Lecture 1
First Meeting & Introduction/Overview I
Lecture Information

Ceng328 *Operating Systems* at February 17, 2011

Dr. Cem Özdoğan
Computer Engineering Department
Çankaya University

Contents

First Meeting I

- CENG 328 Operating Systems Spring 2011

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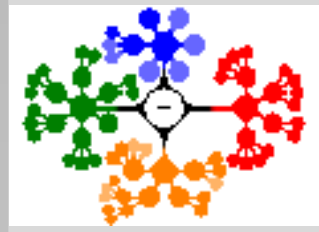
- CENG 328 Operating Systems Spring 2011
- THURSDAY 10:40-12:30 (T1) B301/302



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- Announcements: Watch this space for the latest updates.

  Pazar 13.Subat.2011 23:42 In the first lecture, there will be first metting and Introduction/ Overview. The laboratory notes for the first week is published, see Course Schedule section.

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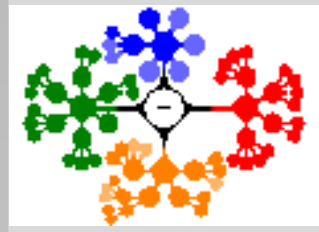

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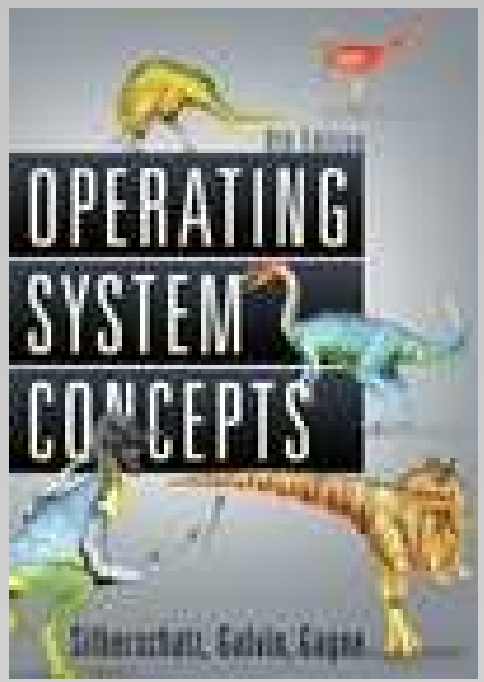
- **Recommended:** Modern Operating Systems, 3rd Edition by Andrew S. Tanenbaum, Prentice Hall, 2008. Another frequently used text book that covers the same material with a different approach



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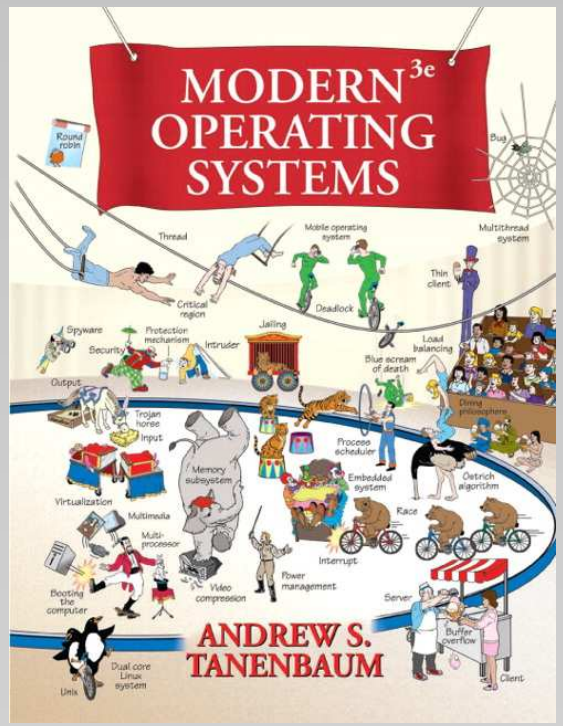

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- Thus, some OSs are designed to be convenient, others to be efficient, and others some combination of the two.

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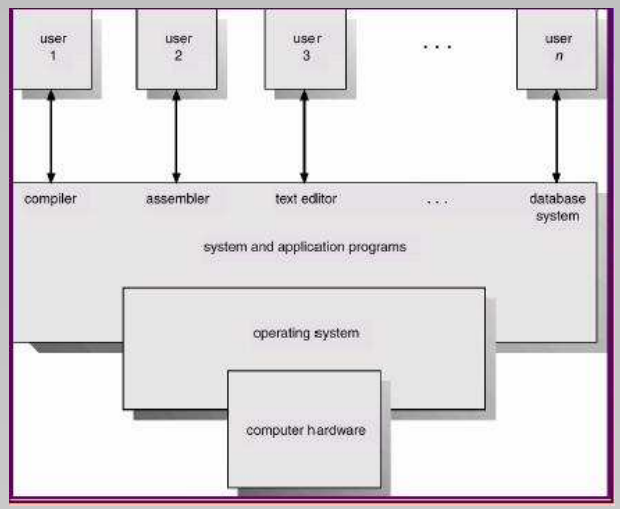

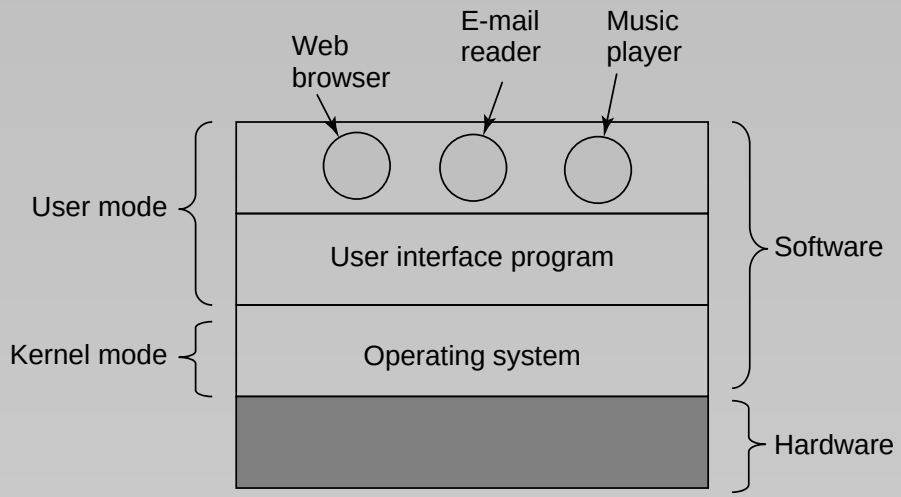

Figure: Abstract view. Where the OS fits in.

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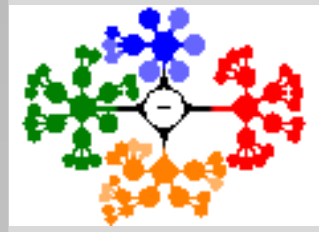

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     - *systems software* (OS & utilities).
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- An OS is similar to a government. Like a government, it performs no useful function by itself. It simply provides an environment within which other programs can do useful work.

User View - The OS as an Extended Machine

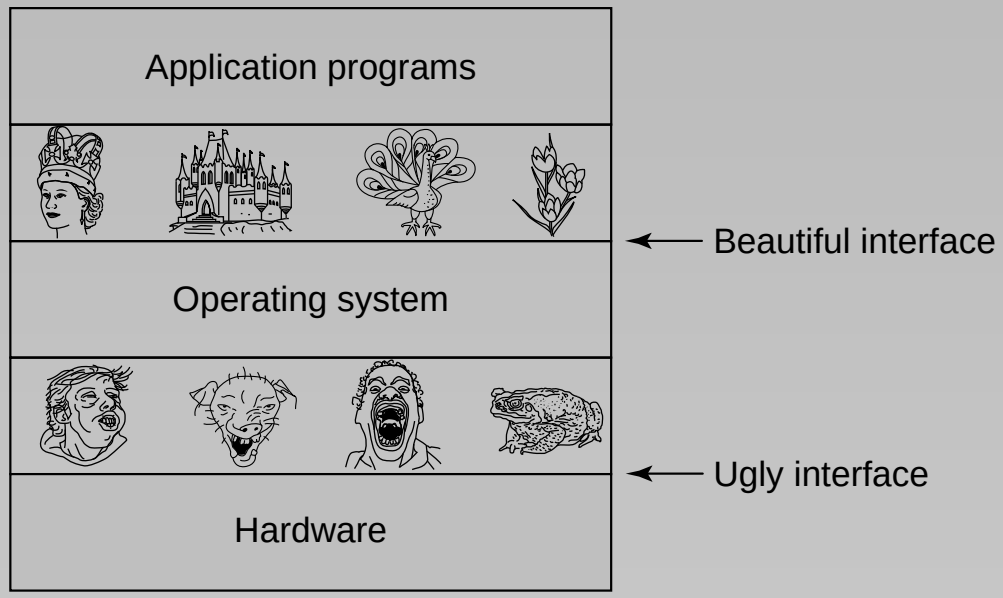

Figure: Operating systems turn ugly hardware into beautiful abstractions.

