CSE 4502: Operating Systems Lab

Introduction to the Course

Department of Computer Science and Engineering (CSE)
Islamic University of Technology (IUT)

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Introduction to CSE 4502

Course Teachers

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Course Objectives

Building a simple Operating Systems (OS) kernel implementing the basic OS concepts like:

- Process and Thread Management,
- Physical Memory management,
- Virtual Memory management,
- Multiprogramming,
- File systems, etc.

Course Organization

- There will be Five (5) experiments and one (1) project.
- To complete a single experiment, students will have two (2) lab weeks.
    - In the first lab week of an experiment, a brief description of the experiment will be delivered, and students will present their solution to the previous experiment. They must bring a prepared ppt to present.
    - The second lab week of the experiment will consist of the query, discussion, and question and answer session.
- A student must submit their solution to the created Google Classroom assignment on the day before coming for the second week of lab.
- Students must have object-oriented concepts as a prerequisite.

Resources and Tools

- The CS422/522: Design and Implementation of Operating Systems course at Yale University will be used as the primary resource.
- The ‘Qemu’ emulator with a multi-library-enabled GCC compiler will be used to emulate the kernel.
- As a debugger, ‘gdb’ (GNU debugger) will be used.
- Any code editor, such as Visual Studio Code, may be used for writing the code.
- Google Classroom will be the primary platform for accessing information and resources.

Assessment Methods & Grading Policy

A student will be evaluated based on

- his/ her presence during the lab sessions,
- his/her solutions to the experiment,
- question answering skills during the viva session.
- the submitted projects.

Attendance	10 %
Continuous Lab Evaluation	40 %
Projects	50 %

Experiments

Experiments	Name	Lab Weeks
Experiment 1	Bootloader & Physical Memory Management	Week 1 & Week 2
Experiment 2	Container & Virtual Memory Management	Week 3 & Week 4
Experiment 3	Process Management & Trap Handling	Week 5 & Week 6
Experiment 4	Multicore and Preemption	Week 7 & Week 8
Experiment 5	File Systems	Week 9 & Week 10
Experiment 6	Advanced OS Projects	Rest of the Semester.

Final Projects

- As a part of the course, students must submit a team project.
- A team will consist of two members.
- Each team must select a final project from the provided project list. The description of projects can be found here.
- One team member must submit their team information with three selected projects in the first week after the mid-examination.
- At best, a single project can be selected by four (4) teams.
- If the number of teams for a specific project is exceeded, then the teams will be selected based on the team members' CGPA.
- The team having a member with a higher CGPA will get the lowest priority in the selection process.
- Each team must submit their solution and project report before the end of the semester.

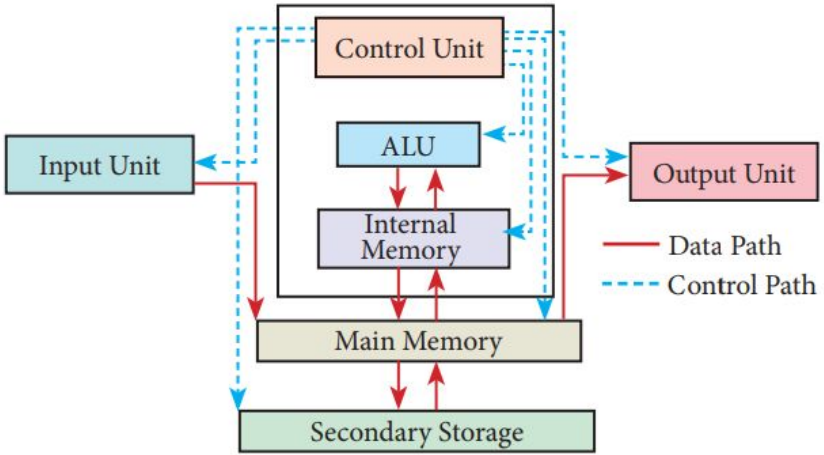
Project List

Projects	Title
Project 1	Video Mode
Project 2	UNIX Shell
Project 3	Debugger
Project 4	Scheduler
Project 5	Audio Support
Project 6	In-kernel Cryptographic Framework
Project 7	Advanced Synchronization - File Sharing
Project 8	Advanced Synchronization - Wait for Multiple Objects
Project 9	Signal
Project 10	Advanced Memory Allocation
Project 11	Advanced Synchronization: User-level Mutex
Project 12	Pub/Sub IPC
Project 13	Networking
Project 14	Resource Limitation and Bandwidth Control

Lab 01: Bootloader & Physical Memory Management

Software setup
Part 1: PC Bootstrap
Part 2: Bootloader
Part 3: Physical Memory Management

Introduction to Computer Systems



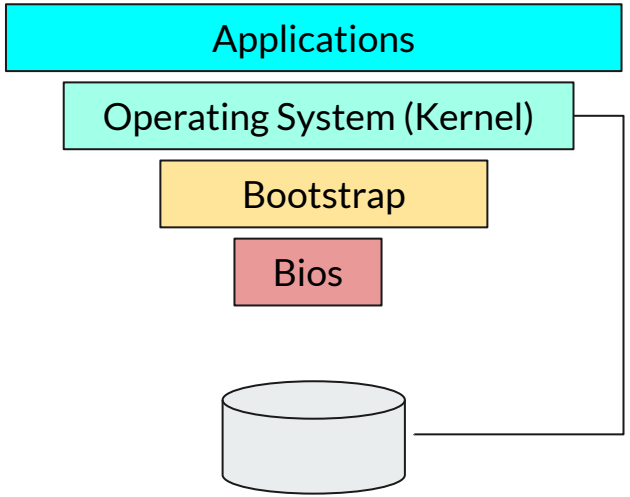


Figure 1: Components of a Computer.

System Boot Sequence

main job of bootstrap : fetches the OS and brings it to the main memory from the secondary memory

- Your turn on power
- CPU jumps to the beginning of BIOS ROM
- CPU executes POST (Power-On Self-Test) and initializes hardware
- CPU executes BIOS routine to load MBR (Master Boot Reader)
- CPU jumps to the routine in MBR
- MBR contains a routine (“ Boot Strap Loader”) to check the partition.
    - Find out which logical drive is the system boot drive
    - Load the boot block (“BootStrap”) of the boot drive and CPU jumps to it.
    - The Boot block contains a routine to start OS (start loading OS system files & drives)

Physical Memory Management

Thank you.