



# CS 423

## Operating System Design: Disk Scheduling Algorithms

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# Why Files?



- Physical reality
  - Block oriented
  - Physical sector #s
  - No protection among users of the system
  - Data might be corrupted if machine crashes
- Filesystem model
  - Byte oriented
  - Named files
  - Users protected from each other
  - Robust to machine failures

# Question



- What functions should file systems provide?

# File System Requirements



- Users must be able to:
  - create and delete files at will.
  - read, write, and modify file contents with a minimum of fuss about blocking, buffering, etc.
  - share each other's files with proper authorization
  - refer to files by symbolic names.
  - see a logical view of files without concern for how they are stored.
  - retrieve backup copies of files lost through accident or malicious destruction.

# Disk Scheduling



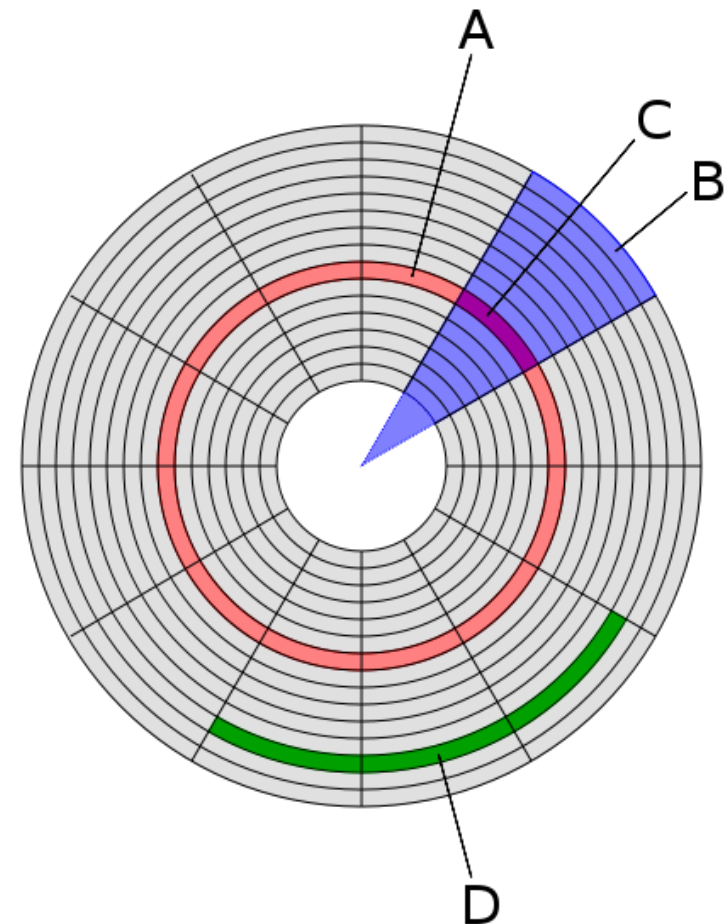
- Which disk request is serviced first?
  - FCFS
  - Shortest seek time first
  - Elevator (SCAN)
  - C-SCAN (Circular SCAN)

A: Track.

B: Sector.

C: Sector of Track.

