MFCF GRAD SESSION 2018
AGENDA

- Introduction, Help Centre, Dept. Grad reps
- Graduate student computing
  - Virtual Private Network (VPN)
  - desktops, printing
  - wireless and wired
- Available computing resources
  - data storage, job management and web pages
  - Windows environment - MS Remote Desktop, Remote applications
  - Linux environment - specialty (fast, big), background jobs, cpu limit
  - GPU computing, HPC computing
- Questions??
HELP CENTRE

- MC 3017, ext. 36323 mfcfhelp@uwaterloo.ca
- Desktops - re-imaging, no admin access, downloading software
- personal laptop wired connections - submit RT
- accounts, printing
- Request Tracker - https://rt.uwaterloo.ca/SelfService/Forms/MFCF/
VIRTUAL PRIVATE NETWORK

- Allows remote access to all campus network resources
  - e.g. files, remote desktop services
  - all data transferred is encrypted and secure
- Install VPN from IST. This is a one-time install.
  - [https://uwaterloo.ca/information-systems-technology/services/virtual-private-network-vpn](https://uwaterloo.ca/information-systems-technology/services/virtual-private-network-vpn)
    - includes Windows and Mac instructions
- the client is called Cisco AnyConnect
- WatIAM credentials to login
**WIRELESS**

- Select eduroam from the list of available Wi-Fi networks
- Authentication
  - userid@uwaterloo.ca
  - WatIAM password

**WIRED**

- submit an RT in the MFCF queue with the following information:
  - operating system
  - room
  - expiry date
  - MAC hardware address
    - [https://uwaterloo.ca/math-faculty-computing-facility/services/wired-connections/how-find-mac-hardware-address](https://uwaterloo.ca/math-faculty-computing-facility/services/wired-connections/how-find-mac-hardware-address)
- sponsor/supervisor
files on local machine are NOT backed up

Common Mathematical software - Maple, MATLAB, R, Office suite, etc....

Mac minis - icons on the desktop to map to:
  - files.math - files stored on the fileserver
  - windows.math - Windows terminal servers using Remote Desktop
  - linux.math - opens Linux command window
    - more about choice of Linux servers later in the presentation

Windows PCs joined to Nexus
  - P: drive - your personal storage

managed by MFCF - no admin access
  - Request to have re-imaged or software installed (new software must be approved by MFCF/SAS)
  - sometime this term all Nexus PCs and Macs will have automatic reboot for patching - (SAS labs already done, managed PCs rebooted weekly)

Linux - managed by the user
DATA STORAGE

UPLOADING FILES

- uploading files - files.math.uwaterloo.ca
- web pages - Scholar - IST https://uwaterloo.ca/scholar/
- how long to keep this site after leaving:
  - indefinite (can not edit after you leave)
  - make sure to put in a link to a new site before it’s read only
  - request to have it shut down/hidden
DATA STORAGE

ACCESS YOUR FILES

- Use Virtual Private Network (VPN) when accessing campus resources remotely [https://vpn.uwaterloo.ca](https://vpn.uwaterloo.ca)
- store files on the Math fileserver (back up your data)
  
  - Mac mini > files.math icon
  - Mac standalone: Go > Connect to Server…
    - smb://files.math.uwaterloo.ca/UWuserid
  - Windows Remote Desktop: windows.math.uwaterloo.ca
    - P: drive (files are stored automatically on the file server)
  - Windows standalone: Map a network drive
    - \files.math.uwaterloo.ca\UWuserid
  - Linux: File Manager > Connect to Sever…
    - smb://files.math.uwaterloo.ca/UWuserid
    - ssh to linux.math.uwaterloo.ca
PRINTING

- access is automatic once registered - check with admin for location to printers
- for thesis only - do not print books
- can be added to your personal workstation

https://uwaterloo.ca/math-faculty-computing-facility/adding-printers-your-computer
WEB PAGES FOR RESEARCH

- UWaterloo Scholar https://uwaterloo.ca/scholar
  - does not require programming or coding skills
  - easy to use tools, self managed with templates/content modules
    - bio, CV, publications, events, etc....
  - publications can be imported into UWaterloo Scholar
- Documentation and guidelines:
  - https://uwaterloo.ca/web-resources/scholar#documentation
SERVERS

- types of Linux servers
  - aliases - ssh to one of: linux.math, biglinux.math, fastlinux, and linux.student.math (course work only)
  - GPU server, Parallel clusters

- what they can be used for:
  - Math applications/IDEs
    - R, RStudio, Julia, Matlab etc.
    - compilers and numerical libraries (gcc, GSL)
    - parallel tools on biglinux (OpenMP) and the clusters (MPI)
  - lots more memory than your supplied desktop or laptop
  - long running jobs
LINUX ENVIRONMENT

**BIG LINUX**

- for very large multi-threaded jobs
- three computers, each with 4 high-core-count CPUs,
- large amount of memory

