Course Syllabus

Introduction to Network Programming

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

Course Objective

- Basic computer network concepts
- UNIX programming tools
- Network-relevant library calls and system calls
- Various models to implement network programs
- Implement (console-based) tools and applications
- Security issues in the network programs

The Instructor

- Chun-Ying Huang (黃俊穎)
  - Office: EC 417
  - Office Hour: by appointment
  - Email: chuang@cs.nctu.edu.tw
  - Phone: (03)573-1875

Teaching Assistant

- 許晉瑋, 黃冠璋, 杜萬珩, 高瑋哲,徐曼妮,蔡旻哲
- **Office**: EC223A
- **Office Hour**: By appointment
- **Email:** ta@zoolab.org

Lecture

- Prerequisite
  - C and/or C++ programming
  - Python programming
  - Operating system
  - Computer network
- Allocated time and classroom
  - 15:30—16:20, Monday @ EC 122
  - 10:10—12:00, Thursday @ EC 122

Textbook

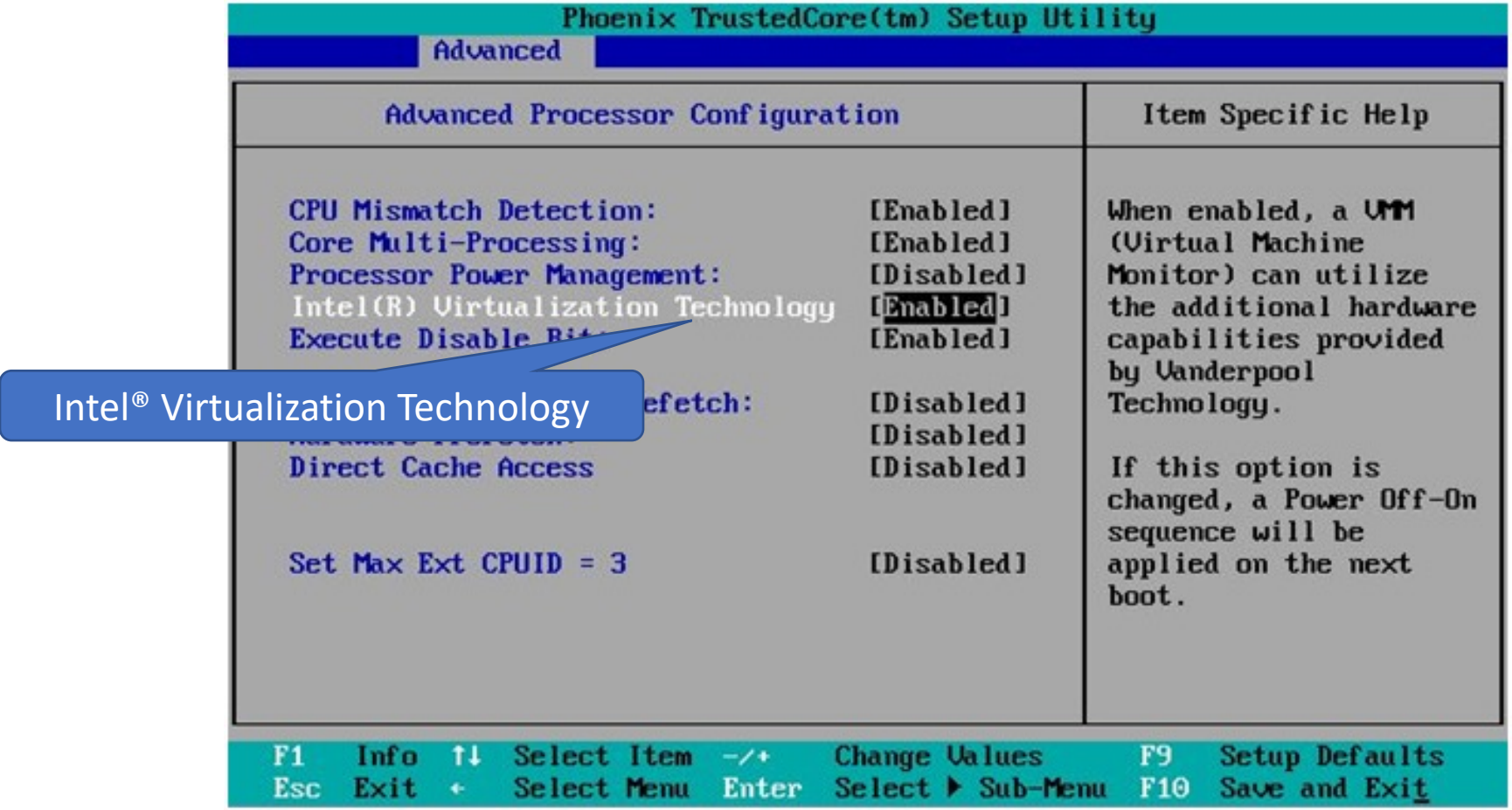
- W. Richard Stevens and Stephen A. Rago, “UNIX Network Programming, Vol. 1” 3rd ed, Addison Wesley (開發圖書)

Course Topics

- Fundamental
- Computer Network Applications
- Introduction to Network Programming
- Transportation Layer: TCP and UDP
- Socket Introduction
- Elementary TCP Sockets
- TCP Client/Server Example
- I/O Multiplexing
- Socket Options
- UDP Sockets
- Name and Address Conversions
- Advanced I/O Functions
- Nonblocking I/O
- ioctl() Operations
- Raw Sockets
- Threads
- 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 (see the next page)


Phoenix TrustedCore(tm) Setup Utility
Advanced
Advanced Processor Configuration
Item Specific Help
CPU Mismatch Detection: [Enabled]
Core Multi-Processing: [Enabled]
Processor Power Management: [Disabled]
Intel(R) Virtualization Technology [Enabled]
Execute Disable Bit [Enabled]
efetch: [Disabled]
[Disabled]
Direct Cache Access [Disabled]
Set Max Ext CPUID = 3 [Disabled]
When enabled, a VMM (Virtual Machine Monitor) can utilize the additional hardware capabilities provided by Vanderpool Technology.
If this option is changed, a Power Off-On sequence will be applied on the next boot.
F1 Info ↑↓ Select Item -/+ Change Values F9 Setup Defaults
Esc Exit ← Select Menu Enter Select ▶ Sub-Menu F10 Save and Exit
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, e.g., raw sockets and packet capture
- 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, 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
  - tmux
- 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)

Grading Policy

- Midterm: 20%
- Final Exam: 20%
- Homework and class participation: 60%

- *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/netprog/
  - Instructor's personal web page -> Courses -> Intro. to Network Programming
- Course materials are password protected
  - Username: `inp110`
  - Password: `np21tauros`

Q & A