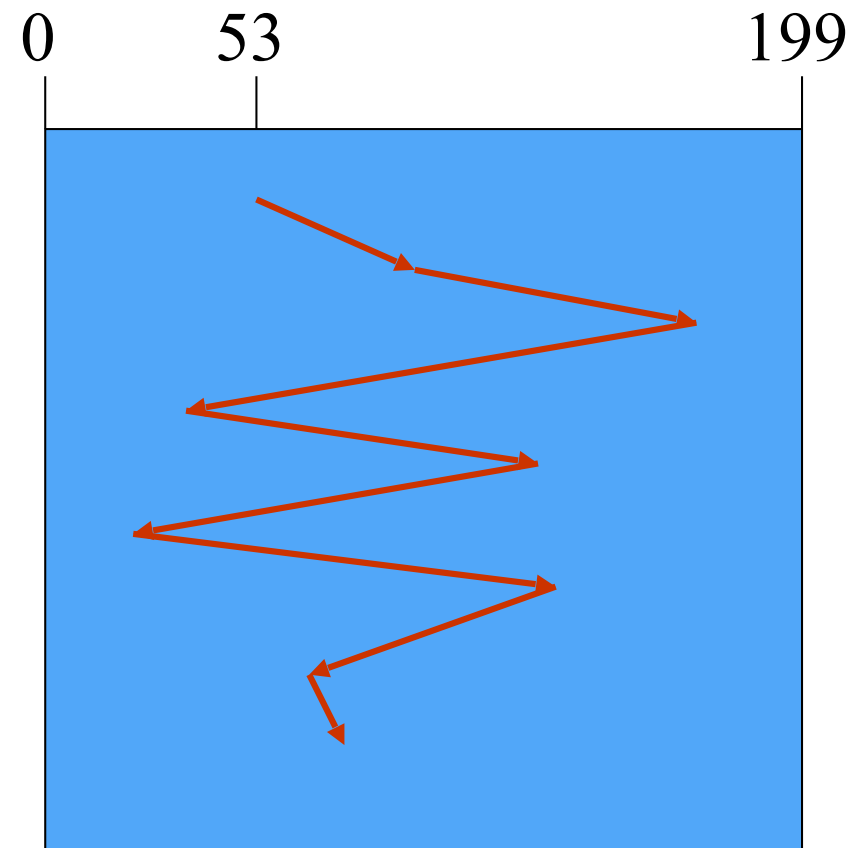
D: File



# FIFO (FCFS) Order



- Method
  - First come first serve
- Pros?
  - Fairness among requests
  - In the order applications expect
- Cons?
  - Arrival may be on random spots on the disk (long seeks)
  - Wild swing can happen
- Analogy:
  - FCFS elevator scheduling?

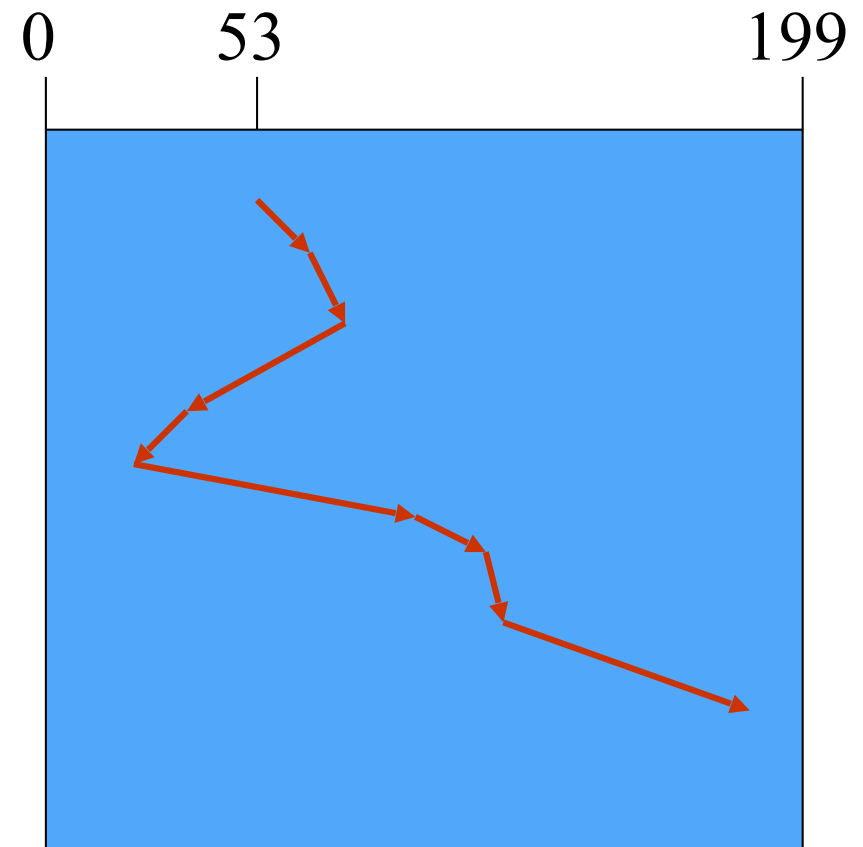


98, 183, 37, 122, 14, 124, 65, 67

# SSTF (Shortest Seek Time First)



- Method
  - Pick the one closest on disk
- Pros?
  - Try to minimize seek time
- Cons?
  - Starvation
- Question
  - Is SSTF optimal?
  - Are we worried about sorting overhead?
  - Can we avoid starvation?

