

# PHYS 511: Computational Modeling and Simulation - Fall 2018

## Note on installing Cygwin, Windows Subsystem for Linux (WSL), and other software

In this course students will be asked to use gfortran compiler along with LAPACK, OpenMP, and MPI libraries and (optionally) Gnuplot plotting utility. This note aims to provide a quick guide how these can be installed on students' individual computers.

### Linux

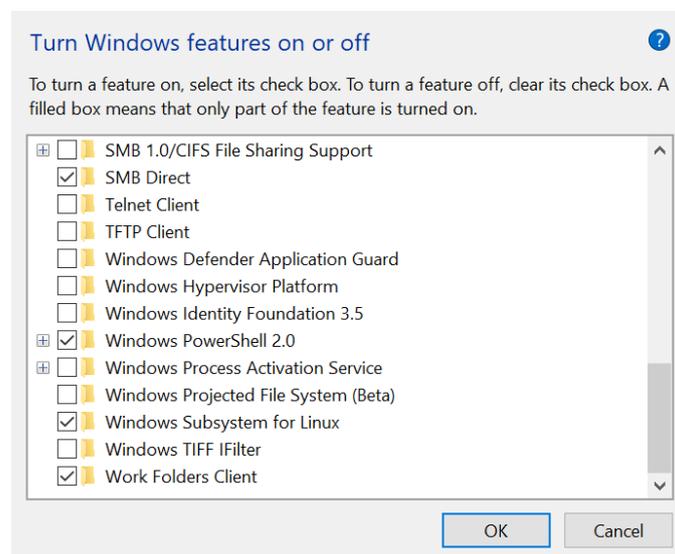
If your computer runs Linux (pretty much any distribution can be used), you will need to install a few packages from its software sources/repositories. This can be done from command line or through a graphical package manager. For example, in Ubuntu (most popular Linux distribution) you can open a terminal and type:

```
sudo apt-get install gfortran liblapack-dev gnuplot openmpi-bin libopenmpi-dev
```

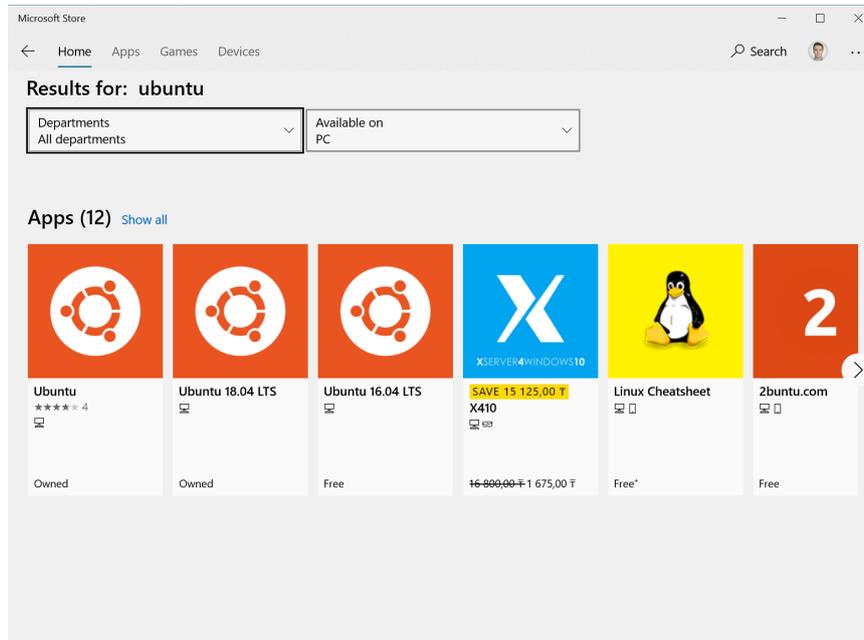
Note that this will require administrative privileges. After installing those packages you are good to go and do coding. To make things more convenient you may consider installing a text editor of your choice or an IDE (Integrated Development Environment). There are many of them available in any Linux distribution.

### Windows 10

If your computer runs Windows 10, you can use Windows Subsystem for Linux (WSL), which will provide you with almost all functionality of Linux (with the exception of some graphics applications). You will first need to enable WSL by clicking the Start button, then going to Control Panel, and clicking Programs. You will see a category called **Turn Windows features on and off**. Click on it (administrator's privileges are required) and in the Window that pops up check the box that reads **Windows Subsystem for Linux**:



You will be required to reboot your computer after Windows enables WSL. After the restart, click the Microsoft Store App and search for **Ubuntu**. You should see several relevant apps there. It is recommended that you install the latest one, **Ubuntu 18.04 LTS**.



