week 11
cs4973/cs6640
03/17 2025
https://naizhengtan.github.io/25spring/

- [x] admin: final project
- [x] 1. intro to fs
- [x] 2. Unix files
- [x] 3. fs namespace
- [ ] admin: exam

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labs exam

65/70 + 25/30

10

70/70 + 25/30 → 95/100

1. intro to FS.

Q: what does a FS do?

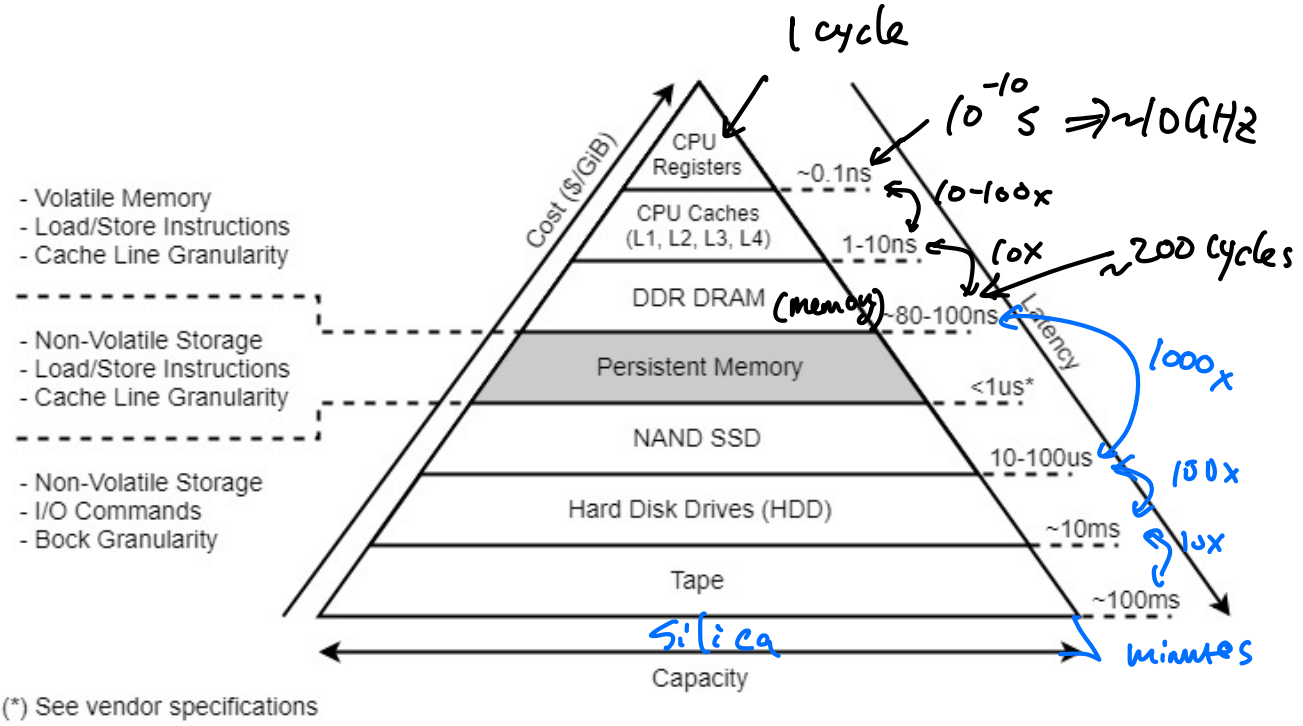
HW

1. provide persistence
2. named sequence of bytes on disk (files)
3. human friedly names (namespace, dirs)

- FLASH
- SD Card
- HDD
- SSD
- tape

New?

- persistent memory



Figures borrowed from "PMDK Introduction"
https://docs.pmem.io/persistent-memory/getting-started-guide/what-is-pmdk

