CSC 4103 - Operating Systems
Spring 2007

LECTURE - I

INTRODUCTION

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January 16th, 2007

Contact Information

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Logistics

- Course web page: http://www.cct.lsu.edu/~kosar/csc4103
  - All lecture notes will be available online
  - Of course also homework assignments, projects and other important course information
- Course mailing list: CS4103@cct.lsu.edu
  - Important course announcements including projects, homework assignments, and exams will be sent to this mailing list
  - Provide me with your active email address to be added to the class mailing list

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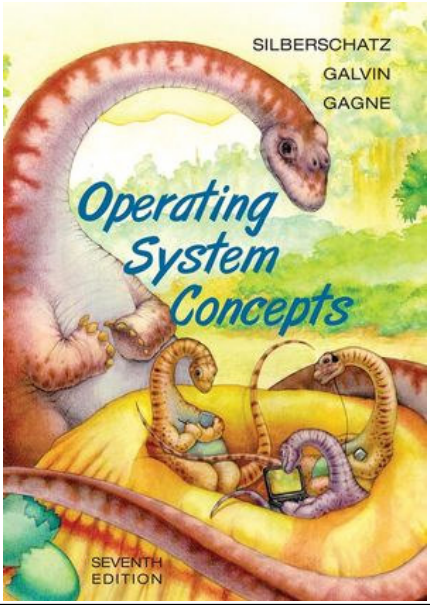
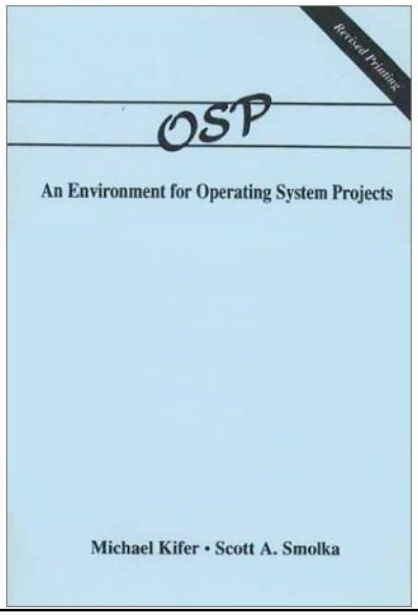
Textbooks





Grading

- The end-of-semester grades will be composed of:

- Pop Quizzes	: 10%	(3-5)
- Homework	: 15%	(5)
- Projects	: 20%	(2)
- Midterm	: 25%	(1)
- Final	: 30%	(1)

You are expected to attend the classes and actively contribute via asking and/or answering questions.

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Teaching Philosophy

- Goal:
  - For instructor: teaching the material
  - For student: learning and applying the material in real life
- Grades are of second degree importance
- Do not memorize, understand the material
- You are only responsible from material
  - Covered in the class
  - Part of projects or homework assignments

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Rules

- Late submission of projects/homeworks will be penalized. (unless otherwise stated!)
- No computers/laptops will be allowed in regular class as well as exam.
- Academic dishonesty will be treated seriously.

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What Expect to Learn?

- Basic Concepts of Operating Systems
- Operation, Resource Utilization, Management
- Processes, Threads and Concurrency
- CPU and I/O Scheduling
- Memory and Storage Management
- File Systems
- Synchronization and Deadlocks
- Protection and Security
- Distributed OS and Related Issues
- Special Purpose Systems (Real Time & Multimedia)

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Introduction

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What is an Operating System?

- A type of dinosaur.
- A program that manages the computer hardware.
- An intermediary between the computer user and the computer hardware.
- Manages hardware and software resources of a computer.

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Operating System Goals

- From the user perspective
  - Execute user programs and make solving user problems easier
  - Make the computer system convenient to use
- From the System Perspective
  - Manage the resources
  - Use the computer hardware in an efficient manner

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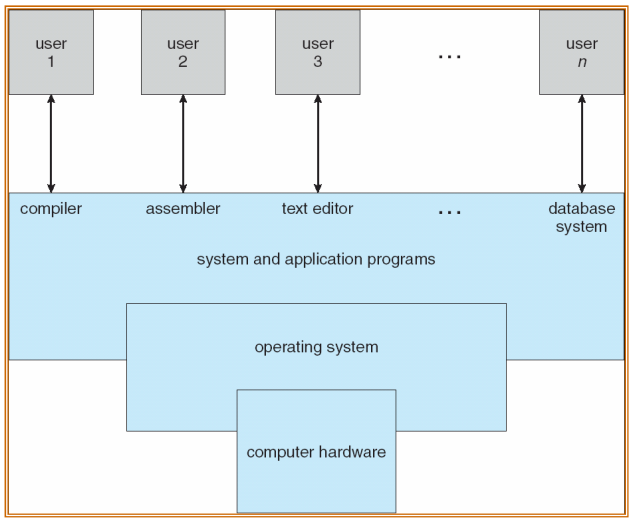
Four Components of a Computer System



