ECE 650
Systems Programming & Engineering

Spring 2018

Introduction

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Slides are adapted from Brian Rogers (Duke)

Welcome!

- Welcome to ECE 650: Systems Programming & Engineering
- Instructor
  - Prof. Tyler Bletsch
    - Can call me “Tyler” or “Dr. Bletsch” or whatever
  - Office hours will be on course page, and I also accept appointments
- TAs
  - Siyang Chen, Yuchen Zhou
  - Office hours will be posted on class page

Getting Info

- **Course Web Page**: static info

➡ http://people.duke.edu/~tkb13/courses/ece650/

  - Syllabus, schedule, slides, assignments, rules/policies, prof/TA info, office hour info
  - Links to useful resources

- **Piazza**: questions/answers
  - Post all of your questions here
  - Questions should be “public” unless good reason otherwise
  - **No code** in public posts!

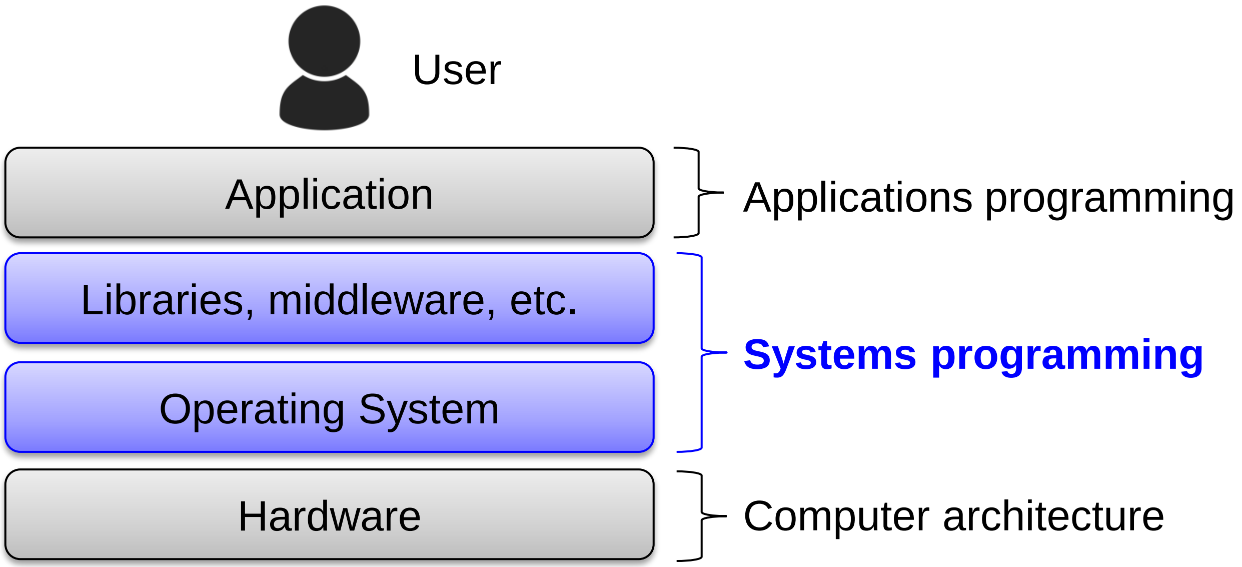
- **Sakai**: just assignment submission and gradebook

Overview of this Class

- You have a foundation of knowledge in:
  - Computer architecture
  - Basics of OS and networking
  - Programming (strong C and C++ skills)
  - Unix development tools
- Using these skills, we will learn to:
  - Write programs that relate to the design of operating systems
  - Write programs for system-level software

What is Systems Programming?

- Of course we should consult Wikipedia!
- **Applications programming**: services for users
- **Systems programming**: services for <u>other software</u>
- "System programming requires a great degree of hardware awareness."