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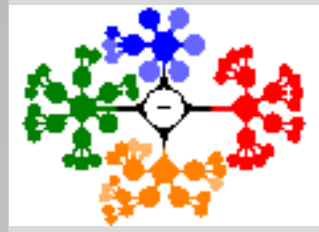

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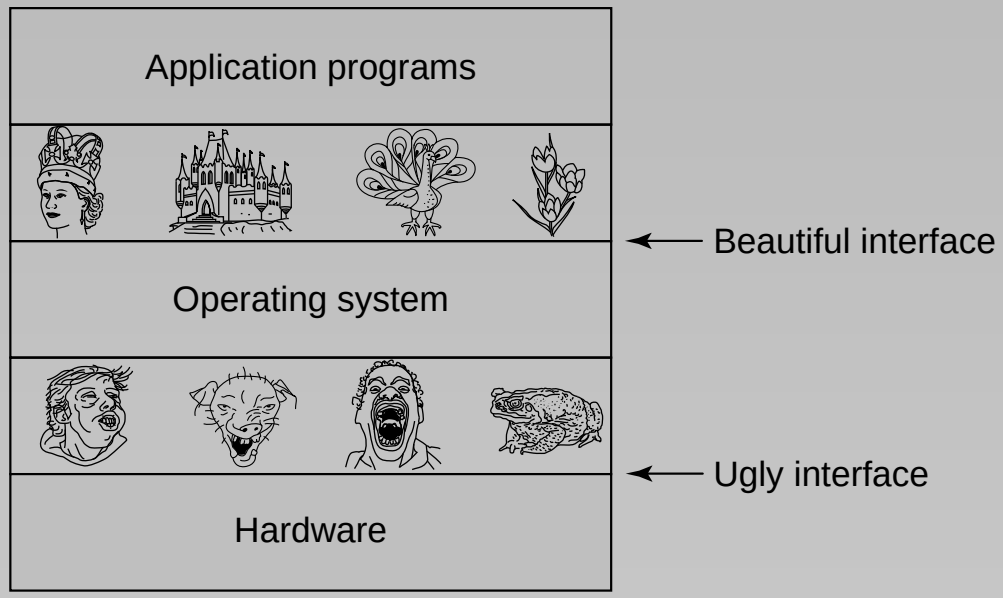

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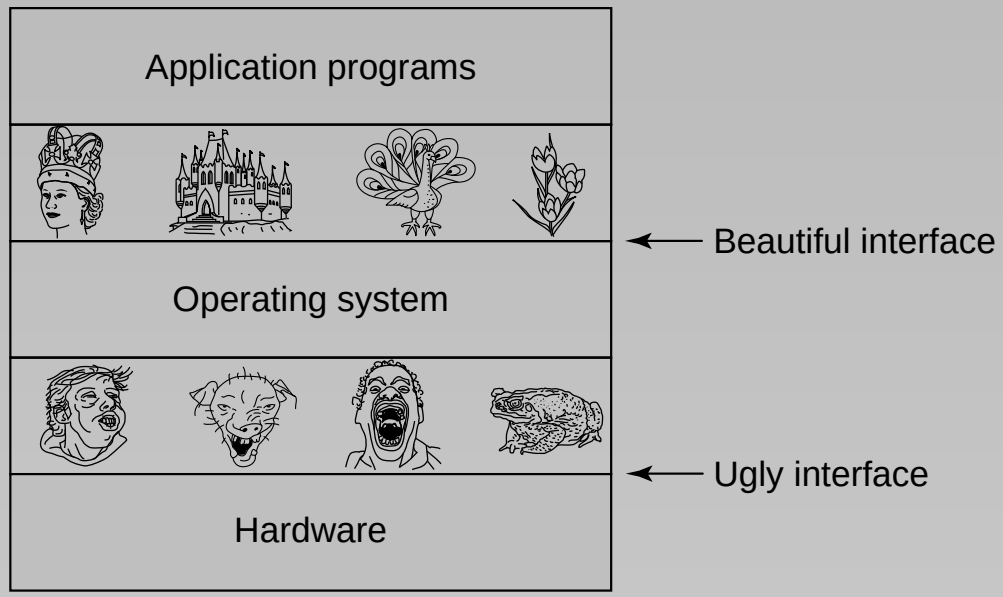

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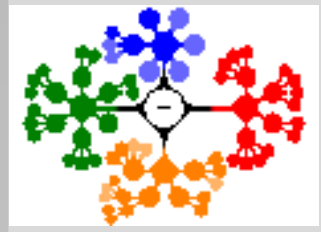

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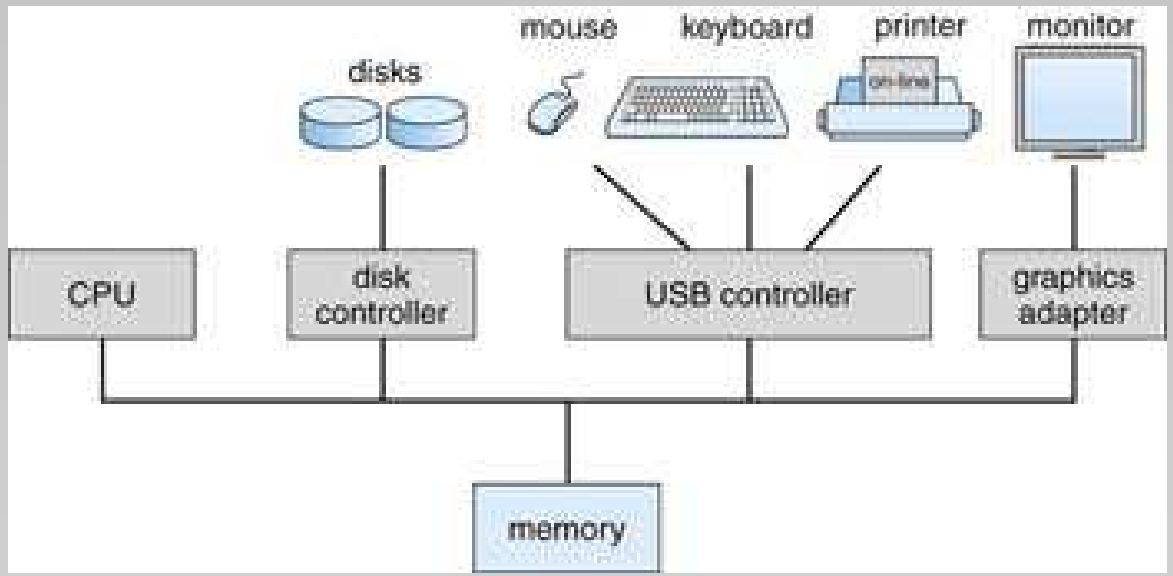

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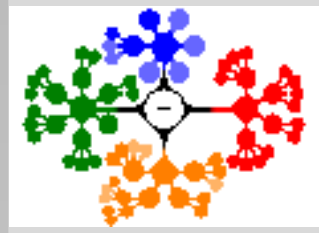
Dr. Cem Özdoğan