It should be noted that there are several other popular Linux distributions that can be made available via WSL, e.g. **Debian** or **OpenSUSE**, in case if you prefer those. Once the Ubuntu 18.04 LTS App (or something else of your choice) is installed you can start it. The first start and setup may take a few seconds or minutes. It is recommended to run updates immediately after that by typing

```
sudo apt-get update
sudo apt-get upgrade
```

in the terminal window. After that you can install the necessary packages by means of the command line:

```
sudo apt-get install gfortran liblapack-dev gnuplot openmpi-bin libopenmpi-dev
```



Note that cutting and pasting text can be done via menu of the terminal window. Of course, you are more than welcome to install other packages and software that you think may be helpful for you.

An important aspect of WSL is that while all the binaries used there are Linux binaries, the file system can also be accessed from Windows. The location, however, is hidden deeply inside Windows directories. The root directory of Ubuntu would be located at (approximately)

```
C:\Users\\AppData\Local\Packages\CanonicalGroupLimited.Ubuntu18.04onWindows_79rhkp1fndgsc\LocalState\rootfs
```

Inside this directory you will find your Linux home directory,

`\home\`

where Ubuntu will store your files.

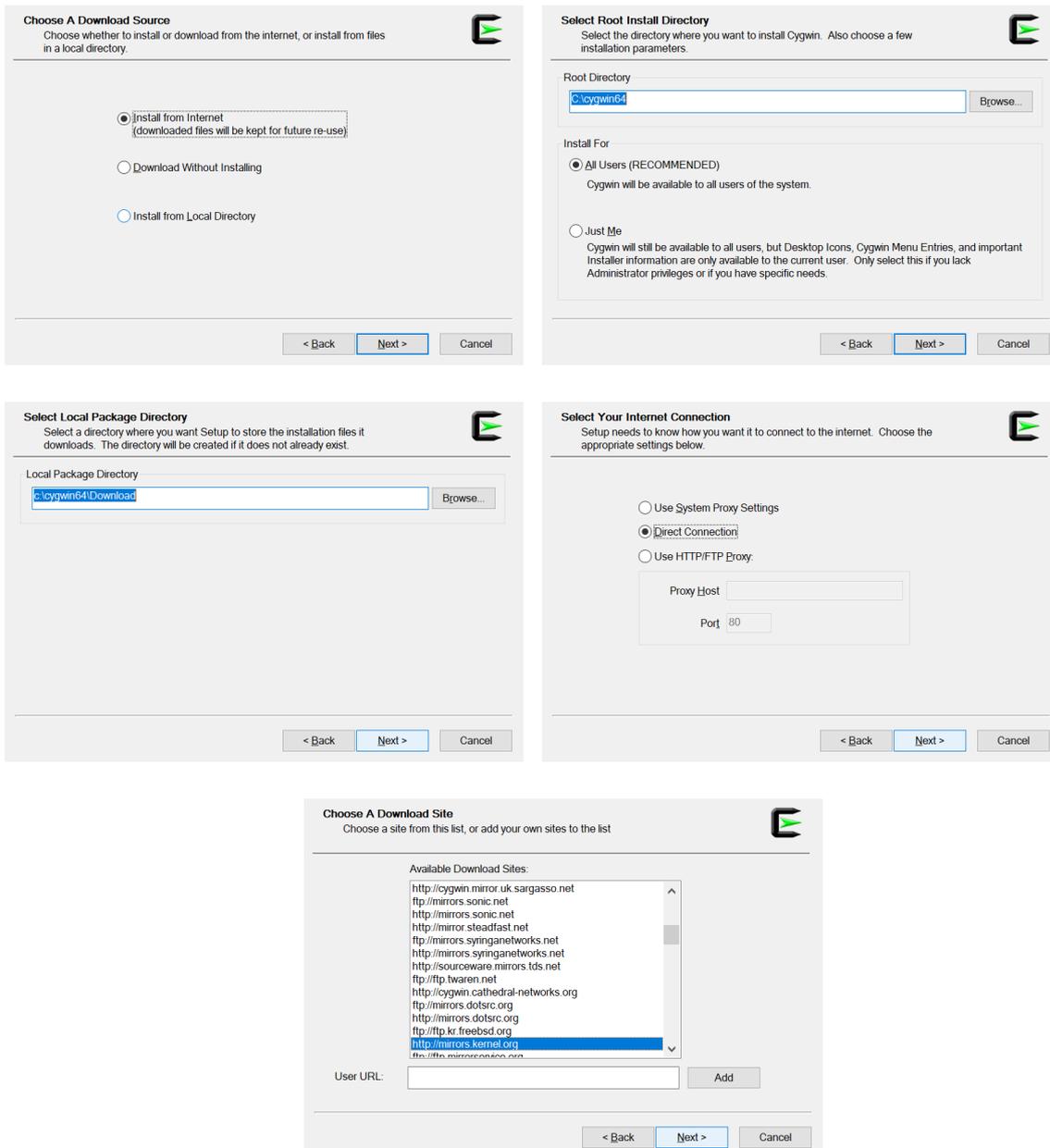
## Windows (any version)

