

1 Flash-Based SSDs

Vocabularies

1. Flash Solid-State Storage

- Is a type of non-volatile computer storage that stores and retrieves digital information using only electronic circuits, without any involvement of moving mechanical parts

2. NAND-Based Flash

- Is an electronic non-volatile computer memory storage medium using NAND-gate that can be electrically erased and reprogrammed.

3. Flash Page

- Is the smallest unit that can be programmed into flash

4. Flash Block

- Is a group of pages and the smallest unit that can be erased.

Physical Block Addresses											
Block 0						Block 1					
Page n	Page 1	Page 0	Page n	Page 1	Page 0	Page n	Page 1	Page 0	Page n	Page 1	Page 0
Sector 0	Sector 1	Sector n	Sector 0	Sector 1	Sector n	Sector 0	Sector 1	Sector n	Sector 0	Sector 1	Sector n



5. Wear Out

- Is similar to going past **expiration date**
- Means it has exceeded their endurance rating

6. **Single-Level Cell**

- Is a type of cell in solid-state storage that stores one bit of data per transistor (0 or 1)

7. **Multi-Level Cell**

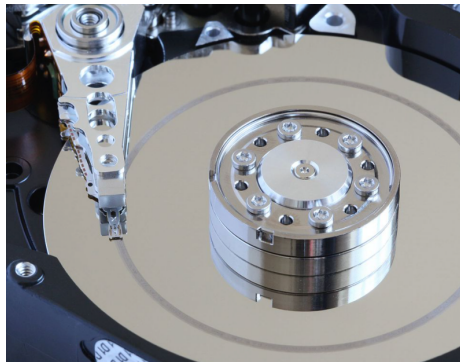
- Is a type of cell in solid-state storage that stores two bits of data (i.e 00, 01, 10, 11) per cell using two different levels of charge

8. **Triple-Level Cell**

- Is a type of cell in solid-state storage that stores three bits of data per cell (i.e 000, 001, 010, 011, 100, 101, 110, 111)

9. **Head Crash**

- Is a condition where the drive head makes contact with the recording surface

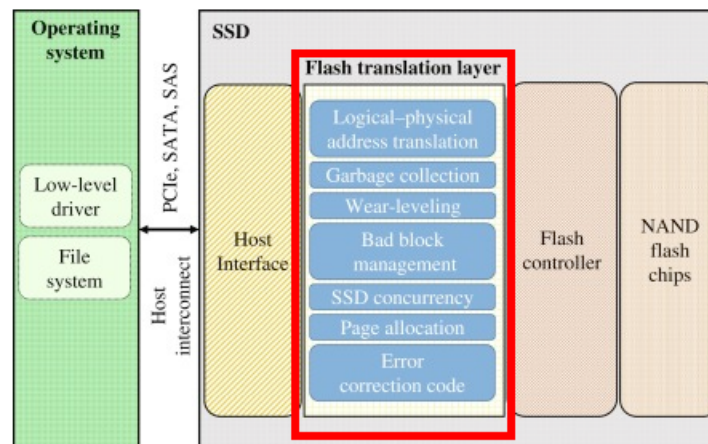


10. **Disturbance**

- Is also known as **read disturbs**
- Is a condition where accessing a bit in a page causes some bits to get flipped in neighboring pages

11. **Flash Transition Layer**

- Is an intermediate system made up software and hardware that manages SSD operations



12. Wear Leveling

- Is a technique for prolonging the service life of some kinds of erasable computer storage media, such as flash memory, which is used in solid-state drives (SSDs)

13. Direct Mapped

- Is a simplest organization of an **Flash Transition Layer** that maps read of logical page N directly to read of physical page N .

14. Logging

- Is a concept in **log-structured file system** that buffer all writes (data + metadata) using an in-memory segment; once the segment is full, write the segment to a log

15. Logical Block Address

16. Program Disturbance

17. In-Memory Mapping Table

18. Garbage

19. Garbage Collection (GC)

20. Dead Blocks

21. Cache Flush

22. Trim

- 23. Overprovision
- 24. Background
- 25. Page-Level FTL
- 26. Hybrid Mapping
- 27. Log Blocks
- 28. Switch Merge
- 29. Partial Merge
- 30. Full Merge

1.1 Storing a Single Bit

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1.2 From Bits to Banks / Planes

1.3 Basic Flash Operations

1.4 From Raw Flash to Flash-Based SSDs

1.5 FTL Organization: A Bad Approach

1.6 A Log Structured FTL

1.7 Garbage Collection

1.8 Mapping Table Size

1.9 Hybrid Mapping

1.10 Wear Leveling

1.11 SSD Performance And Cost