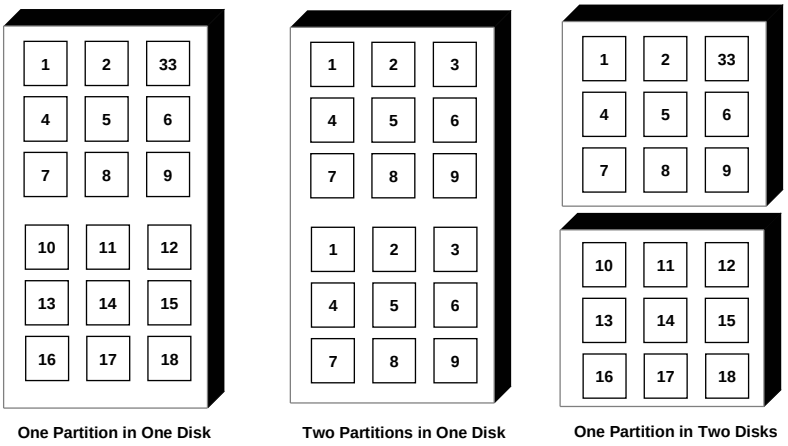
File System Concepts

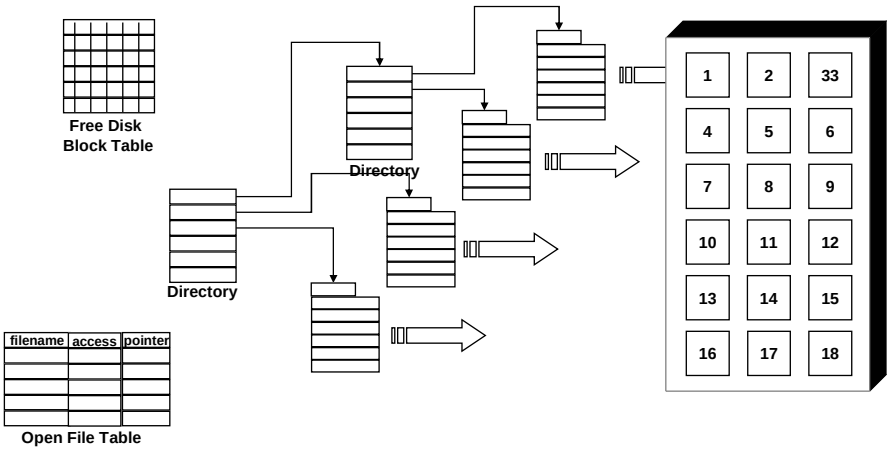
- **What is a File?**
- **Attributes of A File**
- **Operations on a File**
- **Access Modes**
  - ♦ **Sequential vs. direct**
- **Directory**
  - ♦ **Tree vs. acyclic-graph**
- **Protection**
- **Shared Files**
- **File Mounting**
- **Open File Table**

File System Organization: Partition and Physical Disks



One Partition in One Disk | Two Partitions in One Disk | One Partition in Two Disks

Organization of a Partition



Contiguous Allocation

A Contiguous set of block are allocated for each file. First-Fit Best-Fit can be used.

Advantages:

- **No space needed for inodes.**
- **Fast sequential and direct access.**

Disadvantages:

- **External Fragmentation.**
- **No dynamic growth. File size must be known ahead.**

Linked Allocation

Blocks of a file are scattered in disk. But each block has a pointer to next block at the end.

Advantages:

- **No external fragmentation.**
- **Dynamically blocks can be added and deleted.**

Disadvantages:

- **4 bytes in each block is needed. (4/ 512= 12% overhead)**
- **Direct access can be very slow! Reading n th block need reading n blocks.**
- **Reliability! Consider losing one block in a chain!**

FAT based Linked Allocation

The first block of a partition contains a table (File Allocation Table) implementation of linked list. Used by MS-DOS

Advantages:

- **Reliability Improved.**
- **Direct access time is better.**

Indexed Allocation

Each file has its own index table block.