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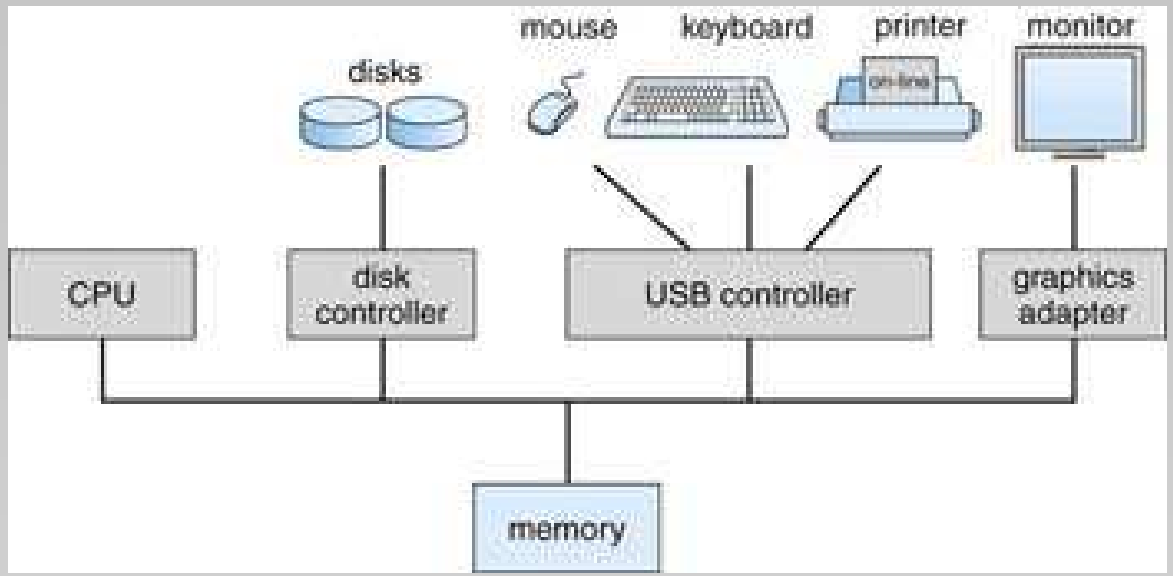

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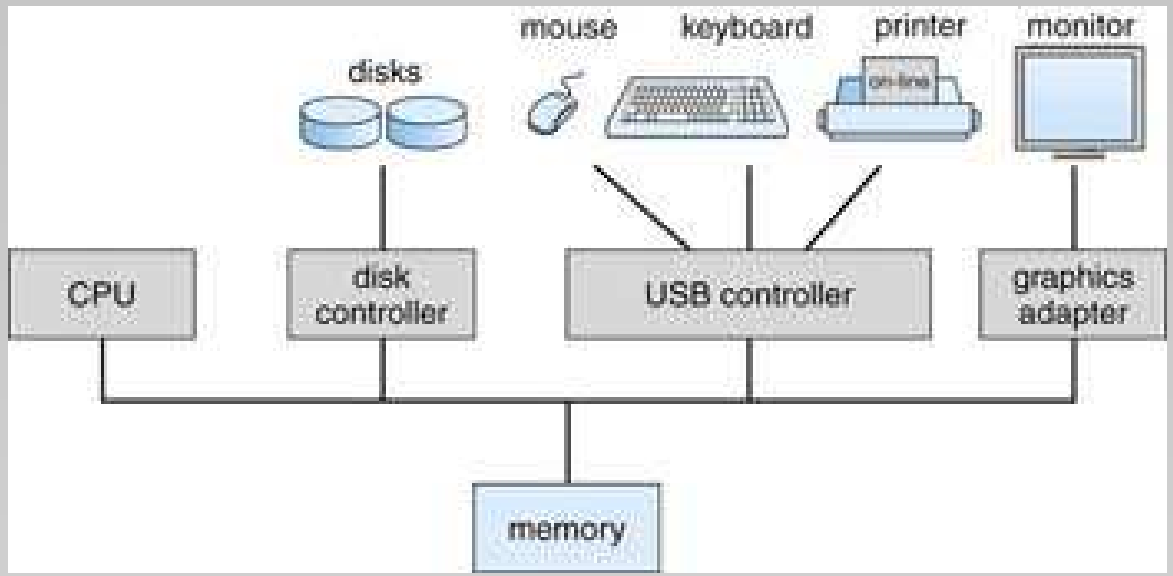
- To ensure orderly access to the shared memory, a memory controller is provided whose function is to synchronize access to the memory.



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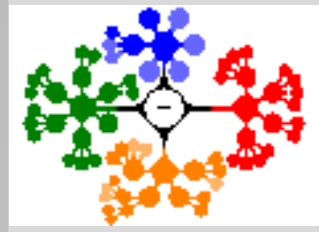

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- The bootstrap program must know how to load the OS and to start executing that system. To accomplish this goal, the bootstrap program must locate and load into memory the OS kernel.

Computer-System Operation II

UNIX System initialization and Bootstrapping;

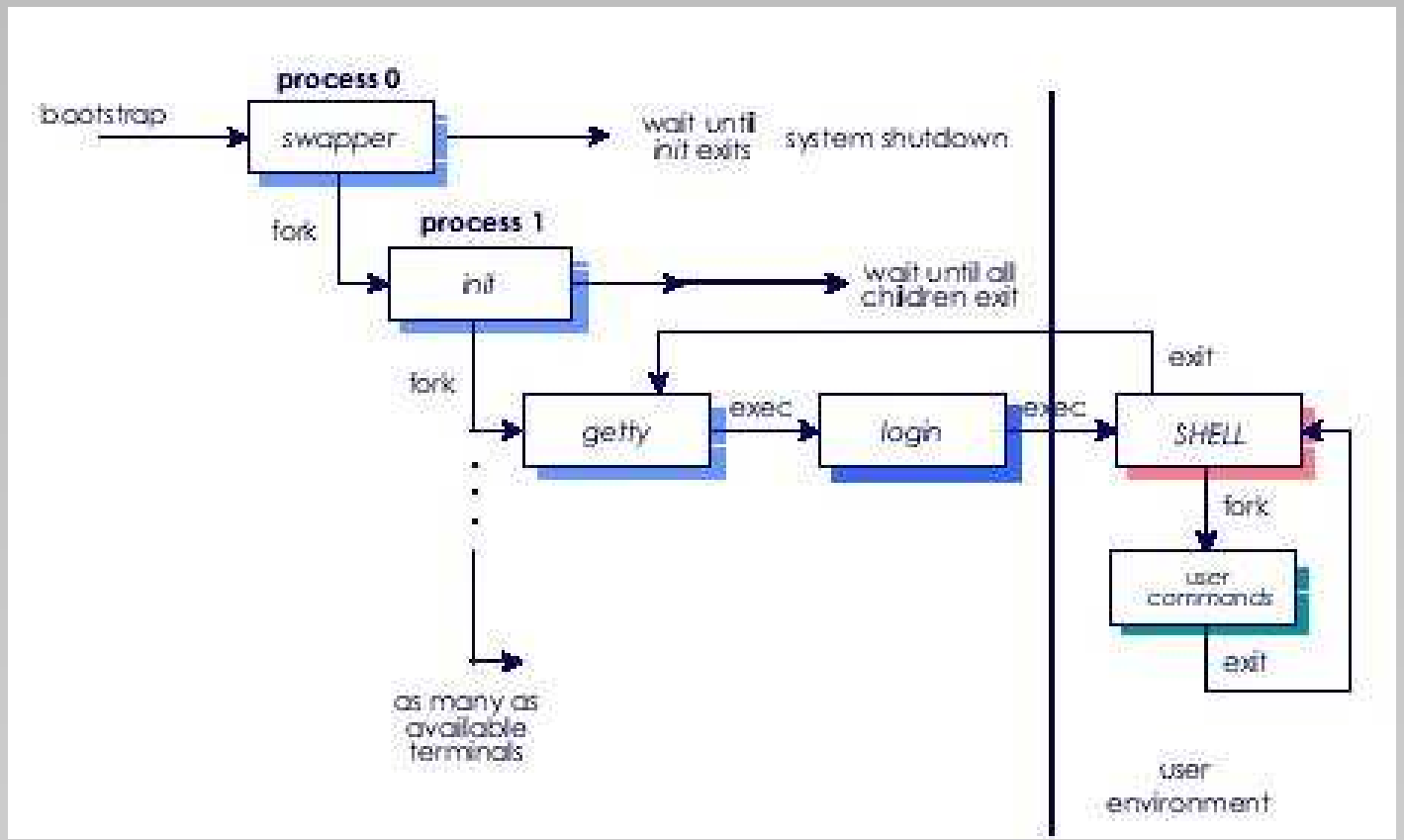

Figure: UNIX System initialization

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- The interrupt must transfer control to the appropriate interrupt service routine (ISR) (see Fig. 5).

