

# Why so slow on hard disk drive?

## **Problem 1: in the original Unix File System, blocks were too small (512 bytes)**

- File index too large
- Require more indirect blocks
- Transfer rate low (get one block at time)

## **Problem 2: unorganized freelist**

- Consecutive file blocks not close together - pay seek cost for even sequential access
- Aging - becomes fragmented over time

## **Problem 3: poor locality**

- inodes far from data blocks
- inodes for directory not close together - poor enumeration performance  
e.g., "ls", "grep foo \*.c"

# FFS - Fast File System

- ➔ Design FS structures and allocation policies to be "disk aware"  
Designed by a Berkeley research group for the BSD UNIX