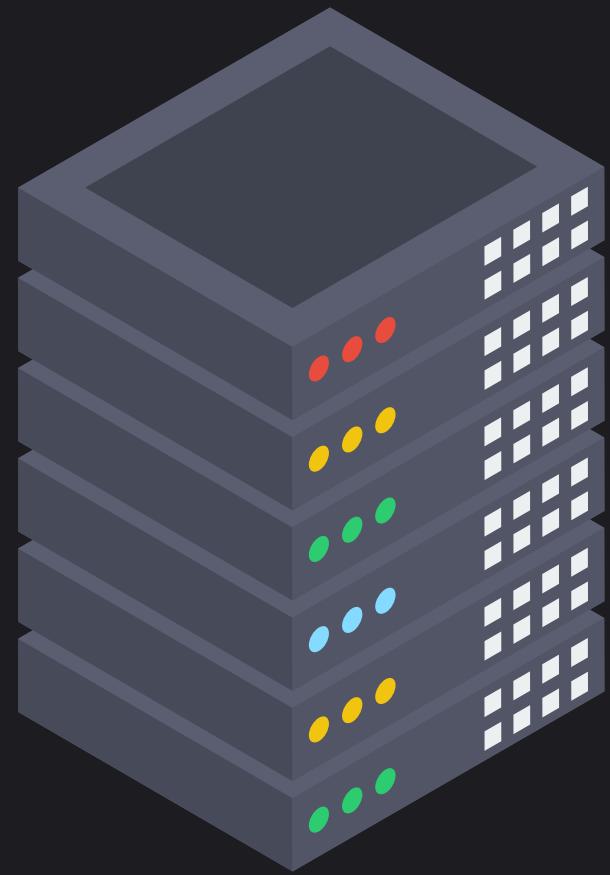


# Computer Architecture



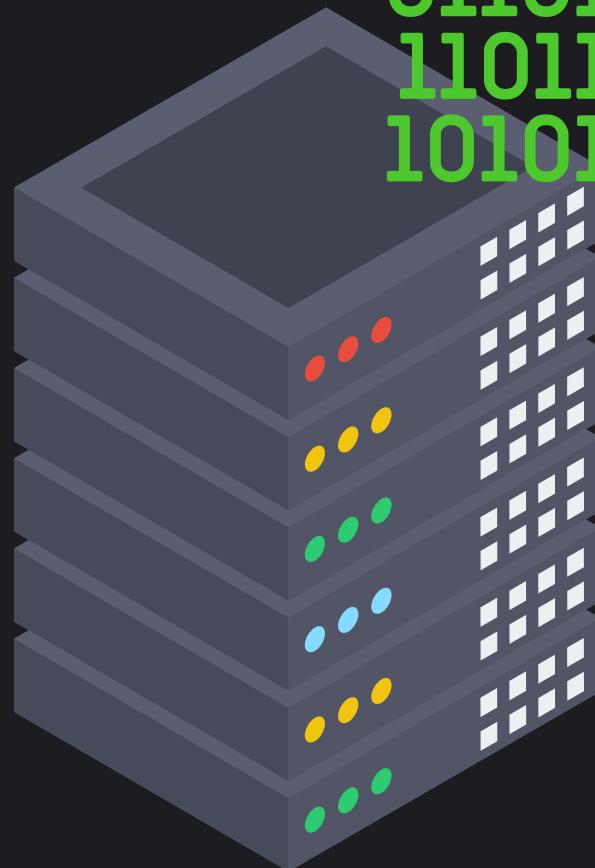


```
101001100010111  
000111010111001  
011010101001010  
110110110101010  
101010101001010
```



```
101001100010111  
000111010111001  
011010101001010  
110110110101010  
101010101001010
```

← → bit - 0 or 1



101001100010111  
000111010111001  
011010101001010  
110110110101010  
101010101001010



**bit - 0 or 1**  
**byte - 8 bits (A, 1)**



101001100010111  
000111010111001  
011010101001010  
110110110101010  
101010101001010



**bit - 0 or 1**  
**byte - 8 bits (A, 1)**

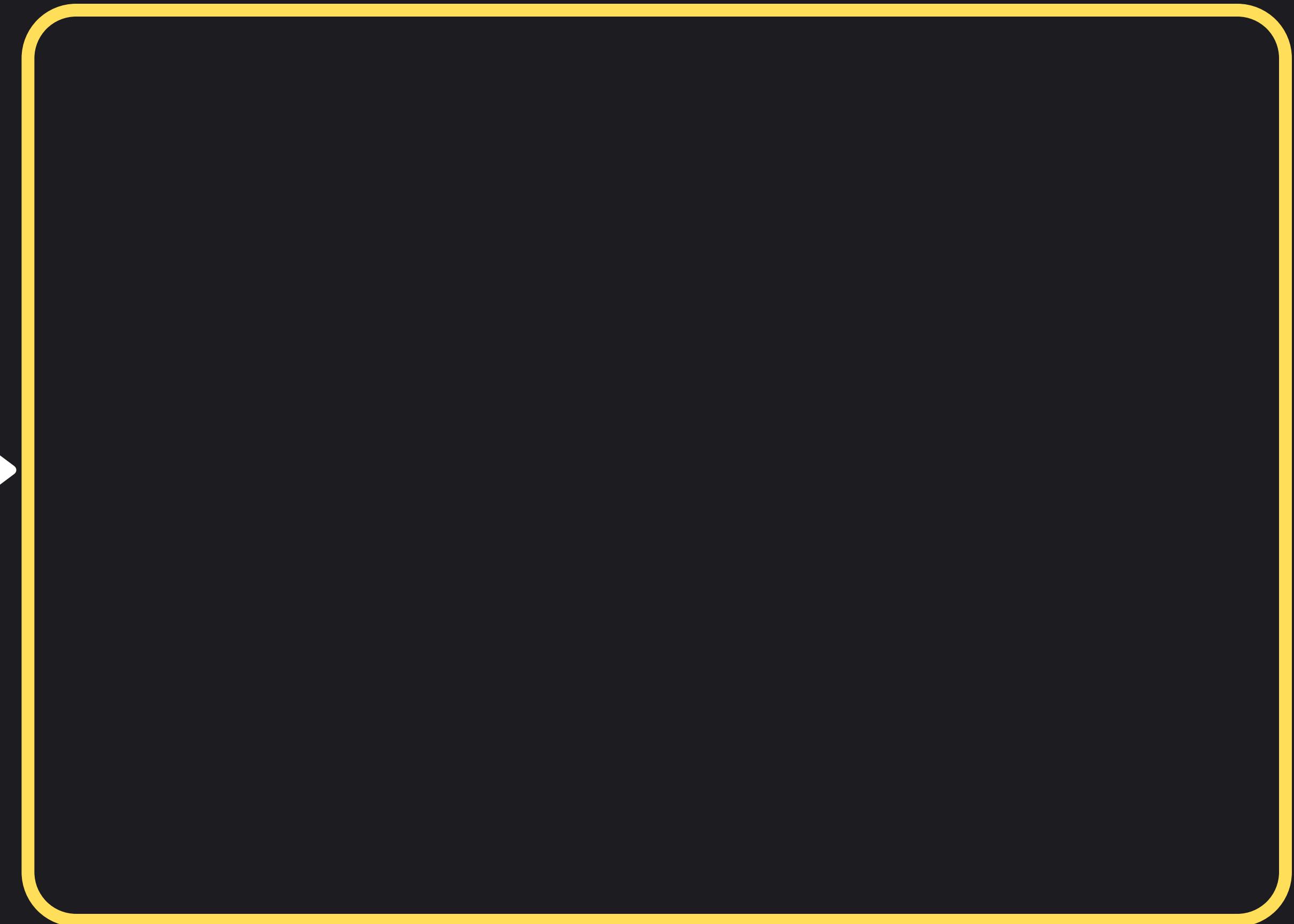
**KB - 1024 bytes**

**MB - 1024 KBs**

**GB - 1024 MBs**

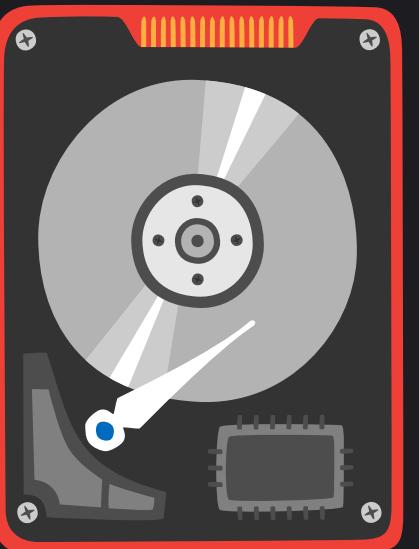
**TB - 1024 GBs**

# Disk Storage



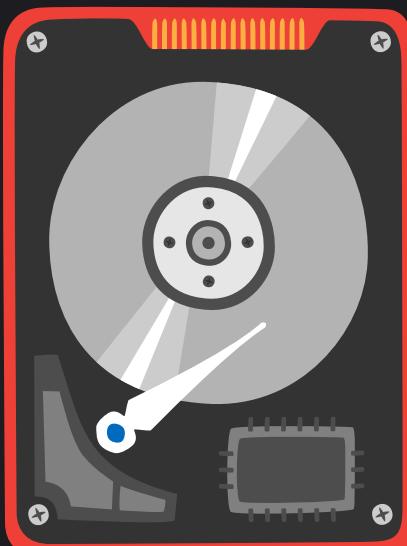


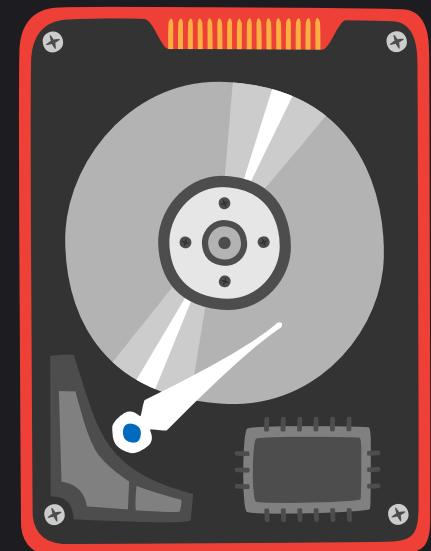
Disk Storage



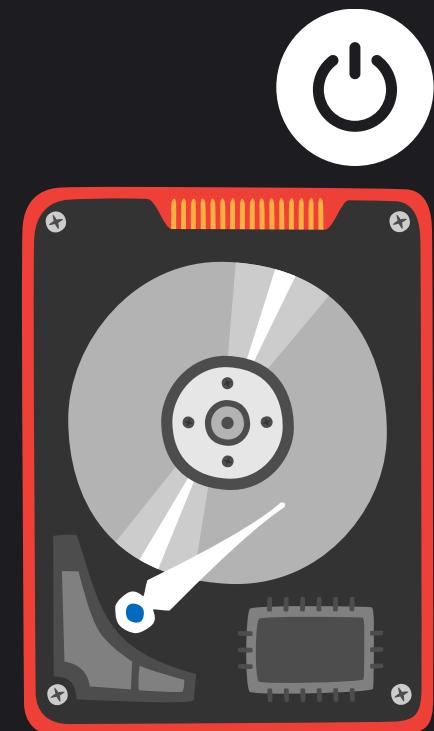
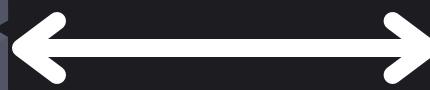
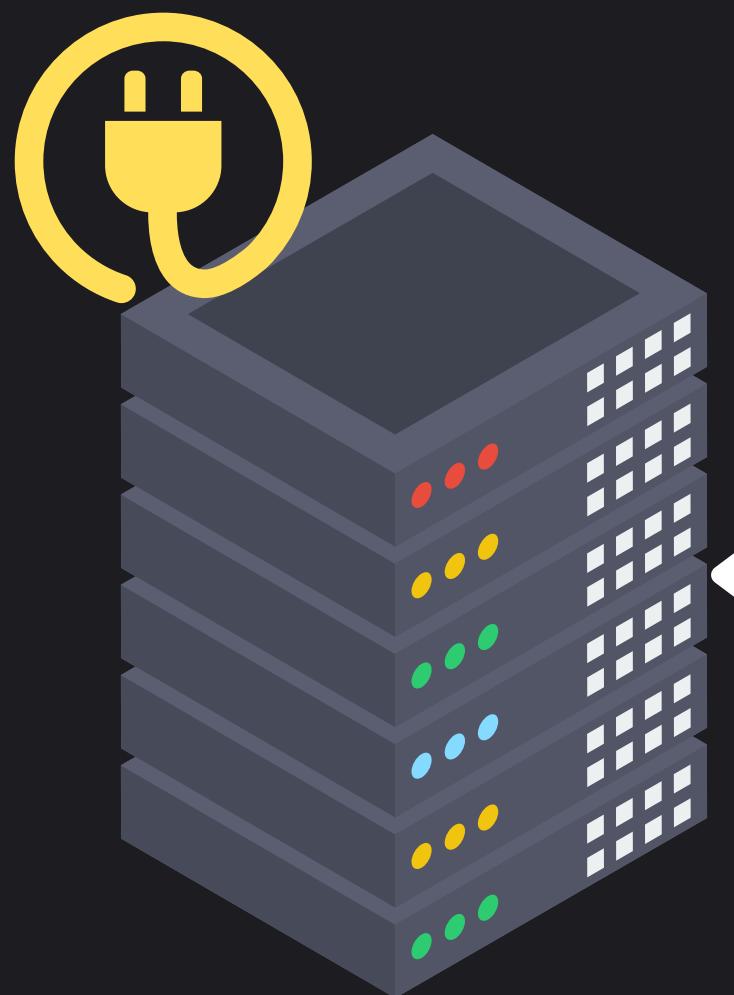