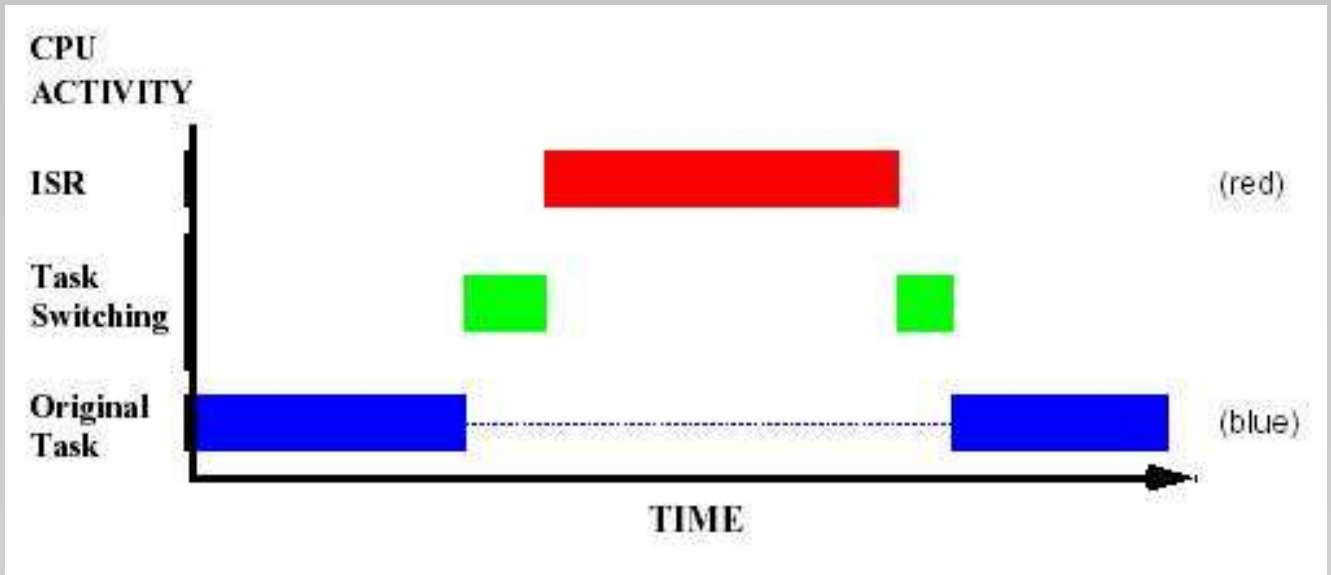

Figure: Interrupt

Computer-System Operation V

The interrupt service routine executes; on completion, the CPU resumes the interrupted computation. A time line of this operation is shown in Fig. 6.

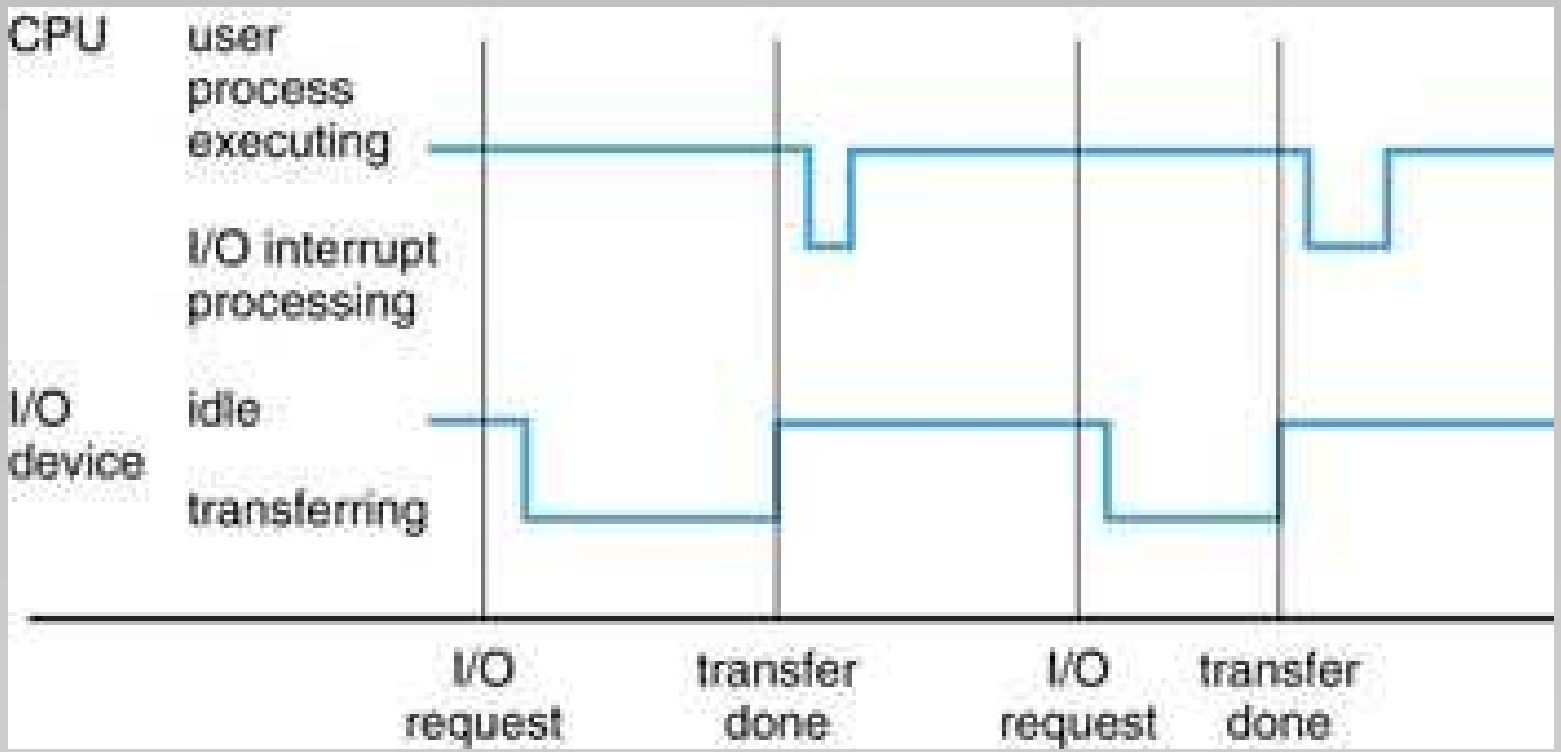

Figure: Interrupt time line for a single process doing output.

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- Notice that the memory unit sees only a stream of memory addresses; it does not know how they are generated (by the instruction counter, indexing, indirection, literal addresses, or some other.

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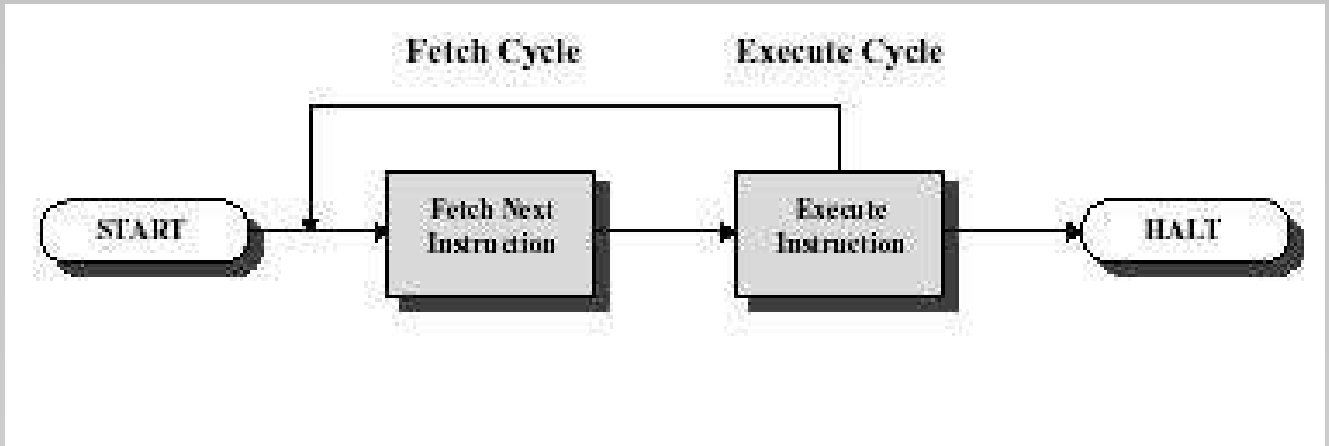

