Weather Applications with WRF

A Self-Help Guide for the Modern Modeler

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Setting up e-WRF

Note: As of early 2021, VirtualBox version 6.1.x does not seem to work consistently on Macintosh operating system version 11.x.x (macOS Big Sur). There may be some workarounds, but those are outside the scope of this installation guide and may vary based on machine settings. For more information, please see:

- VirtualBox version information: https://www.virtualbox.org/wiki/Testbuilds
- Ticket information and potential workaround:
  https://forums.virtualbox.org/viewtopic.php?f=39&t=98763&start=120
- Potential workaround: https://forums.virtualbox.org/viewtopic.php?f=39&t=98763
- Potential workaround: https://forums.virtualbox.org/viewtopic.php?f=8&t=100922

VirtualBox

In order for you to run e-WRF, you will need to install a program that can read a virtual hard disk. One of the best programs for doing that is called VirtualBox, and it can be installed on any type of computer: Windows, Linux, or Macintosh.

Downloading and Installing VirtualBox

1. Visit the VirtualBox website: https://www.virtualbox.org.
2. Click on "Downloads."
3. Where it says "VirtualBox Platform Packages" (see Figure 1.1), select the operating system you are using on your computer, and click the link to download it.
4. Proceed with the installation.

Figure 1.1 - VirtualBox download page (Source: https://www.virtualbox.org).

If you would like to learn more about how VirtualBox works and what it can be used for, you are welcome to look at the VirtualBox Users' Manual:
https://www.virtualbox.org/manual/UserManual.html.

Later in this chapter, we will learn how to use VirtualBox for running Ubuntu Linux and e-WRF. The important thing now is to make sure that your installation is working properly. After the installation is done, you should see a window similar to the figure below:

Figure 1.2 - VirtualBox after it is installed.

e-WRF

Downloading e-WRF

Next, we need to download e-WRF, which will run on VirtualBox. The full e-WRF file is large because it contains both data files and extra processing space to run the model itself.

1. Download the zipped or unzipped e-WRF file, depending on your internet bandwidth speed.
    a. For high-speed internet: CORE-Ubuntu_eWRF.vdi.
    b. Otherwise: CORE-Ubuntu_eWRF.vdi.zip.
        i. This file will have to be unzipped after downloading.
    c. If you have problems downloading the file from these locations, try downloading from our Google Drive folder: https://tinyurl.com/yb62goz6.

Connecting VirtualBox to e-WRF

The idea is to connect your VirtualBox to e-WRF. The following instructions are the same whether your computer is a Windows, Macintosh, or Linux machine.

1. Open VirtualBox and click on the button **New**
   a. Alternatively, you can also select the menu **Machine > New**.
2. After that, name your installation. For example, you could write "Ubuntu e-WRF" (see Figure 1.3).

Figure 1.3 - Setting up a name for our installation. In this case, the name chosen was "Ubuntu e-WRF." Make sure the other options are selected as shown in this figure.

3. Click **Continue**.
4. Now, we need to allocate a RAM memory size for this installation. We recommend using at least 2040 MB of memory so that e-WRF can run properly (see Figure 1.4).
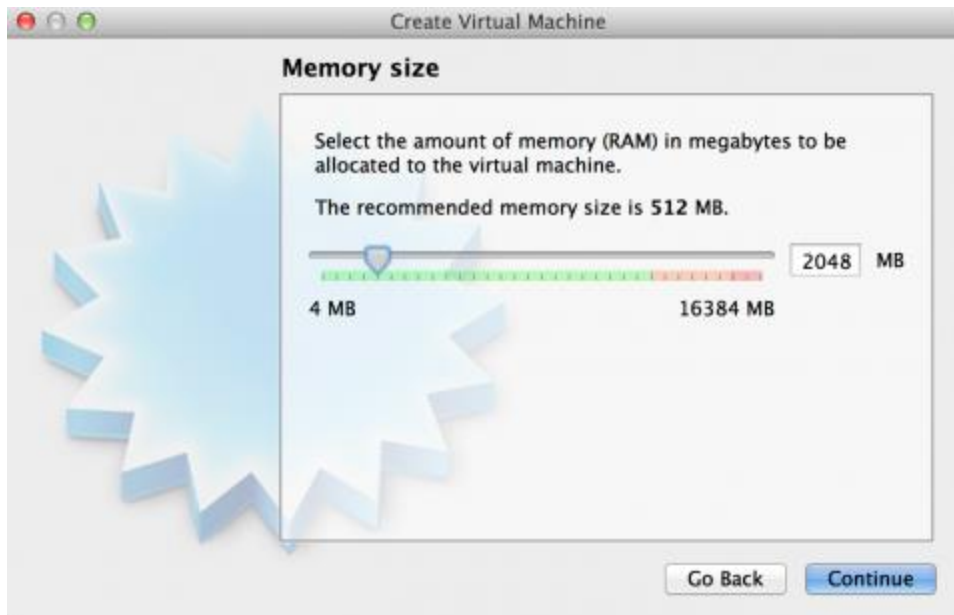
Figure 1.4 - Allocating RAM memory for e-WRF.

