Running Docker tutorials on Windows 10

Step-by-step suggestions

CTEQ Summer School 2022

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Overview of the installation process

Docker is a software that creates a virtual environment to execute pre-compiled tutorials on any operating system. These tutorials can be executed on a Linux operating system with no or minimal reconfiguration. On a computer that has Windows 10 as its primary OS, we will first install a virtual Linux system and Docker, then pull in and run tutorials inside the Linux virtual OS.

Important: Use a Windows account with administrator permissions to avoid unnecessary complications.

Install a virtual Linux

Both BIOS and Windows on your computer must allow running a virtual machine. Otherwise, you will get error messages saying that virtualization is not enabled.

1. Some systems may require to turn on virtualization in BIOS: when rebooting the computer, enter the BIOS menu and check the option "Virtualization (Vtx)".
2. Enable virtualization in Windows: go to "Turn Windows features on or off" in the Control Panel and enable "Virtual Machine Platform" and "Windows Subsystem for Linux". You may also need to turn on "Hyper-V". See detailed instructions at https://docs.docker.com/desktop/windows/troubleshoot/#virtualization.
3. If you are familiar with Virtual Box (www.virtualbox.org), you can install Ubuntu (www.ubuntu.com) or another Linux distribution inside the Virtual Box. You can then skip the rest of this document and directly follow instructions for a Linux OS.
4. As an alternative, we will describe how to install Ubuntu using the Windows Subsystem for Linux (WSL).

Enable WSL version 2

Follow instructions on https://docs.microsoft.com/en-us/windows/wsl/install-manual#step-4---download-the-linux-kernel-update-package .

Install Ubuntu for Windows

Go to the Microsoft App Store and download and install a recent "Ubuntu-2X-YZ-LTS" app.

Optional: install MobaXTerm terminal

Download it from https://mobaxterm.mobatek.net/download.html. MobaXTerm provides various Linux functionalities, such as XServer, SSH, etc. This will be your terminal for Ubuntu. The WSL Ubuntu's native shell or Power Shell can also be used with some tweaks.

Install and run Docker Desktop for Windows

1. Download it from https://docs.docker.com/get-docker/ and install. Choose "WSL" instead of Hyper-V during the installation.
2. Sign up for a user account on https://www.docker.com/.
3. Run Docker Desktop from the Windows Start menu. In the Docker Desktop:
   a. Log into your Docker account.
   b. Execute "Home->Quick Start Guide". You should be able to run

```
docker pull hello-world
docker run hello-world
```

Run the tutorials

In your Windows Documents/ directory, create a subdirectory cteq22/ where your tutorials will reside..

