2G03 Getting Started – Sept 2020

Instructor:
James Wadsley *wadsley@mcmaster.ca* x27106 (ABB 352)
T.A.s:
James Lambert, Anton Borissov, Hector Robinson, Josef Rucska, Rishita Gudapati
Contact: *phys2g03.mcmaster@gmail.com*

1 Course Information

Please see the Avenue to Learn pages for the course. I will keep the most up-to-date information there. If you are registered, PHYS 2G03 should be listed.
`https://avenue.mcmaster.ca/`

On-line classes and discussion (chat) will occurs on Microsoft Teams at McMaster. Normally you should communicate via teams except in personal circumstances (e.g. accommodations, illness, etc...) which should go via email.

2 Accounts on phys-ugrad.mcmaster.ca

All programming work for the course should occur on the computer called **phys-ugrad.mcmaster.ca**

Everything you need to do the work will be provided via this computer. This is a unix machine and part of the course is to learn to work in a unix environment. You will keep your access to this machine and do future research and course work there in later years. It also has a very similar set-up to research servers and most super-computer centres.

You will get detailed assistance with homework problems on this machine. The machine has GNU compilers installed (e.g. cc, c++). The final version of all homework assignments must be shown to work on phys-ugrad.mcmaster.ca or you will not get credit.

The administrator for the machine is a TA for PHYS 2G03: Anton Borissov, borissoa@mcmaster.ca. Anton can set you up with an account and help you with problems. In most cases Anton will have already made an account for you on phys-ugrad.mcmaster.ca .

You will not physically sit at the machine but log in but from your laptop or from home.

3 Laptop Internet Access

You will work on your own laptop in class and out to complete assignments. You will need internet access to log in to phys-ugrad.mcmaster.ca (to work) and to download software.

3.1 On campus internet

Though you will probably be mostly off campus this term, on campus generally you can see the wireless network *Mac-WiFi*.
You can authenticate your access using your MAC ID (username) and password.
See: `https://uts.mcmaster.ca/connect-to-wifi/`

3.2 Off-campus login to phys-ugrad.mcmaster.ca

Note that phys-ugrad.mcmaster.ca is only automatically visible on campus (at McMaster). You will need to use VPN to connect from off campus (see below). While you are on campus (or with VPN) you can just say `phys-ugrad`. The full IP address is `phys-ugrad.mcmaster.ca`.

The VPN client lets your off-campus computer emulate being on campus. It lets you connect to phys-ugrad.mcmaster.ca and also use other things like the library systems as if on campus.

There are VPN clients for WINDOWS, linux and mac OS here:
`https://uts.mcmaster.ca/virtual-private-networks-vpn/`

Specifically for students:
`https://uts.mcmaster.ca/services/computers-printers-and-software/virtual-private-networkin`

Note that even once the VPN software is installed you need to type in where to connect, such as:
`studentvpn.mcmaster.ca`

4 Unix: The operating system for this Course

You need to set up your laptop to allow you to work under unix on phys-ugrad.mcmaster.ca . There is a separate document which is quick summary of the unix operating sytems (see: unixsummary.pdf). We will spend a lot of class time going over unix.

There are three components to this: A terminal, ssh (to connect to phys-ugrad.mcmaster.ca) and an X-server to allow you to pop up new windows.

A terminal is a window that looks a bit like an editor – you type into it. Unlike an editor, everything you type is interpreted as a command and runs programs with the same name as what you type. One program is ssh (secure shell client), it connects you to a new computer. After you run ssh, any further commands are executed on the new computer you connected to.

An X-server (or window server) is a program that lets programs start up new windows on computer, even if those programs are running on a different computer such as phys-ugrad.mcmaster.ca . Without an X-server you can only type into the original terminal window.

The first thing to do is to make sure you have an X-server, terminal and ssh. These sometimes come as one package.

4.1 WINDOWS: Mobaxterm

Mobaxterm is a freely available unix terminal, ssh and X-Windows emulation program all in one. It works on WINDOWS only.

One-time Setup:

1. Get on-line, open a web browser
2. Get the free edition: `https://mobaxterm.mobatek.net/download-home-edition.html`
3. Choose: Mobaxterm Home Edition (installer edition) to download
4. Open the download (a zip file) and extract the contents. Don't just click on the msi file – it will fail to install properly.
5. Then Run: `MobaXterm_installer_20.3`

6. Agree to the licence terms and install it

General use:

1. Double click on Mobaxterm short cut (or from the start menu)
2. Click on *start local terminal*
3. You now have a unix terminal on your laptop, type into it to connect to phys-ugrad.mcmaster.ca :
4. Type: **ssh** *myusername*@**phys-ugrad**
5. enter your password and you are then working on phys-ugrad

The X-server starts by default with Mobaxterm.

Note that the Mobaxterm local terminal is highly functional *but it is only on your laptop NOT phys-ugrad.mcmaster.ca* . There are a some things installed by default (e.g. *xterm*) but no compiler. It is possible to install quite a bit of additional software here (i.e. on your laptop) and make a useable unix environment on your WINDOWS laptop. For this course, we require connecting to phys-ugrad.mcmaster.ca and using the unix environment there (this is what the ssh is for). phys-ugrad.mcmaster.ca does have compilers (e.g. c++) all ready to go.

4.2 Macbooks, MacOS: XQuartz

Macbooks are unix already and only lack an X-server by default. Macs include a terminal already but not an X-server until you install Xquartz.

