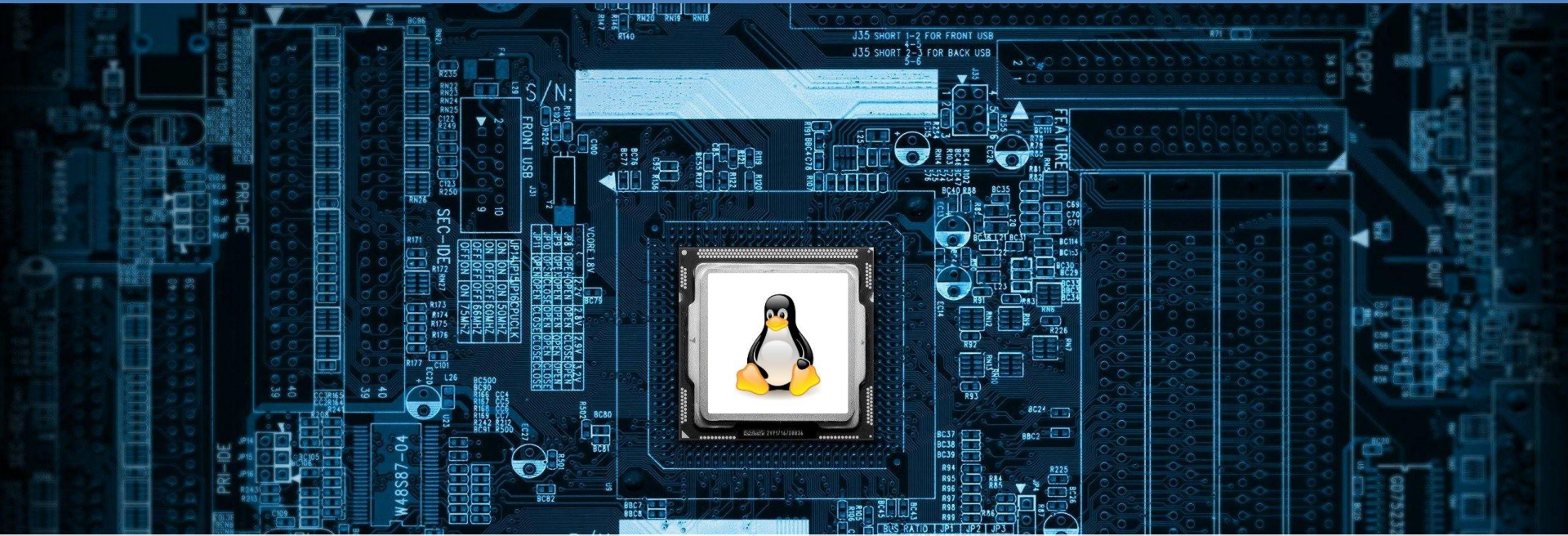

ECE 650 – LINUX & GIT TUTORIAL

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Connecting to ecelinux from home

- Open up an SSH client, eg PuTTY (http://www.chiark.greenend.org.uk/~sgtatham/putty/download.html)
- Connect to `ecelinux4.uwaterloo.ca` with your Quest username and password
- Once connected, type `ssh -X eceLinux`**`N`** to connect to one of the ecelinux work machines to do work (**N** = 1 to 11, except for 4)
  - Eg `ssh -X eceLinux5`
- Once you connect to a work machine, type in command `bash`
  - You will need to do this to use shortcuts (environment variables)
- If at any point it asks you something about RSA key fingerprints or authenticity, just accept them.

Basic Linux commands

Command	What it does
`pwd`	prints out the path to the current working directory you are in
`cd` *folder*	will change the current working directory to *folder*
`ls`	lists all the folders and files in your current working directory
`ls -la`	also lists all hidden files and directories
`ls` *folder*	same command but will list the contents of *folder*
`mkdir` *foldername*	creates a folder called *foldername* in your current directory
`rmdir` *foldername*	deletes the folder called *foldername*
`touch` *filename*	creates a blank file called *filename*
`rm` *filename*	removes the file called *filename*
`rm -r` *folder*	deletes *folder*, and all files and subfolders within *folder*

Basic Linux commands

Command	What it does
`man` *`program`*	display the help page for a particular command or program
`more` *`filename`*	display the contents of the file called *filename*, with controls to advance the contents page by page
`less` *`filename`*	display the last page of content of the file called *filename*, useful for inspecting log files for the most recent events

