

# 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.

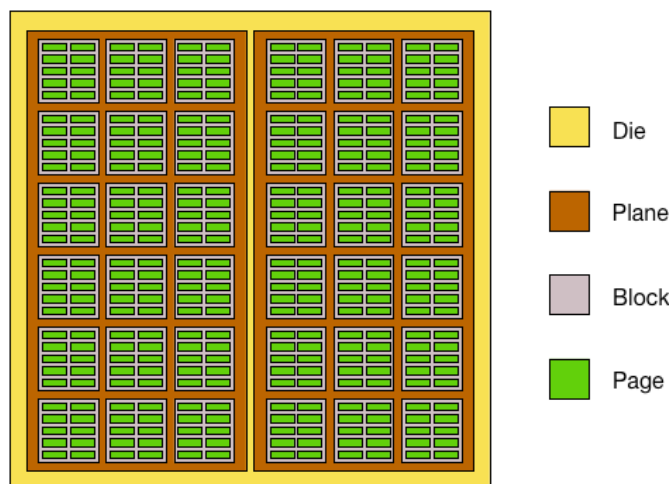
### 3. Flash Page

- 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**

#### 10. **Disturbance**

#### 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**

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|--------------------|
| 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