One-time Setup:

1. Get on-line, open a web browser
2. Go to: `https://www.xquartz.org/`
3. Download: XQuartz-2.7.11.dmg
4. Install the dmg file

General use:

1. Run `Applications > Utilities > XQuartz.app`
2. Right click on the XQuartz icon in the dock and select `Applications > Terminal` to start an xterm terminal
3. You now have a unix X terminal on your macbook, type into it to connect to phys-ugrad.mcmaster.ca :
4. **ssh -Y** *myusername*@**phys-ugrad**

Note 1: that you will only have to run XQuartz once until you next reboot. As long as the Xquartz icon is visible in the dock, the X-server is already running. Macs can install all the regular unix tools like compilers (gcc) and so on and provide a good place to develop code. For this course, we advise connecting to phys-ugrad.mcmaster.ca and using the unix environment there.

Note 2: Macs sometimes have an annoying timeout issue with ssh that makes you have to log in again (e.g. windows stop opening). Using ssh -Y (shown above) should avoid the problem.

4.3 Linux laptops

Congratulations, you are good to go. You should already have terminals, X-servers and ssh installed.

Note that Chromebooks actually run linux but it is a broken linux that does not include an X-server. We can try to help you with this but you may be out of luck so we don't recommend chromebooks at all.

5 Connecting to phys-ugrad.mcmaster.ca

The most reliable way to connect is to type the following into your terminal:

ssh -Y *myusername*@**phys-ugrad.mcmaster.ca**

For ssh the -Y (note: capital Y) is necessary to be able to pop-up windows from the remote machine. Some versions of ssh don't need this (e.g. Mobaxterm). If you are on campus you don't need the full name so this may work:

ssh *myusername*@**phys-ugrad**

Your username is the same as your MAC ID name (i.e. your mac email account username). Your phys-ugrad.mcmaster.ca password is not the same as your Mac ID password. We will talk about this in class.

You are now connected to phys-ugrad.mcmaster.ca . Any program or command you enter after the ssh command is now run on phys-ugrad.mcmaster.ca . You can create xterm terminals (more windows) and edit or run programs in your directory on phys-ugrad.mcmaster.ca .

6 X-Windows

Here are some example windows applications. Historically, programs that can pop-up new windows under unix were often prefaced by a letter x.

xterm &	Create a new terminal window
xterm -fn fixed -sb &	Create a new terminal window with small font and scrollbar
xeyes &	A silly application
gedit *file* **&**	Start a gedit editor window (*recommended editor*)
xemacs *file* **&**	Start an xemacs editor window

7 File transfer

The `Mobaxterm` client also allows you to transfer files. Once you log in with ssh it shows you a file transfer window with your files and folders on phys-ugrad.mcmaster.ca . You can drag and drop files from here.

You can also copy files using **scp** and **sftp**.

scp *localfile myusername*@**phys-ugrad.mcmaster.ca :***remotefile*

Using **scp** for unix to unix transfers is fine. **scp** can cause issues from unix to WINDOWS because of the difference in text file formats. See the section on printing below for text file conversion issues for WINDOWS.

8 UTS accounts

UTS stands for University Technology Services. They manage the computer labs and university level student accounts. There are student consultants available in larger labs on campus.
Get help with accounts at the UTS lab webpage:
`https://uts.mcmaster.ca`

9 Printing

All your work files should reside on phys-ugrad.mcmaster.ca . However, we require PDFs of assignments to be handed in. **For 2020 we will accept only digital hand-ins.**

If you did wish to print files created on phys-ugrad them you must first move them to a machine where you have permission to print. You can transfer files to the local computer in a UTS lab and then use the UTS printing services.

WINDOWS and Unix have a slightly different text file format. This means that some WINDOWS applications like **notepad** can't correctly view files source code like *myprogram.c* after you move it from a unix machine to a WINDOWS machine. Use WINDOWS **wordpad** to correctly view such files.

10 Other ways to get unix on a laptop (NOT REQUIRED)

10.0.1 Windows subsystem for Linux (WSL)

Another alternative is the Windows subsystem for Linux. This is real linux running under windows, e..g Ubuntu. It works very well but is fiddly to set-up and you would have to install quite a few things. You can google if you want to learn more or talk to the instructor/TAs. Note that for the course you would still neet to install ssh and use it to connect to phys-ugrad.mcmaster.ca .

10.1 Cygwin

Cygwin is a unix-like environment under WINDOWS that includes core GNU and Open Source tools. Mobaxterm uses parts of Cygwin and you can install more (e.g. compilers). Under Mobaxterm this is done with the `|apt-get|`program. E.g. to install gcc/g++ you can search for packages with the name gcc and install a recent version:

```
apt-get search gcc
```

`apt-get install gcc4`

There are other ways to get and use Cygwin. This includes directly from their website: `www.cygwin.com` or Swan desktop —www.starlig.ht—. Most students find the original Cygwin clunky and problematic. The easiest way to use it is probably via Mobaxterm.

10.2 Dual boot

If you are really hard core you can make your laptop dual boot linux or Windows or even install just linux on it. The advantage to a proper install is you get full performance on Linux. Linux under Windows is typically slower. The disadvantage (if you care) if that Linux will not run most Windows apps.

11 Independence

I like to think of the course as excellent training for summer research work that requires use of a unix environment. Any summer student should know that summer employers value and expect independence in summer students. While in a summer job you might be dropped in a room with an unfamiliar computer, this is a course so you will be given a lot of assistance with things critical to the course: unix, terminals, shells, compiling and running. We will be spending lots of time trying things and the instructor and the T.A.s will gladly answer questions. For things outside the core course you should be willing to try things yourself (e.g. Mobaxterm, Cygwin, XQuartz, VPN at home). The instructions here are somewhat brief but should contain enough information for you to get started.