Course Topics

- Operating systems
  - Concurrency and inter-process communication (IPC)
  - Interactions between user space and kernel space
  - Process management and scheduling
  - Security, malware, exploits
  - System boot process
  - I/O systems
  - File systems
  - Virtual memory management for the OS
  - Hypervisors: virtualizing the OS

- Networking
  - Link layer (hubs, switches, etc.)
  - IP, routing review, BGP routing, UDP, TCP
  - Flow and congestion control
  - DNS, HTTP, ICMP
- Databases
  - Tuples, tables, schema, relational algebra
  - SQL basics, C programming, ACID, transactions, isolation
  - Data organization, including B-trees and indexing
  - Distributed hash tables
  - Distributed files systems
  - MapReduce and Hadoop

Grading Breakdown

Assignment	%
Homeworks	55%
Midterm Exam	15%
Final Exam	30%

Partial credit is available – provide detail in your answers to seek it!

Late homework submissions incur penalties as follows:

- Submission is 0-24 hours late: total score is multiplied by 0.9
- Submission is 24-48 hours late: total score is multiplied by 0.8
- Submission is more than 48 hours late: total score is multiplied by the Planck constant (in J·s)

$\sim 6.6\times10^{-34}$

NOTE: If you feel *in advance* that you may need an extension, contact the instructor.

These assignments are looooooooooooong. START EARLY.

Grade Appeals

- All regrade requests must be in writing
  - Email the UTA who graded the question (we'll indicate who graded what)
- After speaking with the TA, if you still have concerns, contact the instructor
- All regrade requests must be submitted no later than 1 week after the assignment was returned to you.

Grading Scale

> 97 A+	92-96.9 A	90-91.9 A-
87-89.9 B+	82-86.9 B	80-81.9 B-
77-79.9 C+	72-76.9 C	70-71.9 C-
67-69.9 D+	62-66.9 D	60-61.9 D-
< 70 F		

Example Assignments

- **Security**: develop a portion of a rootkit to hide the presence of malicious activity on a system
- **Concurrency**: implement a thread-safe system library (e.g. memory allocation)
- **Networking**: simulate an IP routing system
- **IPC**: build an application consisting of multiple processes that must communicate and coordinate via an OS-supported IPC mechanism
- **Databases**: create an SQL database and interact with it from a program

Academic Misconduct

- Academic Misconduct
  - Refer to Duke Community Standard
  - Homework is individual – you do your own work
  - Common examples of cheating:
    - Running out of time and using someone else's output
    - Borrowing code from someone who took course before
    - Using solutions found on the Web
    - Having a friend help you to debug your program
- I will not tolerate any academic misconduct!
  - Software for detecting cheating is very, very good … and I use it
  - I've referred over a dozen cases to the Office of Student Conduct; don't be one of them!

- "But I didn't know that was cheating" is not a valid excuse

Academic Integrity for Assignments

- Your work is expected to be your own
- If you are unsure whether a certain course of action is permissible or not, please ask.
    - If you think that asking is a bad idea because I would probably say “no,” you can be fairly certain it is not permissible.

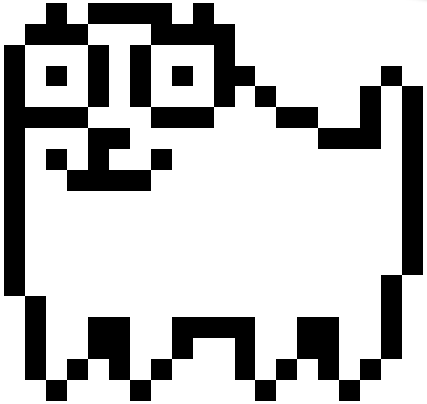
Our Responsibilities

- The instructor and TAs will…
  - Provide lectures at the stated times
  - Set clear policies on grading
  - Provide timely feedback on assignments
  - Be available out of class to provide reasonable assistance
  - Respond to comments or complaints about the instruction provided

- Students are expected to…
  - Receive lectures at the stated times
  - Turn in assignments on time
  - Seek out of class assistance in a timely manner if needed
  - Provide frank comments about the instruction or grading as soon as possible if there are issues
  - Assist each other *within the bounds of academic integrity*

The course website again

➡ http://people.duke.edu/~tkb13/courses/ece650/ ⬅



BOOKMARK IT!

Let’s get started!