Short-lived data?
Safely Cut Data Protection Tax From Your SSD

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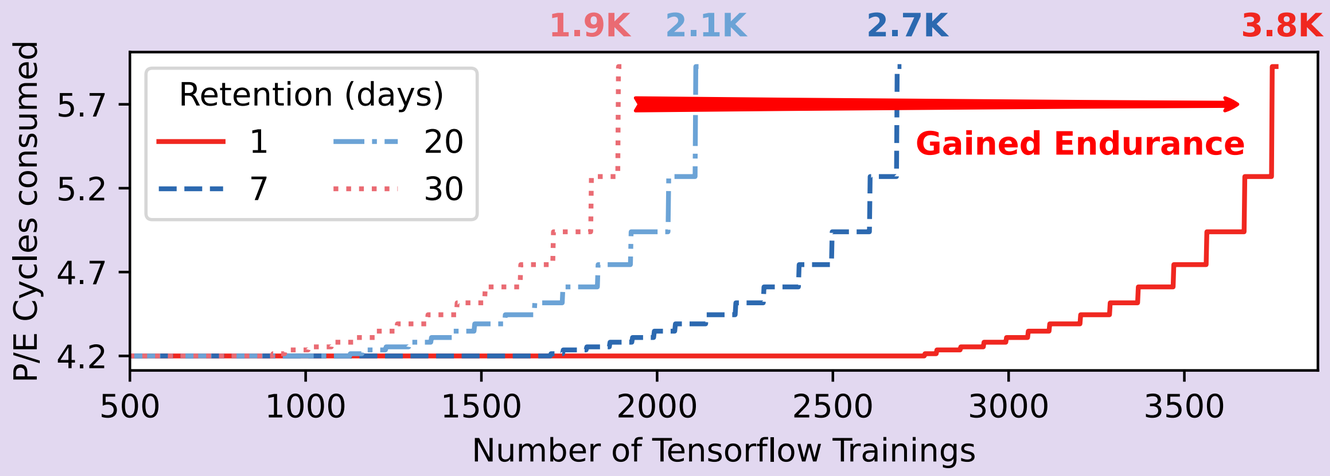
if data retain for **< 1 day**
- ✓ Use simple ECC
- ✓ Reduce storage overhead
- ✓ Expand SSD lifespan



2X more Tensorflow trainings before *wearing out your SSD*

Short-lived data are everywhere

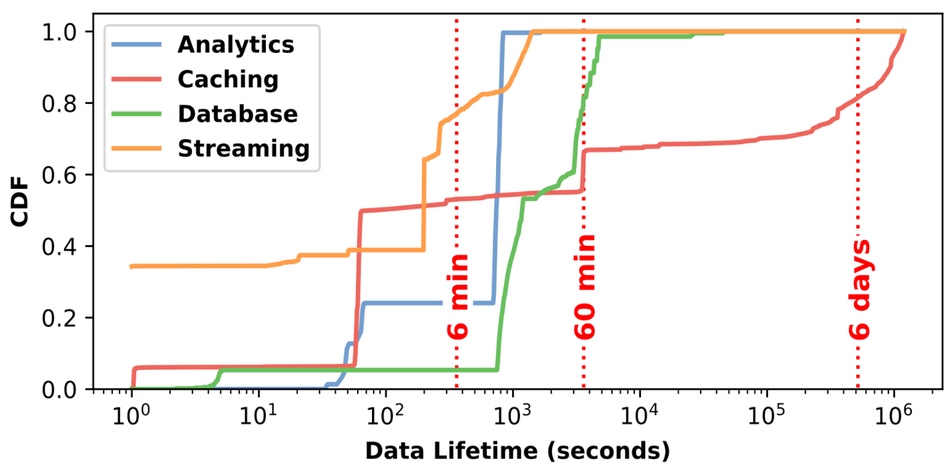
3 Months: required retention for enterprise SSDs

- Microsoft Object Cache & Video Analytics:

  > 50% expires by *6 minutes*

- PageRank (Apache Spark), Facebook Key-Value Database:

  > 80% expires by *60 minutes*

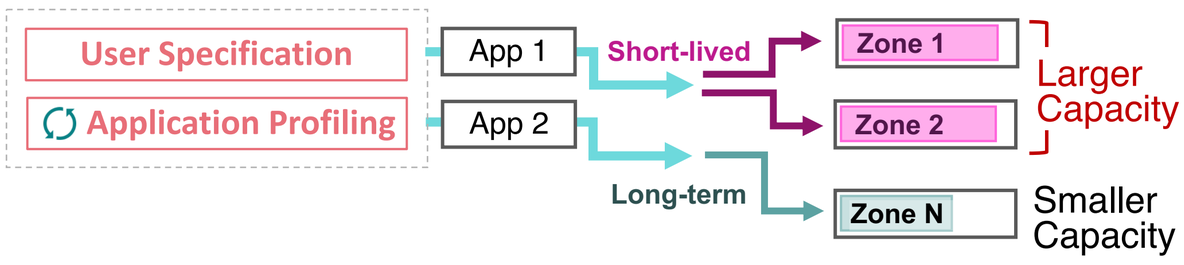


Data Lifetime Cumulative Distribution (CDF)