HDD | SSD

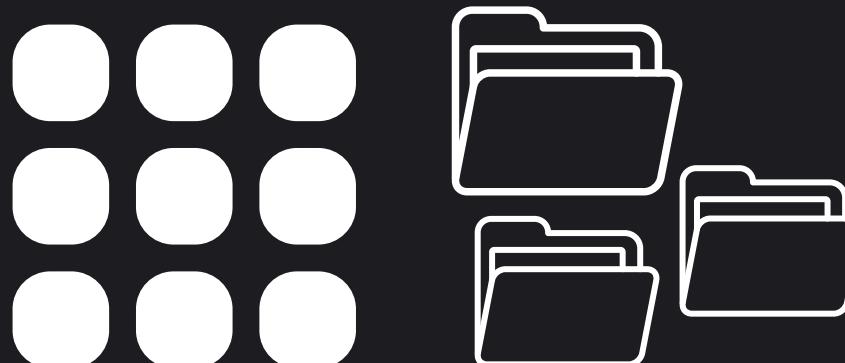
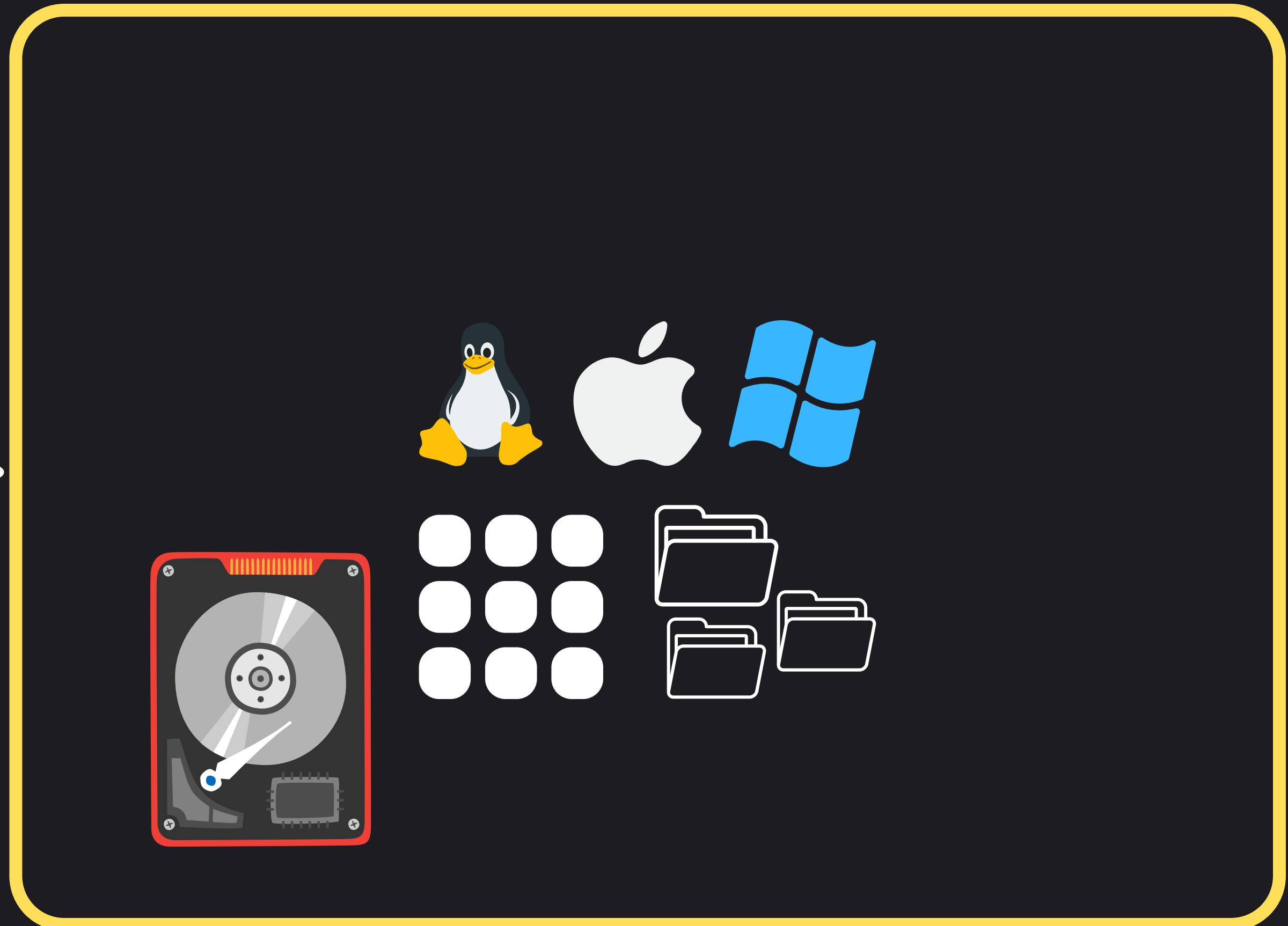
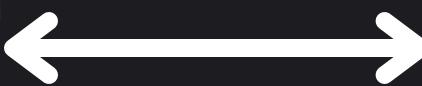


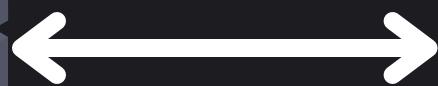


**Non-volatile**

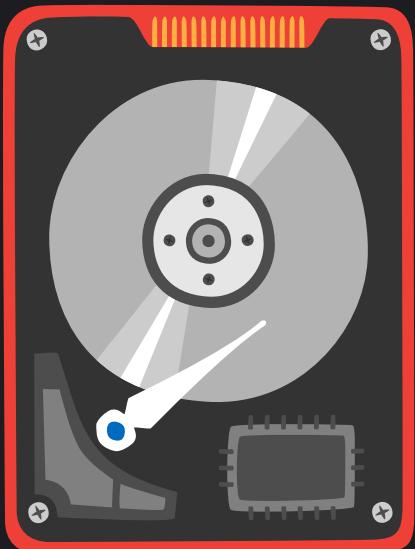


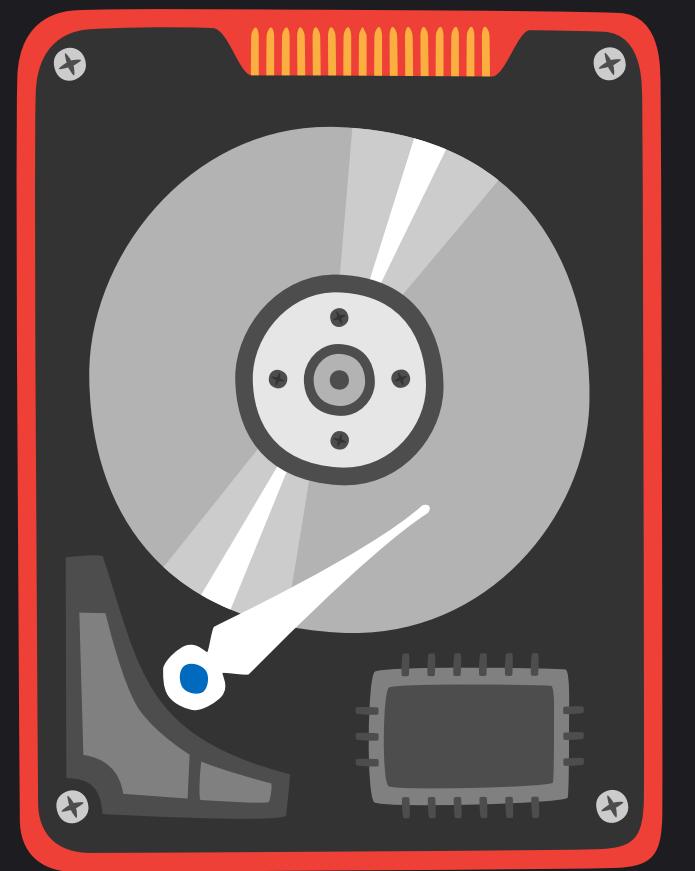
**Non-volatile**

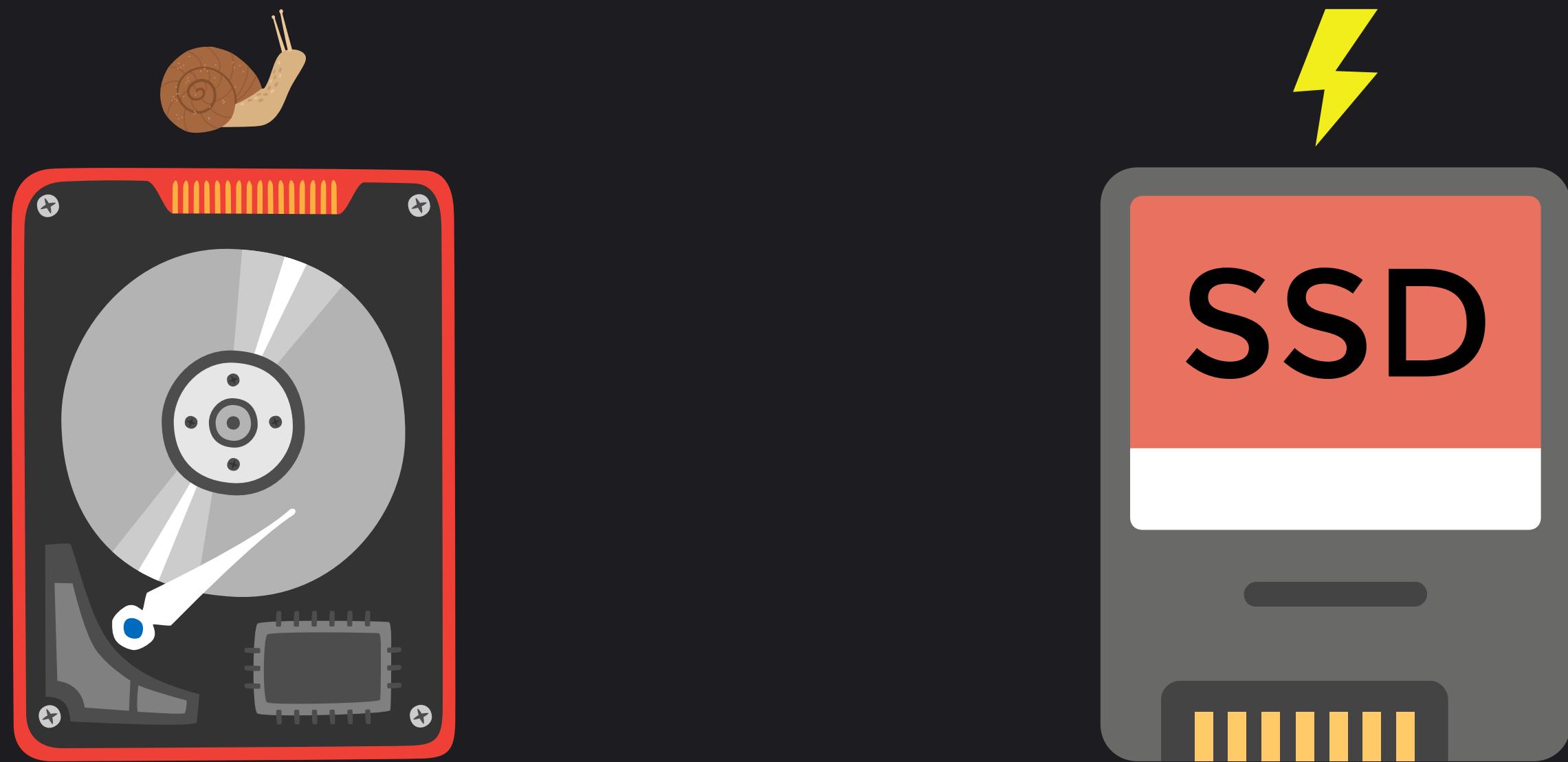




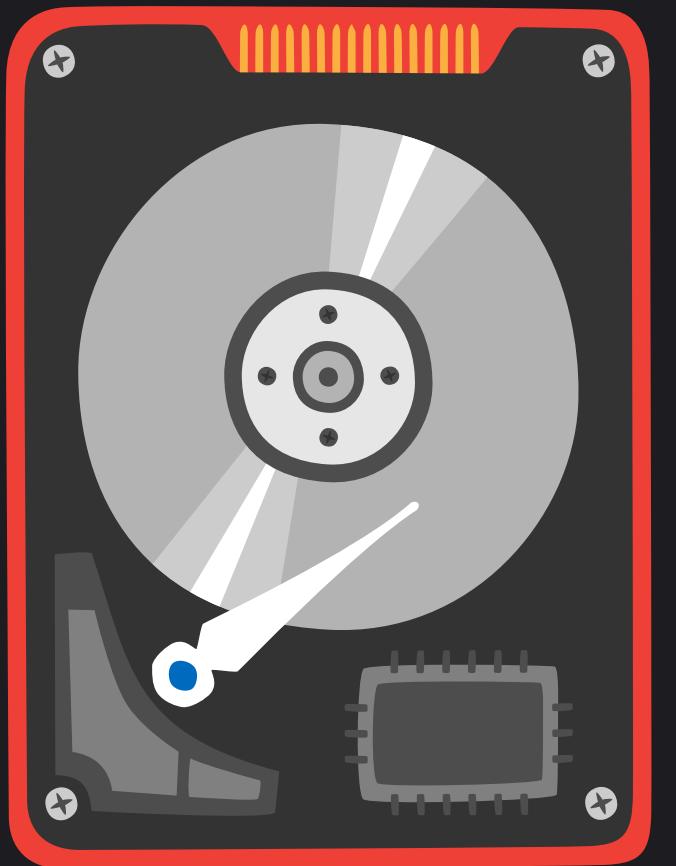
**256 GB, 512 GB, 1 TB, 2 TB**







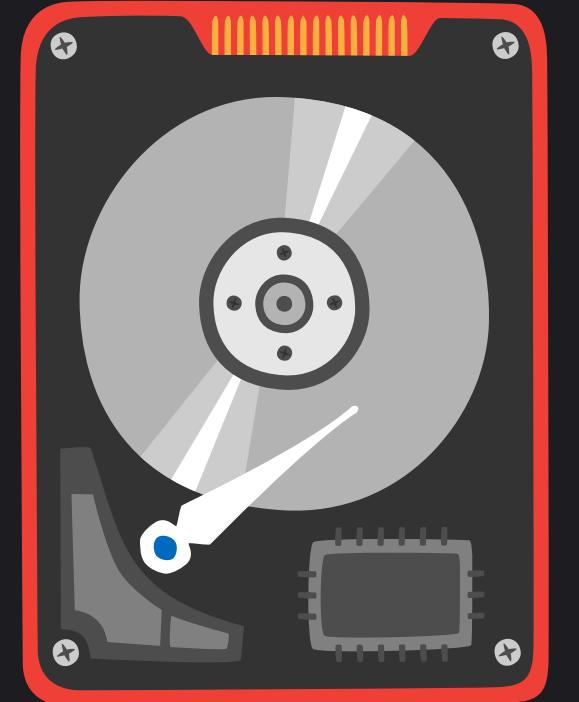
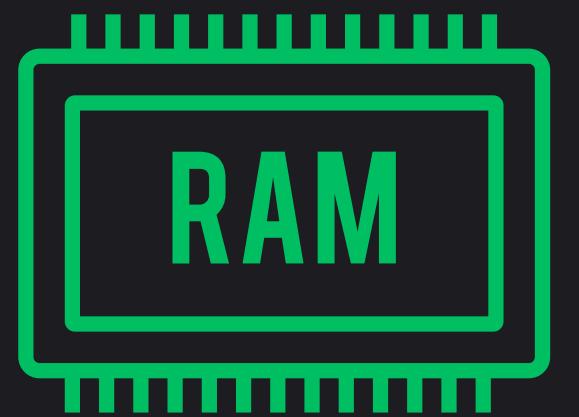
**80 MB/s to 160 MB/s**

