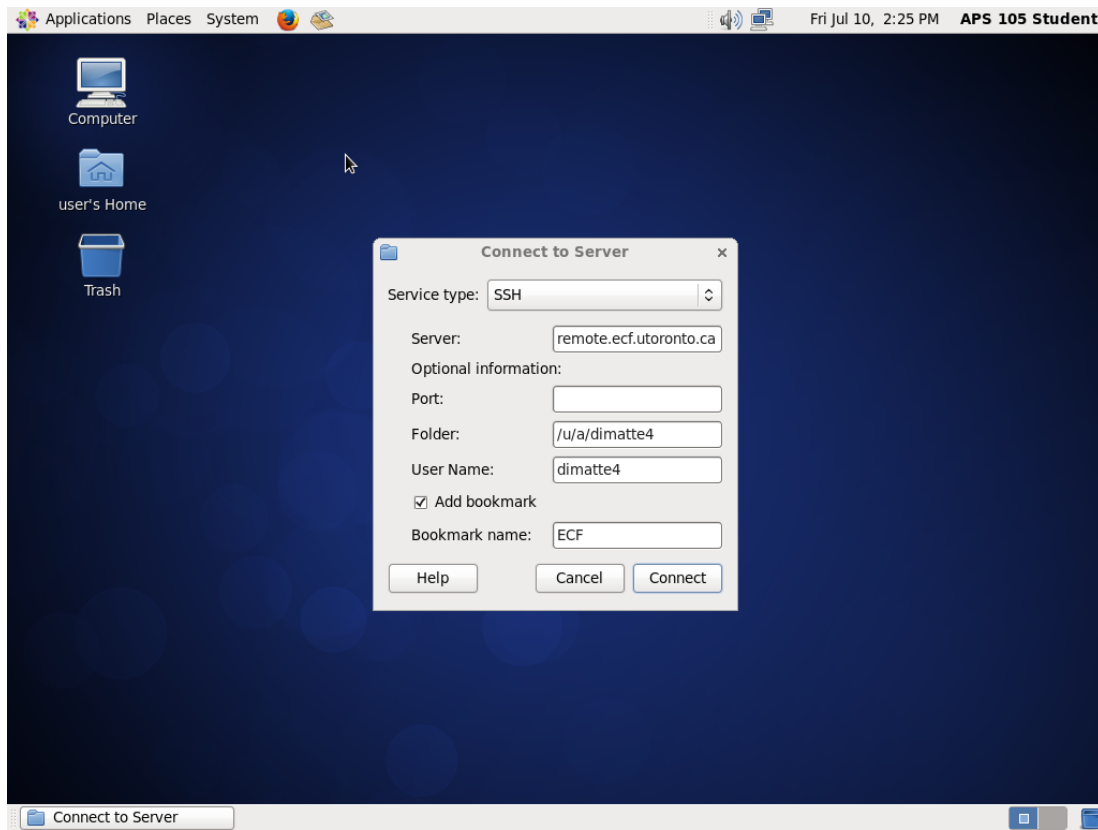


Fig. 7: Connecting to your ECF home directory.

- 3) Click "Connect". This will mount the ECF drive on the desktop of your virtual machine (like a USB key), and open a window to your home ECF directory (see Figure 8).