Advantages:

- **No external fragmentation.**
- **Dynamically blocks can be added and deleted.**
- **Fast direct and sequential access.**

Disadvantages:

- **Space wasted for index blocks for small files.**
- **File size is limited by block size.**

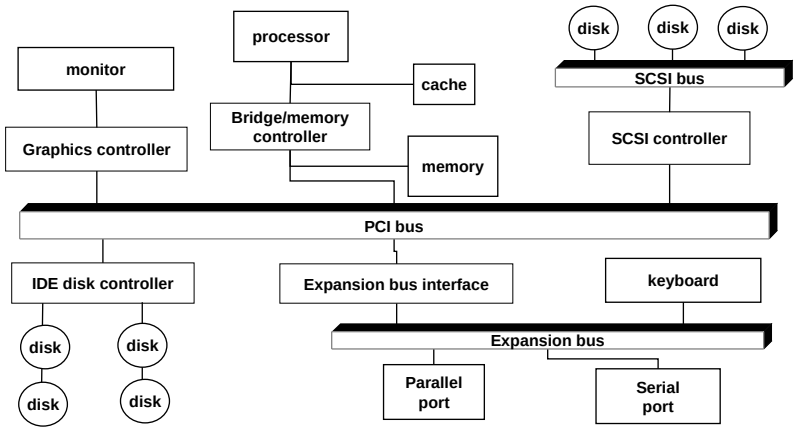
BSD Unix approach:

- **Combined scheme.**

Free Space Management

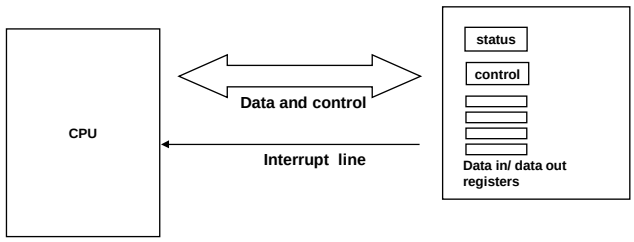
- **Bit Vectors:**
  - **Very efficient, but may be very large for large disks (1.3 GB disk with .5K blocks need 310Kbytes).**
- **Linked List:**
  - **Each free block contains pointer to the next one. Takes a disk access to find a free block.**
- **Grouping:**
  - **The index of first n free blocks are in the first block. A large number of free blocks can be found at once.**

A Typical PC bus Architecture



Os-slide#9

Communication between CPU and Controller



- Character stream vs. block devices
- Sequential vs. random access
- Synchronous vs. asynchronous devices
- Sharable vs. dedicated devices
- Slow vs. fast devices
- Read-only, write-only, read/write devices

I/O vs. Memory Mapped
Polling
Interrupt Vector
DMA
Spooling

Os-slide#10

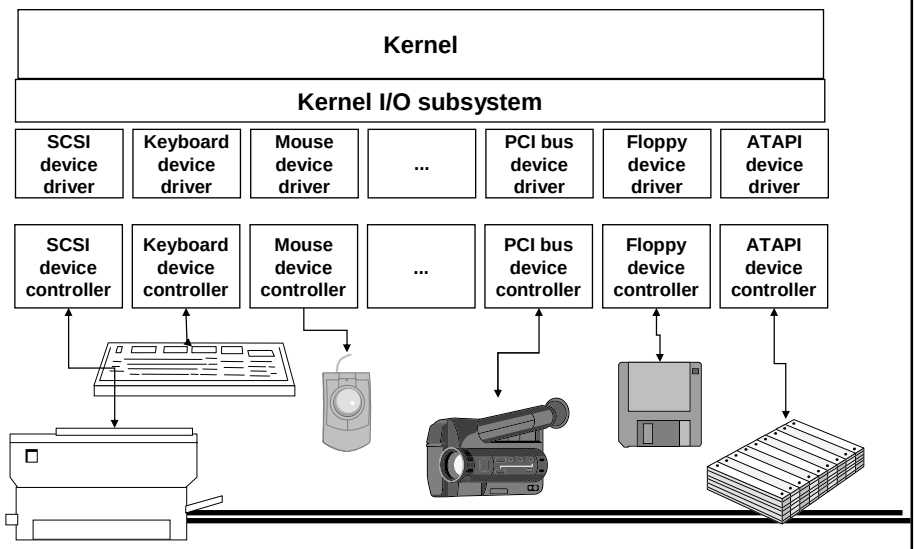
Disk Scheduling

Init Position 53

Request 98, 183, 37, 122, 14, 124, 65, 67

- **FCFS Algorithm:**
  - **Read Order: (53) 98, 183, 37, 122, 14, 124, 65, 67**
- **SSTF Algorithm:**
  - **Read Order: (53) 65, 67, 98, 122, 124, 183**
- **SCAN Algorithm:**
  - **Read Order: (53) 37, 14, (0), 65, 67, 98, 122, 124, 183**
- **C-SCAN Algorithm:**
  - **Read Order: (53) 37, 14, (0), 183, 124, 122, 98, 67, 65**
- **LOOK Algorithm:**
- **C-LOOK Algorithm:**

OS Organization



Disk Management

- **Formatting**
- **Boot Block**
- **Bad Blocks**
- **Swap Space Location**
- **Swap Space Management**