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Loading the OS

- **bootstrap program** is loaded at power-up or reboot
  - Typically stored in ROM or EEPROM, generally known as **firmware**
  - Initializes all aspects of system
  - Loads operating system kernel and starts execution

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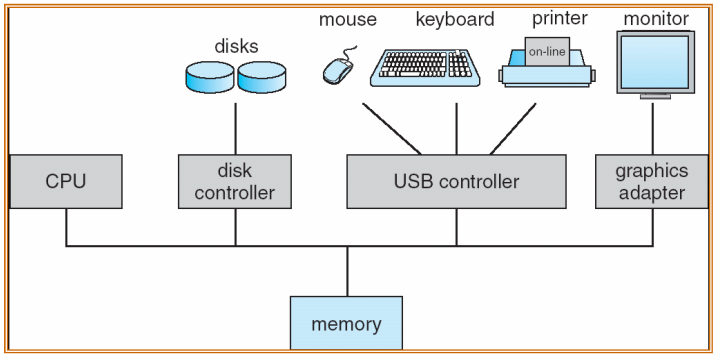
Computer System Organization

- Computer-system operation
  - One or more CPUs, device controllers connect through common bus providing access to shared memory
  - Concurrent execution of CPUs and devices competing for memory cycles



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Computer-System Operation

- I/O devices and the CPU can execute concurrently.
- Each device controller is in charge of a particular device type.
- Each device controller has a local buffer.
- CPU moves data from/to main memory to/from local buffers
  - If no CPU involved → DMA
- I/O is from the device to local buffer of controller.
- Device controller informs CPU that it has finished its operation by causing an *interrupt*.

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Common Functions of Interrupts

- Interrupt transfers control to the interrupt service routine generally, through the *interrupt vector*, which contains the addresses of all the service routines (interrupt handlers).
- Interrupt architecture must save the address of the interrupted instruction. (also save state of CPU, eg. registers, PC)
- Incoming interrupts are *disabled* while another interrupt is being processed to prevent a *lost interrupt*.
- A *trap* is a software-generated interrupt caused either by an error or a user request.
- An operating system is *interrupt* driven.

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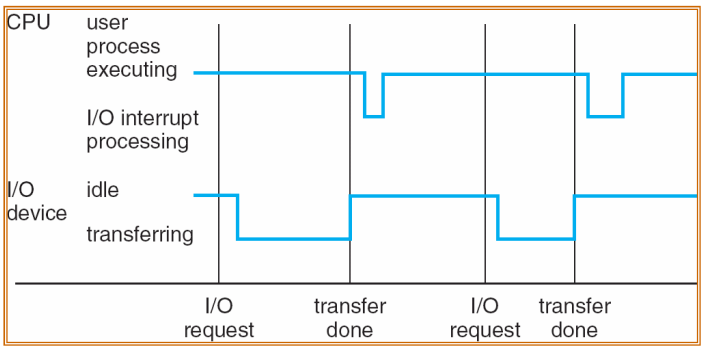
Interrupt Timeline for I/O



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I/O Structure

- After I/O starts, control returns to user program only upon I/O completion ➔ synchronous
  - Wait instruction idles the CPU until the next interrupt
  - Wait loop (contention for memory access).
  - At most one I/O request is outstanding at a time, no simultaneous I/O processing.
- After I/O starts, control returns to user program without waiting for I/O completion ➔asynchronous
  - *System call* – request to the operating system to allow user to wait for I/O completion.
  - *Device-status table* contains entry for each I/O device indicating its type, address, and state.
  - Operating system indexes into I/O device table to determine device status and to modify table entry to include interrupt.

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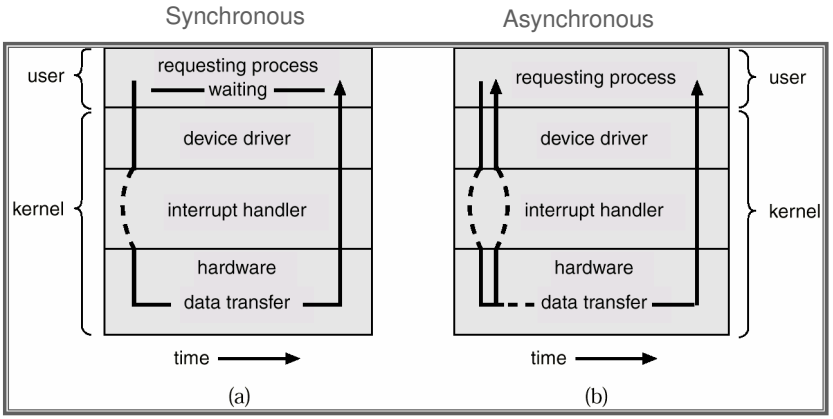
Two I/O Methods



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Reading Assignment

- Read chapter 1 from Silberschatz.

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Acknowledgements

- “Operating Systems Concepts” book and supplementary material by Silberschatz, Galvin and Gagne.

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