SEEM3460 Tutorial

Unix Introduction

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Before we start, pls ensure the followings:

- **You have your SEEM account & password**
  - Each SEEM student should have an account when you first joined the department
    - If you have problems with the account, you can send emails to help@se.cuhk.edu.hk
    - This is important since you need to use it for the assignments and project
  - For Non-SEEM students: We have created some guest accounts and sent it to you via emails, pls also ask the TA for the elock cards
- **Connect to CUHK/SEEM via VPN if you are out of the campus**
  - Otherwise you won't be able to connect to the servers

Unix-like system is everywhere

- Linux
  - Android for smartphones
  - Google Chrome OS for Chromebook
  - Web servers
- OS X for MacBook/iMac
- iOS for iPhone/iPad

Unix Shell

- Shell: a program that acts as a middleman between you and the UNIX OS
- Terms similar (but different) to shell:
  - Terminal / Terminal Emulator
  - Console
- A shell allows users to
  - Run programs
  - Manage I/O of processes easily

SSH and X Window System

- **SSH (Secure Shell)**
  - connect to remote machines and execute commands remotely
- **X Window System**
  - commonly used in Unix-like systems to provide GUI environment
  - To run GUI program remotely, you need to provide a local X Server
  - We use **VcXsrv** to start an X Server on Windows

Required Software (Windows)

- **SSH client (required)**
  - **PuTTY** (FREE)
  - SSH Communications Security
  - ***Update:*** The built-in SSH client is now enabled by default in Windows 10's April 2018 Update, you can now connect to a Secure Shell server from Windows without installing PuTTY if you are using the new version.

- **X server (optional, but needed for GUI)**
  - **VcXsrv**: an open-source display server for Microsoft Windows. It enables a user of the Windows operating system to run GUI programs designed for the X Window System.

Required Software (OS X)

- **SSH client**
  - No need, OS X have native support
  - Open Terminal and type:
  - ssh [your UNIX name]@[your host name]
  - ssh –X [your UNIX name]@[your host name] with GUI support
- **X server**
  - XQuartz
  - http://xquartz.macosforge.org/

Step-by-step demonstrations

- We have three available servers for this class:
  - linux03.se.cuhk.edu.hk
  - linux04.se.cuhk.edu.hk
  - linux05.se.cuhk.edu.hk
- Inside SE intranet, you may omit ".se.cuhk.edu.hk" part

- To connect these servers outside CUHK, you need to connect the CUHK/SEEM VPN
  - https://www.cuhk.edu.hk/itsc/network/vpn/vpn.html

Windows: Using Putty

- Download and install putty
- https://www.chiark.greenend.org.uk/~sgtatham/putty/latest.html

MSI ('Windows Installer')

32-bit:	putty-0.74-installer.msi	(or by FTP)	(signature)
64-bit:	putty-64bit-0.74-installer.msi	(or by FTP)	(signature)