1. Click **Continue**.
2. This part is really important. Here, you need to tell VirtualBox that you already have a virtual hard disk (i.e., e-WRF). So, select the option "Use an existing virtual hard drive file." Then, click on the little yellow folder-like icon, locate the e-WRF file that you downloaded, and select it. That file name is "CORE-Ubuntu_eWRF.vdi" (see Figure 1.5).

Figure 1.5 - Pointing VirtualBox to the existing e-WRF virtual hard disk.

3. Click **Create**.

4. Now, you are ready to use e-WRF. You can click on the button **Start** (see Figure 1.6) so that e-WRF can start for you.

Figure 1.6 - My VirtualBox installation has other operational systems, such as Windows and Ubuntu. So, for instance, if we want to run Windows on my Macintosh, we can just click on the Windows option and select **Start**. If we want to use my "Ubuntu e-WRF" installation, we select that option and click **Start**. If you want to install other operational systems in the future, you can find more information on that on the VirtualBox website.

Things to Remember
1. The Ubuntu e-WRF file will likely be in your default location for downloads. Do not remove this file. However, you may remove the zipped file once it has been unzipped, if you used that format. VirtualBox communicates with the Ubuntu e-WRF file at this location to run e-WRF.
2. Make sure you change your keyboard layout. The e-WRF installation uses the English keyboard, but you can change that in the Ubuntu **System Settings** (button located on the right side of your Ubuntu desktop) or by clicking on the **en** icon on the top right of your Ubuntu desktop.
3. Change the password to a password that you choose by clicking on the **System Settings** button. The current e-WRF password is "123456789."

Using Ubuntu

We will be using VirtualBox to run e-WRF, but e-WRF is installed on Ubuntu Linux. How do you use Ubuntu (https://ubuntu.com/)? Ubuntu is a free open-source, Linux-based operating system. We will be accessing it mainly for working with a program there called "Terminal," where we will run the WRF Preprocessing System (WPS) and WRF programs. You can also use Ubuntu for doing other things, such as using an internet browser or writing documents.

There are a number of Ubuntu resources and manuals online. Some of those resources and the manual from the Ubuntu Manual Project are available on our resources webpage and on their website: https://ubuntu-manual.org/. If you are unfamiliar with Ubuntu, we highly recommend downloading and skimming through the manual, which we will refer to as the Ubuntu Users' Guide. To complete the e-WRF activities we provide throughout this book, you should be certain you can answer these two important questions:

A. What does the Terminal program in Ubuntu do?
B. How do you access Terminal in Ubuntu?

Check Your Reasoning

According to the Ubuntu Users' Guide, the answers to the questions regarding the Terminal program are below:

A. "Most operating systems, including Ubuntu, have two types of user interfaces. The first is a graphical user interface (GUI). This is the desktop, windows, menus, and toolbars you click to get things done. The second, much older type of interface is the command-line interface (CLI). The terminal is Ubuntu's command-line interface. It is a method of controlling some aspects of Ubuntu using only commands that you type on the keyboard."
B. "You can open the terminal by clicking **Dash*** **> Applications > Terminal**. When the terminal window opens, it will be largely blank with the exception of some text at the top left of the screen, followed by a blinking block. This text is your prompt—it displays, by default, your login name and your computer's name, followed by the current directory. The tilde (~) means that the current directory is your home directory. Finally, the blinking block is called the cursor—this marks where text will be entered as you type. To test a terminal command, type **pwd** and press Enter. The terminal should display /home/yourusername. This text is called the 'output.' You have just used the pwd (print working directory) command, which outputs (displays) the current directory."
    a. Note: **Dash** is the first icon at the top of the Ubuntu Launcher.

Tips

- If you would like to change the view in Ubuntu to full-screen mode, go to the top menu bar in VirtualBox and select **View > Full-screen mode.**
- If using the Terminal program, selecting the option above may create a large black border around the smaller Terminal window. To remove this border, go to **System Settings > Displays** and change the **Resolution** options to fit your computer screen.
  - For example, you could choose a resolution of 1280 pixels x 800 pixels (16:10 aspect ratio).

After following the above steps, you will have successfully installed everything you need to run e-WRF and continue with Chapter 1.