If your Windows version is below 10, or you simply prefer not to use WSL, you can opt for Cygwin – a Unix-like environment and command-line interface for Microsoft Windows. Keep in mind, however, that Cygwin does not provide a native Linux environment. It is based on Windows libraries and a certain compatibility layer. You cannot copy a binary file from a Linux system and run it under Cygwin. That said, for the purpose of this course Cygwin functionality may suffice.

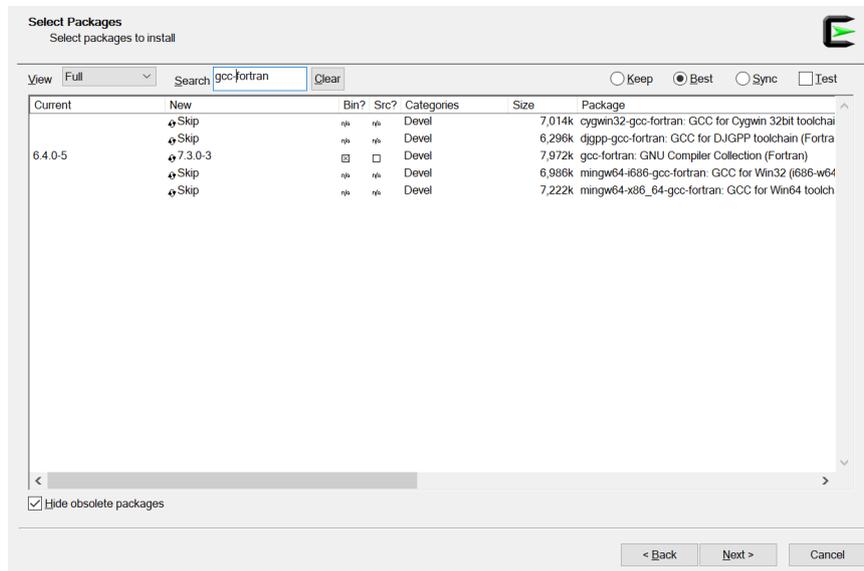
To install Cygwin, go to <http://www.cygwin.com> website and download an installer. Depending on the version of your operating system you should download a 64-bit or 32-bit installer. Next, place this installer (assuming a 64-bit version) into a newly created folder

`C:\cygwin64`

and execute it (administrative privileges will be required). Follow the instructions on the screen. The installer will download and install basic Cygwin packages.



Fortran and the libraries that are needed in this course are not included in this default set of packages. After the initial Cygwin installation and set up, you will need to run the same installer again. When the screen where packages are selected is shown, pick **Full** in the View drop-down menu and search for relevant packages such as `gcc-fortran`, `liblapack-devel`, `gnuplot`, `openmpi`. Select each of the necessary packages for installation. Also, you can install other packages that may be helpful for you personally (e.g. some editor). Cygwin repositories contain a lot (yet not all) of Linux software compiled for use under Windows.



Just like in the case of WSL, Cygwin root directory is mapped to a Windows folder that you can access from any Windows application. The location of that folder is

`C:\cygwin64\home\`

To edit files (e.g. fortran source files) you can use any Windows text editor of your choice. Also, some IDEs (such as NetBeans for Windows) support the toolchain of GNU compilers (`gcc`, `gfortran`) available via Cygwin.