Welcome to CSE 506
Introduction & Review

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Why Grad OS?
• Primary Goal: Demystify how computers work

An example progression
• Undergrad OS:
  – High-level understanding of paging
  – Theoretical issues like fragmentation
• Grad OS (506): Build a pager
  – Solid understanding of how paging SW + HW work
• Advanced Grad OS (624): Read novel research papers
  – Do creative things with paging: virtualization, security, etc

506: Learn by doing
• You will write major chunks of your own OS
  – Memory management, context switching, scheduler, file system, IPC, network driver, shell, etc.
  – Linux scheduler:
    • Difficult to understand just by reading source
    • Small modifications require first understanding the code
    • Impossible to replace/reimplement
  – No substitute for building it yourself!

A logical view of hardware

CPU(s)  RAM  PCI-X Bus

North Bridge
(Fast devices:
e.g., GPU)

North Bridge

South Bridge
("Slow" Devices:
e.g., Disk, USB,
Most network)

Fewer Bridges
• Newer system organizations are moving more
devices to the North bridge, and consolidating more
things on the CPU itself.
Labs, cont.

- This course is **coding intensive**
  - You should know C, or be prepared to remediate quickly
  - You will learn basic, inline x86 assembly
  - You must learn on your own/with lab partner
- The lab is difficult, but worthwhile
  - You will want to commemorate, with a T-shirt, tattoo, etc.

JOS

- Developed at MIT, used at several top schools
  - The “J” is for Josh Cates, not Java
- In C and Assembly, boots on real PC hardware
  - You get the skeleton code, fill in interesting pieces
- Build the right intuitions about real OSes
  - but with much simpler code

JOS 64

- You will actually implement a 64-bit variant of JOS
- Developed at Stony Brook!
  - Primarily by Amit Arya and Abhinand Palicherla
  - Contributions also by: Vivek Kulkarni, Varun Agarwal, Chia-Che Tsai, Tao Zhang, Sagar Trehan, Jiahong Huang…
    - Some of these final projects or just contributions from a previous 506 course
    - See your name here next year if you add a particularly useful feature!

Lab 6

- 3 Options
  1) Network device driver (guided assignment)
  2) Make JOS a hypervisor (guided assignment)
  3) Open-ended project
    - Add a significant feature to JOS
    - A research task on another system
Challenge Problems
• Each lab includes challenge problems, which you may complete for bonus points (generally 5—10 points out of 100)
  – Unwise to turn in a lab late to do challenge problems
  – Can complete challenge problems at any point in the semester—even on old labs
• Indicate any challenge problems completed in challenge.txt file

CSE 522
• This course can also count as your MS project course (CSE 522)
• Requirements: Same as 506, except:
  – You must do the labs alone
  – You must complete 1 challenge problem in each lab

No Textbook
• You’re welcome
• Several recommended texts
  – Several free on SBU safari online site
  – Others on reserve at library
  – Required readings will mainly be papers you can print out

Lectures
• Compare and contrast JOS with real-world OSes
  – Mostly Linux, some Windows or OS X, FreeBSD, etc.
• Supplement background on hardware programming
  – Common educational gap between OS and architecture

My Lecture Style
• I like participation and questions
• I can explain any concept in many ways, and explain missing background on the fly
  – ...but I can’t read your mind—I need to know if you don’t understand something!

SBU Capture
• Experiment: TLT will be recording the projection and audio (no video of me, sadly)
  – Recordings will be automatically posted to BlackBoard
  – Intended to help you study
  – Especially helpful for people without strong English
• This is best effort
  – No guarantee all lectures will be recorded
• This is no substitute for lecture attendance
  – Can’t ask questions
• If attendance suffers, I will stop recording lectures
Guest Lectures

- Senior graduate students will give some lectures to gain teaching experience
  - Including today!
- Professor Porter will review and critique guest lectures (in person or recorded) with guests

Please:
- Ask questions if something is unclear: in class or on piazza
- Give Prof. Porter comments on guests (and his lectures) — positive and negative

Prerequisites

- Undergrad OS
  - In some cases, industry experience is ok
  - Worth brushing up if it has been a while
  - In-class quiz, due before you leave
    - If you can’t answer 50% of these questions, consider undergrad OS
- C programming
- Basic Unix command-line proficiency
- See me if you have already done the JOS lab, or similar

Piazza

- This is the primary announcement medium
- And for discussions about course work
  - Do not post code here or other solutions
  - Goal: Everyone can learn from general questions
- Material discussed on piazza can be an exam question

Details for piazza forum are on the course website

Other administrative notes

- Read syllabus completely
- 2 exams cover: lectures, labs, mailing list
- Every student will get a VM for lab work
  - You may use your own computer, staff can’t support it
- All staff email goes to cs506ta@cs.stonybrook.edu
  - Except private issues for instructor only

VM Assignments

- Your VM is cse506-USER, where USER is your netid
- Each VM is hosted on the server esx1sc---esx4sc
  - You should receive an email with your server and initial password
- The account is cse506
- Once it is powered on, it will listen for ssh on port 130
- Change the password immediately
- Also, checkpoint your VM before you change things

Lab Partners

- Can work alone, but better with help
  - Some excellent students earned A’s working alone
  - Many good students earned B’s working alone
  - No need to be a hero
- Choose your own partners
  - Lab mailing list good for finding them
- Same for entire course
  - Changes only with instructor permission
To Do

• Email me your partner selection
• We will then create the git repository you will use to turn in your assignments
• In the meantime, clone the read-only, http repository to get started
• Please do this well in advance of the deadline

Academic Integrity

• I take cheating very seriously. It can end your career.
• In a gray area, it is your job to stay on right side of line
• Never show your code to anyone except your partner and course staff
• Never look at anyone else’s code (incl. other universities)
• Do not discuss code; do not debug each other’s code
• Acknowledge students that give you good ideas

Integrity Homework

• Exercises applying course policies and ethics to several situations
• Due in class 2/11

Lateness

• Each group gets 72 late hours
  – List how many you use in slack.txt
  – Each day after these are gone costs a full letter grade on the assignment
• It is your responsibility to use these to manage:
  – Holidays, weddings, research deadlines, conference travel, Buffy marathons, release of the next Zelda game, etc.
• 3 Exceptions: illness (need doctor’s note), death in immediate family, accommodation for disability

Lab 1 assigned (soon)

• Due Friday, 2/19 at 11:59 pm, eastern.
• Instructions on website
• Quick demo

Getting help

• TA’s (TBD) will keep office hours
• Instructor keeps office hours
  – Note that “by appointment” means more time available on demand
Questions?