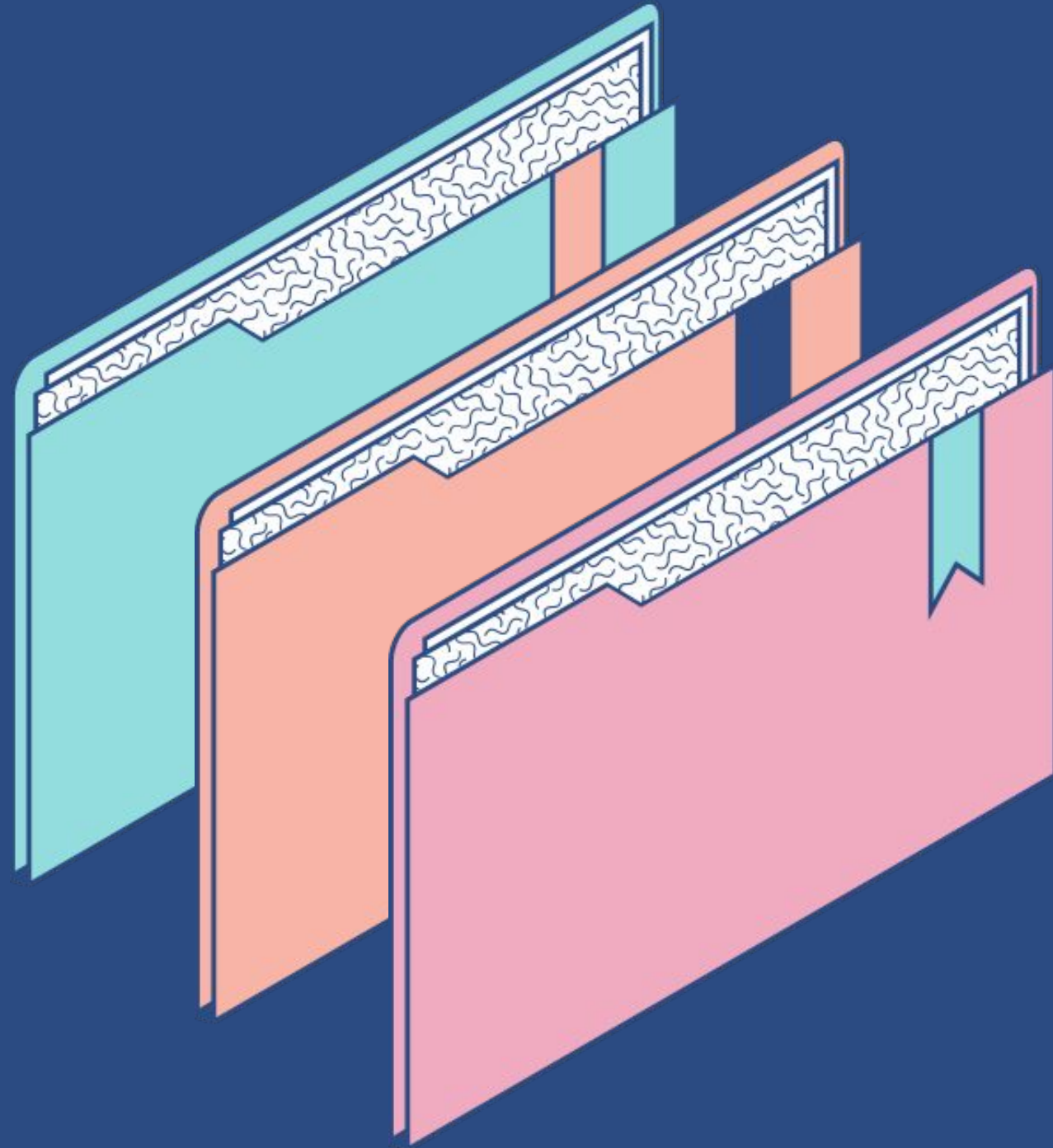




MODULE 8

# Digital Storage: Preserving Content Locally and on the Cloud

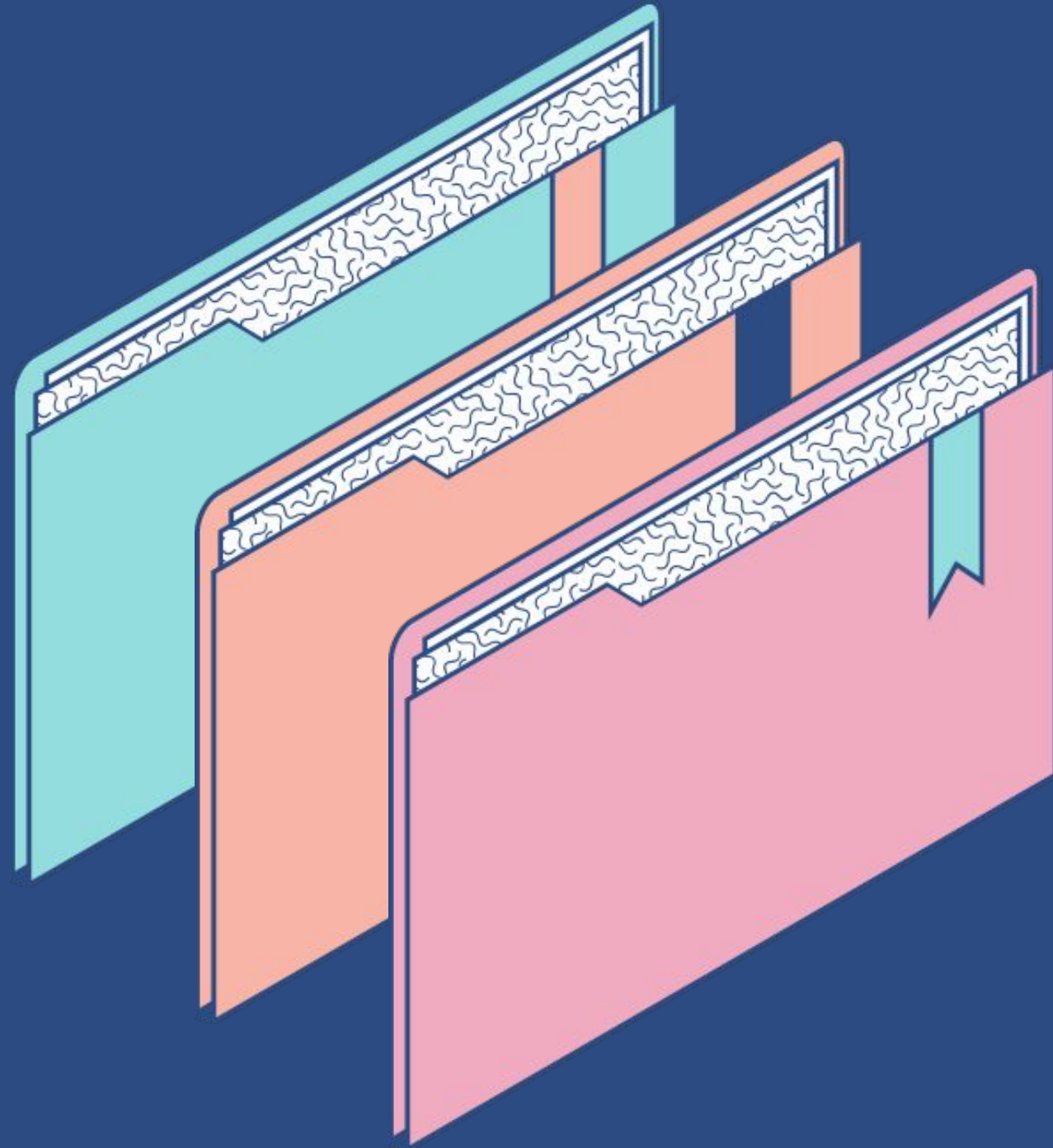
B14204028陳揚棋



# 議程

- Differentiate between storage and memory.
- Describe the characteristics of internal hard disks.
- Describe the benefits of solid-state drives.
- Identify uses of external hard drives and Redundant Array of Independent Disks (RAID).
- Differentiate among various types of memory cards and Universal Serial Bus (USB) flash drives.





