操作系统

Operating system

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内容纲要

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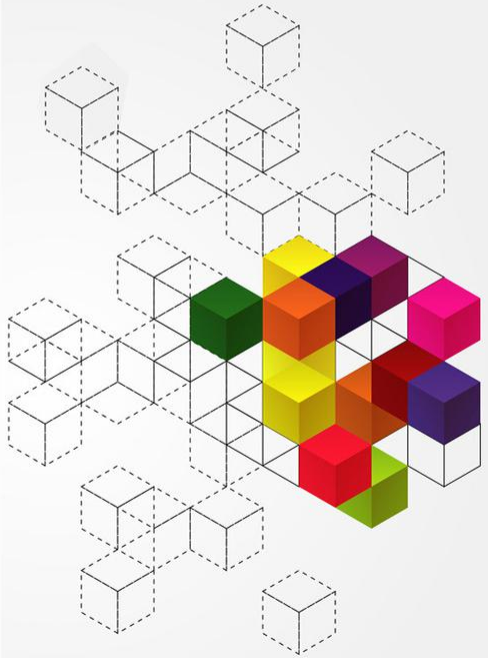
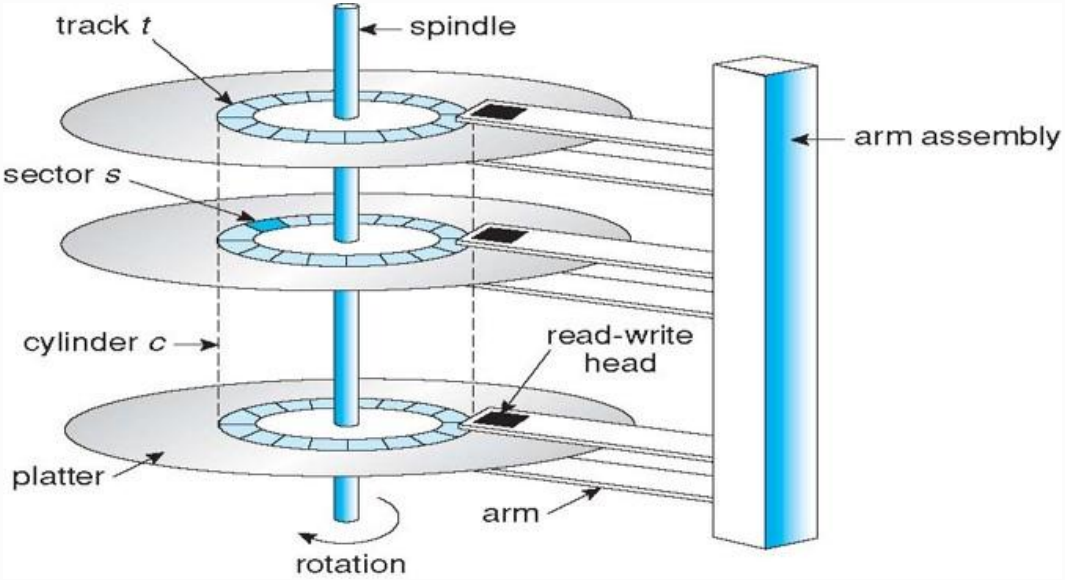
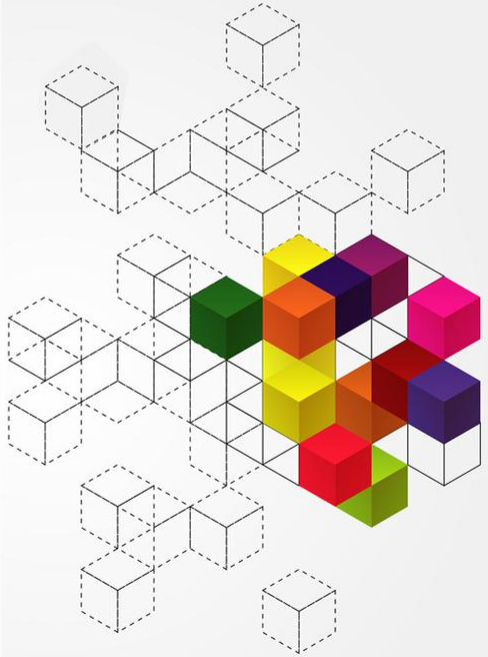