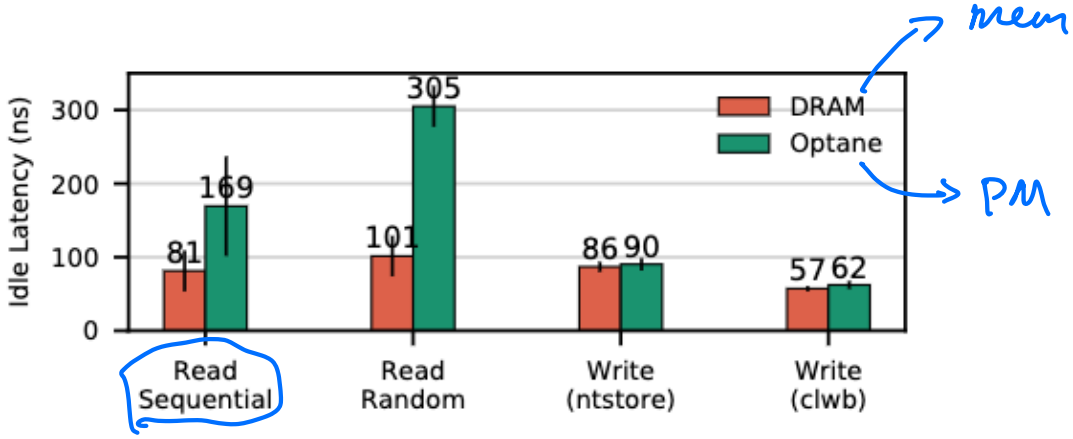


Figure 2: **Best-case latency** An experiment showing random and sequential read latency, as well as write latency using cached write with `clwb` and `ntstore` instructions. Error bars show one standard deviation.

Above figures are borrowed from An Empirical Guide to the Behavior and Use of Scalable Persistent Memory

Q: What is a file?