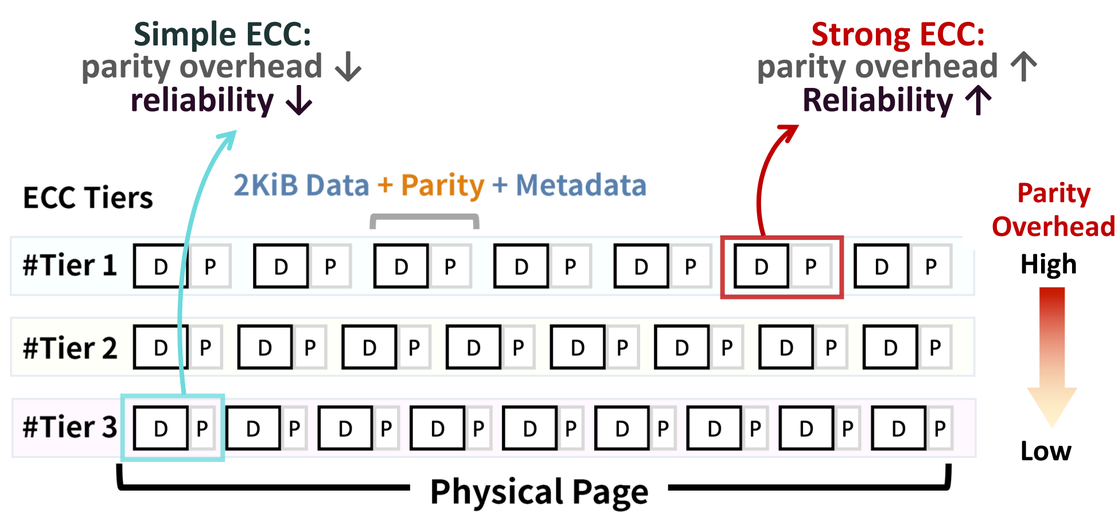
Larger capacity for short-lived data

❶ Get data lifetime
(w/ safety margin)

❸ Cut ECC overhead to store more user data



❷ Lifetime-aware Interface
(Extend NVMe Zone-Namespace)



3-tier Logical Page Layout w/ Adaptive Error Correction

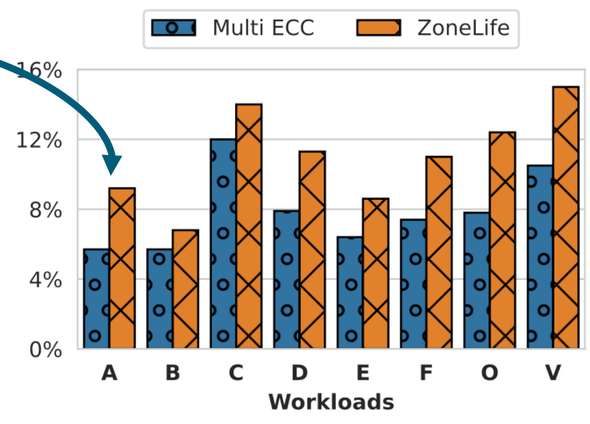
Data Safety ✓ SSD Life 70% ↑ Write Performance 15% ↑

Evaluated Benchmark
- DB & E-mail workloads on F2FS
- ZNS-based RocksDB

Comparisons
- Multi-ECC (Seagate Patent, 2016): weaker ECC in beginning of life, stronger ECC as SSD ages.
- SR-FTL (EuroSys, 2014): uses old blocks to store short-lived data.

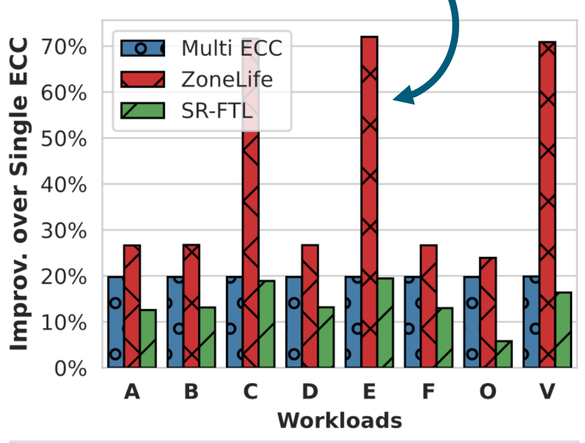
Limitations
- Inapplicable: Data lifetimes fluctuate indefinitely & short-lived data inseparable from long-lived one.

Less write overhead



Write Perf. Improvement

Lower aging rate near end of the SSD's life



Lifespan Improvement

Aged memory can be utilized

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