# 議程

- Discuss the benefits and uses of cloud storage.
- Describe characteristics of and differentiate among types of optical discs.
- Explain types of enterprise storage.
- Identify uses of magnetic stripe cards, smart cards, Radio Frequency Identification (RFID) tags, and Near-Field Communication (NFC) tags.

# Storage

- A storage medium is the physical material on which a computer keeps data, information, programs, and applications.
- Cloud storage keeps information on servers on the Internet, and the actual media on which the files are stored are transparent to the user.



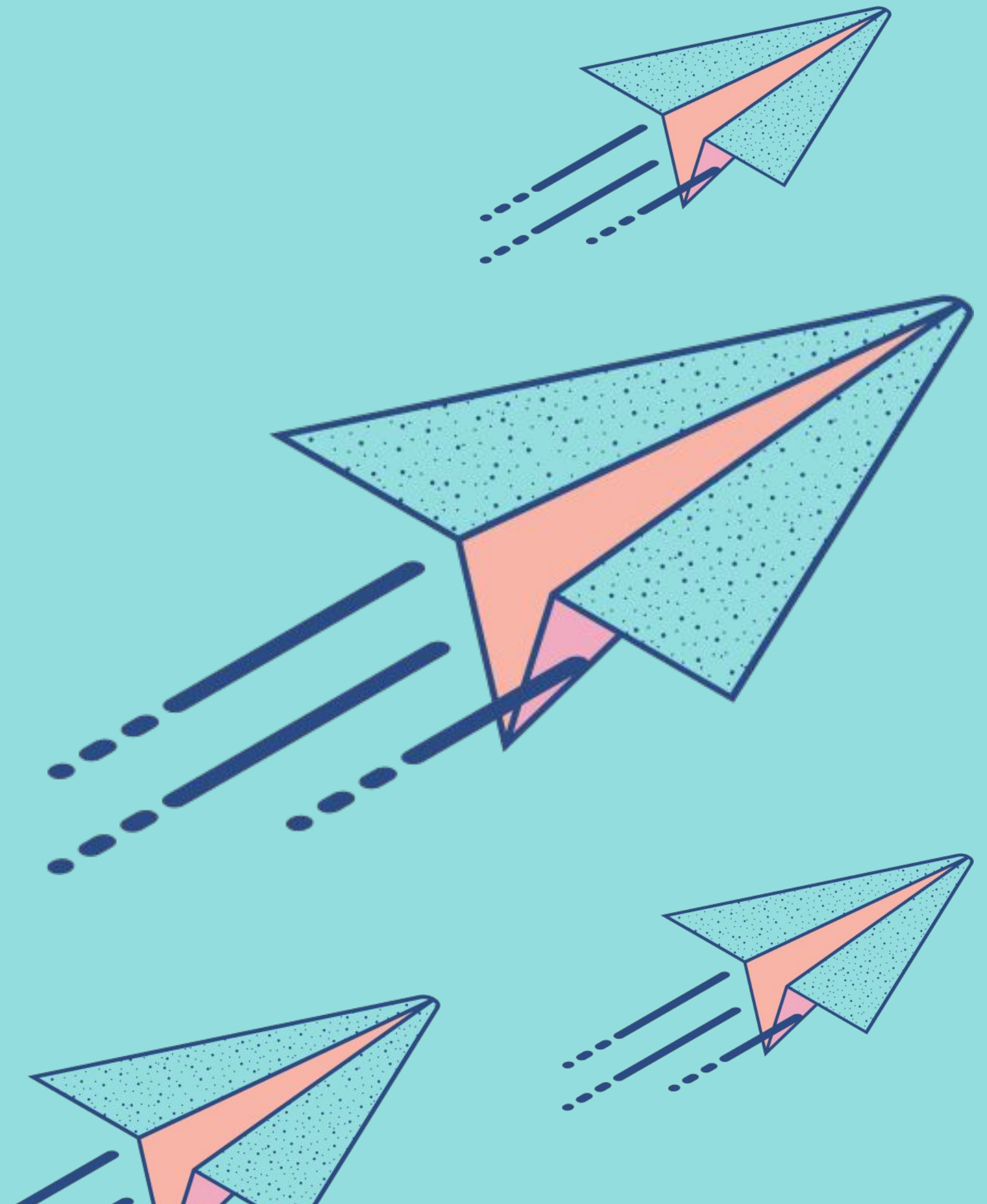