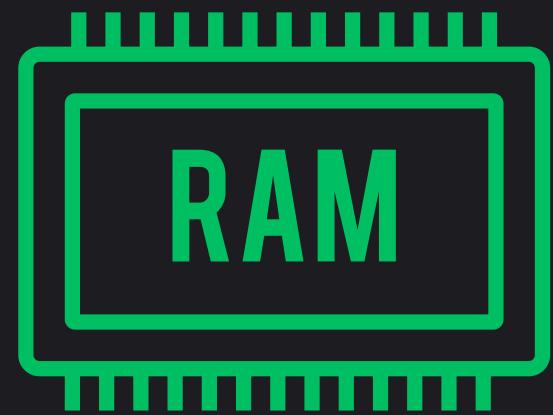


**500 MB/s to 3,500 MB/s**

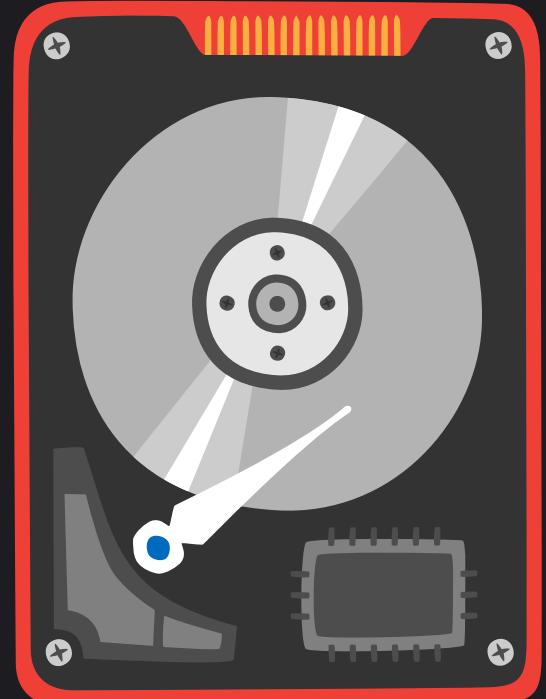


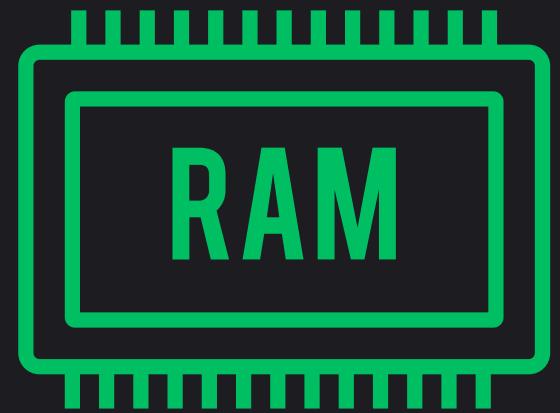
# RAM



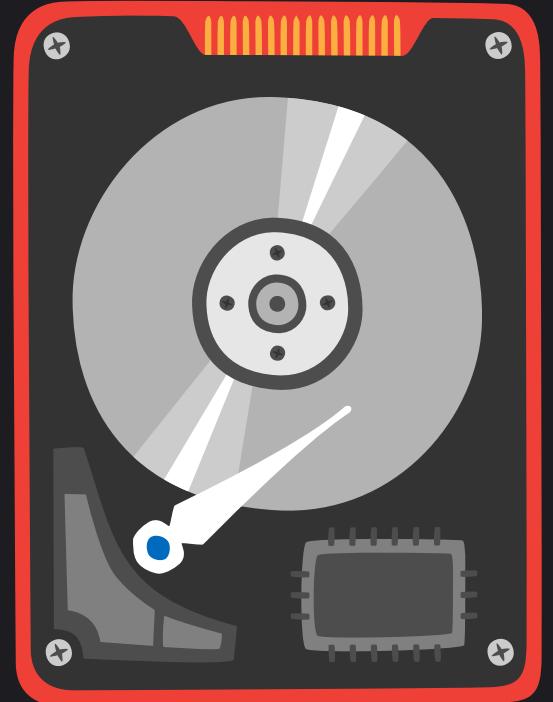


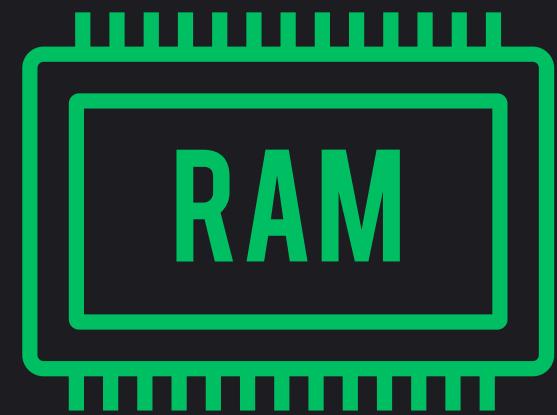
**data structures, variables,  
and application data**



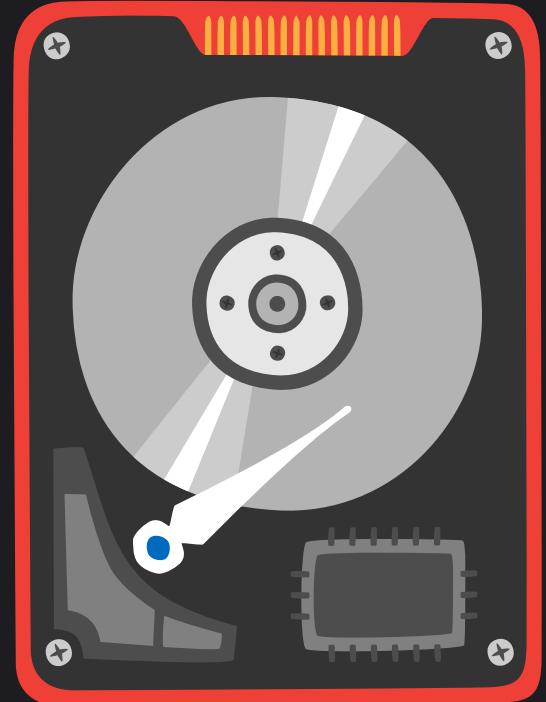


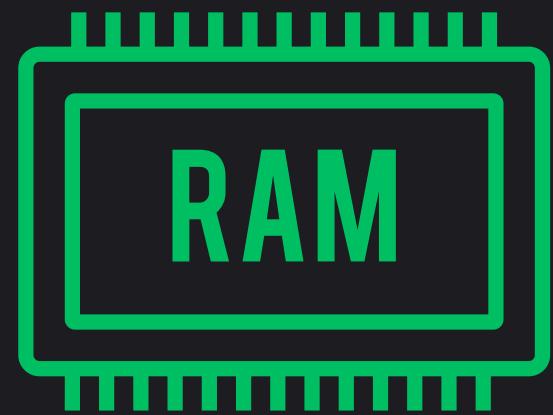
DDR4 | LPDDR5



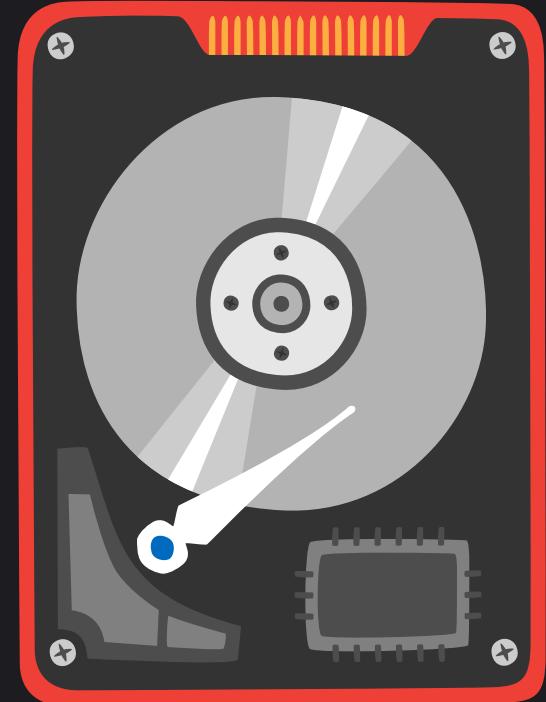


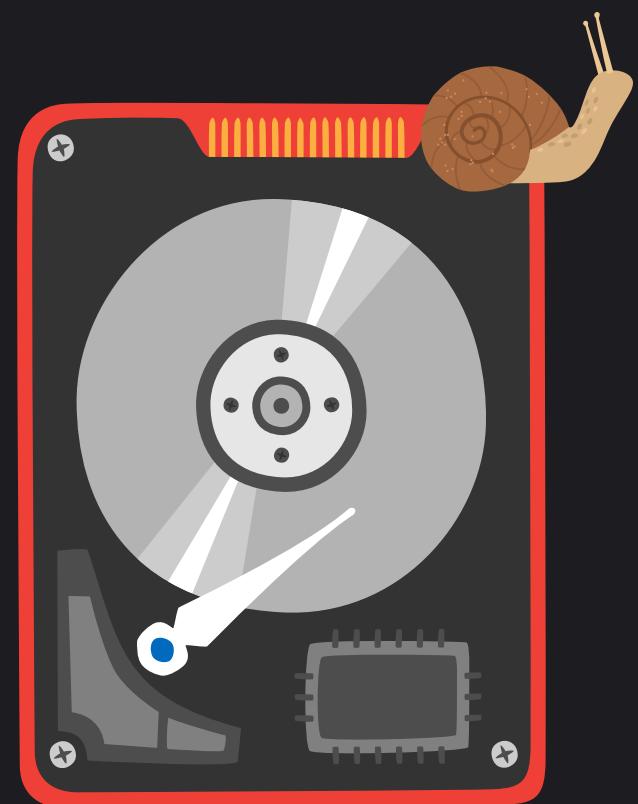
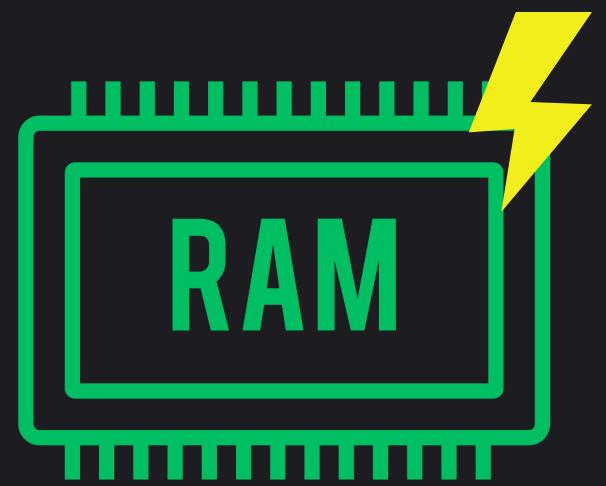
volatile memory