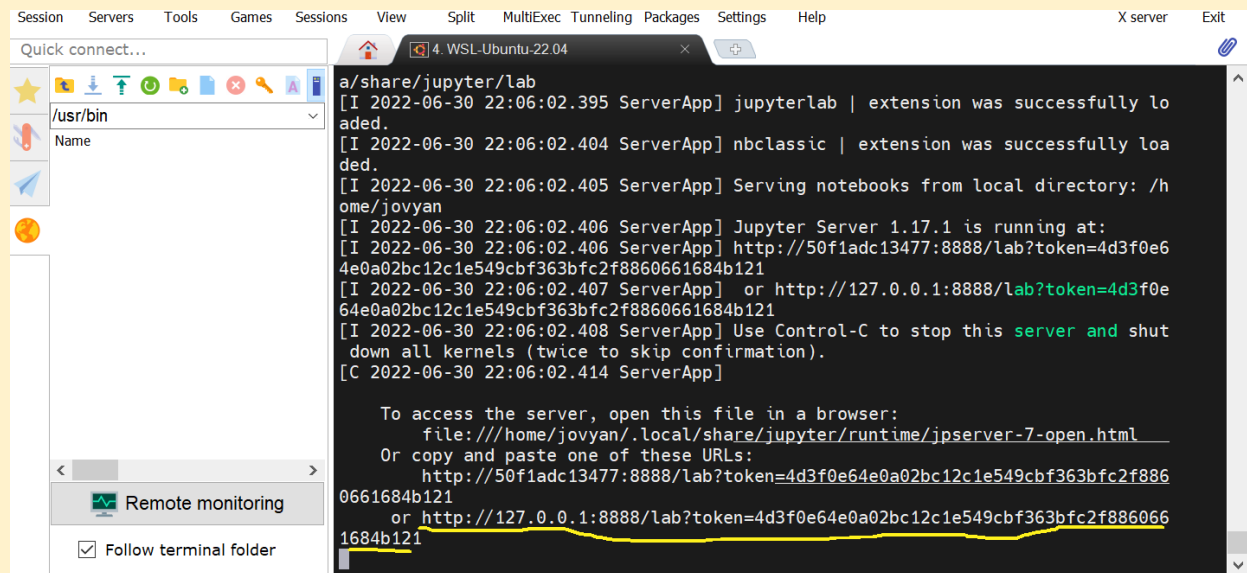In MobaXTerm, start a WSL-Ubuntu-2X-YZ session.
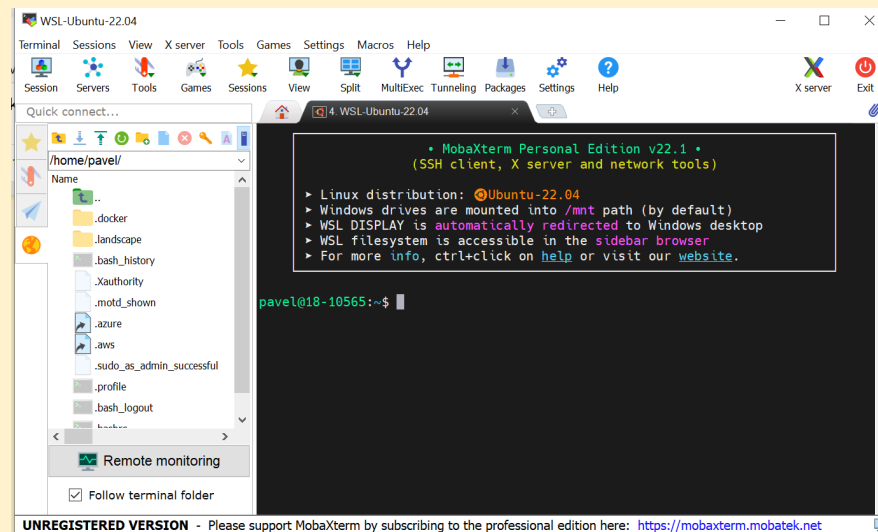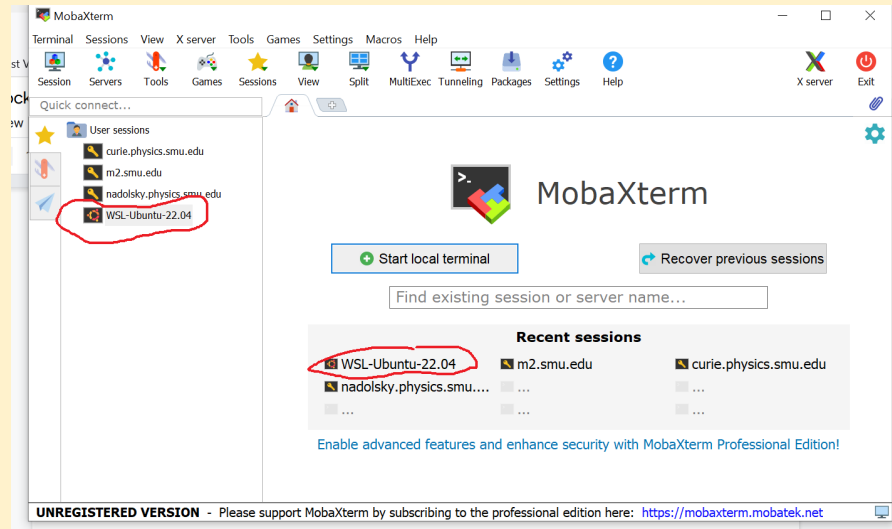
If your Windows user name is CSWu, and the Windows path to the tutorials' directory is C:\Users\CSWu\Documents\cteq22\, in Ubuntu this directory can be accessed as cd /mnt/c/Users/CSWu/Documents/cteq22/ .

From there you can run the tutorials as instructed in the manuals, see
https://gitlab.com/cteq-tutorials/2022. You can examine the outputs in this directory with either
Windows or Linux programs.

Examples of commands to run tutorials

Machine Learning Tutorial

```
docker pull jupyter/tensorflow-notebook
docker run -p8888:8888  jupyter/tensorflow-notebook
```


In a Windows browser, open the underlined address to access an interactive JupyterLab
session.
Follow the manual instructions.

Sherpa tutorial

Red color indicates the parts that must be changed from sherpa.pdf.

```
cd /mnt/c/Users/CSWu/Documents/cteq22/
git clone https://gitlab.com/shoeche/tutorials.git
docker pull cteqschool/tutorial:sherpa-2.2.7

cd tutorials/
alias docker-run-sherpa="docker run -it -u $(id -u $USER) --rm -v
$PWD:$PWD \
-w  $PWD cteqschool/tutorial:sherpa-2.2.7"
```

```
cd rivet/
docker-run-sherpa rivet-buildplugin ./MC_TTBar.cc
mv RivetAnalysis.so ../mc/sherpa/
cp ../mc/sherpa/Run.dat .
docker-run-sherpa Sherpa -e1 -o3
docker-run-sherpa plot_graphs.sh graphs/
```
In a Windows browser, open `cteq22\tutorials\rivet\graphs\index.html`.
```
Follow the manual.
```

Herwig tutorial

Pythia tutorial

Resummation tutorial

Parton-shower tutorial