DATA STORAGE TECHNOLOGIES & NETWORKS

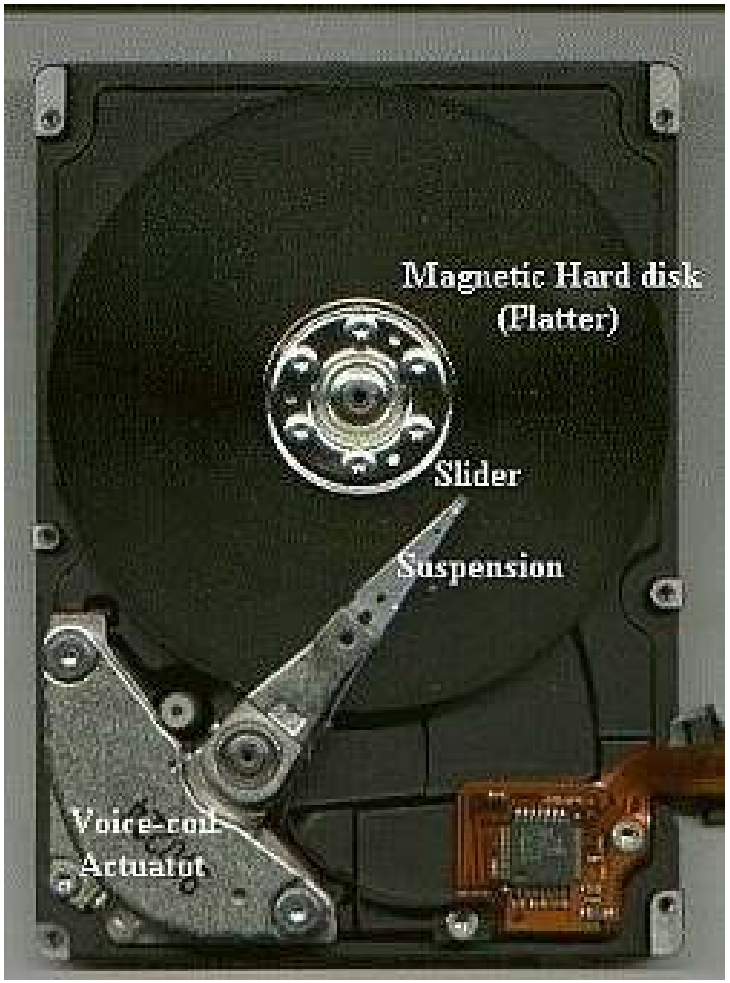
(CS C446, CS F446 & IS C446)

