



Persistent Memory

Questions you should ask

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What is persistent memory?



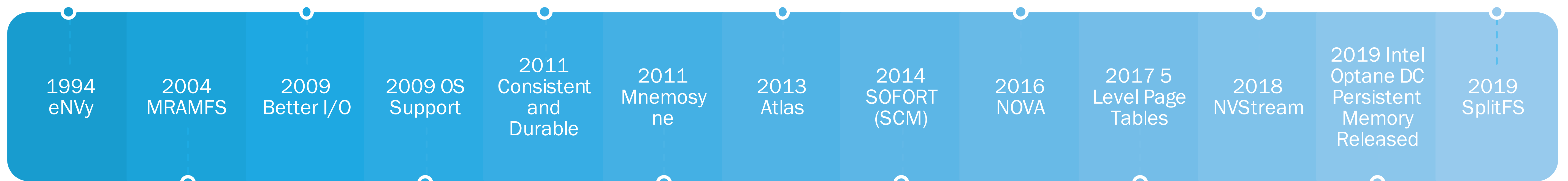
"You need to be more persistent. Now, get out of here and keep coming back until you've worn me down."

Persistent *Memory*

- Persistent
- Byte addressable
- Load/store
- Behaves like DRAM

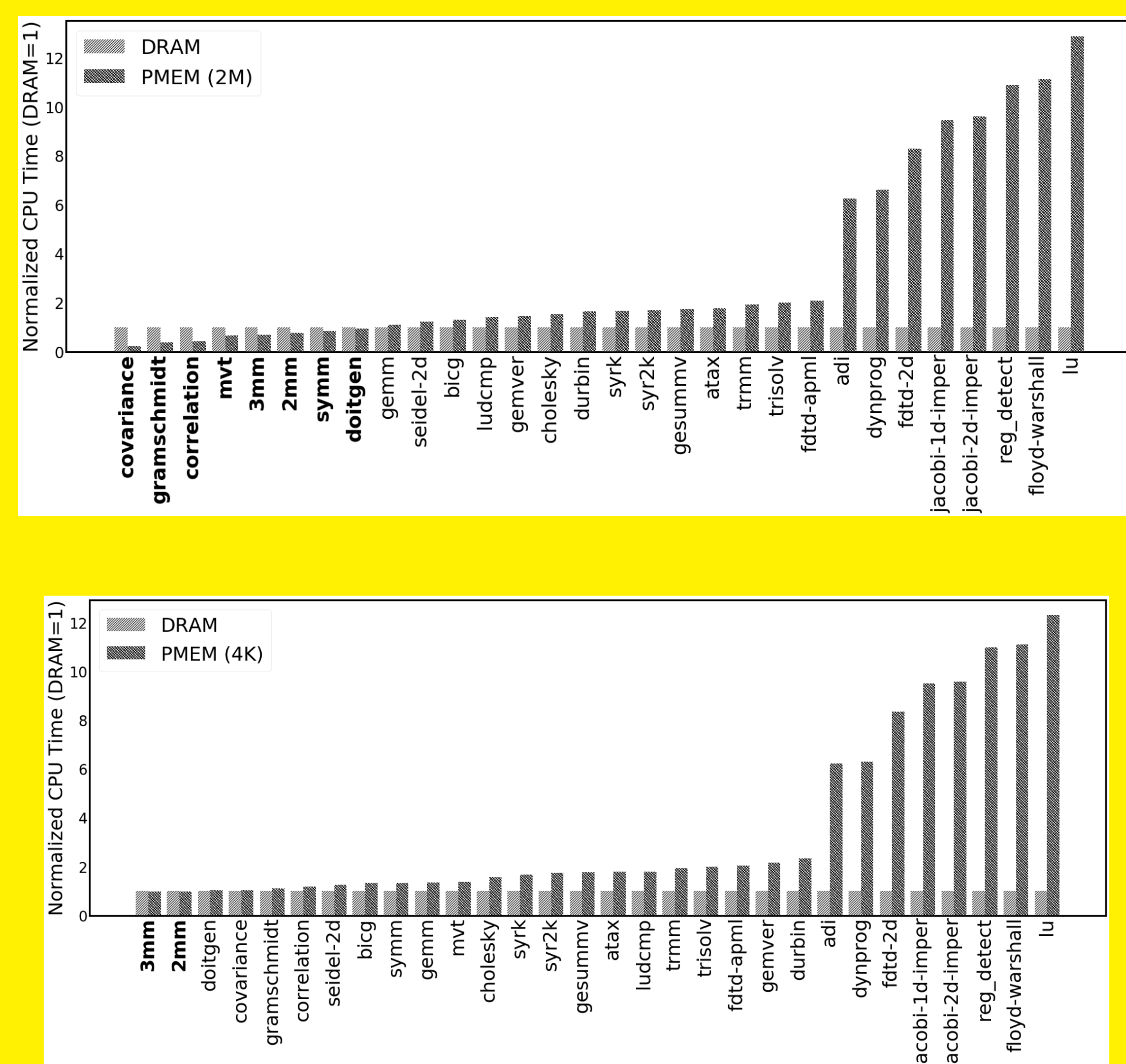


Persistent *Storage*

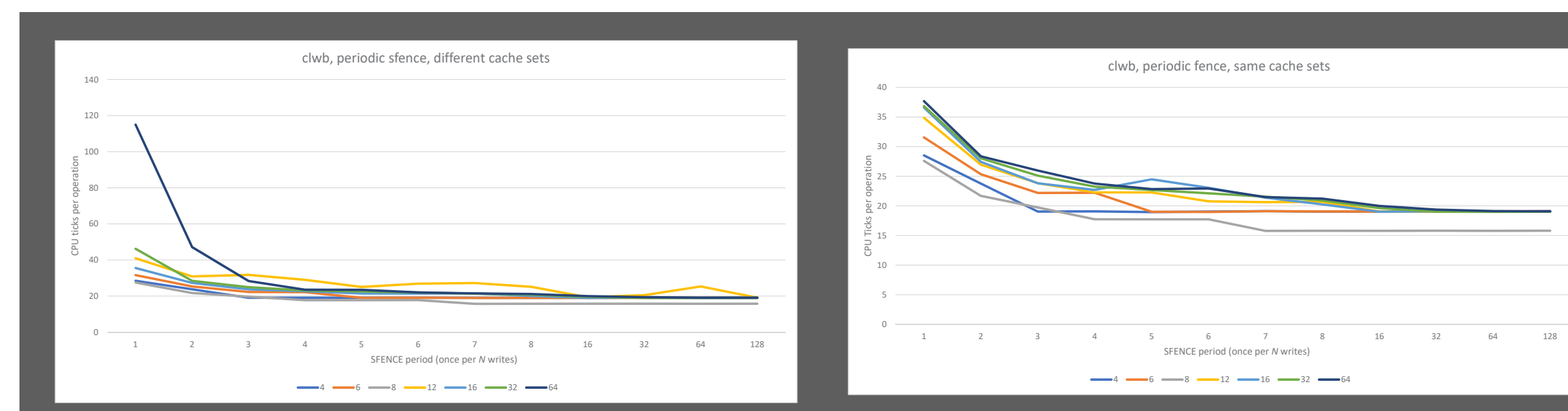
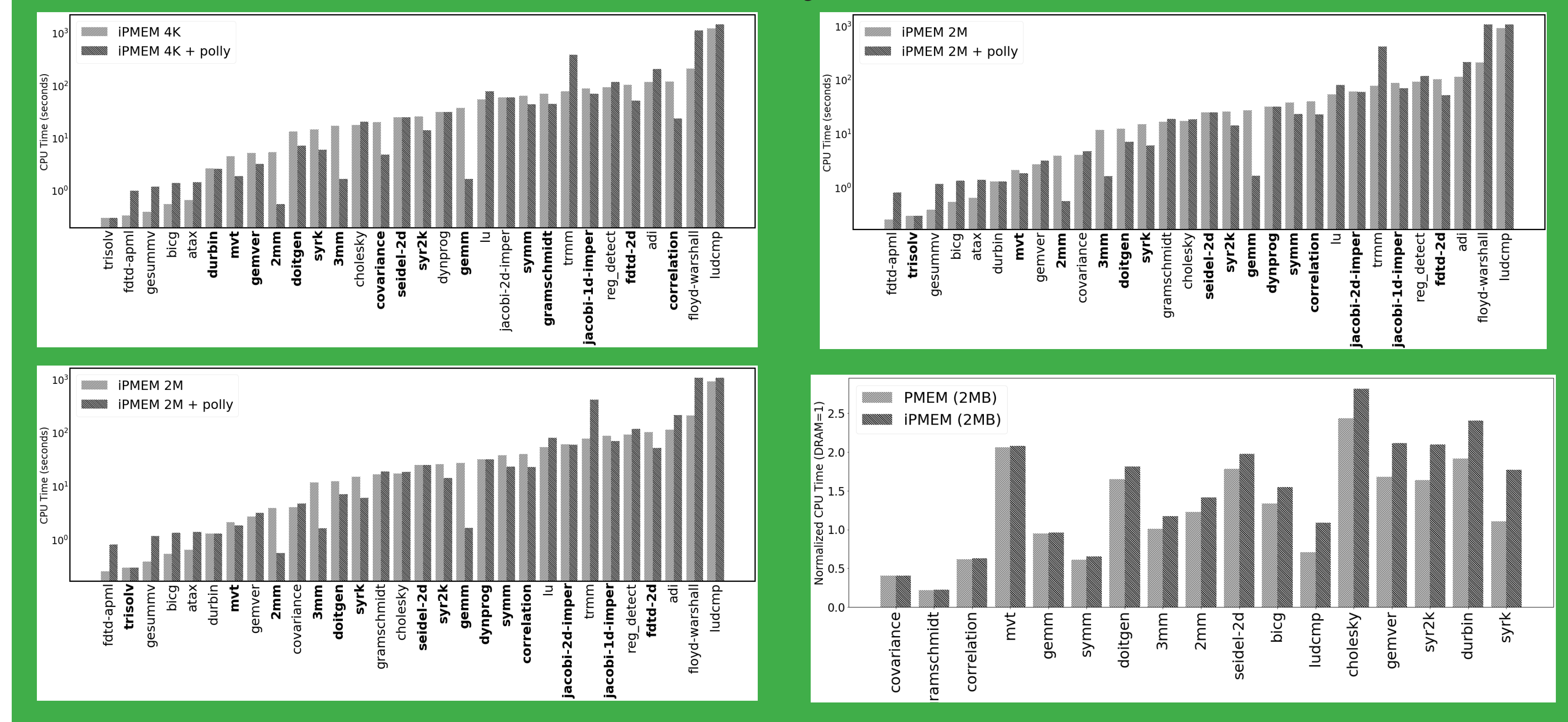


