Introduction

Introduction to Computer Systems
1st Lecture, Sep. 1, 2015

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The original lecture notes are made by the authors of the textbook from CMU. You can find them at http://www.cs.cmu.edu/afs/cs/academic/class/15213-f15/www/index.html.
People

■ Instructors
  ▪ Younghoon Kim, Yusung Kim and Dohyung Kim

■ TA
  ▪ Hyunjun Kim and Kyungjun Lee
Lecture and Assignments

- Lecture will explain high level concepts

- More detailed knowledge can be learned from programming assignments
  - 3 programming assignments total
  - TAs will help you completing the assignments
Prerequisites

- **Prerequisites**
  - C/C++ programming is a must!
  - Data structure would help!

- **What do we prepare by ourselves?**
  - How to use Linux commands
  - How to edit source code (vi), compile (gcc/make) and run
  - How to use debugger (gdb)
  - Details in C library functions, network APIs, and thread APIs
Computer Systems Track

Databases
Networks
Operating Systems
Compilers
Digital Computation
Architecture
Embedded Systems
Embedded System Eng.

Data Reps. Memory Model
Network Protocols
Processes Mem. Mgmt
Machine Code
Arithmetic
Execution Model
Memory System

Distributed systems
Network Prog Concurrency

Computer Systems
(System Programming)

Foundation of Computer Systems
Underlying principles for hardware, software, and networking
What do we learn in this course

Coverage

- Machine-level programming
- Optimizing performance
- Memory hierarchy
- Linking
- Virtual memory
- Network programming
- Thread programming
Some Examples:
zero is not zero

- Demo
Some Examples: Memory System Performance Example

void copyij(int src[2048][2048],
            int dst[2048][2048])
{
    int i, j;
    for (i = 0; i < 2048; i++)
        for (j = 0; j < 2048; j++)
            dst[i][j] = src[i][j];
}

void copyji(int src[2048][2048],
            int dst[2048][2048])
{
    int i, j;
    for (j = 0; j < 2048; j++)
        for (i = 0; i < 2048; i++)
            dst[i][j] = src[i][j];
}

4.3ms 81.8ms

2.0 GHz Intel Core i7 Haswell

- Hierarchical memory organization
- Performance depends on access patterns
  - Including how step through multi-dimensional array
Evaluation

- **Exams (60%)**
  - Mid-term : 30%
  - Final-term : 30%
  - **If you don’t show up, you will automatically **fail** this course**

- **Programming assignments (30%)**
  - 3 separate programming assignments (10% each)

- **Participation (10%) –Extra**
  - Quiz
  - Attendance
Programming assignments

- Assignments for individuals
  - No group assignments

- Late policy
  - 10% penalty per day, up to 5 days
  - 50% of the full score is the maximum, if you delay more than 5 days
  - Submitting after 10 days gives you nothing

- Cheating will make you fail this course
  - Copying, retyping, looking at, or submitting a copy from others and internet
  - Will fail this course and get disciplinary actions
  - Discussions on high-level design issues are not cheating
Textbook and references

- **Computer systems: A Programmer’s Perspective**
  - Randal Bryant and David O’Hallaron, Prentice Hall, 2003
  - [http://csapp.cs.cmu.edu](http://csapp.cs.cmu.edu)

- **C Programming Language**

- **The Art of Assembly Language Programming**

- **Intel Architecture Software Developer’s Manual**
  - Volume 1: Basic Architecture
  - Volume 2: Instruction Set Reference
  - Volume 3: System Programming Guide
etc

- http://comnet.skku.edu/
  - Lectures → current lectures → Introduction to Computer Systems

- Class materials will be distributed from icampus including materials for programming assignments

- Be ready for the class
  - Get an linux(unix) account or install Cygwin on windows machines
  - Review C language classes