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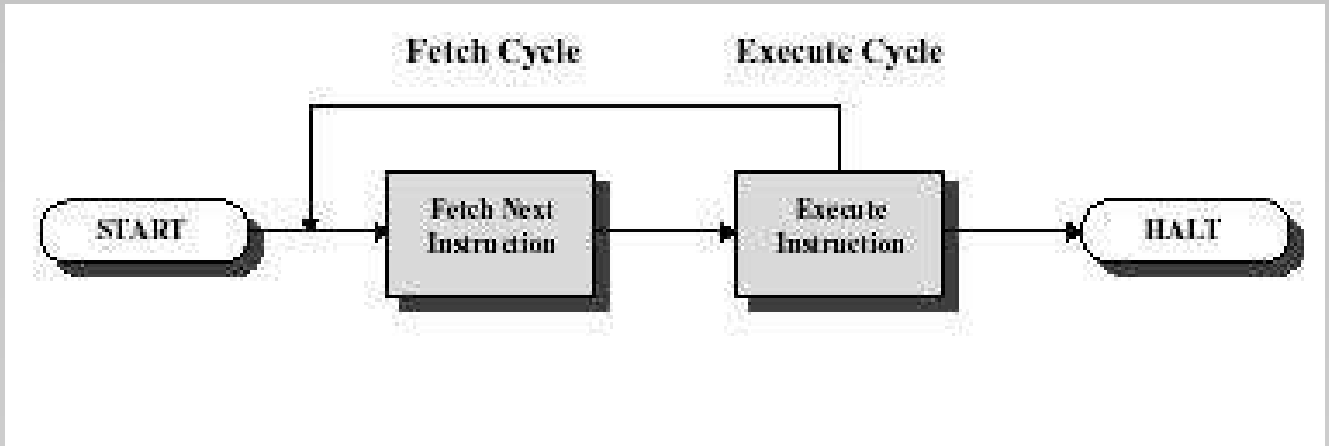

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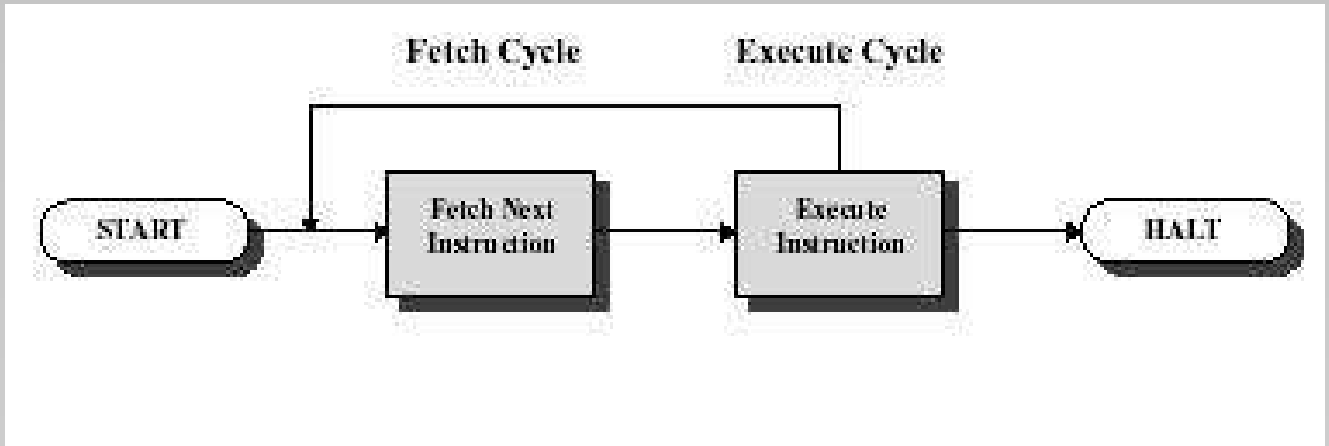

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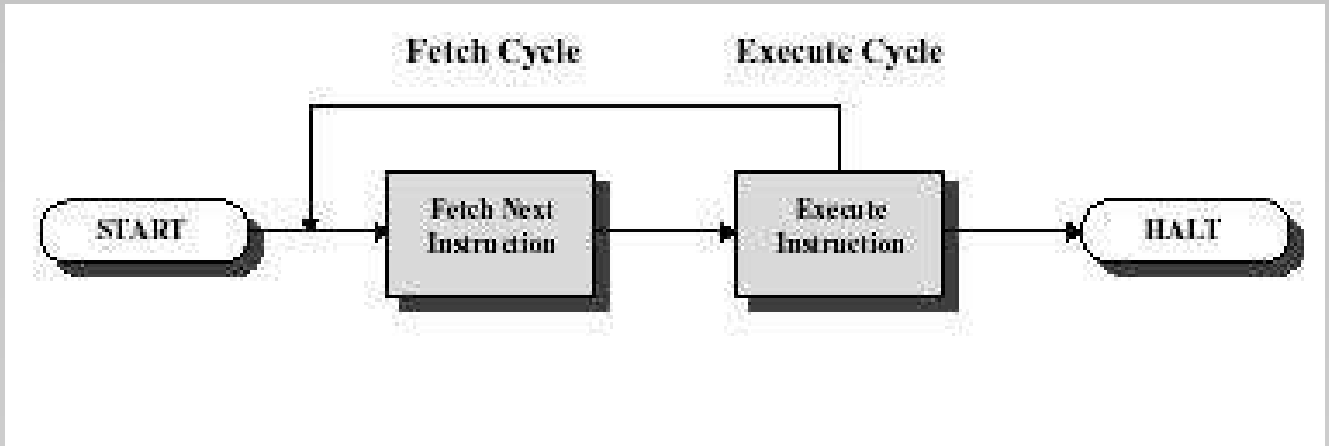

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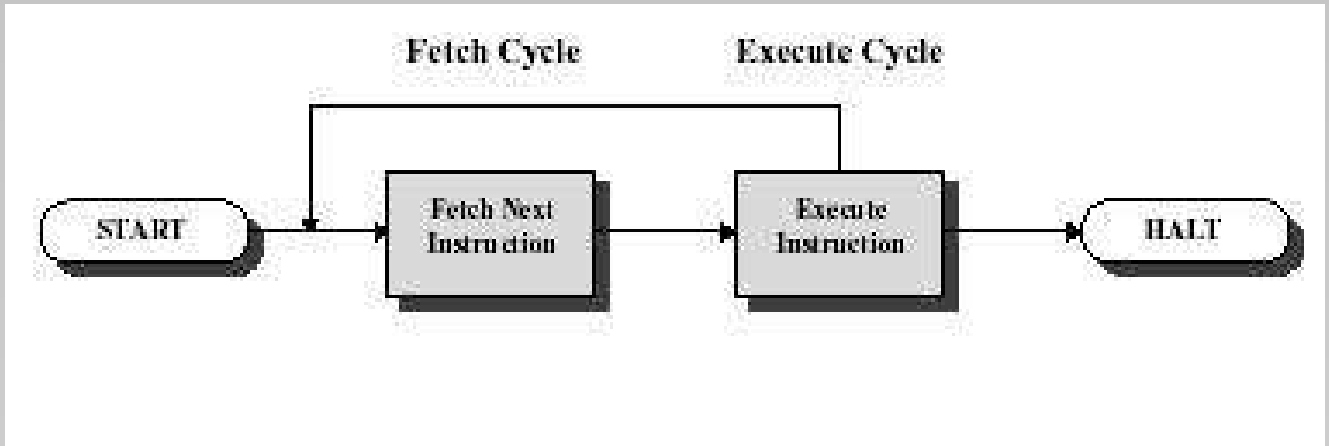

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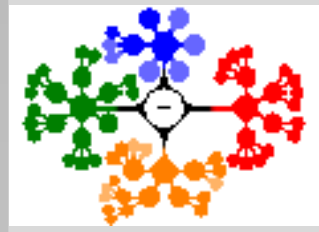

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- Many programs then use the disk as both a source and a destination of the information for their processing. Hence, the proper management of disk storage is of *central importance* to a computer system.

Storage Structure IV

The main differences among the various storage systems lie in speed, cost, size, and volatility. The wide variety of storage systems in a computer system can be organized in a hierarchy (See Fig. 8) according to speed and cost.