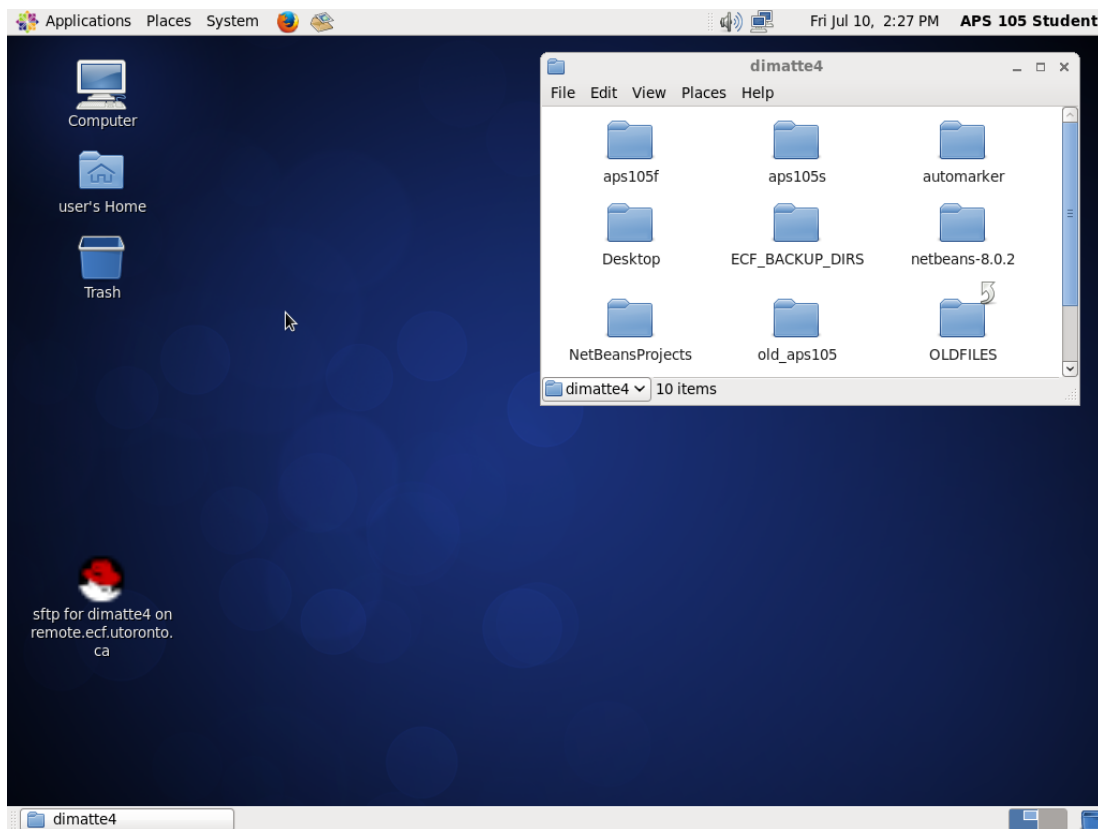


Fig. 8: Viewing your connected ECF home directory.

- 4) You can now drag-and-drop CodeLite projects from your Workspace folder in the virtual machine into the Workspace folder on your ECF account. The ECF Workspace folder can be opened on the virtual machine by double-clicking the folder “user’s Home” on the desktop, and then double-clicking the folder “Workspace” (or whatever name you gave it on the ECF machines).
- 5) To reconnect to your ECF folder in the future, just click the “ECF” bookmark under the “Places” menu at the top of the screen (see Figure 9).

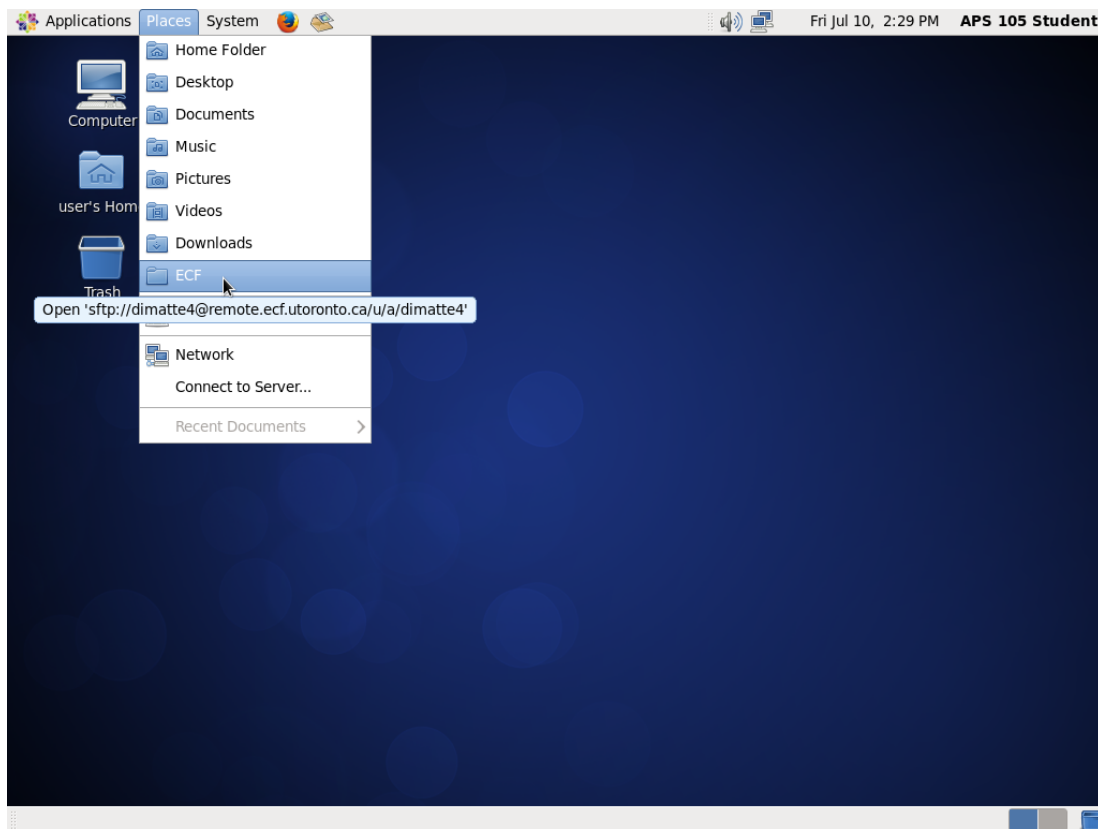


Fig. 9: Connecting to your ECF home directory using the bookmark.