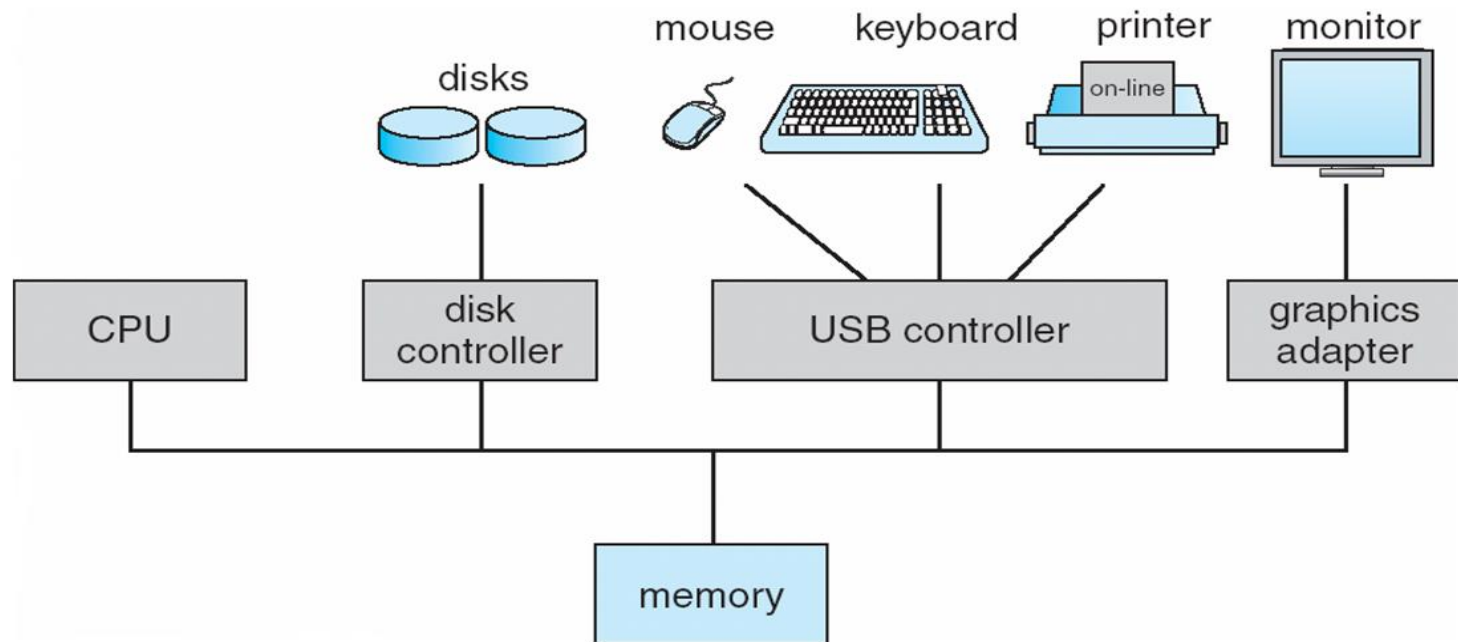


Subject: Operating System

Hardware Components of a Computer

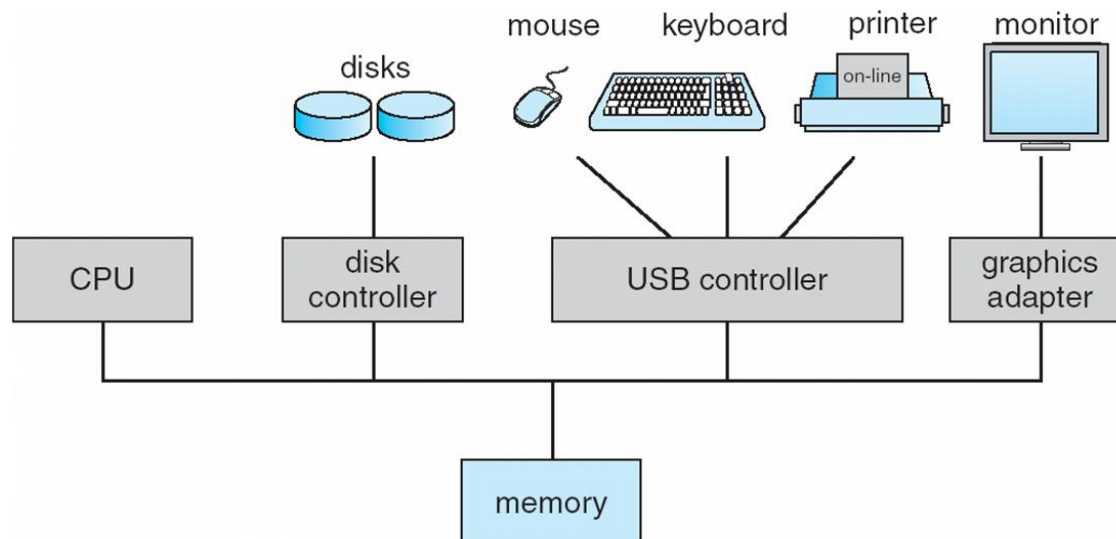


- CPU, memory, storage and other I/O devices connected by a bus
- The bus transports both data and control messages