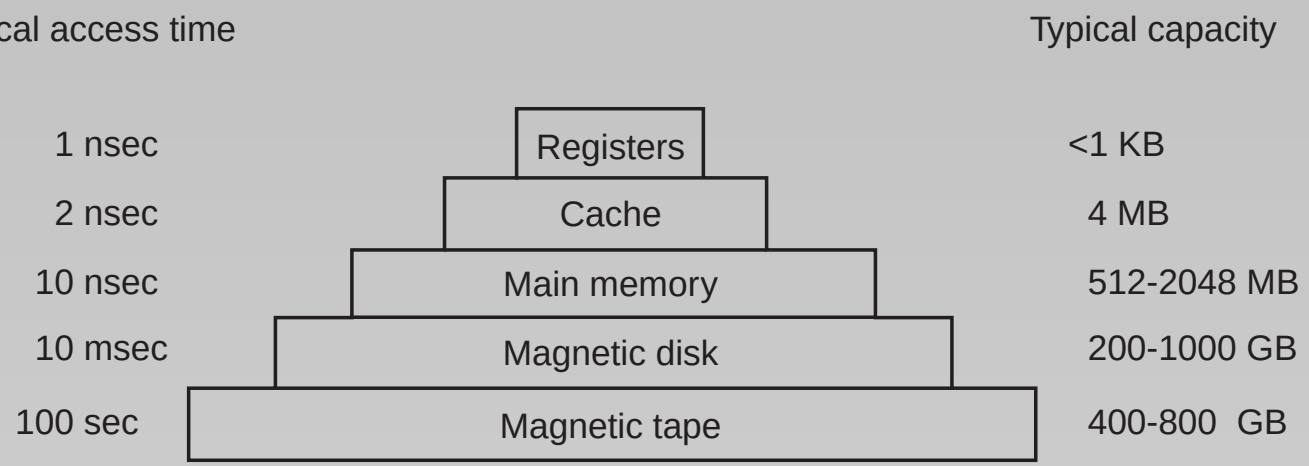

Figure: A typical memory hierarchy. The numbers are very rough approximations.

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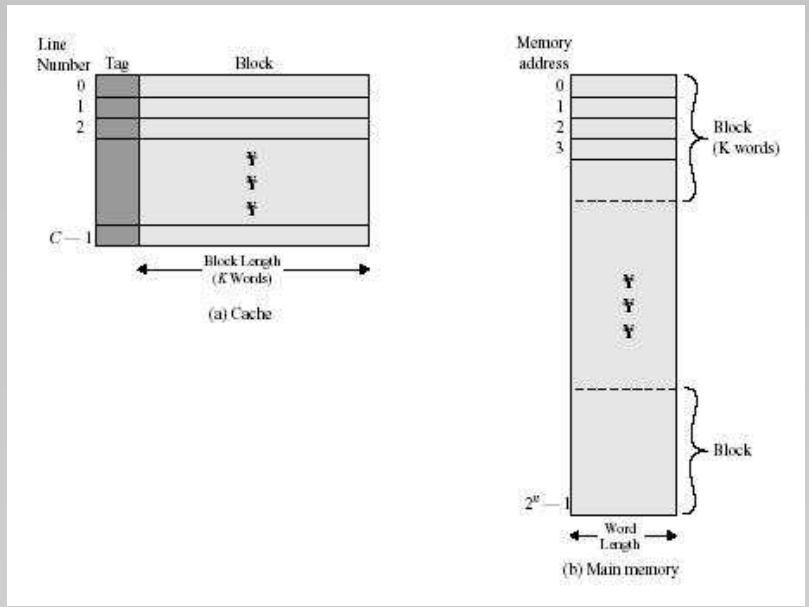


Figure: Cache and Main Memory

Storage Structure VI

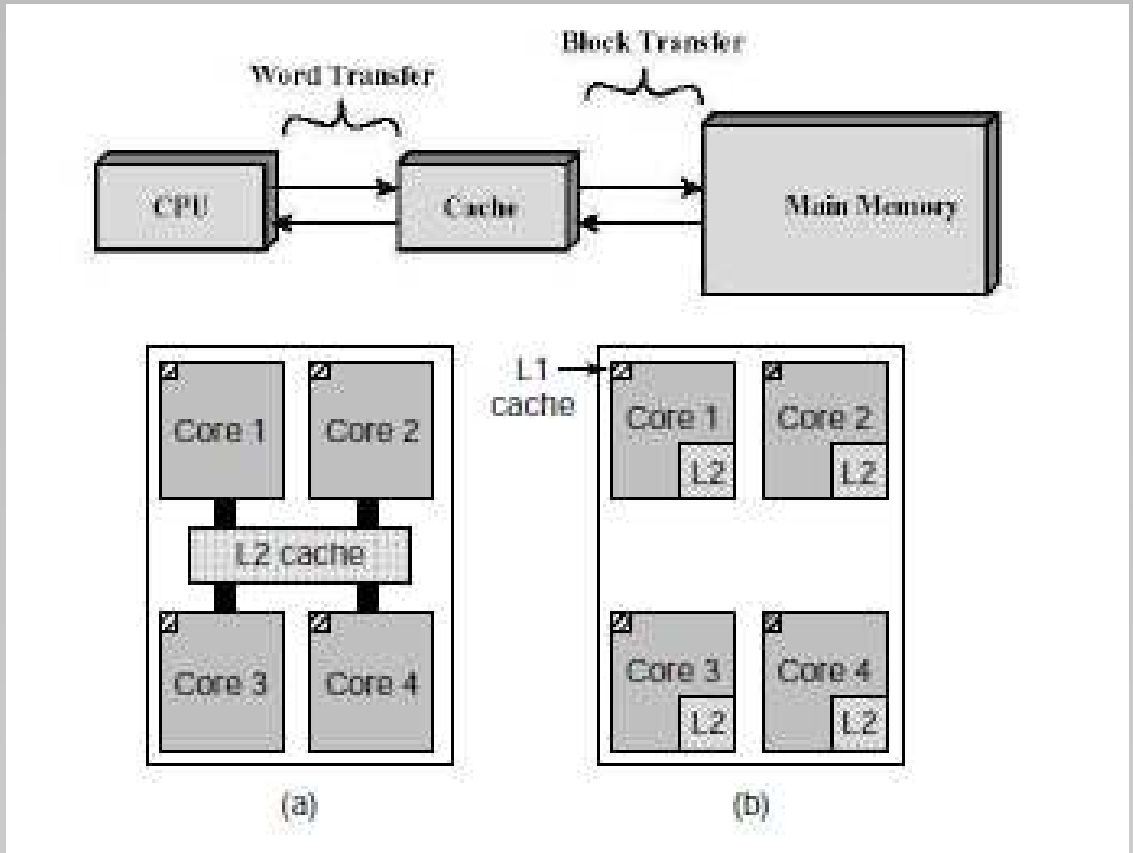
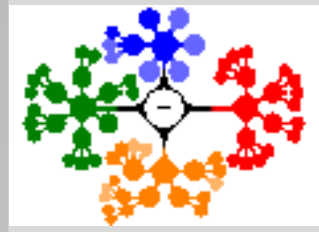


Figure: Upper: Cache Memory. Lower: (a) A quad-core chip with a shared L2 cache. (b) A quad-core chip with separate L2 caches.



Storage Structure VII

Future storage technology includes 3-dimensional crystal structures which allow optical access to a dense 3-dimensional storage facility (see Fig. 11).