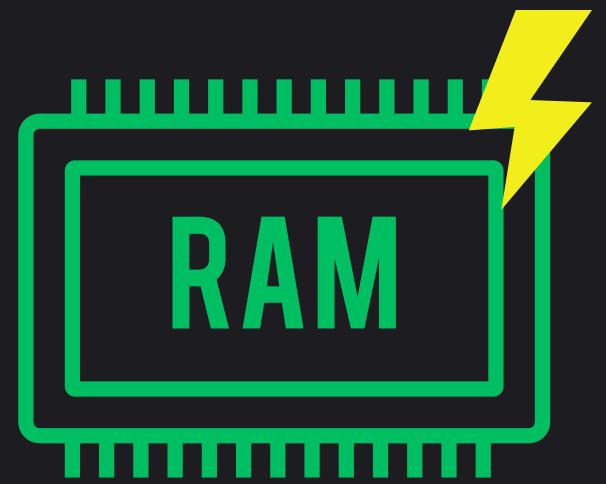




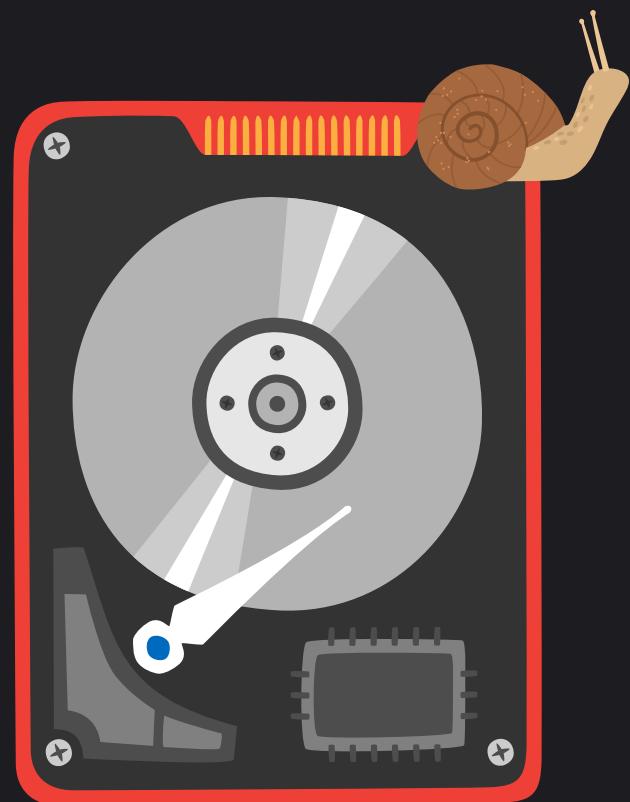
4 GB, 8 GB, 16 GB -> 32 GB, 64 GB



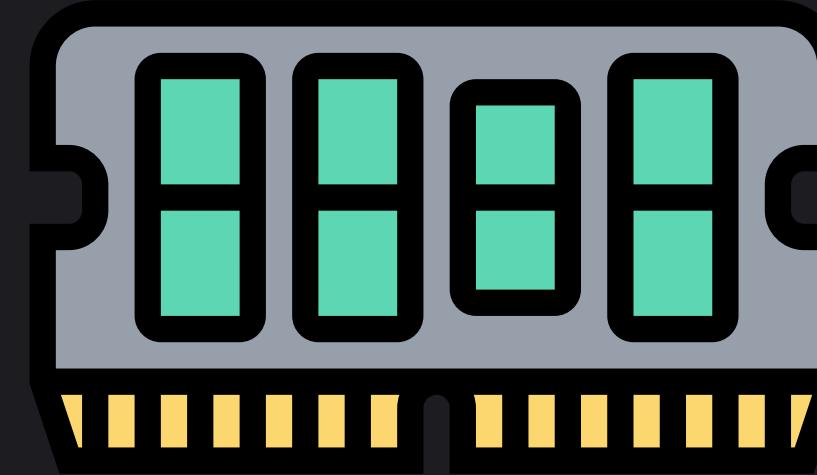
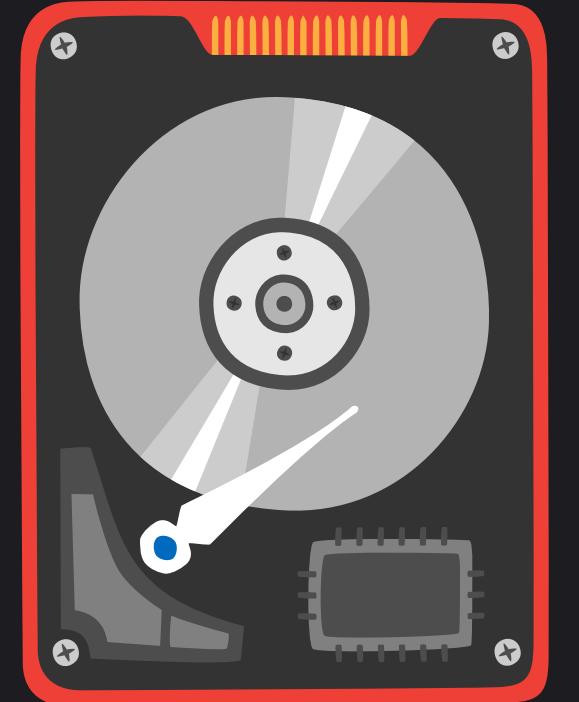
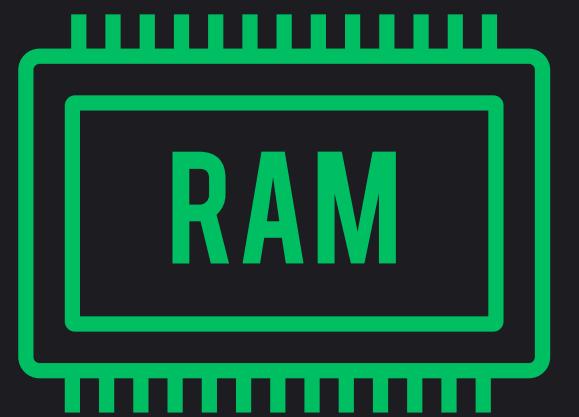


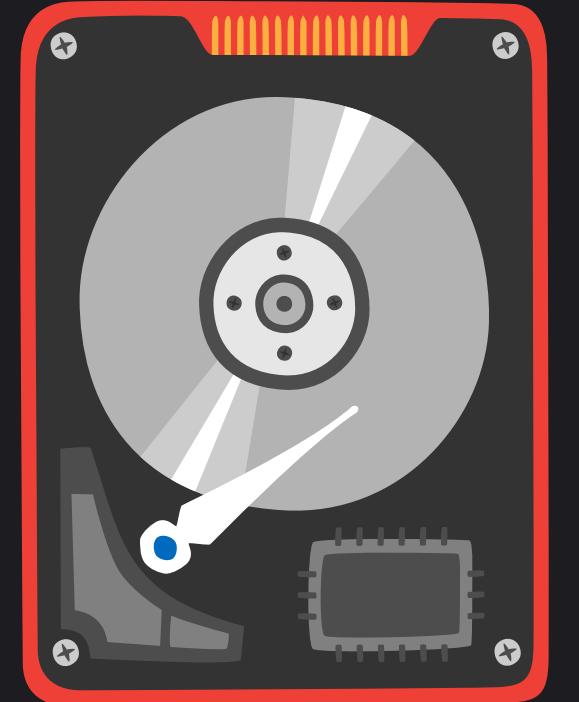
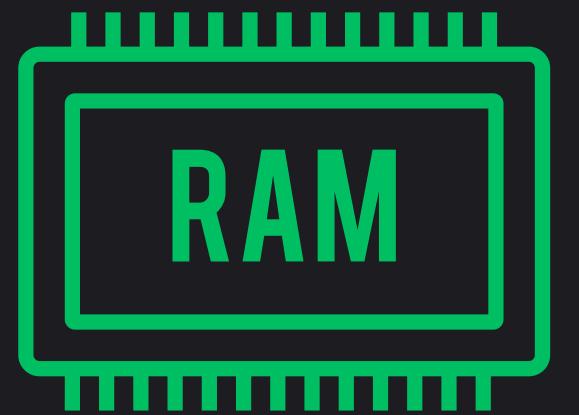


>5,000 MB/s

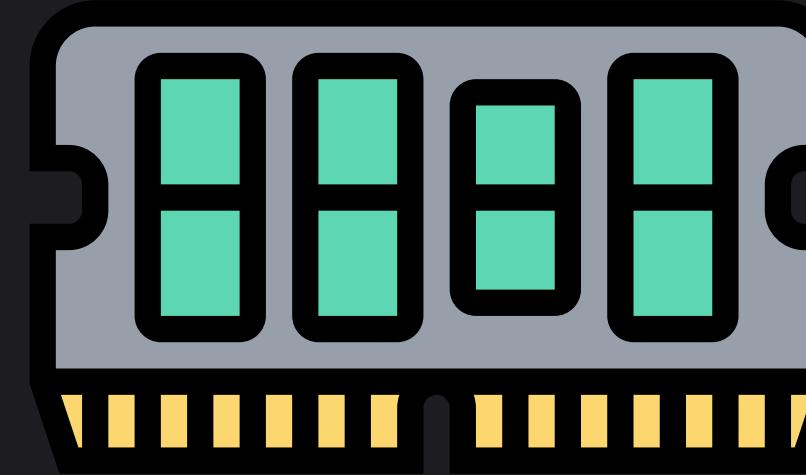


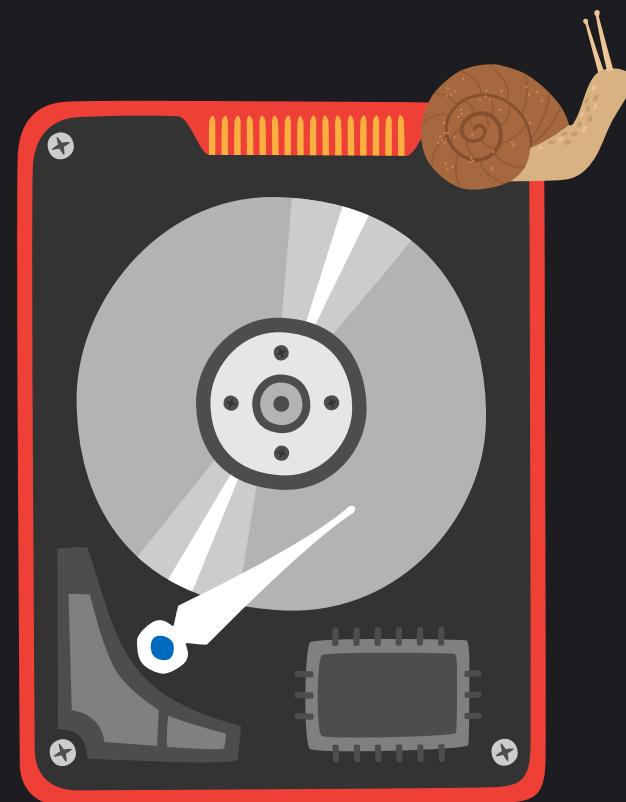
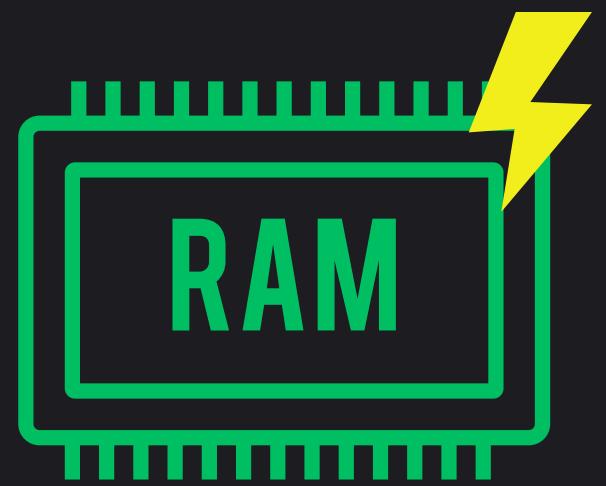
# Cache



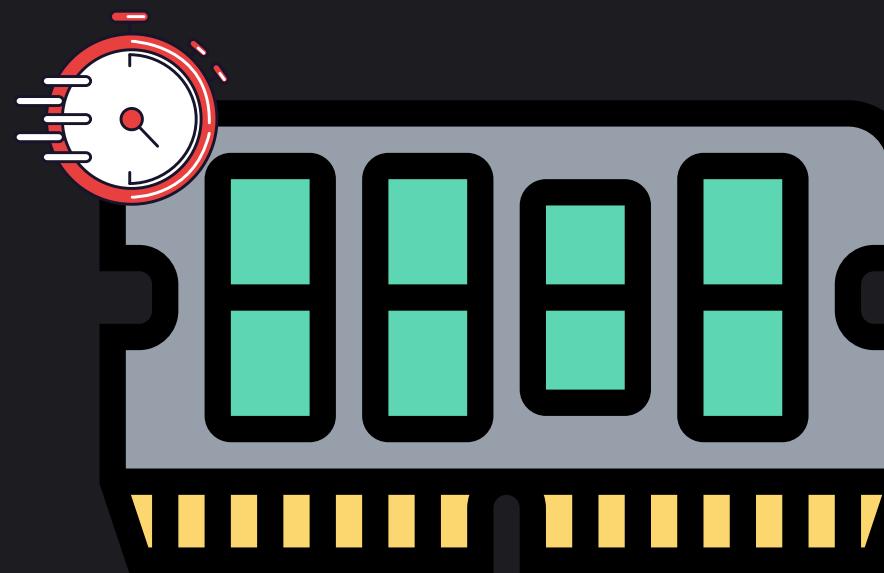


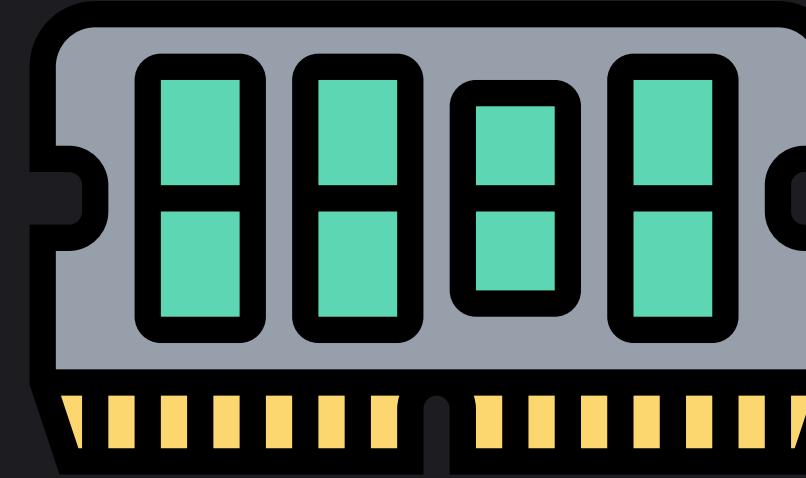
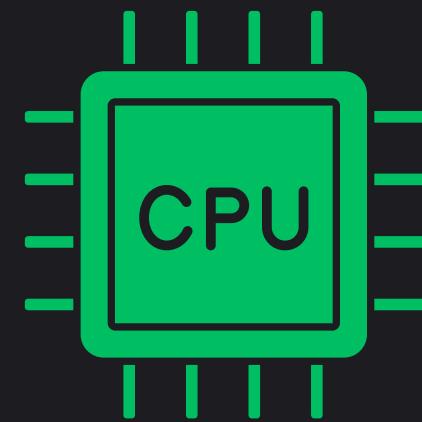
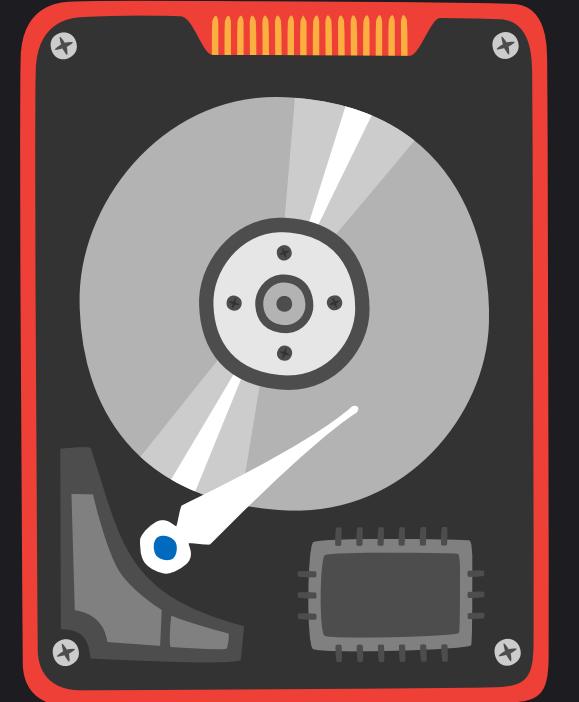
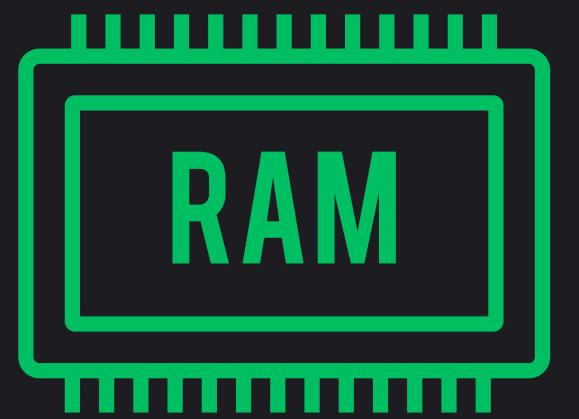
MBs