一、磁盘物理结构

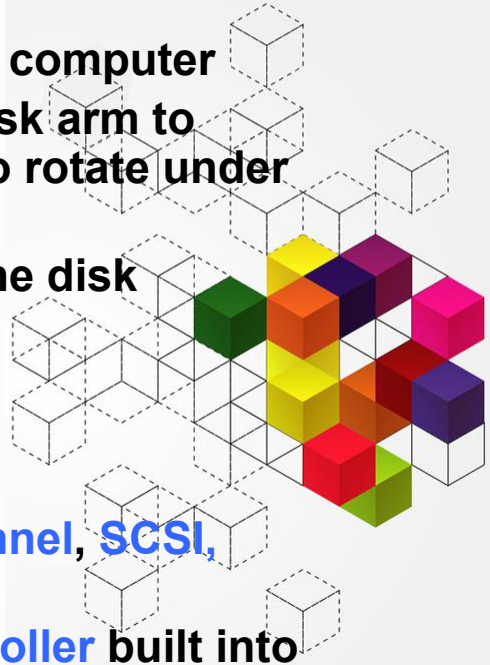
- **机械磁盘结构示意图**
  - 柱面（Cylinder），磁道（track），扇区（sector）





一、磁盘物理结构

- **Magnetic disks** provide bulk of secondary storage of modern computers
  - **Drives rotate at 60 to 250 times per second**
  - **Transfer rate is rate at which data flow between drive and computer**
  - **Positioning time (random-access time) is time to move disk arm to desired cylinder (seek time) and time for desired sector to rotate under the disk head (rotational latency)**
  - **Head crash results from disk head making contact with the disk surface -- That's bad (should through cushion of air)**
- Disks can be removable (e.g., floppy disks)
- Drive attached to computer via **I/O bus**
  - **Busses vary, including EIDE, ATA, SATA, USB, Fibre Channel, SCSI, SAS, Firewire**
  - **Host controller in computer uses bus to talk to disk controller built into drive or storage array (for data transfer)**

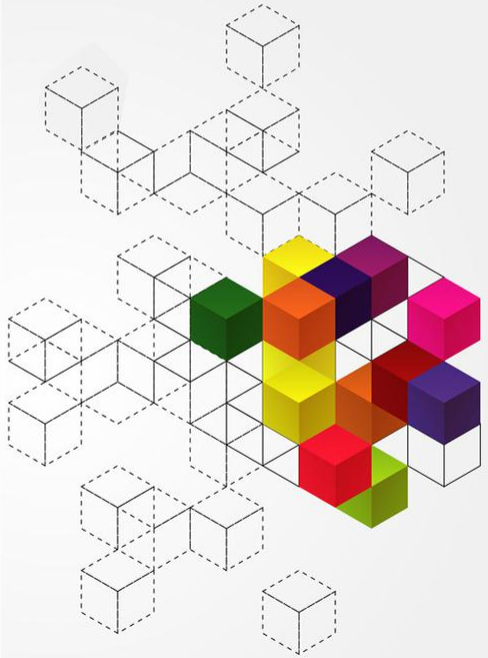


一、磁盘物理结构

- **现代机械磁盘的典型参数值**
  - 理论传输速率：6Gb/s
  - 实际（有效）传输速率：1Gb/s
  - 寻道时间：3ms~12ms
  - 旋转延迟：1/(RPM*60)
  - 平均旋转延迟=0.5*旋转延迟

Spindle [rpm]	Average latency [ms]
4200	7.14
5400	5.56
7200	4.17
10000	3
15000	2

(From Wikipedia)



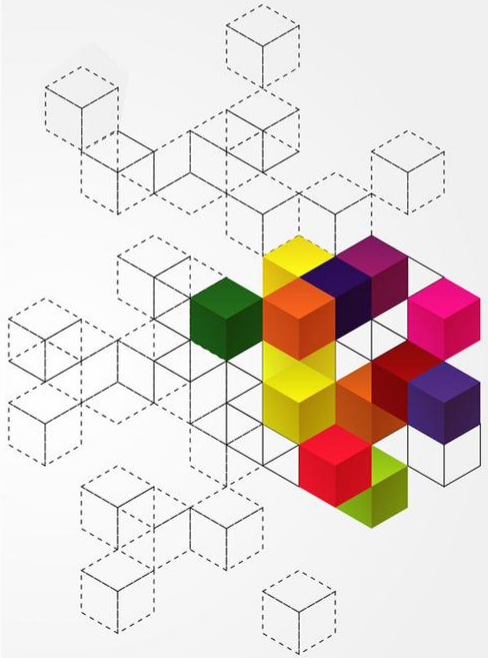
一、磁盘物理结构

- Disk drives are addressed as large 1-dimensional arrays of **logical blocks** (e.g., 512B), where the logical block is the smallest unit of transfer