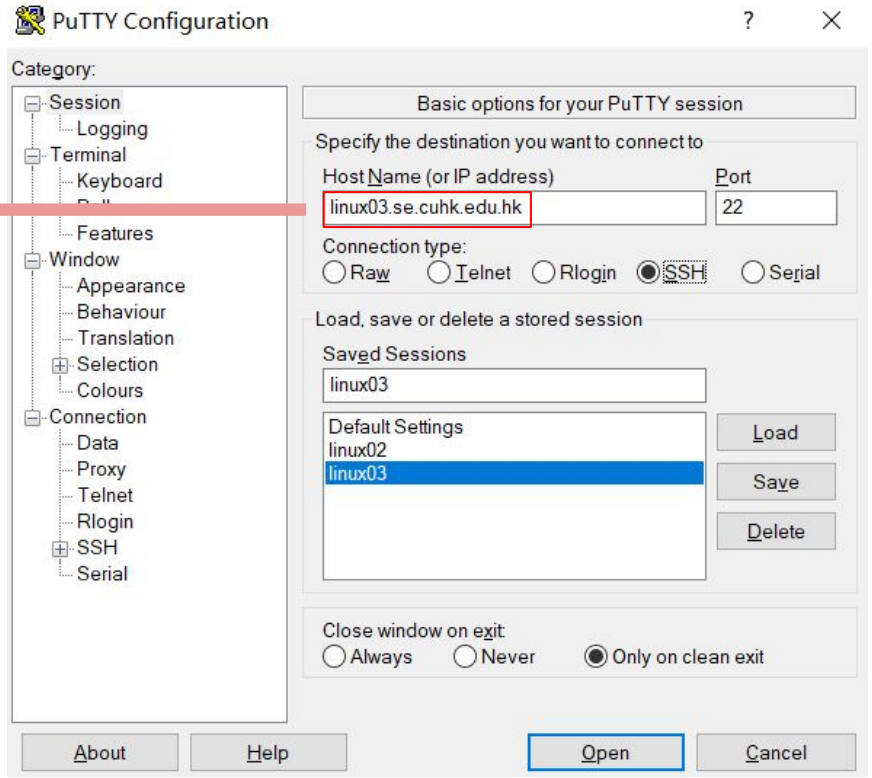
Unix source archive

.tar.gz:	putty-0.74.tar.gz	(or by FTP)	(signature)

Windows: Using Putty

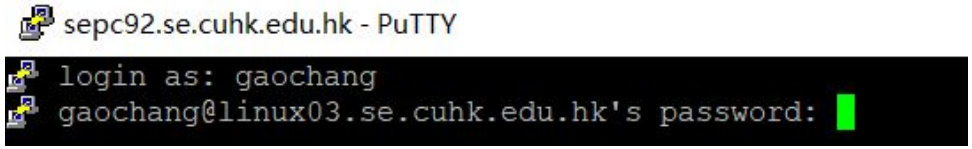
- Open putty

Host Name

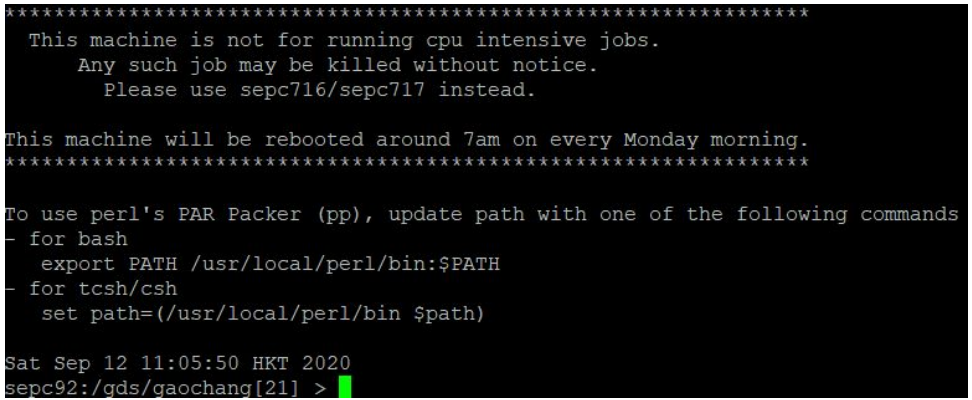


Windows: Using Putty

- Enter your username and password

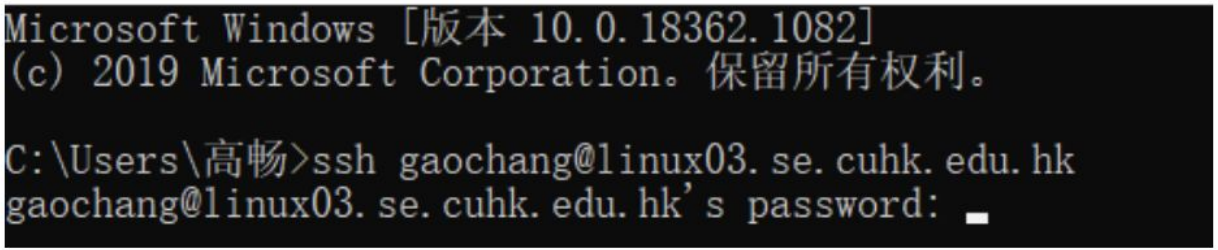


- Afterward, you should see something like this



Windows (Windows 10's April 2018 Update)

- The SSH is natively supported, you don't need to use PuTTY
- Just open CMD and type ssh [your UNIX name]@[your host name]