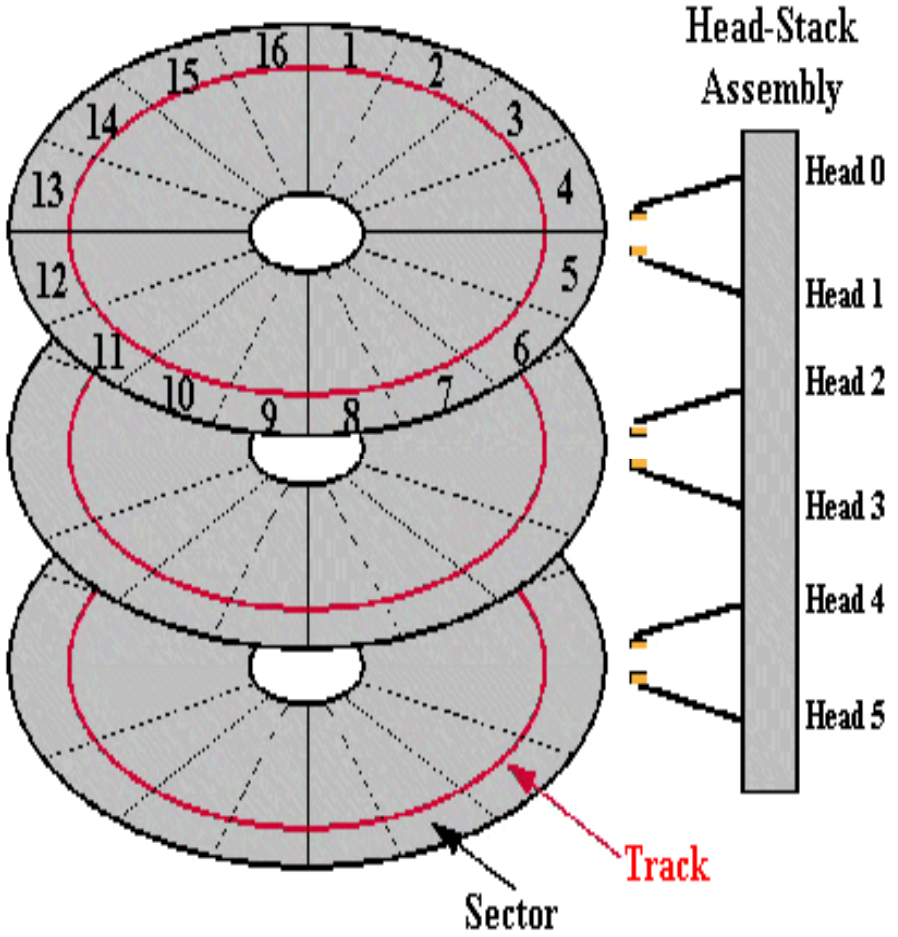
LECTURE 10 – STORAGE

Controller

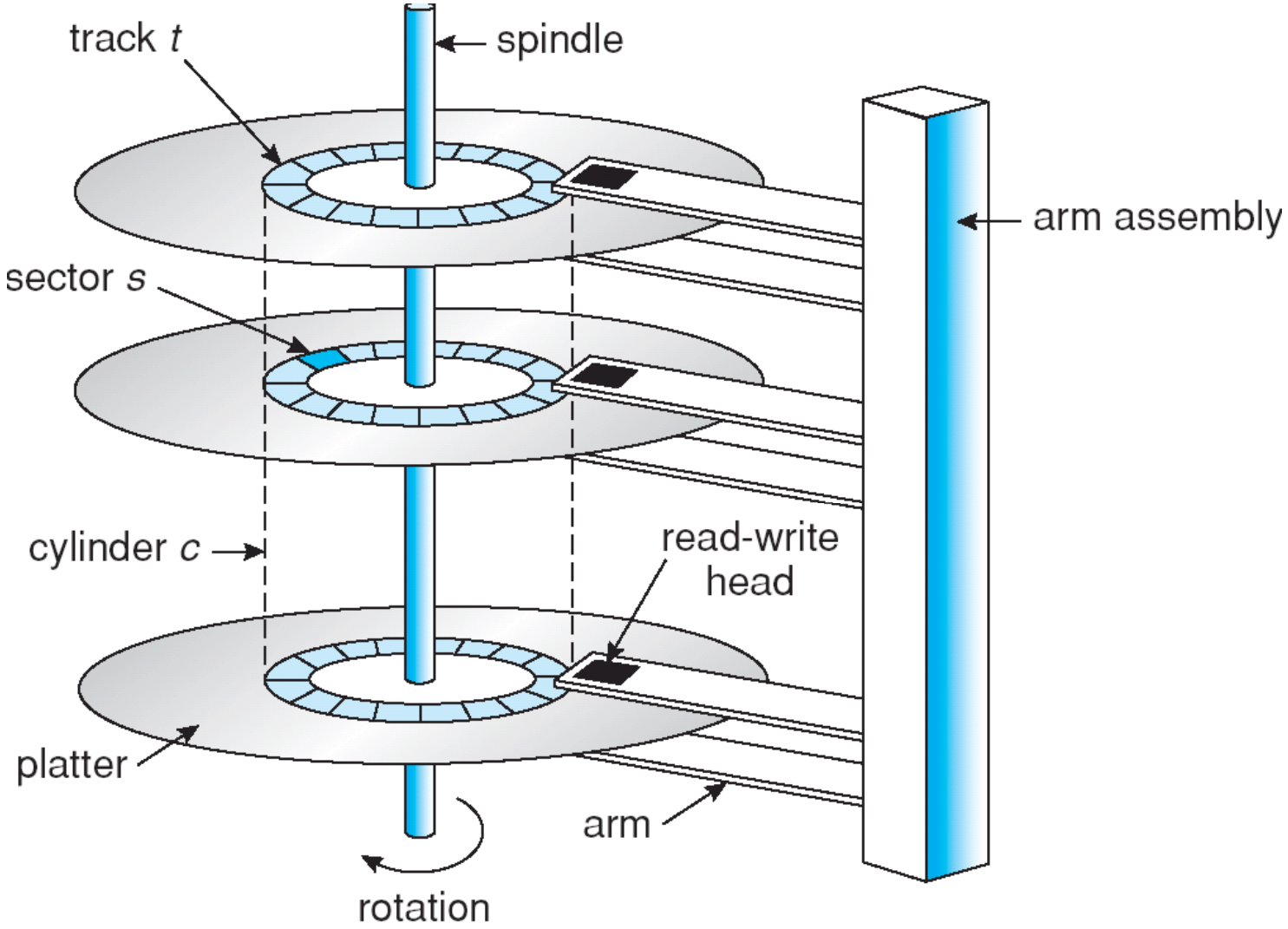
- Consists of Microprocessor, Internal memory, firmware ….
- Mounted at the bottom of the disk drive
- Firmware
  - Controls power to the spindle motor and speed of the motor
  - Manages communication between the drive and the host
  - Controls R/W operation by moving the actuator arm and switching between different R/W heads and performs the optimization of data access.