user: an array of bytes

FS: a set of disk blocks

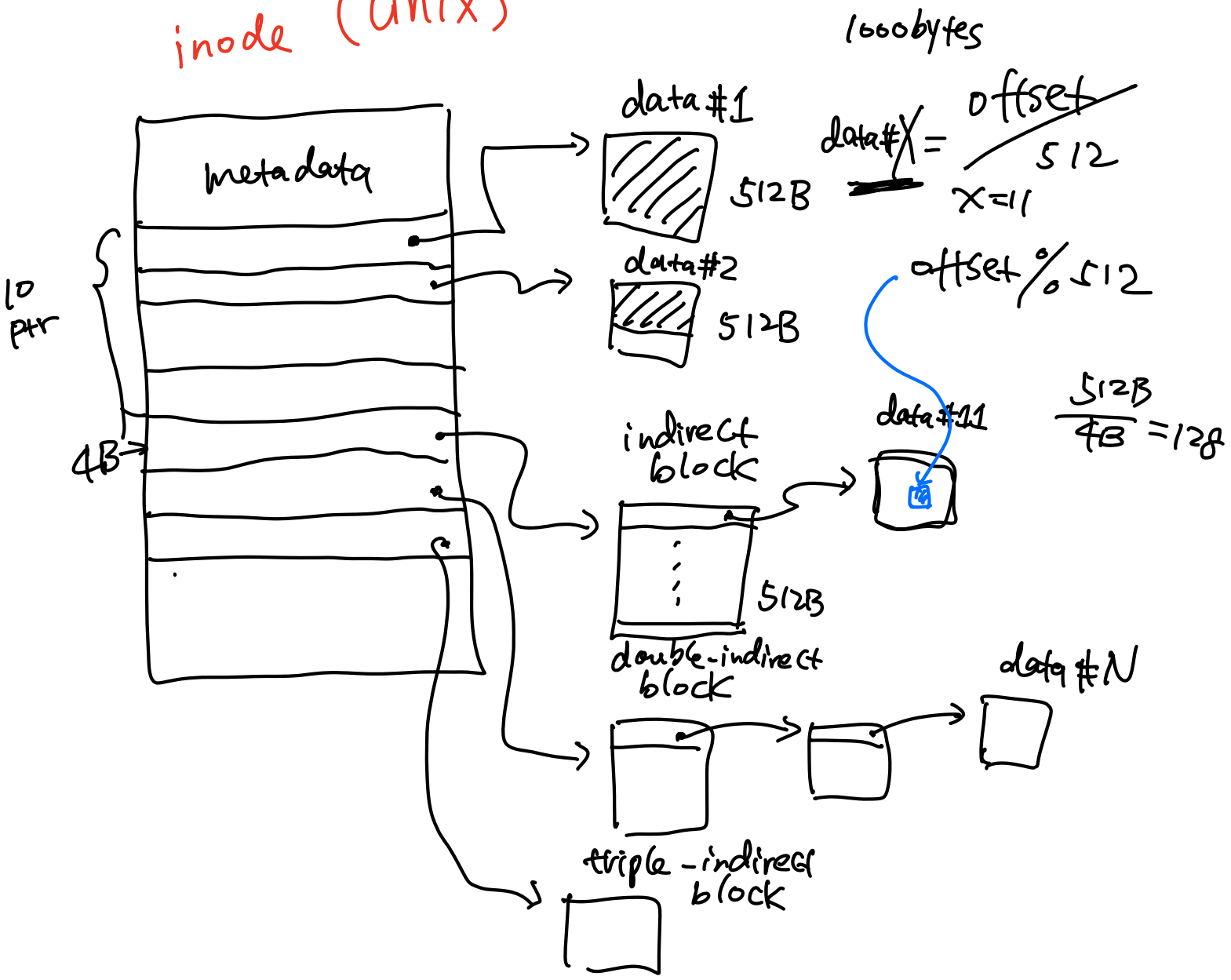
mapping

- file:

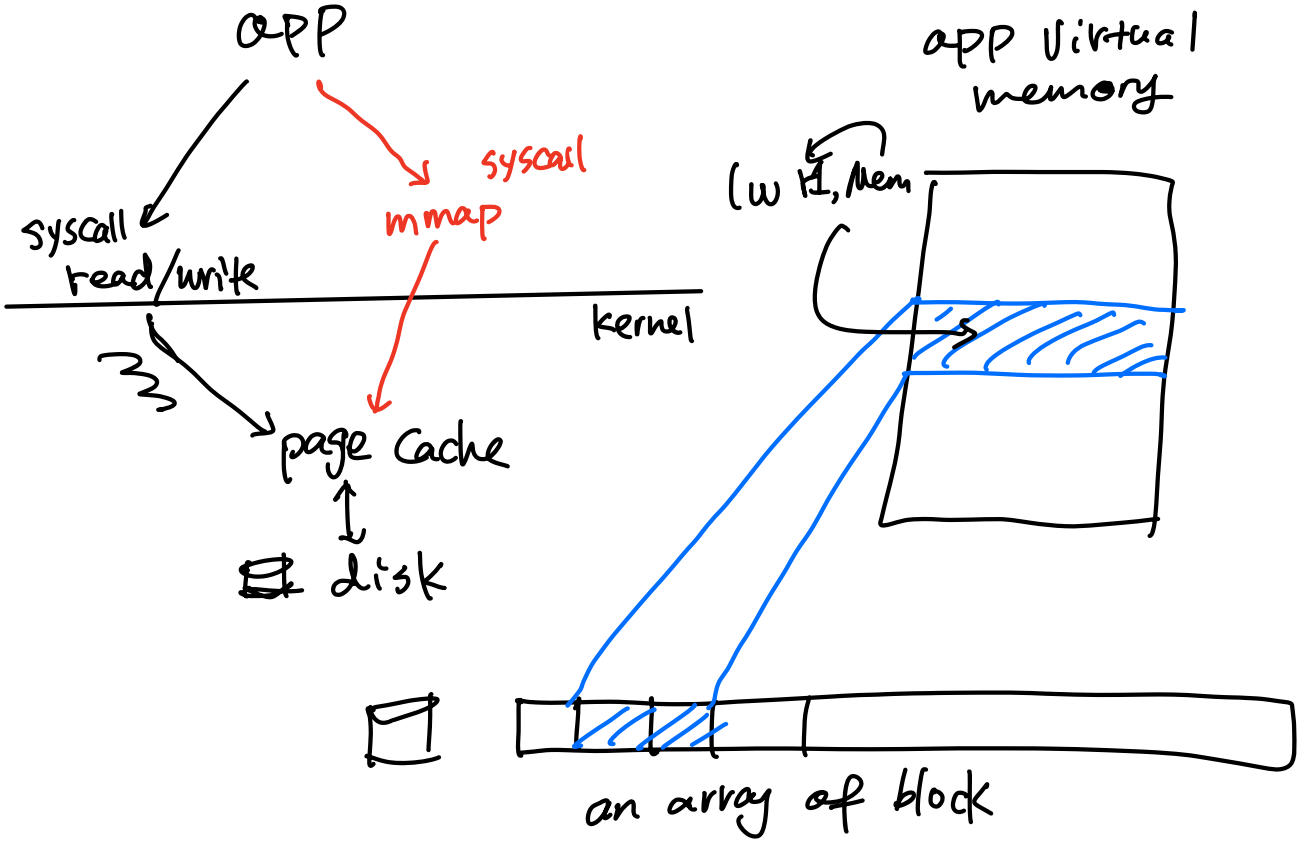
{file, offset} → disk block address

VA → PA

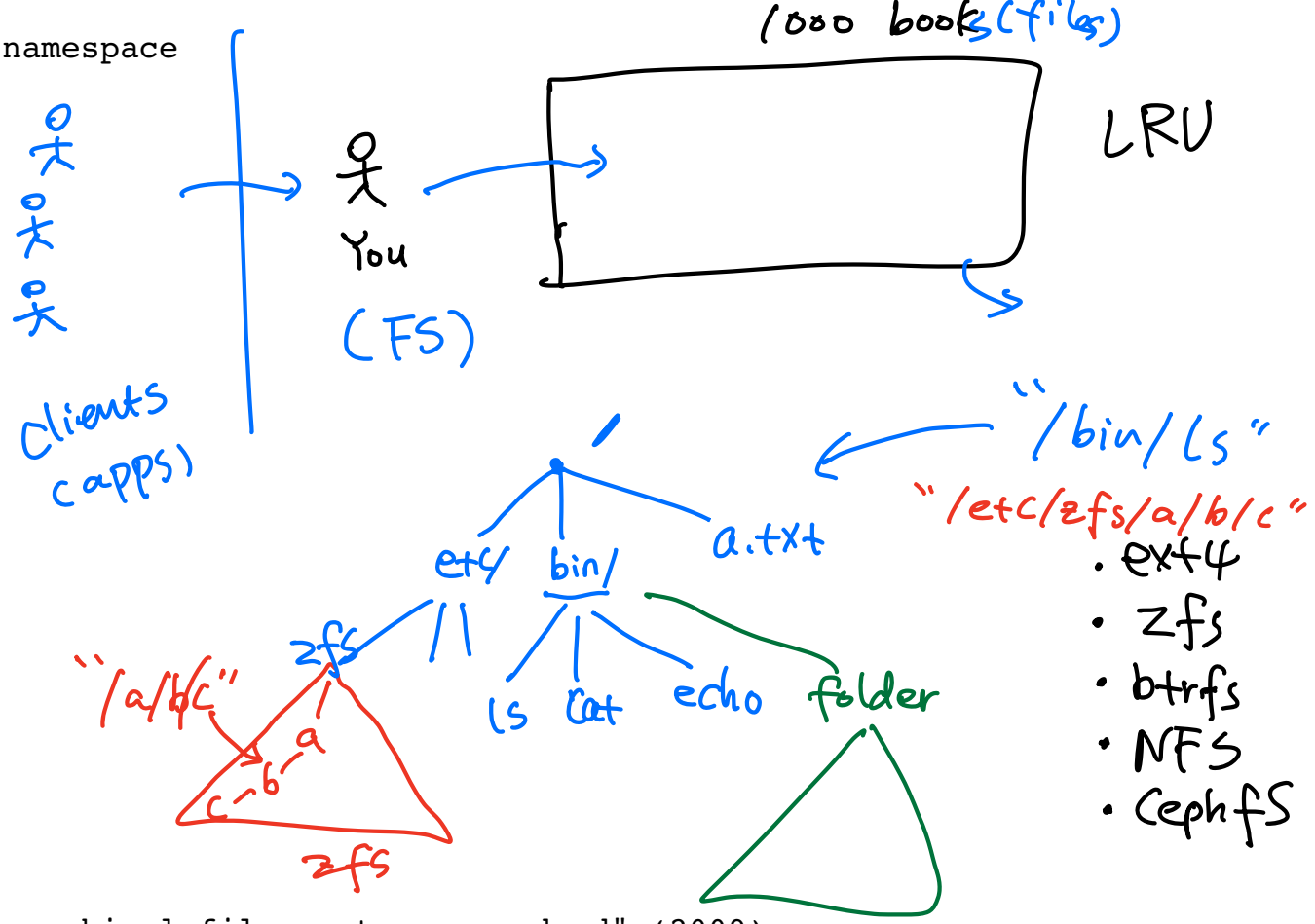
inode (unix)



Q: How does Unix fs reads/writes files?



3. fs namespace



* "Hierarchical file systems are dead" (2009)
  Margo Seltzer and Nicholas Murphy, HotOS'09

  -- hFSD argues,
     hiererachical namespace works good in the past.
     "The situation, however, has evolved"

  i) storage size grows
     -- 1992: 300 MB (HDD)
     -- 2009: 300 GB (HDD) (1000x)
     -- 2025: 36 TB (HDD) (100x)
     -- 2030(?): 1000 TB (SSD)

  ii) "..they [file sizes] have not increased by the same margin."

  iii) "Google is a verb"