**FAST LINUX**

- jobs where processor speed is most important
- four computers with fastest CPUs, only 2 CPUs per machine
- low core count
- not a large amount of memory
**JUPYTER**

- web based application that allows you to create documents that contain live code, equations, and visualizations
- use it remotely for Python, R, Octave, or other shell for quick work
- [jupyter.math.uwaterloo.ca](http://jupyter.math.uwaterloo.ca) (may have to log into VPN)
GPU SERVERS

- gpu01.math
- two 14-core CPUs, 128GB RAM
- four NVIDIA Tesla P100 GPUs
  - P100: ~3600 cores, 5.4 teraFLOPS DP
- CUDA and other parallel GPU tools
- authentication using Nexus password
- home directory is research file server (files.math)
LINUX ENVIRONMENT

JOB MANAGEMENT

- background jobs
- batch
- nice
- limit - cpu, memory, etc....
- nohup and screen
PUT JOBS IN THE BACKGROUND

if you do this:

- $ firefox

you can’t run another command until firefox exits

- put an ampersand on the end:
  - $ firefox &

it runs in the background and you can type more commands

- see what jobs you have in the background:
  - $ jobs
  - e.g. bring the third one to the foreground again:
    - $ fg %3
  - e.g. kill the second one:
    - $ kill %2
BATCH

- leave a job running after log-out
  - submits job to a queue
  - runs when conditions allow (load, etc.)
  - send you mail about status
  - restarted if interrupted

- syntax: batch queue name -c "command options..."

- examples:
  - % batch big -c "./my_big_job.a <infile >outfile"
  - % batch long -c "./my_long_job.a <in>out"
  - % batch status
  - % batch cancel -q big 1234

- see "man batch"
**NOHUP**

- log-out sends “hang up” (HUP) to child processes
- “nohup” command blocks HUP signal
- syntax: (put ‘nohup’ in front of usual command line)
  - `% nohup ./myprog.a <infile>oufile`
  - `% nohup matlab -nojvm -r [a,b,c]=myarray -logfile myarray.log`
  - `% logout`

**SCREEN**

- lets you disconnect from session and reconnect later
- start: `screen`
- disconnect: `ctrl-A d`
- reconnect: `screen -x`
LINUX ENVIRONMENT

NICE

- commands run from the shell prompt run at normal interactive priority
- batch jobs run at a low background priority
- so it is not polite (or "nice") to run big/long jobs at normal priority
- use the "nice" command to start a job at a polite background level:

  % nice 19 ./a.out &

- use the "renice" command to reset the priority of a running job:

  % ./a.out &
  % ps -u

  USER       PID %CPU %MEM    VSZ   RSS TTY      STAT START   TIME COMMAND
  rblander   14142  0.8  0.0  13796  2016 pts/3    Ss   11:29   0:00 ./a.out

  % top

  PID   USER      PR  NI  VIRT  RES  SHR S %CPU %MEM    TIME+   COMMAND
  14142  rblander  20  0  269m  150m  5092 R 100.0  0.0   0:01.12 ./a.out

  % renice 19 14142

  % top

  PID   USER      PR  NI  VIRT  RES  SHR S %CPU %MEM    TIME+   COMMAND
  14142  rblander  39 19  269m  150m  5092 R 100.0  0.0   0:01.23 ./a.out
LIMIT

- protects against accidental long-running jobs
- default is 1200 seconds (20 minutes) CPU time
- Increase it in your shell control file
  - open the .cshrc file with your favourite editor
    - e.g. change "limit cputime unlimited"
    - e.g. change "limit memoryuse unlimited"
- log out and log back in again for it to take effect
- "man limit"
WINDOWS ENVIRONMENT

SERVERS

- types of Windows servers
  - aliases
    - windows.math - research computing cluster
    - windows.student.math - student/course computing - 2 hrs auto-logout - NOT for research
  - how to access them
    - remoteapps and remote desktop
  - Mondo.math - research GPU computing - reservations only
REMOTE DESKTOP

- Microsoft Remote Desktop (version 10) from Mac
  - P: files.math - Math research
  - M: files.student.math - Math student/courses
- Save your work often
- write code with checkpoint methods
REMOTE APPS

- https://remoteapp.math.uwaterloo.ca
- has latest versions of common software
- one session accessible from many devices

MONDO

- Research GPU Windows computing
- What can it be used for:
  - test code before sending to Linux servers or SHARCNET
  - code that needs graphics console, or, highly I/O intensive
RESOURCES

- Grad reps
  - liaison between grads and MFCF
    - new developments, computing improvement suggestions
- lynda.com - online training
- Request Tracker - online reporting system
THANK YOU

From the MFCF Team

suggestions for future topics??

https://uwaterloo.ca/math-faculty-computing-facility/services/audience/25