Drive Physical and Logical Organization





Source: Data Clinic (dataclinic.co.uk)


track t
spindle
arm assembly
sector s
cylinder c
read-write
head
platter
arm
rotation

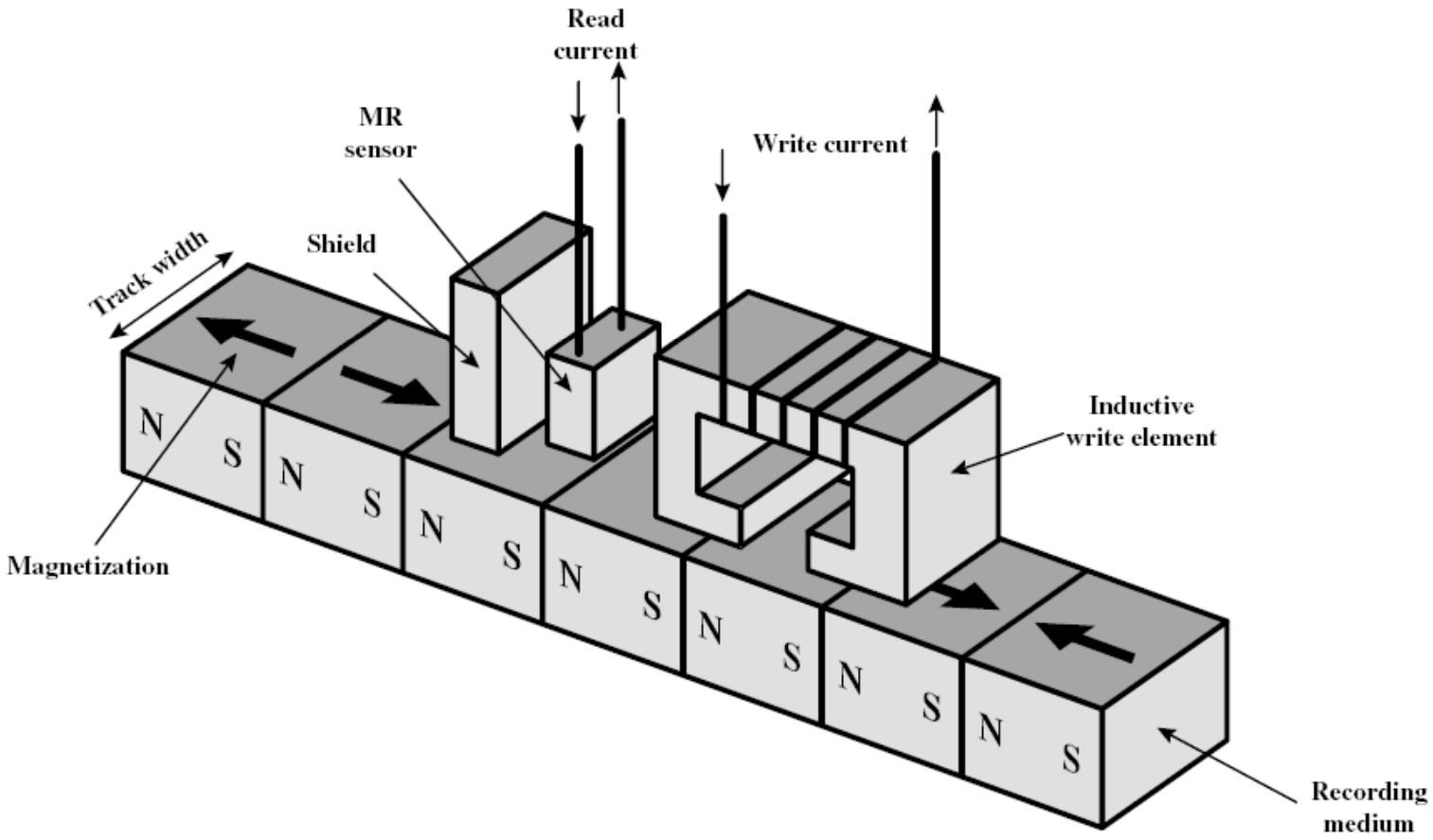
Disk structure

- Recorded on tracks
  - Tracks are concentric rings on the platter around the spindle
  - Tracks are numbered from 0 [outer edge of the platter]
  - Track density = # of tracks per inch [TPI]
    - Measures how tightly tracks are packed on a platter
  - Each track is divided into sectors
    - Smallest individual addressable unit
- While formatting track and sector structure is written on the platter
- Cylinder – set of identical tracks in both surfaces of each drive platter

Hard Disks - Geometry

- Capacity depends on
  - Recording density (bits/inch)
  - Track Density (tracks/inch)
- Aerial Density is
  - Product of recording density and track density
- Total capacity is
  - (# bytes / sector) * (# sectors / track) * (#tracks / surface) * (# surfaces / platter) * (#platters / disk)

Read and Write in Hard disks



Read and Write in Hard disks

- Recording and retrieval via conductive coil(s) called a head(s)
- May be single read/write head or separate ones
- During read/write, head is stationary (actually moves radially to platters) and platter rotates beneath head
- Hard disk Write
  - Current through coil produces magnetic field
  - Pulses sent to head
  - Magnetic pattern recorded on surface below

Hard disk Read

- Magnetic field ***moving*** relative to coil produces current – Analogous to a generator or alternator
- Coil can be the same for read and write
- Used with:
  - Floppies
  - Older hard disks
- Separate read head, close to write head
- Partially shielded magneto resistive (MR) sensor
- Electrical resistance depends on direction of magnetic field – Passing current through it results in different voltage levels for different resistances
- High frequency operation -- Higher storage density and speed