Brief History of Persistent Memory Research (1994-2020)

DRAM v PMEM Performance



Locality Matters!



Judicious flush/fence usage

Demand Paging: Not Compelling for PMEM

- PMEM Density much larger
- Time to transfer 1TB from storage: 32 seconds @ max bus speed
- Time to switch 6TB PMEM from storage: 6.4 minutes
- Conclusion: certainly not at 4KB, probably not at all.

What does a PMEM based system design look like?

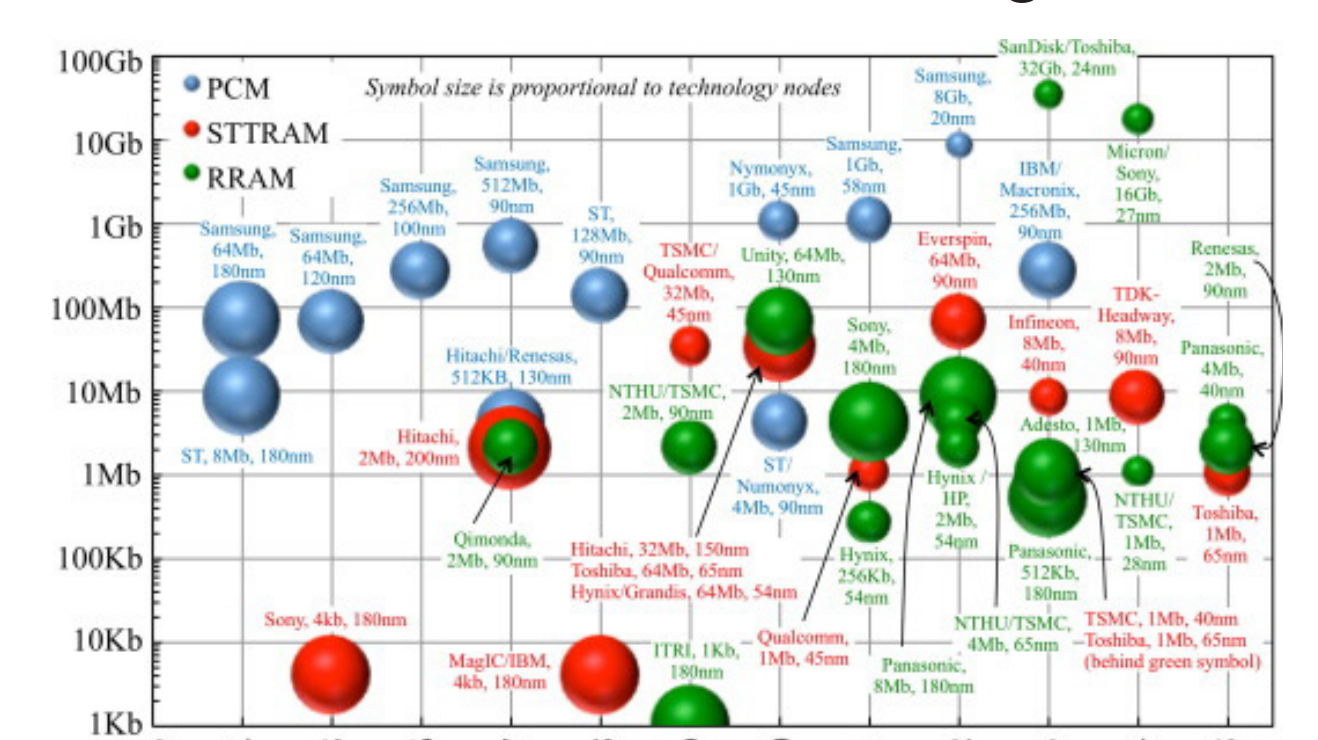
Data (Memory) Intensive

- Flat addressing/no paging
- Critical spacial locality
- CPU caches less effective

Persistence Focused

- Flat addressing (fix pointer issue)
- Efficient load/store usage
- Recovery: PMEM doesn't forget

Future PMEM Technologies



Source: A review of emerging non-volatile memory (NVM) technologies and applications (Solid State Electronics, Volume 125, November 2016)