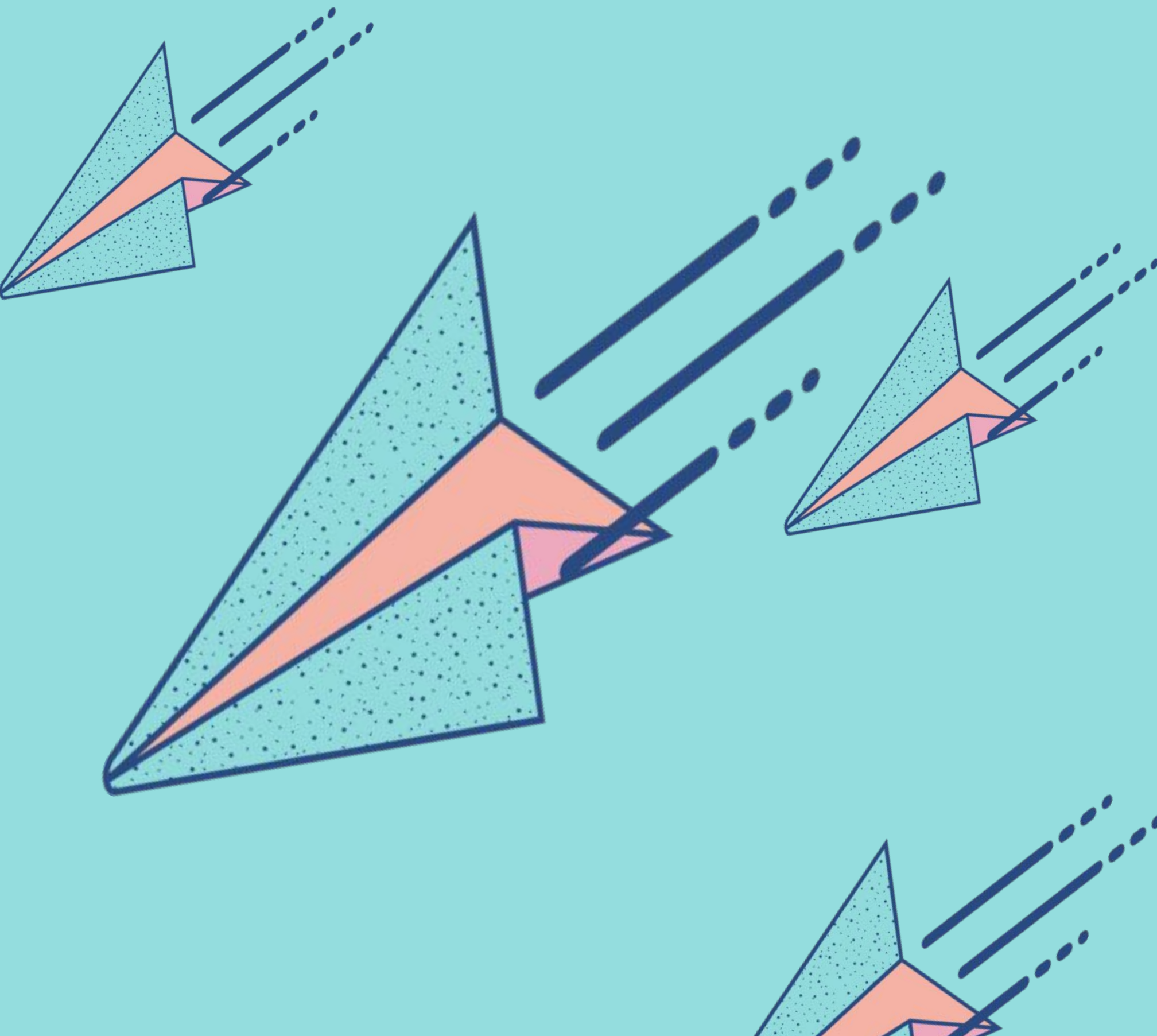




# WRITING

- It is the process of transferring items from memory to a storage medium.





朋友：你是怎麼考上第一志願的？  
我：



# READING

- It is the process of transferring items from a storage medium into memory





# CAPACITY

Storage Term	Approximate Number of Bytes	Exact Number of Bytes
Kilobyte (KB)	1 thousand	2 <sup>10</sup> or 1,024
Megabyte (MB)	1 million	2 <sup>20</sup> or 1,048,576
Gigabyte (GB)	1 billion	2 <sup>30</sup> or 1,073,741,824
Terabyte (TB)	1 trillion	2 <sup>40</sup> or 1,099,511,627,776
Petabyte (PB)	1 quadrillion	2 <sup>50</sup> or 1,125,899,906,842,624