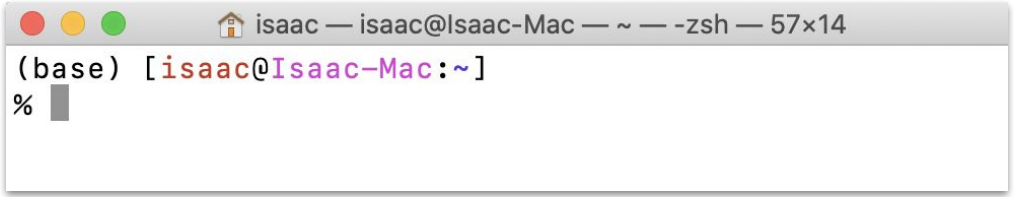


Windows: Using Putty with GUI support (Optional)

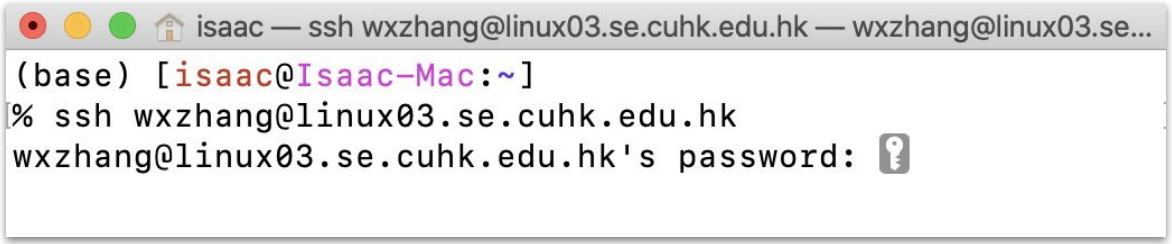
- If you need to run GUI programs like gedit, you need to start a local X Server such as **VcXsrv**
- Run VcXsrv
  - run/start Xlaunch which will ask for some configurations
  - just take all the default options and click Next until you see the Finish button
  - click finish and a small X icon will appear in the system tray
- Run putty.exe
  - [Connection]-[SSH]-[X11]: Enable X11 forwarding
  - [Session]: Host Name: (e.g.) linux02

Mac: No need to use third party tools

- Open terminal in your Mac

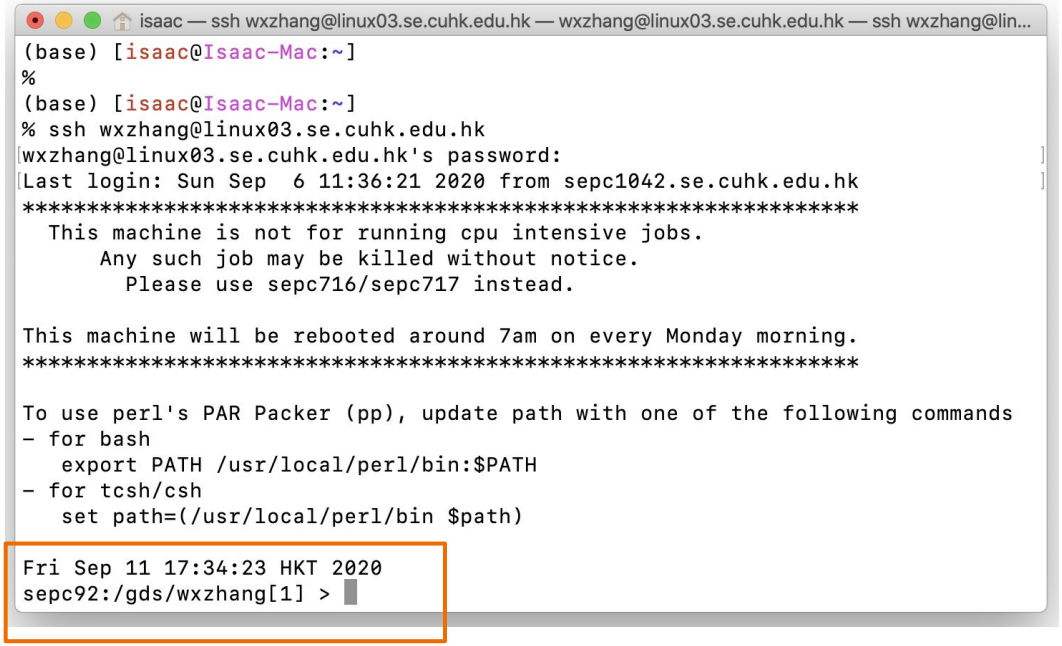


- Type: ssh [your UNIX name]@[your host name]