http://www.voyle.net/Guest Writers/Michael E. Thomas/Atomic_press.htm

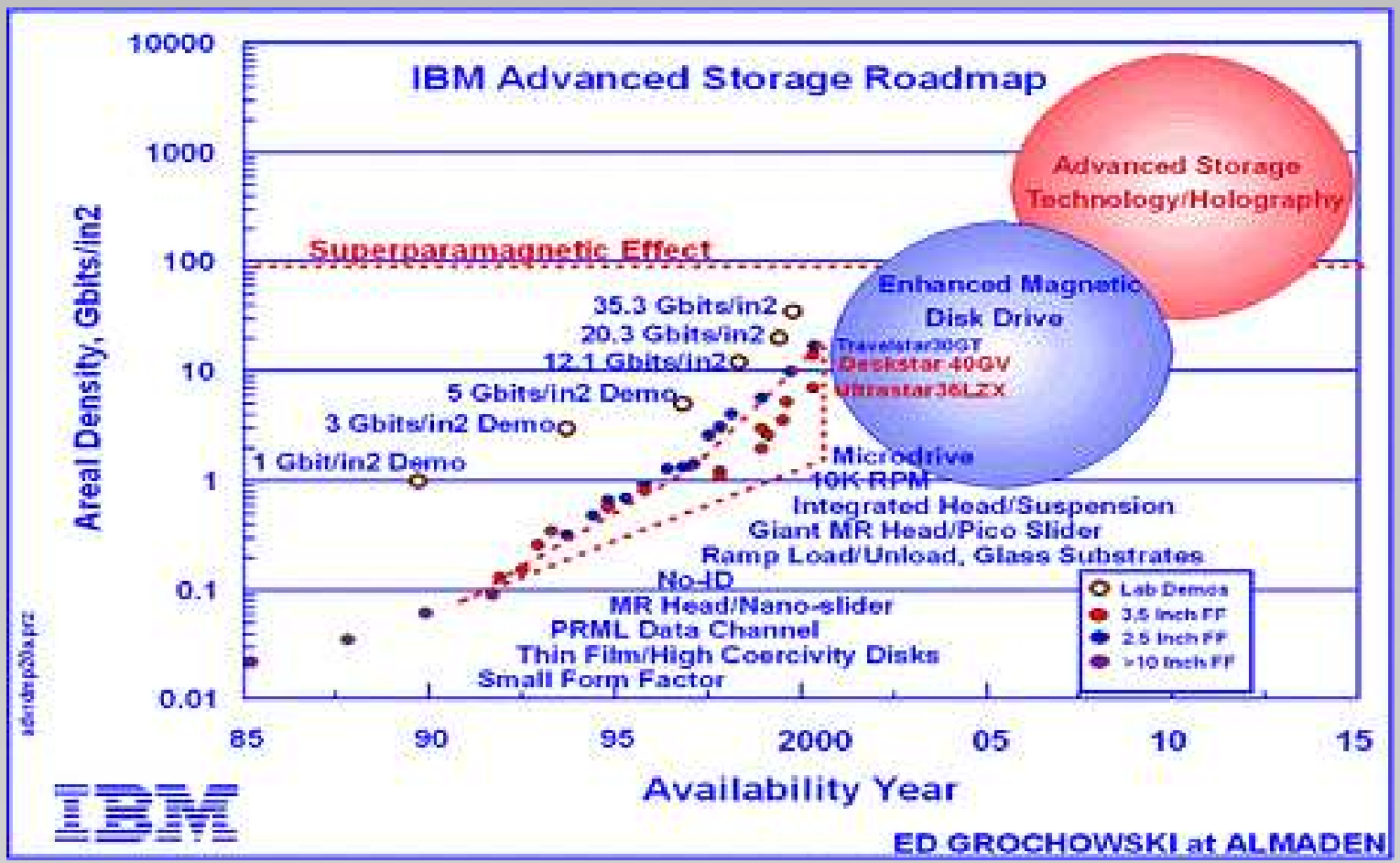
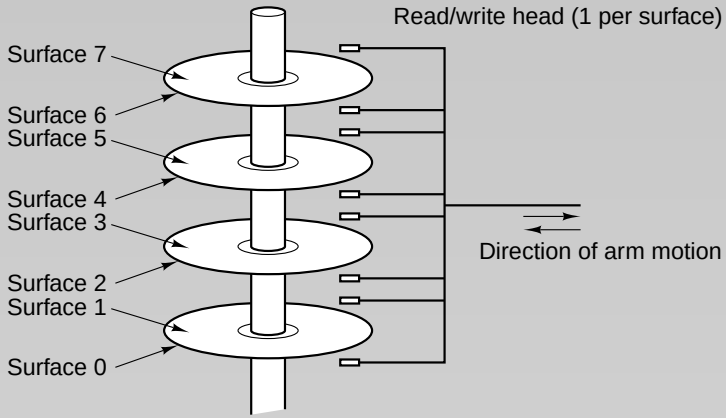


Figure: IBM Advanced Storage Roadmap.

I/O Structure I

- Storage is only one of many types of I/O devices within a computer.



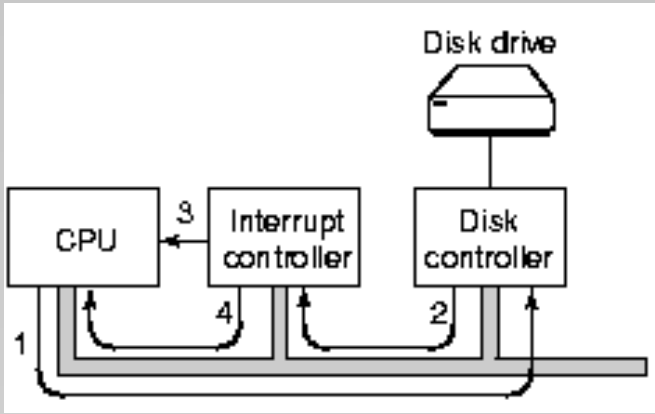
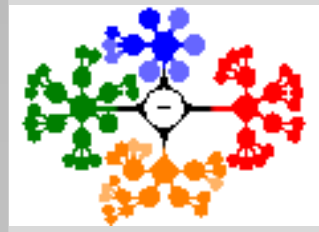


Figure: Left: Structure of a disk drive. Right: The steps in starting an I/O device.



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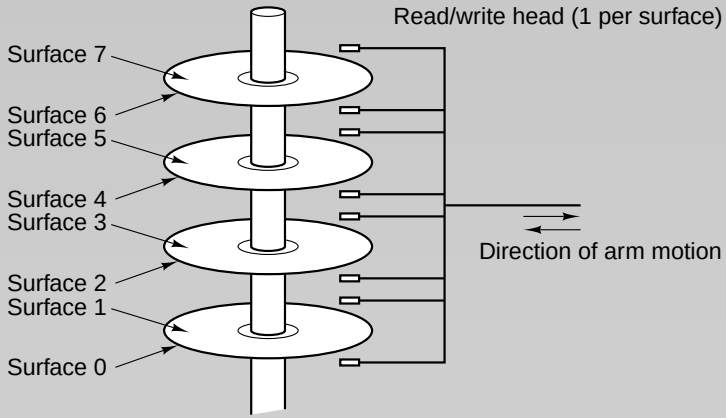
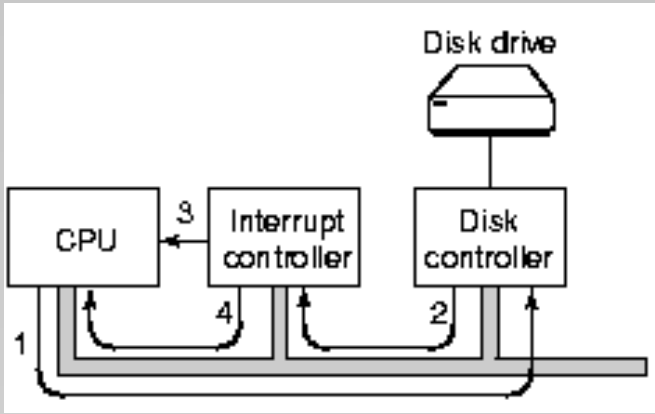
- A large portion of OS code is dedicated to managing I/O, both because of its importance to the reliability and performance of a system and because of the varying nature of the devices.





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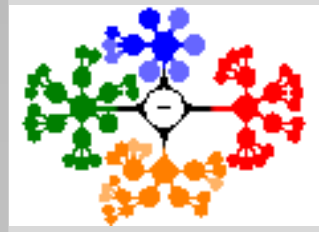

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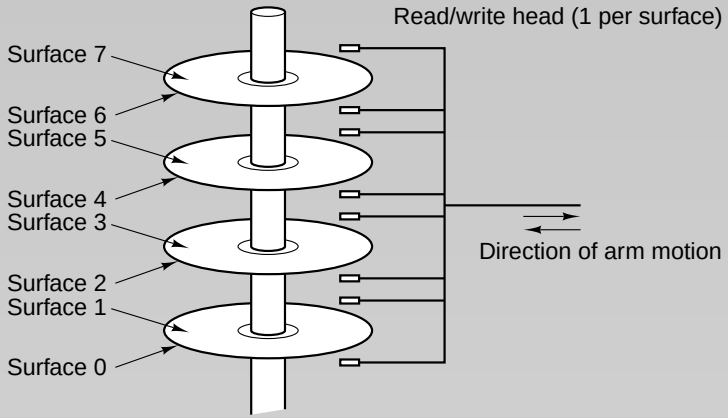