- The 1-dimensional array of logical blocks is mapped into the sectors of the disk sequentially
  - **Sector 0 is the first sector of the first track on the outermost cylinder**
  - **Mapping proceeds in order through that track, then the rest of the tracks in that cylinder, and then through the rest of the cylinders from outermost to innermost**
  - **Logical to physical address should be easy**
    - **Except for bad sectors**
    - **Non-constant # of sectors per track via constant angular velocity**

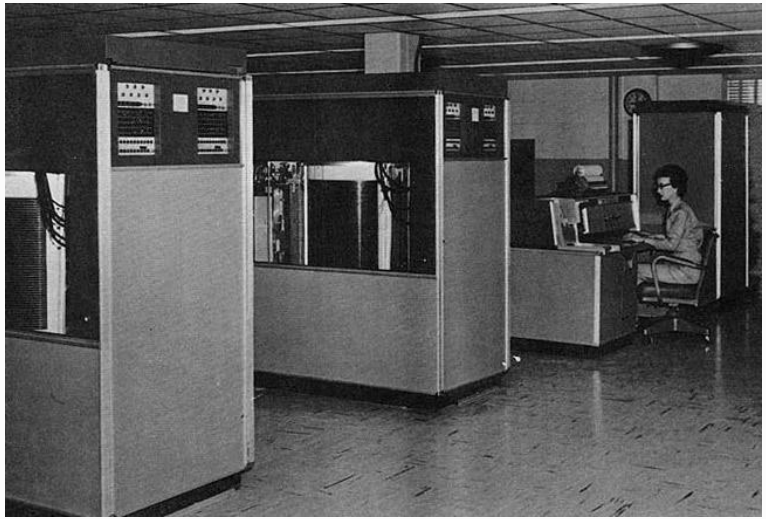
二、大容量存储技术发展

- **史上最早的商用磁盘**
  - the IBM Model 350 disk storage system， 1956
  - 容量： 5M (7 bit)
  - 50个24英寸磁碟（Platters）
  - 访问时间 < 1 second



二、大容量存储技术发展

- **IBM推动早期硬盘技术的创新**
  - RAMAC：最早使用硬盘存储的商用计算机，上面装载了Model 350 disk storage system
  - 需要整个房间放置该计算机，其硬盘系统有两个冰箱那么大



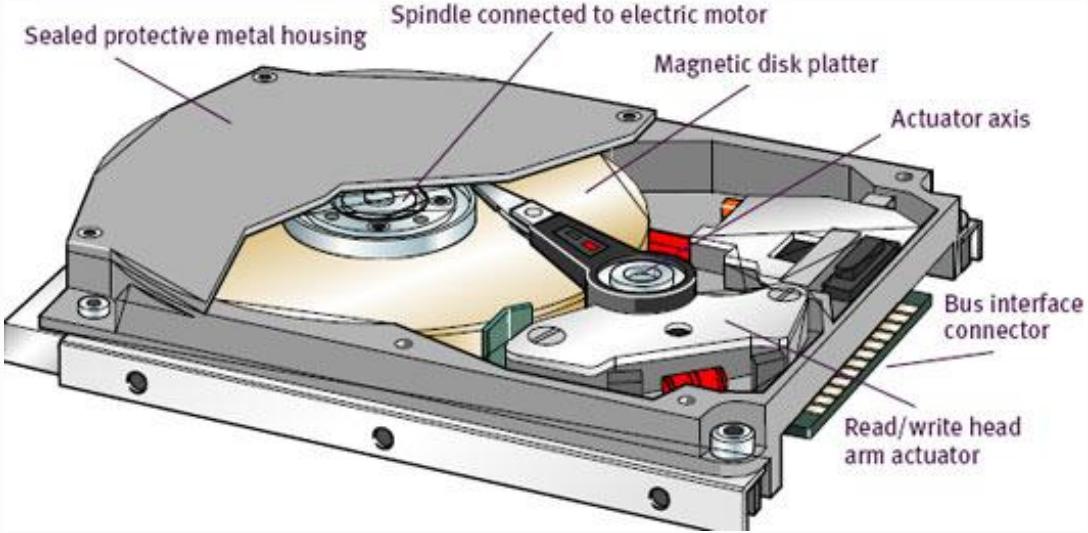
RAMAC：Random Access Method for Accounting and Control

二、大容量存储技术发展

- **IBM早期推出的可移动存储：IBM 1311磁盘**
  - Removable storage

二、大容量存储技术发展

- **现代磁盘样式结构**



本讲小结

- IO子系统功能概述