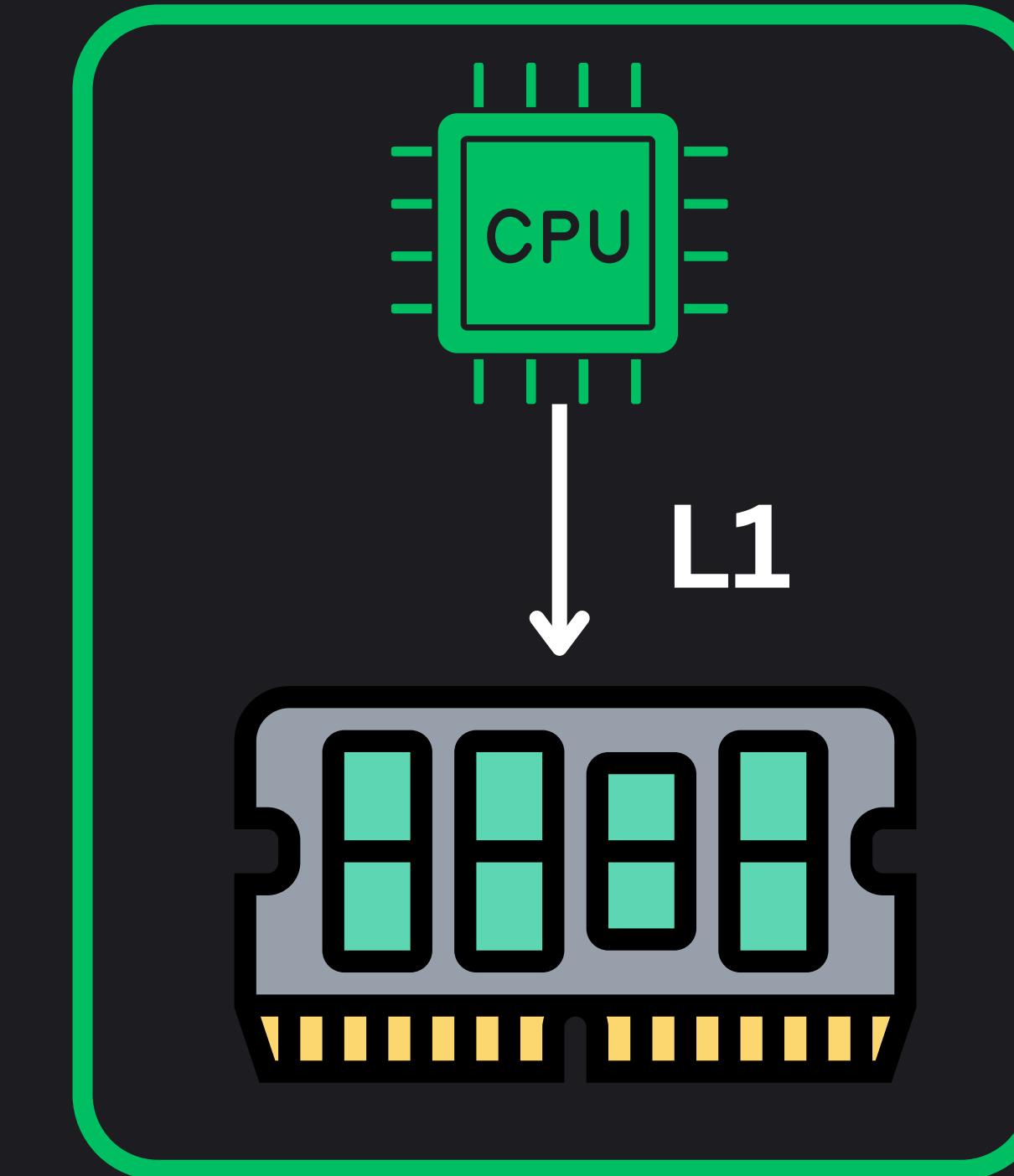
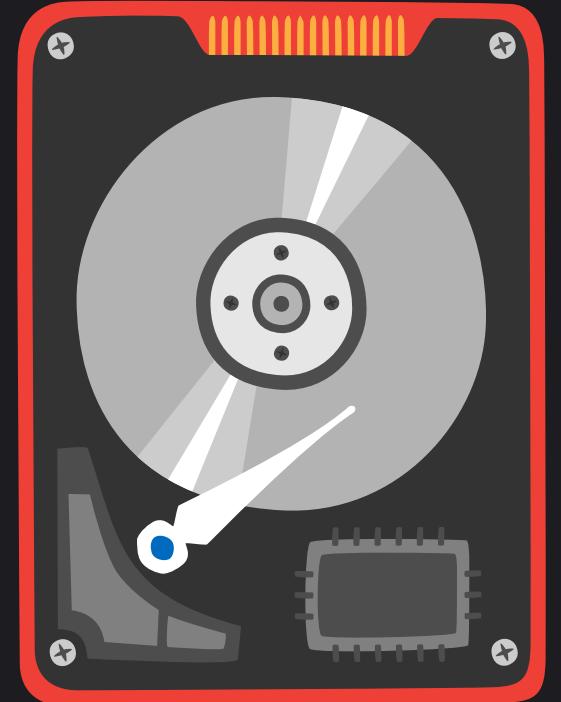
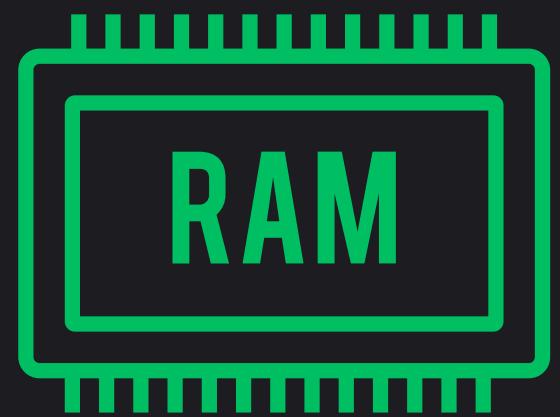


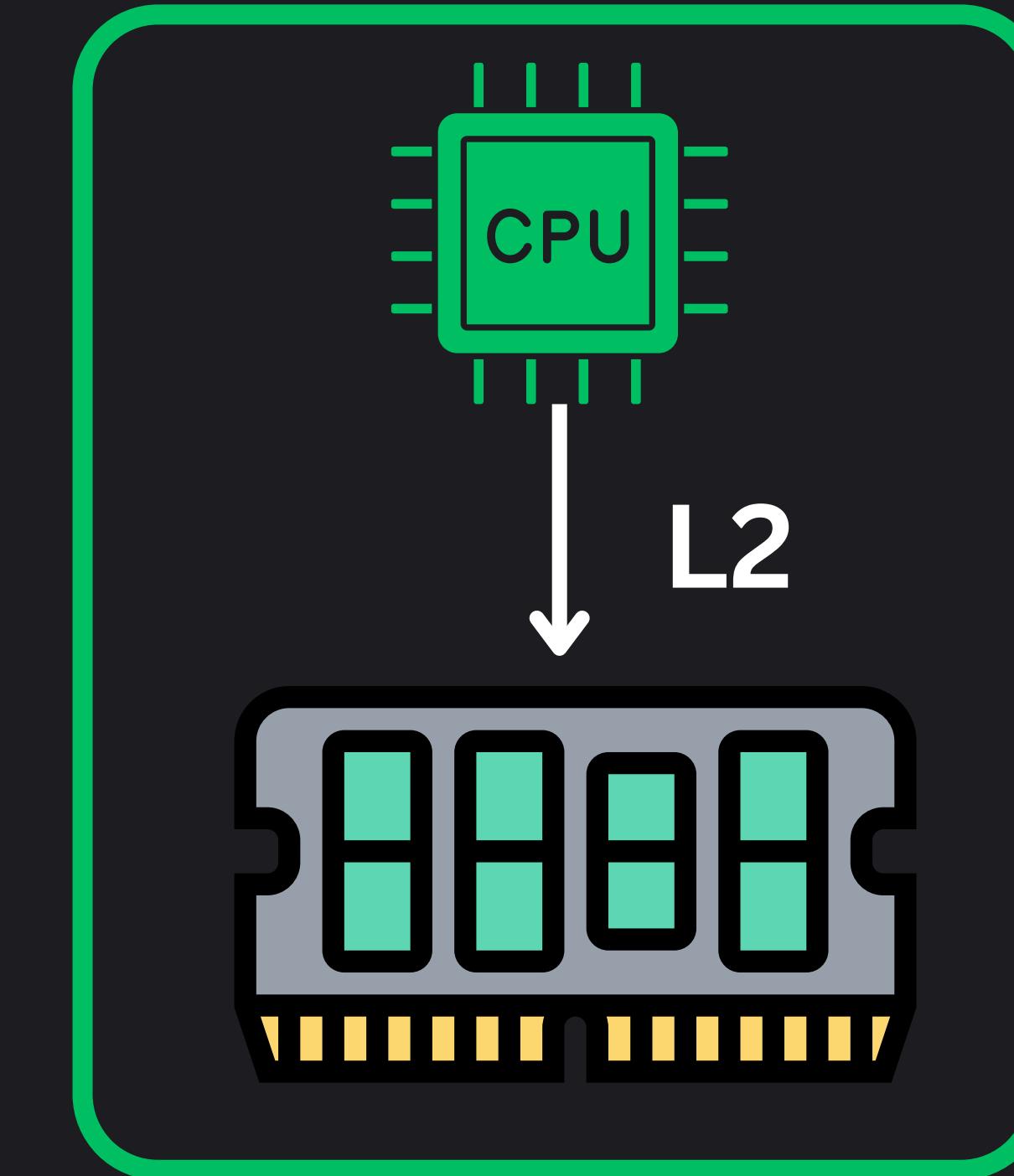
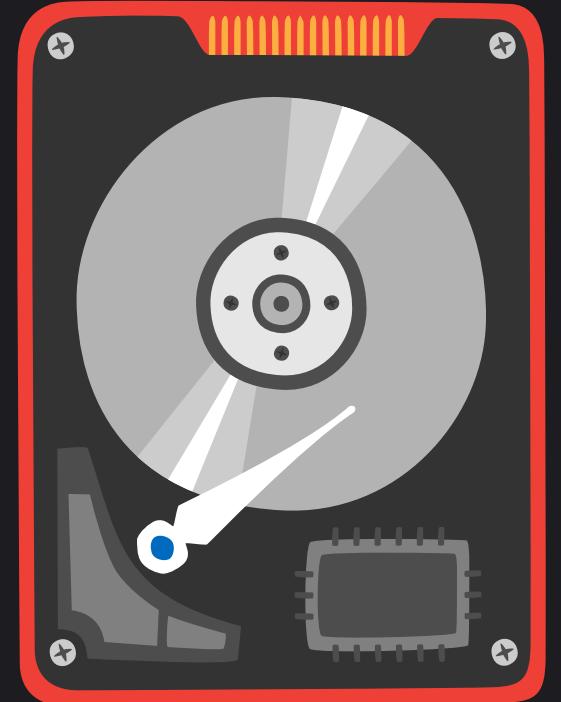
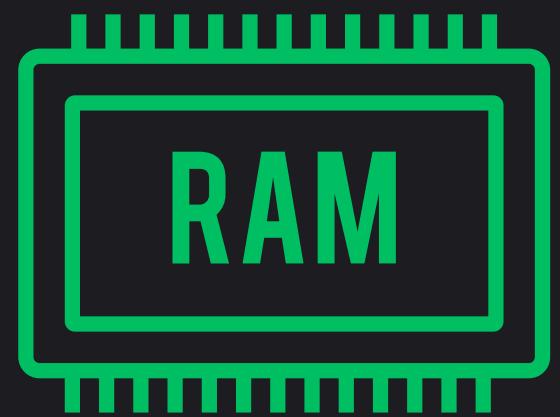