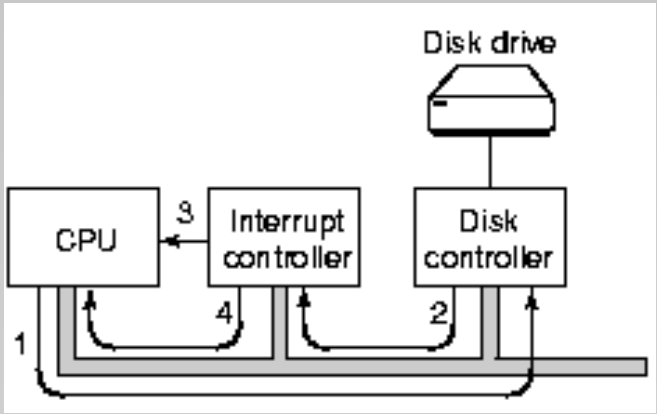

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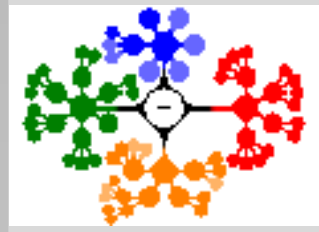

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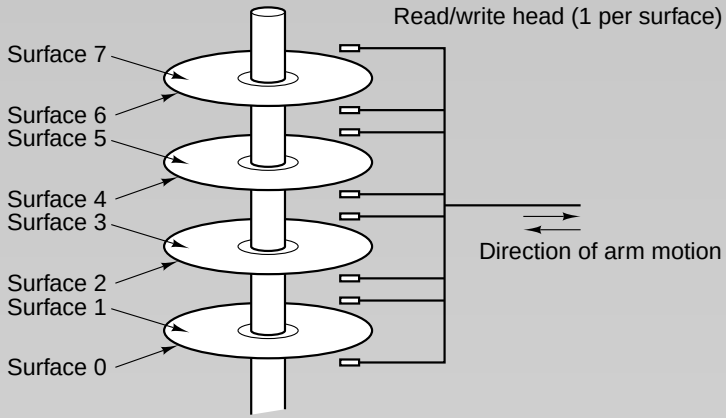
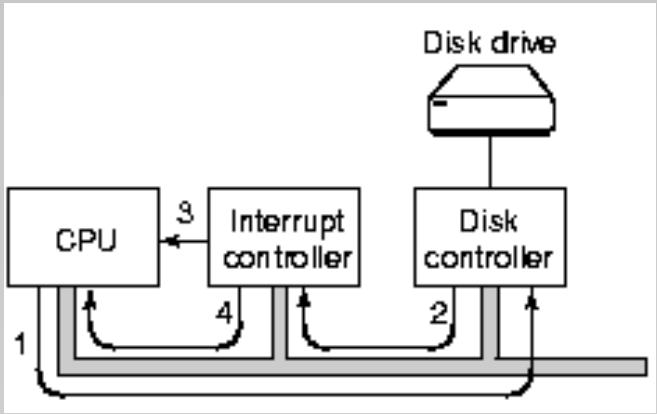
- This means access usually involves a disc rotation delay and also a head positioning delay (see Fig. 12left).





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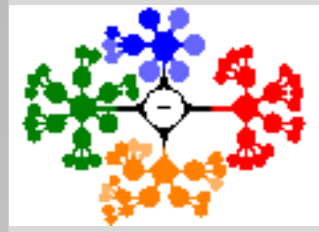
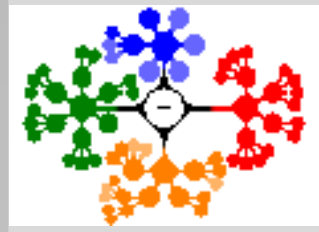


I/O Structure II

- A general-purpose computer system consists of CPUs and multiple device controllers that are connected through a common bus (see Fig. 13).



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  - The controller starts the transfer of data from the device to its local buffer.
  - Once the transfer of data is complete, the device controller informs the device driver via an interrupt that it has finished its operation.
  - The device driver then returns control to the OS, possibly returning the data or a pointer to the data if the operation was a read.

I/O Structure III

A system bus would involve a pathway along which data could travel (usually 32-bits side-by-side i.e. in bit-wise parallel).

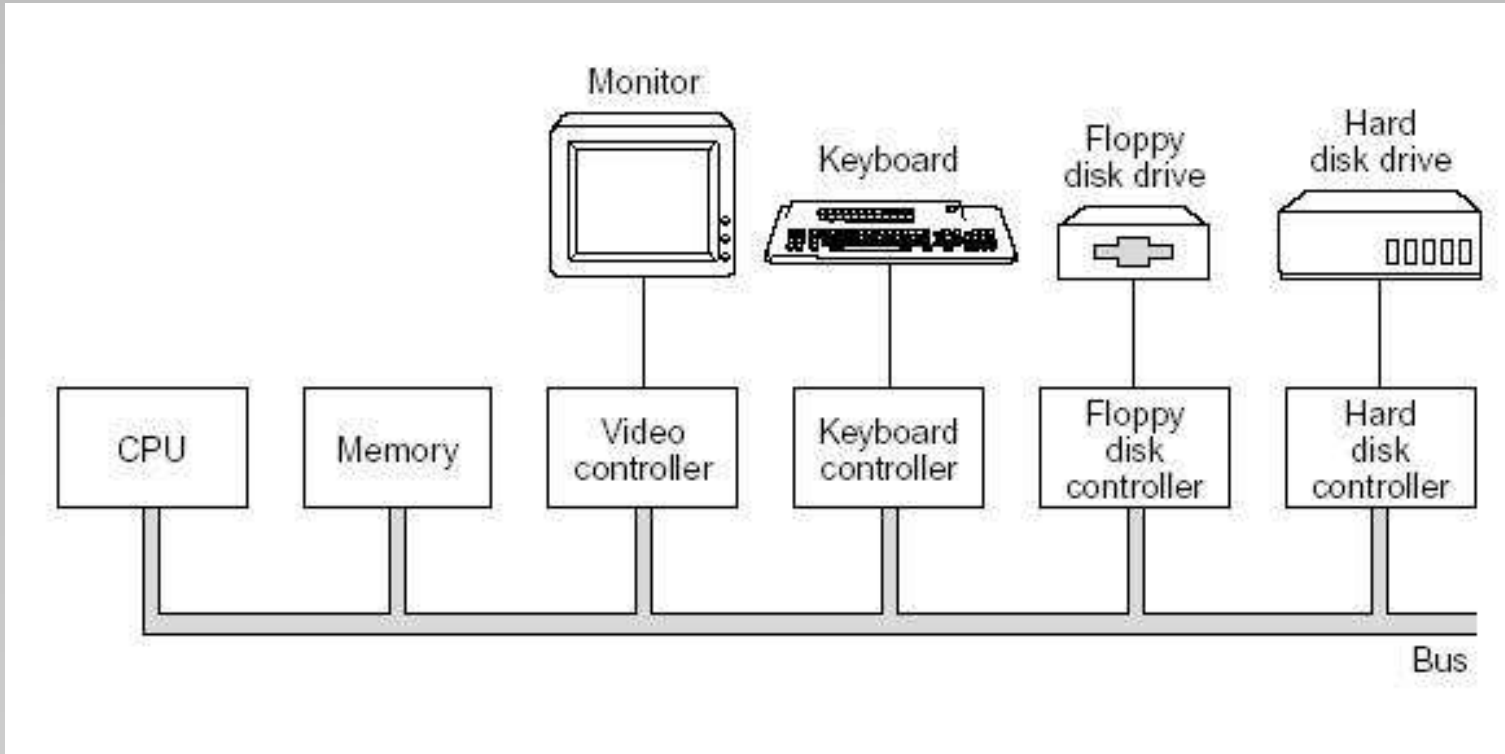

Figure: Top-level Components.

I/O Structure IV

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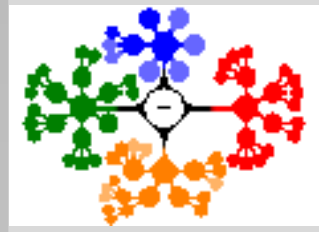

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- This form of interrupt-driven I/O is fine for moving small amounts of data but can produce high overhead when used for bulk data movement such as disk I/O.
- To solve this problem, direct memory access (DMA) is used. After setting up buffers, pointers, and counters for the I/O device, the device controller transfers an entire block of data directly to or from its own buffer storage to memory, with no intervention by the CPU.