

# 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**

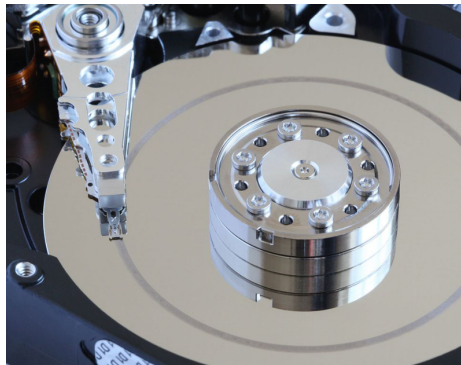
- Is a type of cell in solid-state storage that stores two bits of data (i.e 00, 01, 10, 11) per cell using two different levels of charge

#### 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**

#### 12. **Wear Leveling**

#### 13. **Direct Mapped**

#### 14. **Logging**

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