Computer Startup

Bootstrap program is loaded when a computer is powered-up or rebooted

- Typically stored in ROM or EPROM, generally known as firmware
- Initializing all aspects of system
- Loading **the most fundamental control software** (note: operating system kernel) and starts execution



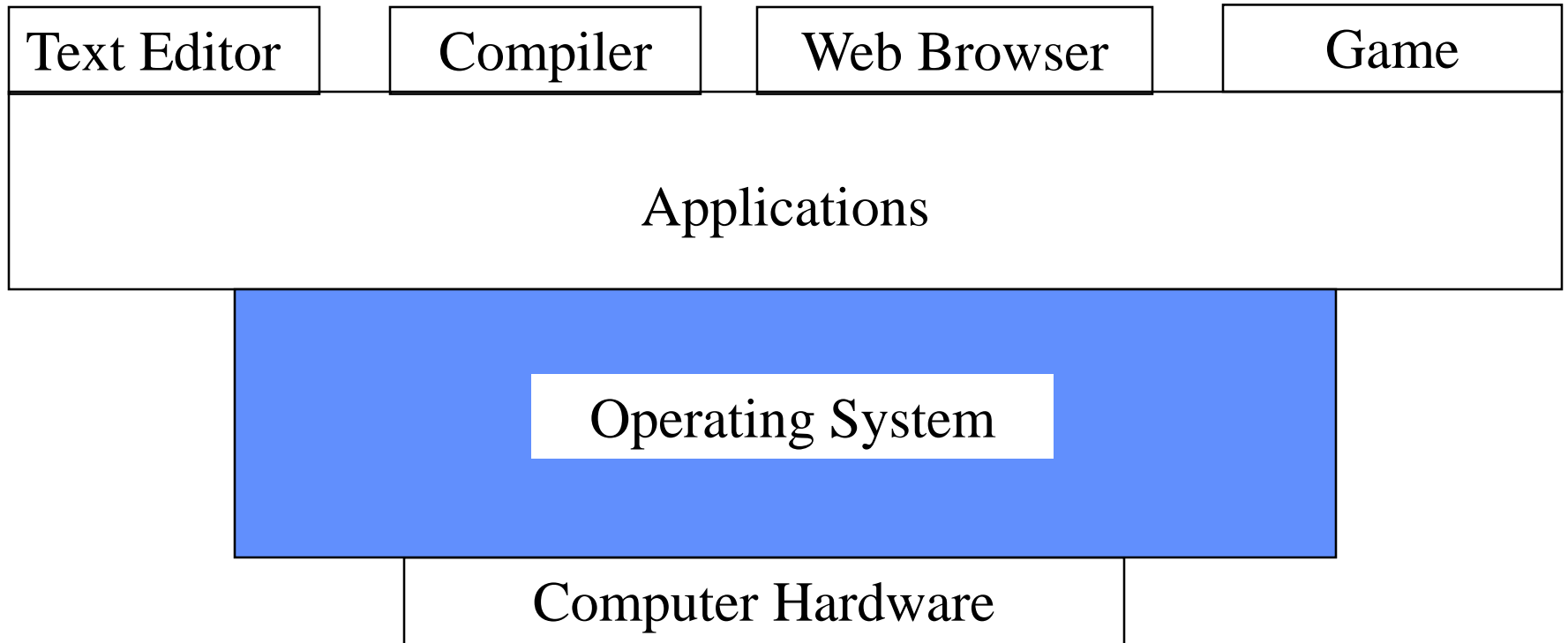
What does an OS do?

- Manage execution resources (e.g., CPU, GPU, co-processors)
- Manage memory space (RAM)
- Manage permanent storage space (Disk, flash)
- Manage I/O devices (display, network card, sensors)
- Manage programs (code)
- Support communication between programs and between computers
- Keep the system secure and safe

The Roles of an Operating System

- OS is a **resource allocator/manager**
 - Manages all resources
 - Decides between conflicting requests for efficient and fair resource use
- OS is a **control program**
 - Controls execution of programs to prevent errors and improper use of the computer

Computer System



What is this course about?

- Learn to use one or some operating system? NO!
- Learn to design an operating system? NO!
- We will learn how an operating system works
 - Some fundamental concepts
 - Some data structures
 - Some algorithms
 - Some theories

More specifically ...

- Background: Hardware support; Key ideas and structures for OS
- Processes
- Threads
- Synchronization
- CPU Scheduling
- Deadlock

More specifically ...

- Main Memory Management
- Virtual Memory
- File-System Interface & Implementation
- Mass-Storage Structure & I/O Systems
- Protection & Security
- Advanced topics: Distributed Operating Systems

System Programming

- System calls, system programs
- Multi-process programs
- Inter-process communication: shared memory; message passing, socket
- Multi-thread programs: kernel-level threads; user-level thread libraries
- Develop a simple user-level thread library
- Inter-process and inter-thread synchronization