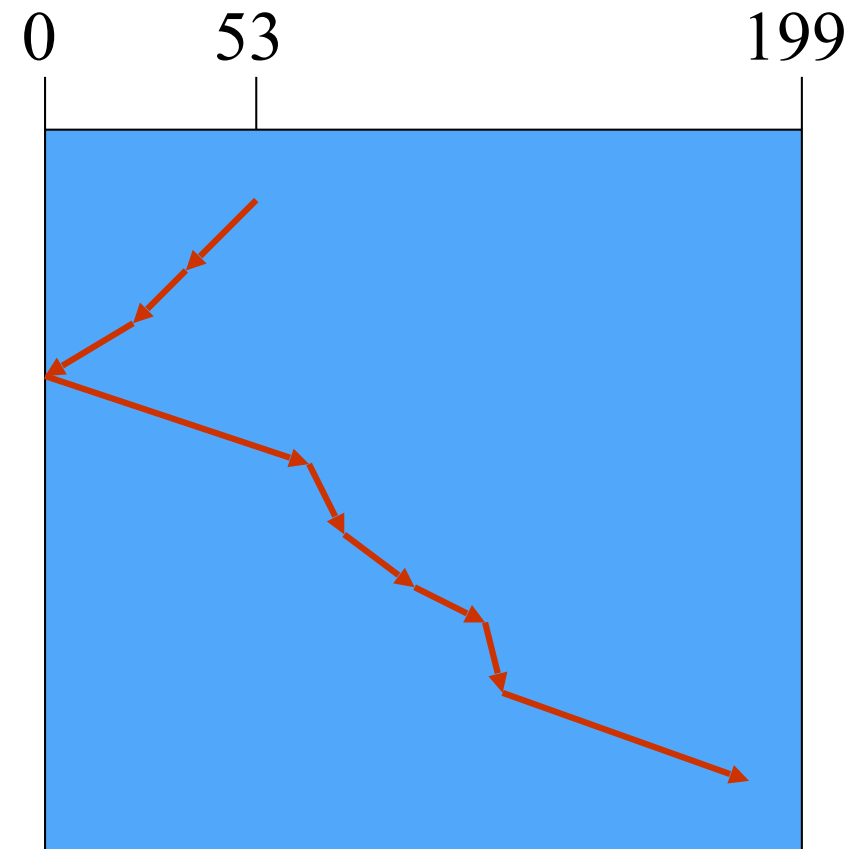


98, 183, 37, 122, 14, 124, 65, 67  
(65, 67, 37, 14, 98, 122, 124, 183)

# Elevator (SCAN)



- Method
  - Take the closest request in the direction of travel
- Pros
  - Bounded time for each request
- Cons?
  - Request at the other end will take a while
  - Which sectors have shorter wait times?
    - How to fix?



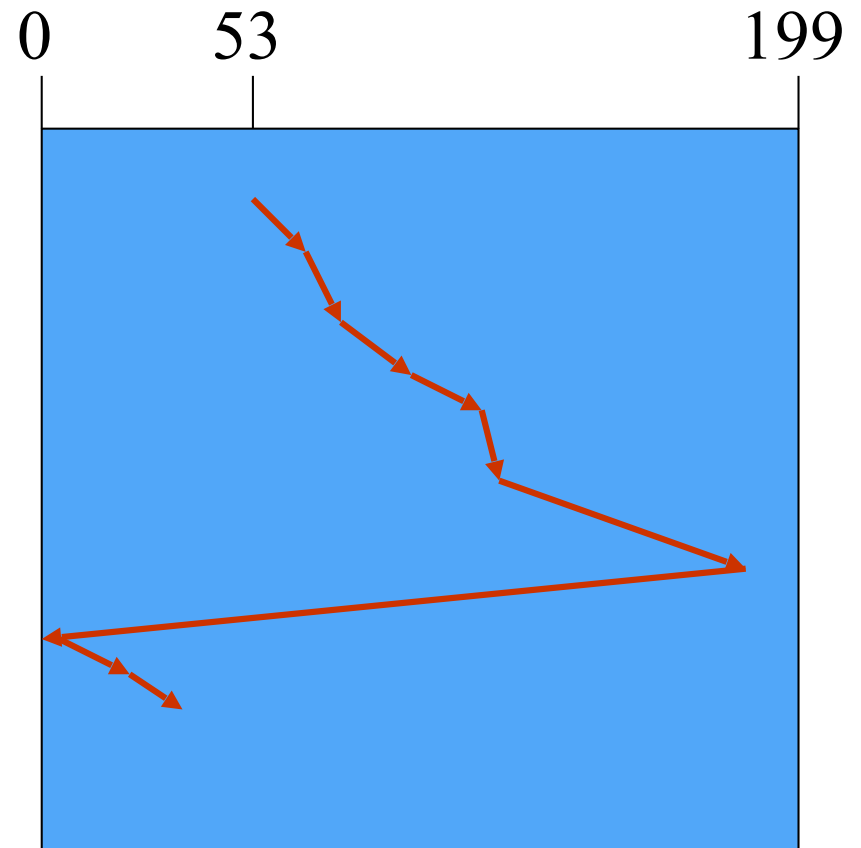
98, 183, 37, 122, 14, 124, 65, 67  
(37, 14, 65, 67, 98, 122, 124, 183)



# C-SCAN (Circular SCAN)



- Method
  - Like SCAN
  - But, wrap around
- Pros
  - Uniform service time
- Cons
  - Do nothing on the return



98, 183, 37, 122, 14, 124, 65, 67  
(65, 67, 98, 122, 124, 183, 14, 37)