Course Syllabus

Advanced Programming in the UNIX Environment

Chun-Ying Huang <chuang@cs.nctu.edu.tw>

UNIX OS is Popular …

Let's see some numbers …

Worldwide Device Shipments by Operating System (Thousands of Units)

	2012	2013	2014	2015	2016
Android	505,509	898,944	1,156,111	1,454,760	1,619,030
Windows	346,468	326,060	262,615	279,415	298,896
iOS/Mac OS	212,875	236,200	333,017	355035	393,256
Others	1,152,588	873,195	626,358	380,545	261,155
Total	2,217,440	2,334,399	2,378,101	2,469,755	2,572,337

Android + Apple ~ 80%. The raise of mobile operating systems!

Source: Gartner
http://www.gartner.com/newsroom/id/2610015, 2791017, 2954317

Course Objective

UNIX programming tools

Library calls and system calls

Implement (console-based) tools and applications

Low-level programming in the UNIX environment

Security issues in the UNIX programming environment

The Instructor

Chun-Ying Huang (黃俊穎)

- Office: EC 417
- Office Hour: Fri 10am-12nn, or by appointment
- Email: chuang@cs.nctu.edu.tw
- Phone: (03)573-1875

Teaching Assistant

Jin-Wei Hsu, Kuan-Ting Chen, Ting-Yu Chen, Pin-Chih Chao

Office: EC223A

Office Hour: By appointment

Email: ta@zoolab.org

Lecture

Prerequisite

- C and/or C++ programming
- Python programming
- Some Assembly language (IA32 and IA64) – will be briefly introduced
- Operating system
- Computer network

Allocated time and classroom

- 10:10—12:00, Monday @ EC 114
- 9:00—9:50, Wednesday @ EC 114

Textbook

W. Richard Stevens and Stephen A. Rago, “Advanced Programming in the UNIX Environment,” 2nd ed. or 3rd ed, Addison Wesley (開發圖書)

Course Topics

Fundamental tools and ~~shell programming~~

Files and directories

File I/O and standard I/O

System data files and information

Process environment

Process control

Signals

Assembly language integration

Threads

Thread control

Daemon processes

Advanced I/O

Inter-process communication

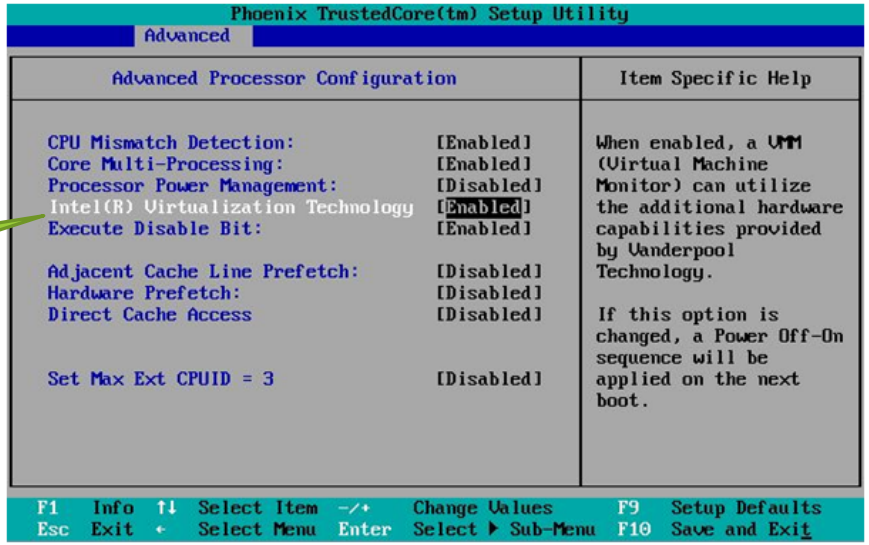
Network I/O

Other Topics

Working Environment – Setup (1/3)

Option #1: Install your own virtual machine and your preferred OS

- VirtualBox – Open-source solution, supports Windows, Mac OS X, and Linux
- VMware – Commercial solution, supports Windows, Linux, and Mac OS X
- HyperV – Built-in since Windows 8
- ➔ You may have to enable CPU's VT-x feature (in BIOS) to have better performance



Intel® Virtualization Technology

Working Environment – Setup (2/3)

Option #2: ~~For CS students, you may try Linux or BSD workstations~~

- linux1.cs.nctu.edu.tw ~ linux4.cs.nctu.edu.tw
- bsd1.cs.nctu.edu.tw ~ bsd4.cs.nctu.edu.tw
- No root permission - we may need root permission for some topics

Option #3: If you have a Mac

- Install Xcode, and you should have the required tools
- iOS and Mac OS X are based on a BSD kernel
- In addition, you can install homebrew, macports, or fink
- Current recommendation: docker (DockerDesktop) on Mac

Working Environment – Setup (3/3)

Option #4: If you were a hardcore Windows player

- Install CYGWIN or MSYS2 and the required tools
- Not really recommended, because it is an emulated environment.

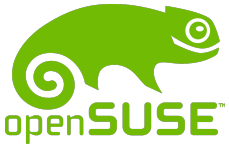
Instructor's Recommendation

- Native Linux or Linux in a virtual machine

Popular UNIX distributions (mostly Linux)

- http://distrowatch.com/: Statistics based on web visitors
- Manjaro, Mint, Debian, Ubuntu, OpenSUSE, Fedora, FreeBSD




Working Environment – Required Tools

Terminal
- putty (recommended ssh client for accessing the platform on Windows)
- Windows terminal + WSL1/2
- Built-in terminal or iTerm2 app in Mac OS X and Linux/UNIX
- CYGWIN/MSYS2's default terminal

Development tools
- gcc/g++/clang/yasm/nasm
- gdb
- make

Text Editors
- Visual studio code (multiple platforms)
- notepad++: https://notepad-plus-plus.org/ (Windows only)
- vim (multiple platforms)

bash – for shell programming

Grading Policy

Midterm: 25%

Final Exam: 35%

Homework and class participation: 40%

No copycats! You are encouraged to discuss with your classmates, but all your submissions must be your own work.

Course Web Site

URL

- http://people.cs.nctu.edu.tw/~chuang/courses/unixprog/
- Instructor's personal web page -> Courses -> UNIX Programming

Course materials are password protected

- Username: `unix109`
- Password: `up21tauros`

Q & A

BEFORE OUR NEXT CLASS, PLEASE ENSURE THAT YOU HAVE SETUP YOUR WORKING ENVIRONMENT