Mac: No need to use third party tools

- After typing in the password, you should see something like this:



Practice-1

- Login to linux03~05 using your PC

Utilities

- Unix utilities are the basic programs supporting the user to control the system
- Examples:
  - date: shows the system date
  - man -s 1 ls: shows help on ls from the built-in manual section 1
  - pwd: prints the working directory
  - echo: prints a message

A shell command

- **ls -lp ~**
- ls: program name, “ls” is the utility to list files
- -lp: options/switches, starting with a hyphen
  - “l” means list in long format
  - “p” means putting a slash after directory names
- ~: remaining parameters
  - actual meaning depends on the program used
  - for ls, the remaining parameters are the files or directories to be listed
  - “~” means the home directory of the current user

Unix file system in brief

- A hierarchy of directories
- To locate a file in the system, a pathname is needed
- Command: **pwd**
  - print your current working directory
- Pathnames
  - Absolute pathnames
    - Starting from the root (with a beginning “/”)
  - Relative pathnames
    - Starting from the current working directory

Directory: ls, cd, mkdir

- List files in a directory or fits the pattern
  - ls <directories/filename patterns>
- Change working directory
  - cd <aDirName>
- Creating (making) a directory
  - mkdir <newDirName>

File Operations

- View the content of a file
  - cat <file paths>
  - less <file paths>
  - head <file path>
  - tail <file path>

- If you don't have any file at hand, you can download a sample text file to try these common file operations:
  - wget https://www.gutenberg.org/files/1342/1342-0.txt

cp, rm, mv

- Copying a file
  - cp <oldFileName> <newFileName>
- Remove a file
  - rm <FileName>
- Remove a non-empty directory
  - rm –r <DirName>
- Remove a whole directory without prompt
  - rm –rf <DirName>
- Moving (renaming) a file
  - mv <aFileName> <aDirectoryName>
  - mv <oldFileName> <newFileName>

Editing a file

- nano
  - Advantage: simple, easy to learn and use
  - Disadvantage: no GUI
- emacs
  - Adv: has GUI, easy for beginners
  - Dis: relatively slow
- vi/vim (vim stands for Vi Improved)
  - Adv: fast for advance users
  - Dis: text-version is quite difficult to learn
  - GUI version: gvim, rgvim
  - To learn, type “vimtutor” in console
- Check their “man” page for detail usages

Pratice-2

- Use nano/pico/vim to create/edit/save a file and exit
- Tips:
  - For nano or pico, to create or edit a file, type ‘nano/pico filename’ to run. (e.g. ‘nano hello.c’)
    - Press ‘Ctrl+o’ to save, ‘Ctrl+x’ to exit.
    - Find more tips below the screen. ‘^’ means ‘Ctrl’ under linux command line.
  - For vim, press ‘i’ to insert mode, otherwise you cannot modify the file.
    - To create or edit a file, type ‘vim filename’ to run vim. For example, ‘vim hello.c’
    - To exit, first press’ ESC’, then type
    - ‘:q’ to exit if you do not modify anything
    - ‘:q!’ to exit forcedly regardless of any modification
    - ‘:wq’ to save and exit

Compiling C programs in Unix

- Compiler:
  - cc – the native C compiler under Unix
  - gcc – C compiler under GNU project
  - Usage is the same, gcc is more popular
- To compile a C source code file, say example.c, type in:
  - gcc example.c
  - The output of both compilers (i.e. the executable) would be “a.out” by default
- To override the default executable name, use “-o” flag
  - gcc example.c –o example
- You can name the executable as .exe or .bin file to remind yourself the nature of the file

Practice-3

- Get familiar with file/directory-related commands
- Create a seem3460 folder in your home directory
- In the tutorial-01 subfolder, create a **hello.c** file with the following content, compile with gcc and run the compiled program to see the output

```
#include <stdio.h>
int main() {
  printf(“Hello World\n”);
}
```

- **Note:** Copy and Paste may produce strange characters in your editor, so try to type the code by yourself.

Q&A