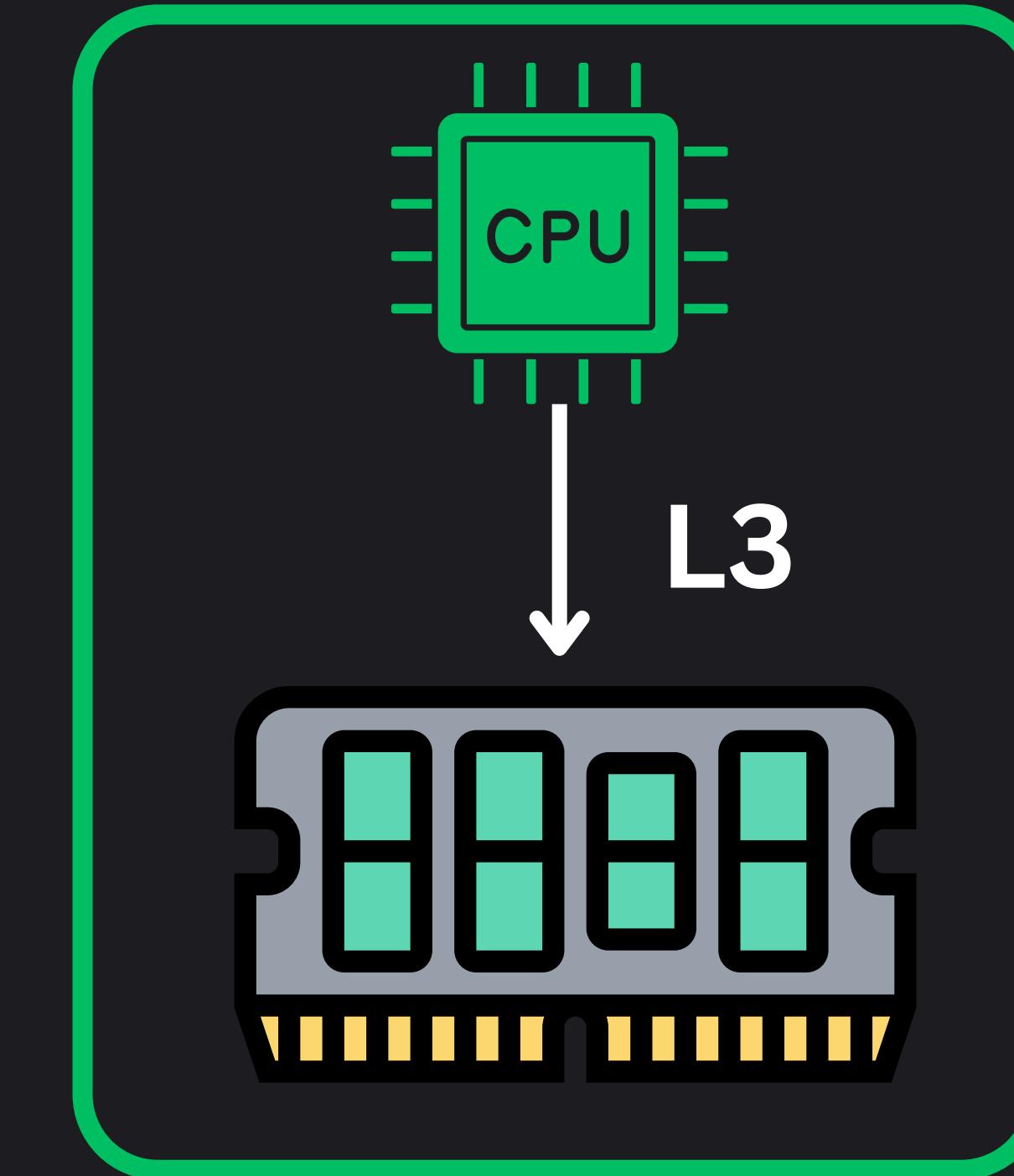
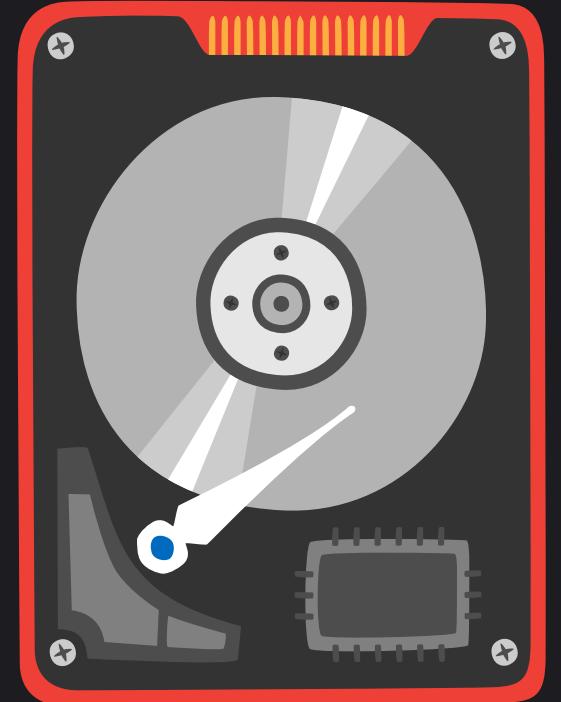
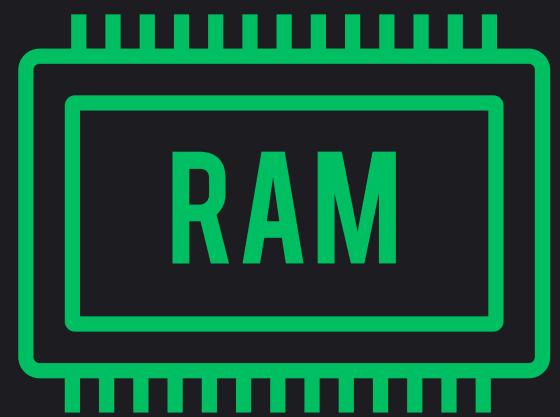
few nanoseconds

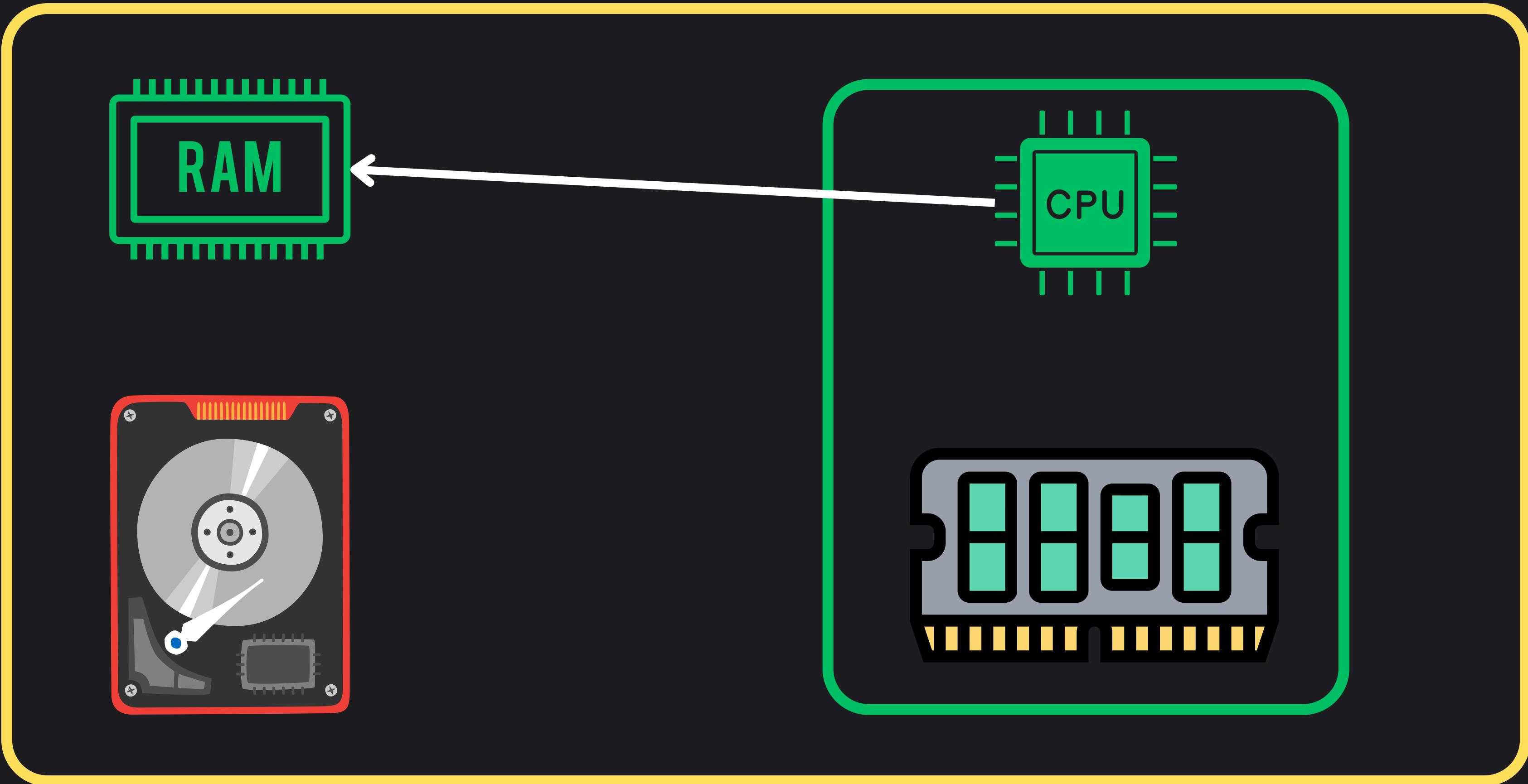


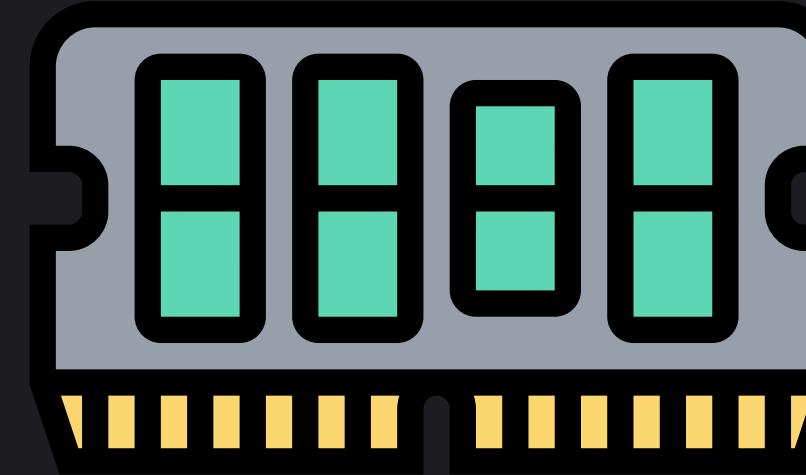
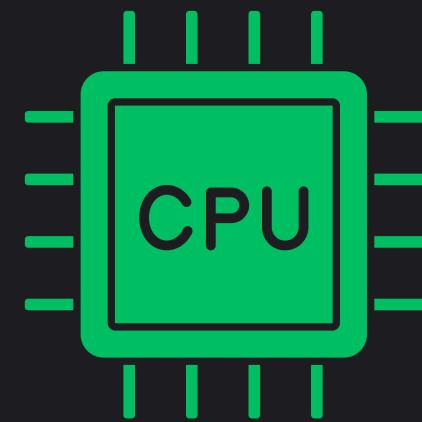
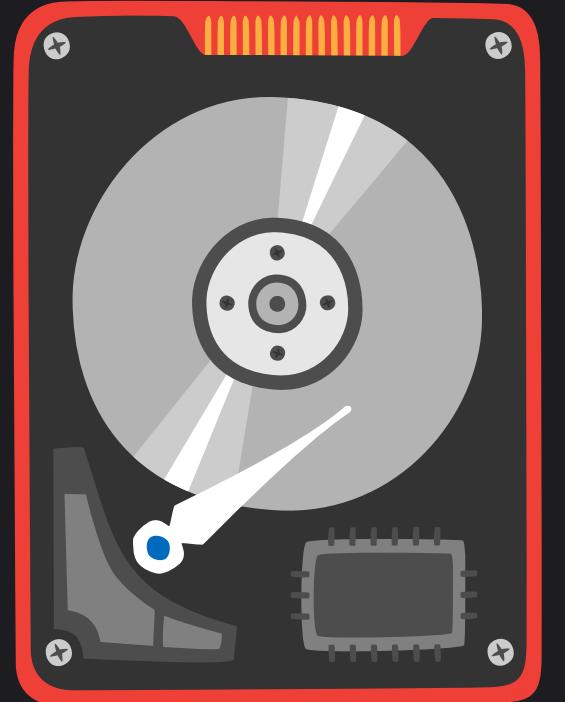
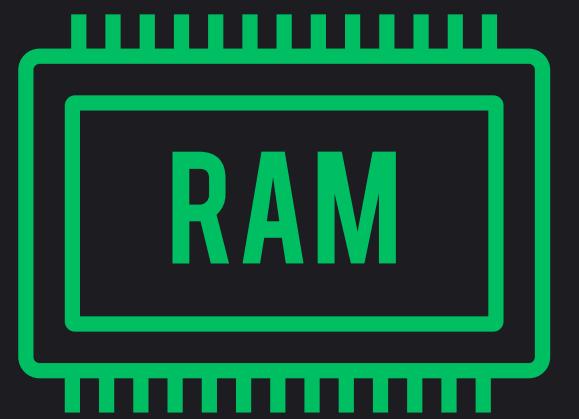