There’s many more Linux commands, look them up on Google

File Editing

- There are various ways to create and edit files in Linux, but most commonly these will be text files
- Most popular command line text editors: `emacs`, `vi`, and `vim`
- Most popular graphical text editors: `gedit`
  - In `ecelinux` you won't be able to get a graphical user interface running, in your own Linux computers you can use graphical text editor tools

Vim (Vi Improved)

- Has 4 modes, normal, insert, visual, and ex mode, which you must switch between
  - Vim always launches in normal mode (for viewing)
- Basic tutorial: http://vim.wikia.com/wiki/Tutorial
- Advanced commands (search & replace, etc):
  - https://danielmiessler.com/study/vim/
  - http://derekwyatt.org/vim/tutorials/novice/
- To edit a file: type `vim filename` in command line to launch vim with that file opened
  - Press i to enter insert mode, start editing
- To save the file, from insert mode, press esc, then type :w and press enter
  - Press i again to go back to insert mode
- To quit the program, from insert mode press esc then type :q
  - Together: :wq will save and quit

Linux Shortcuts and Environment Variables

- ~ is a shortcut to your home directory (eg `cd ~`), on `ecelinux` this is `/home/`*`yourUWID`*
- You can create your own custom shortcuts (called environment variables) by editing the file `~/.bash_profile`
- Eg add this to `.bash_profile` then save:
  - `export ECE650=~/myCourses/ECE/650`
  - `export A1=$ECE650/assignment1`
- Of course, you'll also have to create these folders using `mkdir`
- Run command `source .bash_profile` to add the environment variables to memory
- To see that it is in memory, use echo command: `echo $ECE650`
- You can then use `cd $A1` to jump right to `/home/uwID/myCourses/ECE/650/assignment1` folder

Source Code Version Control Systems

- Software systems to help you manage and share source code and projects
  - Versions and version history
  - Team editing
- Two most popular systems: `Git`, `Hg`
- Two most popular hosting sites: Github.com (works with Git only), Bitbucket.org (works with both Git and Hg)
  - Create an account and a git project on one of these!
- `ecelinux` only has `Git` installed

Git System

- Keeps track of incremental updates to your source code and project via a series of **Commits**
  - repeat(make some file edits and changes, commit)
  - You can backtrack your commits to go to an earlier version of your project, and go forward again as well
- Keeps track of development work in parallel across team members using **Branches**
  - From some commit, we **Fork** into two branches, each branch then advances with its own series of commits, and some time later we **Merge** the branches
  - Each branch typically owned and worked on by 1 person
  - Merge will combine the work across team members

Basic Git project management

- To clone a project (including your own) from the web, use `git clone` command:
  - Eg `git clone https://github.com/youraccount/yourproject.git`
- Committing:
  - Add all relevant files you want to the commit using `git add`
    - `git add /path/to/filename`
  - Then create a commit:
    - `git commit`
    - It will prompt you with a screen asking you to enter a commit message, the message describes the overall changes you did in this commit (eg added display functionality, changed x, removed y…)
  - To upload the commit to the server, use `git push`
- Full tutorial: http://rogerdudler.github.io/git-guide/

Transferring files between your computer and ecelinux

- Since ecelinux doesn't have a graphical user interface for you, email won't really work (you'll need a web browser, which can't run on console)

- Use Git:
  - **Commit** & **Push** from your own computer to your project on Github or Bitbucket
  - **Pull** the updated project in ecelinux
- Recommended workflow:
  - Create and edit your software code on your own computer, test and fix problems on your own computer first
  - Once that's done and ready, transfer to ecelinux and make sure it runs there
    - If there's additional problems, fix them
  - If everything works, submit your files to Learn

Virtual Machines

- A technology which allows you to run multiple virtual computers inside a single physical computer
- Each virtual machine is a virtual computer, has its own operating system
  - Host OS → The one installed directly onto the physical computer
  - Guest OS → The one installed inside the virtual machine
- There are both commercial and personal use virtual machine systems
  - VMware is the most popular commercial system
  - Oracle VM VirtualBox is the most popular personal use system

Getting Linux working inside a VM

- Download Oracle VM VirtualBox for your Host OS:
  - https://www.virtualbox.org/wiki/Downloads
- Download Linux installation ISO disk
  - Eg for Ubuntu: http://releases.ubuntu.com/15.04/ubuntu-15.04-desktop-amd64.iso
- In VirtualBox:
  - Create a Linux VM, make sure its 64 bits (or matching your Linux OS)
  - Adjust the settings of the VM for CPU, Memory, etc… and attach the ISO to the virtual CD drive
  - Power on the VM, proceed to install Linux
  - Once installation is completed, you can detach the ISO file using the same menus
  - Configure Linux to your likes
  - Enjoy!