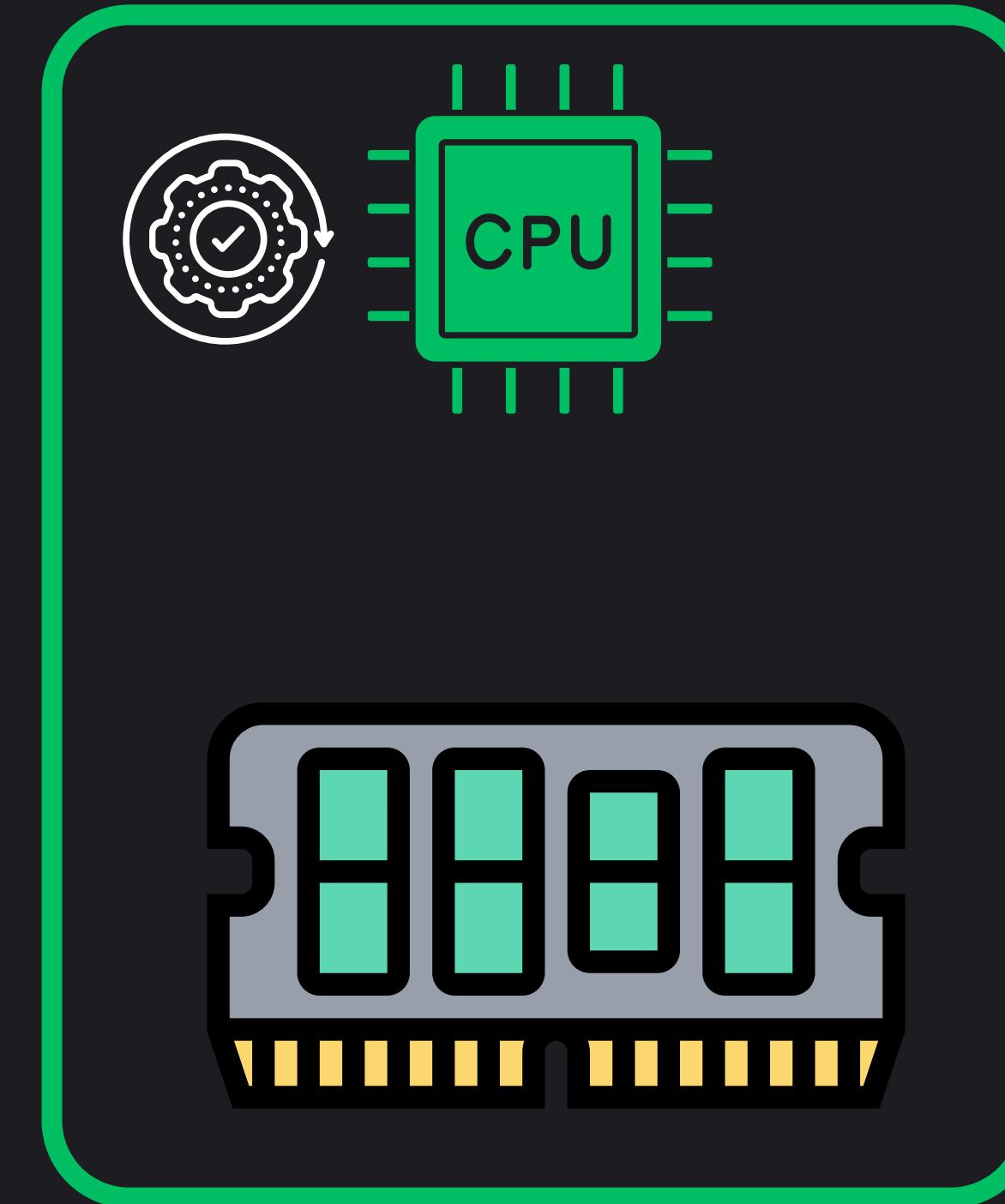
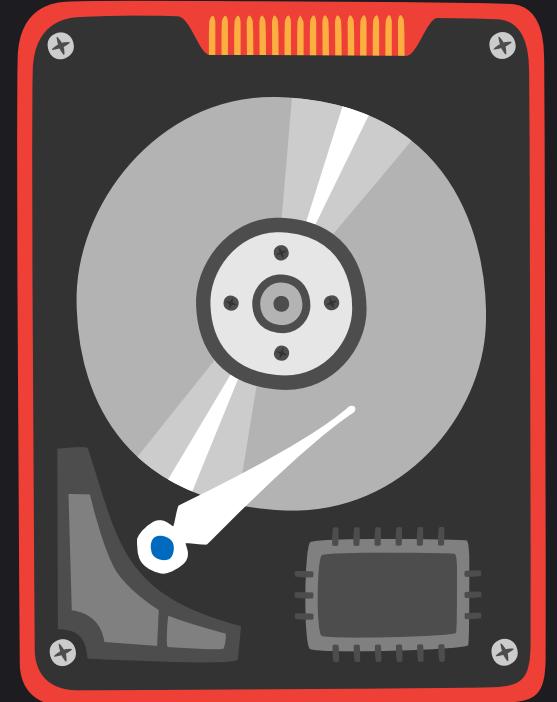
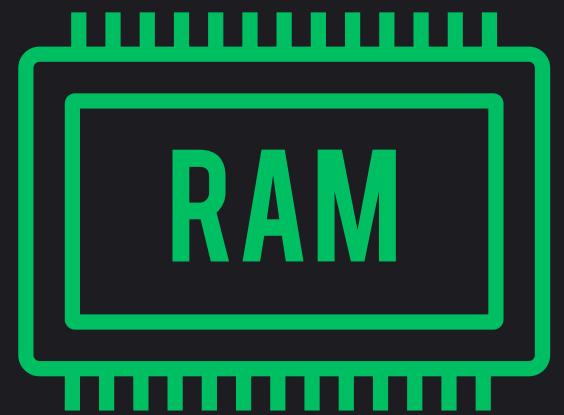


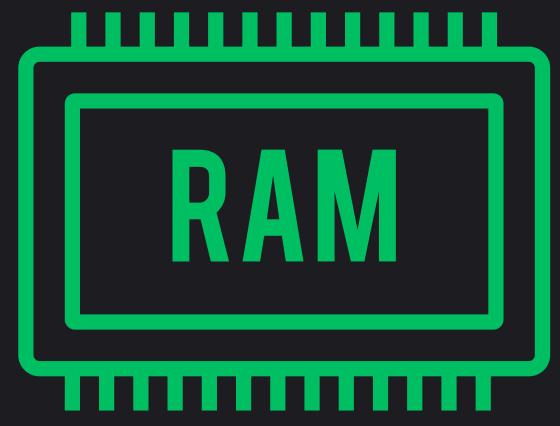




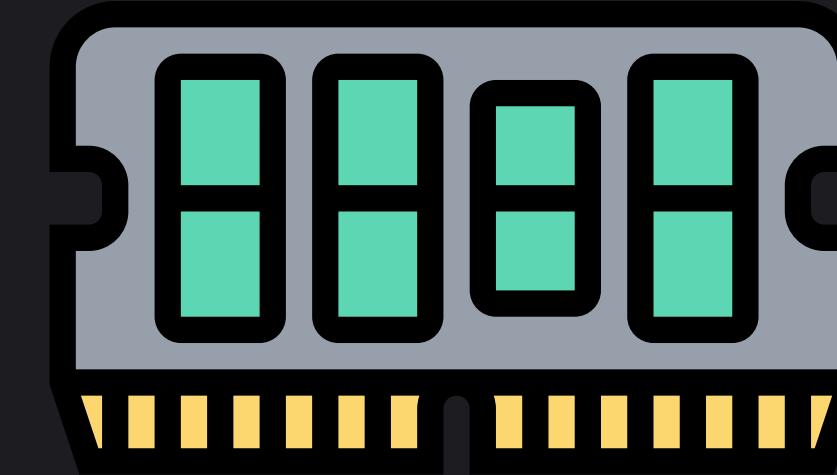
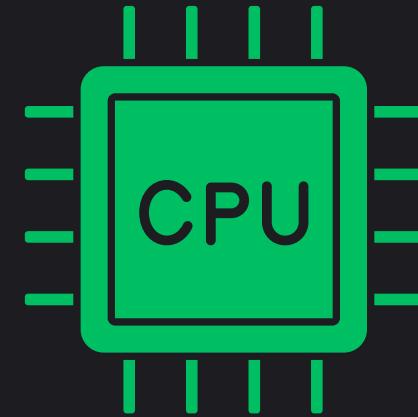
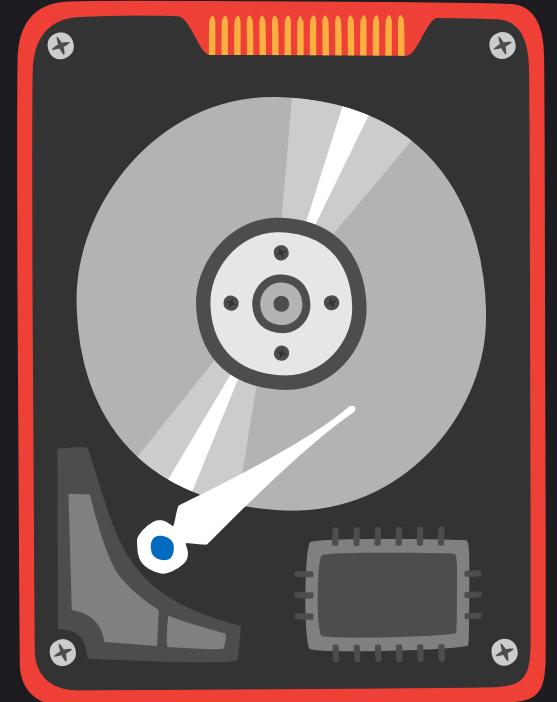


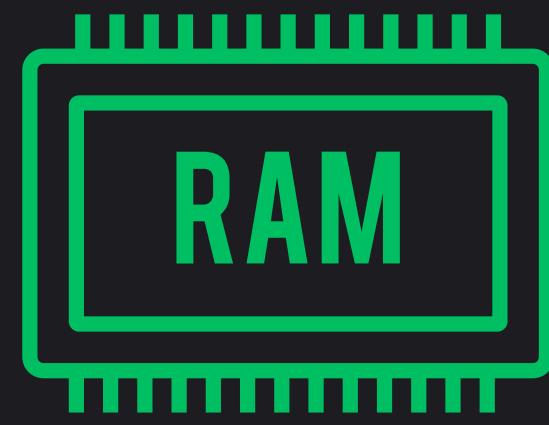
# CPU



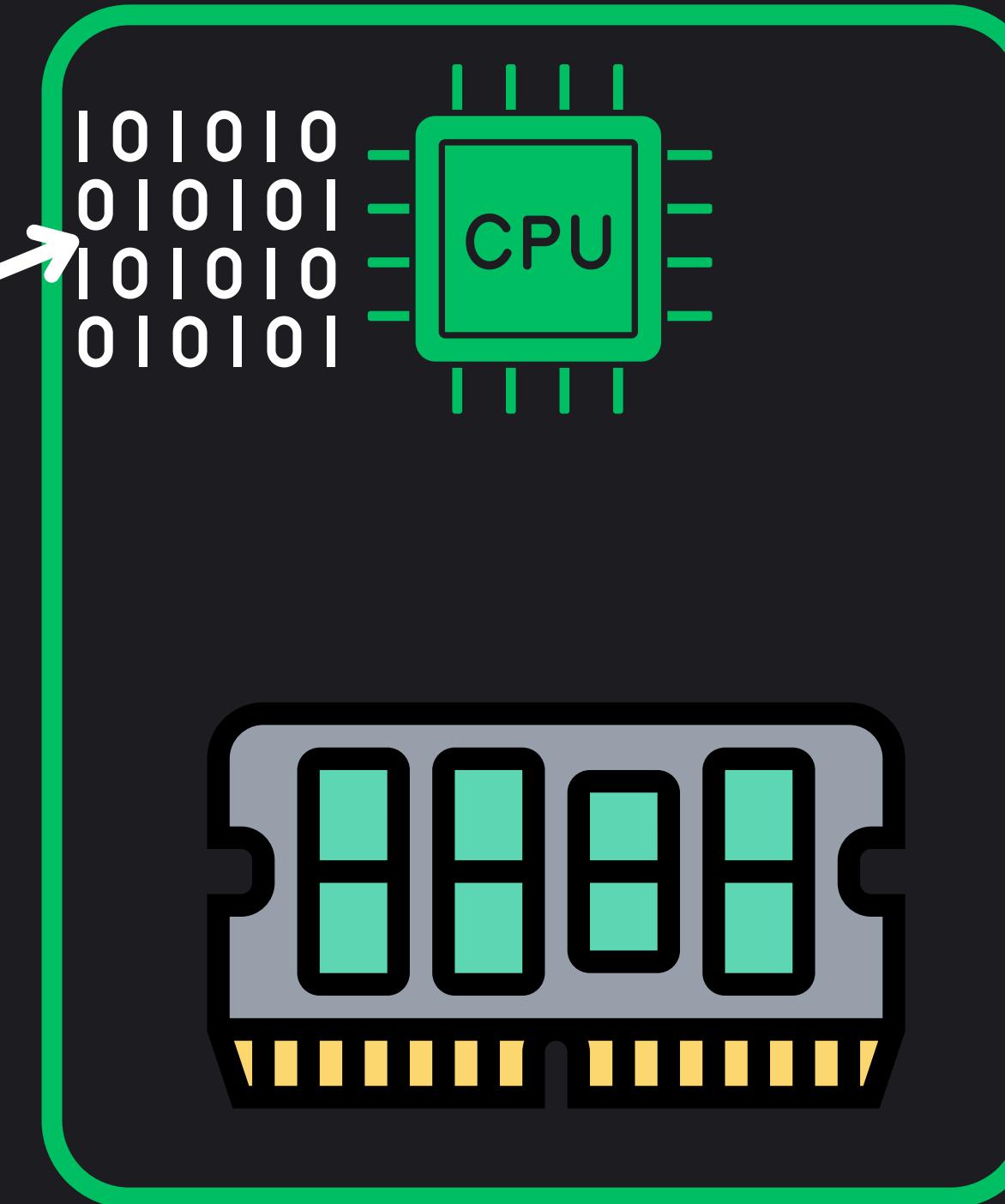
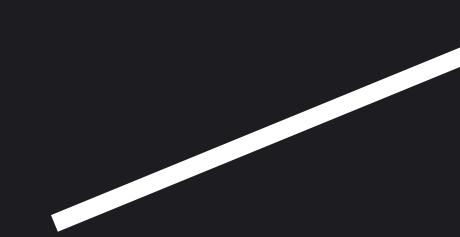
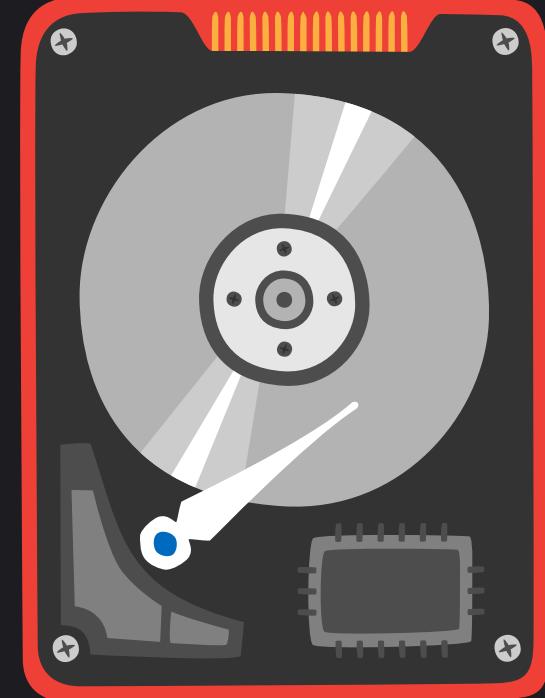


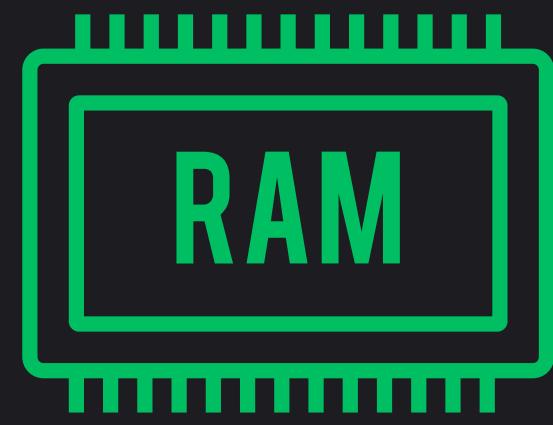
Java, C++, Python, ...



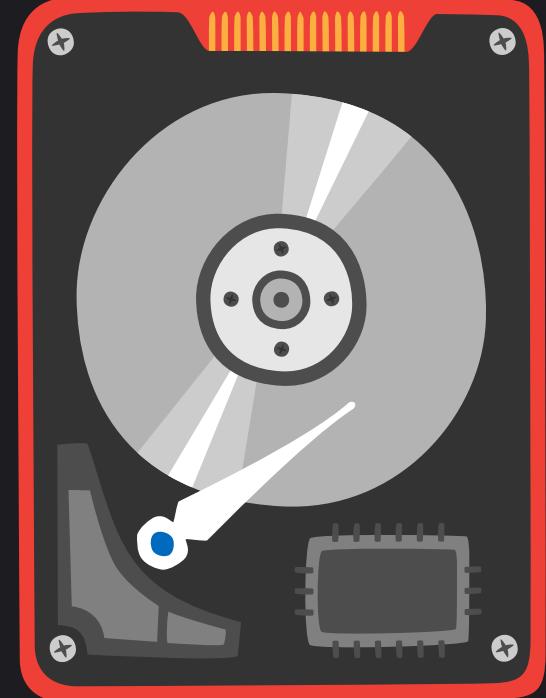


Java, C++, Python, ...

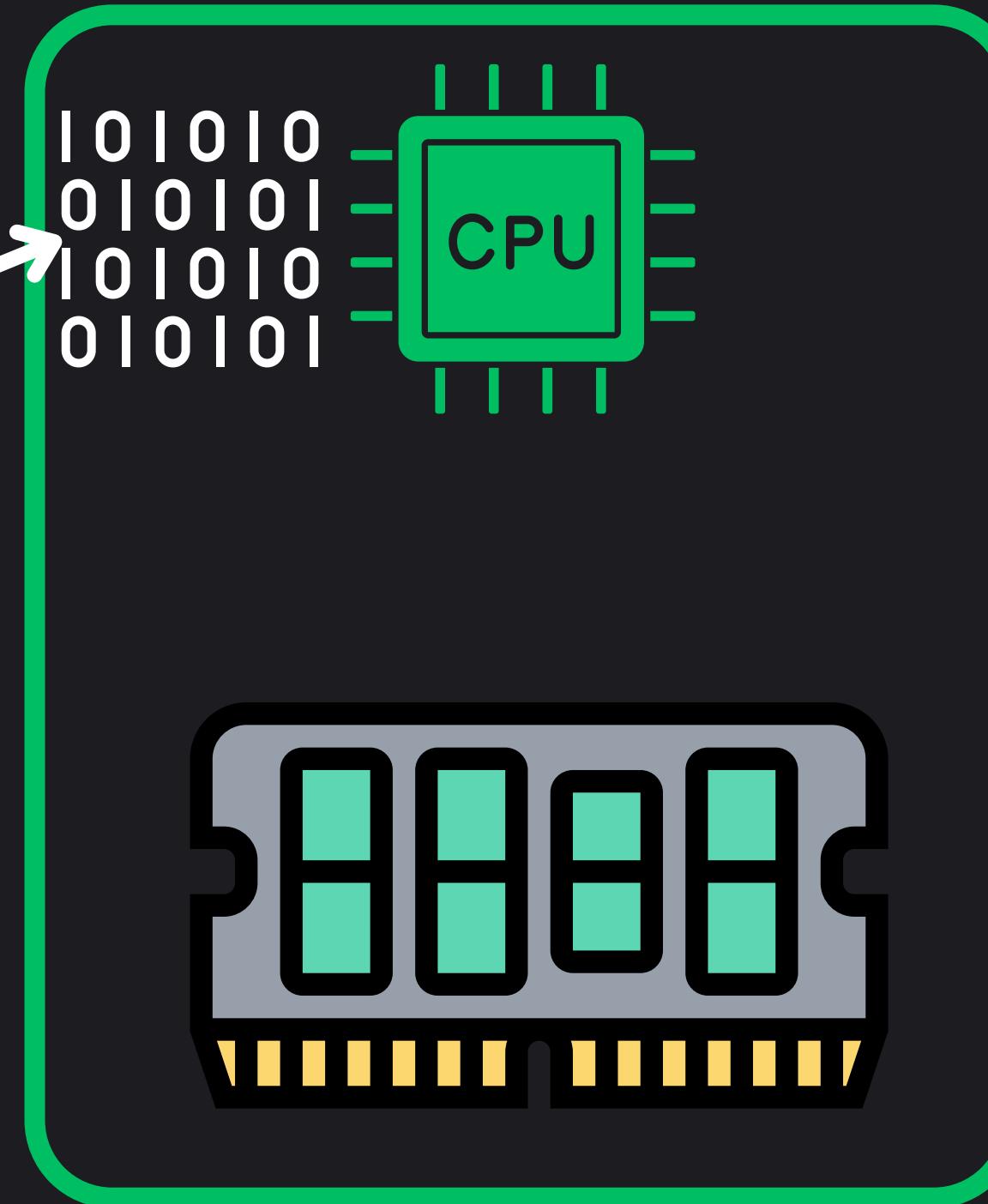
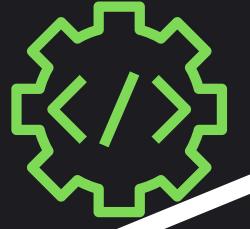


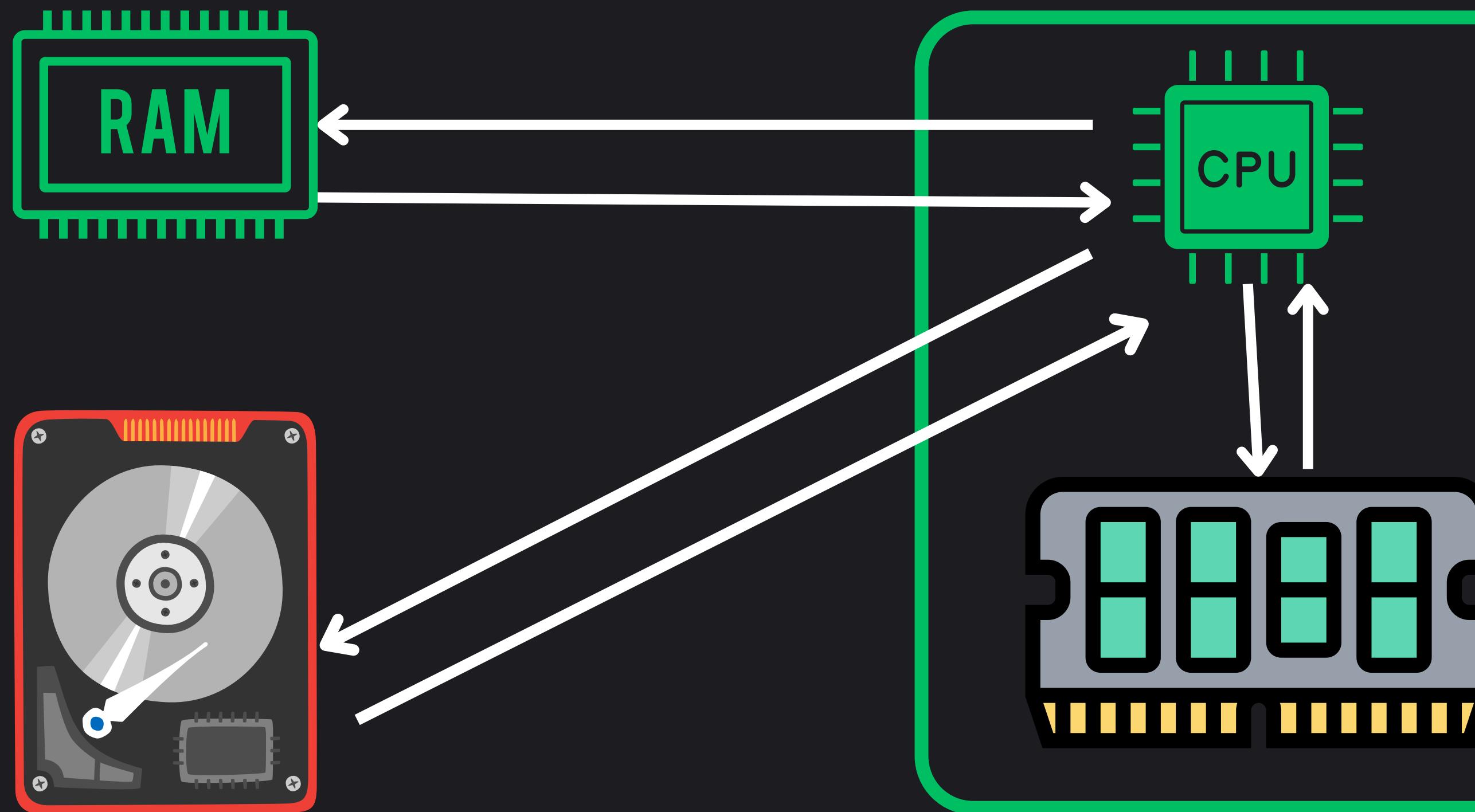


Java, C++, Python, ...



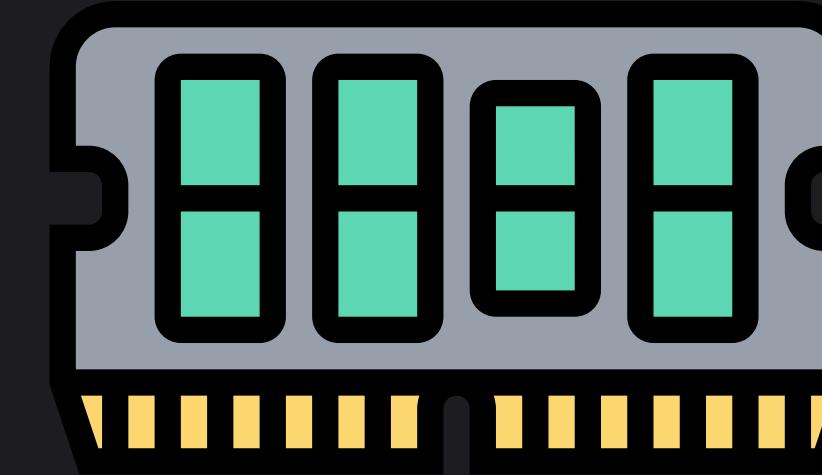
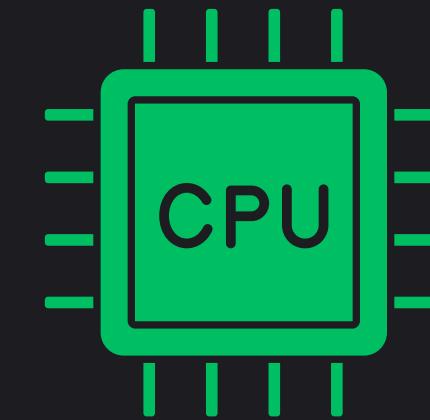
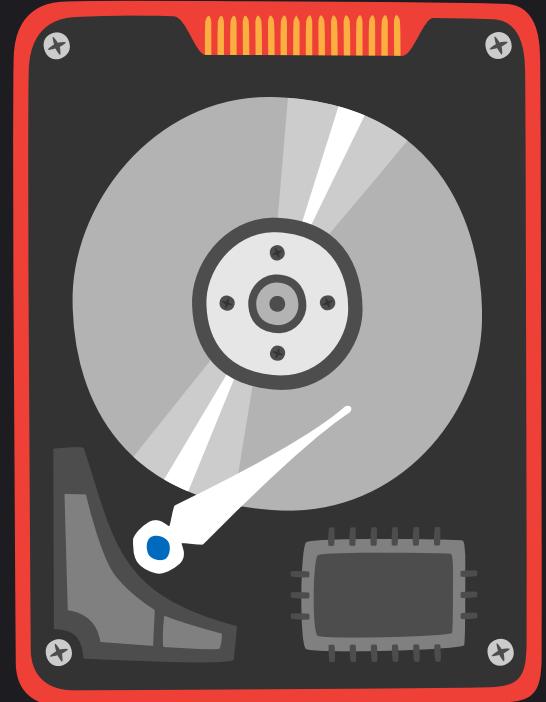
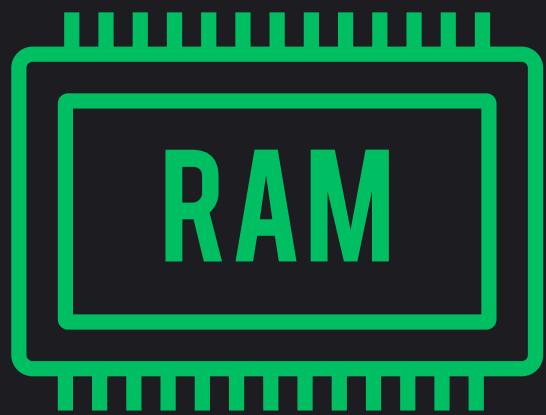
Compiler





# Motherboard

# Motherboard



# Motherboard