Exabyte (EB)	1 quintillion	2 <sup>60</sup> or 1,152,921,504,606,846,976
Zettabyte (ZB)	1 sextillion	2 <sup>70</sup> or 1,180,591,620,717,411,303,424
Yottabyte (YB)	1 septillion	2 <sup>80</sup> or 1,208,925,819,614,629,174,706,176

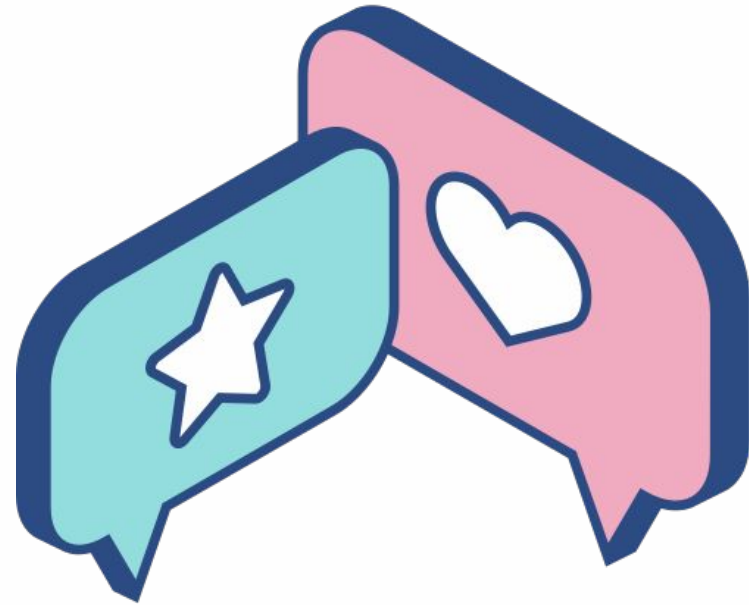


# RAM

REMEMBER QUICKLY AND FORGET QUICKLY

- A screen display is considered volatile because its contents disappear when power is removed. Likewise, most Random Access Memory (RAM) is volatile. That is, its contents are erased when power is removed from a computer or mobile device. Storage, by contrast, is nonvolatile. Its contents remain when power is off.



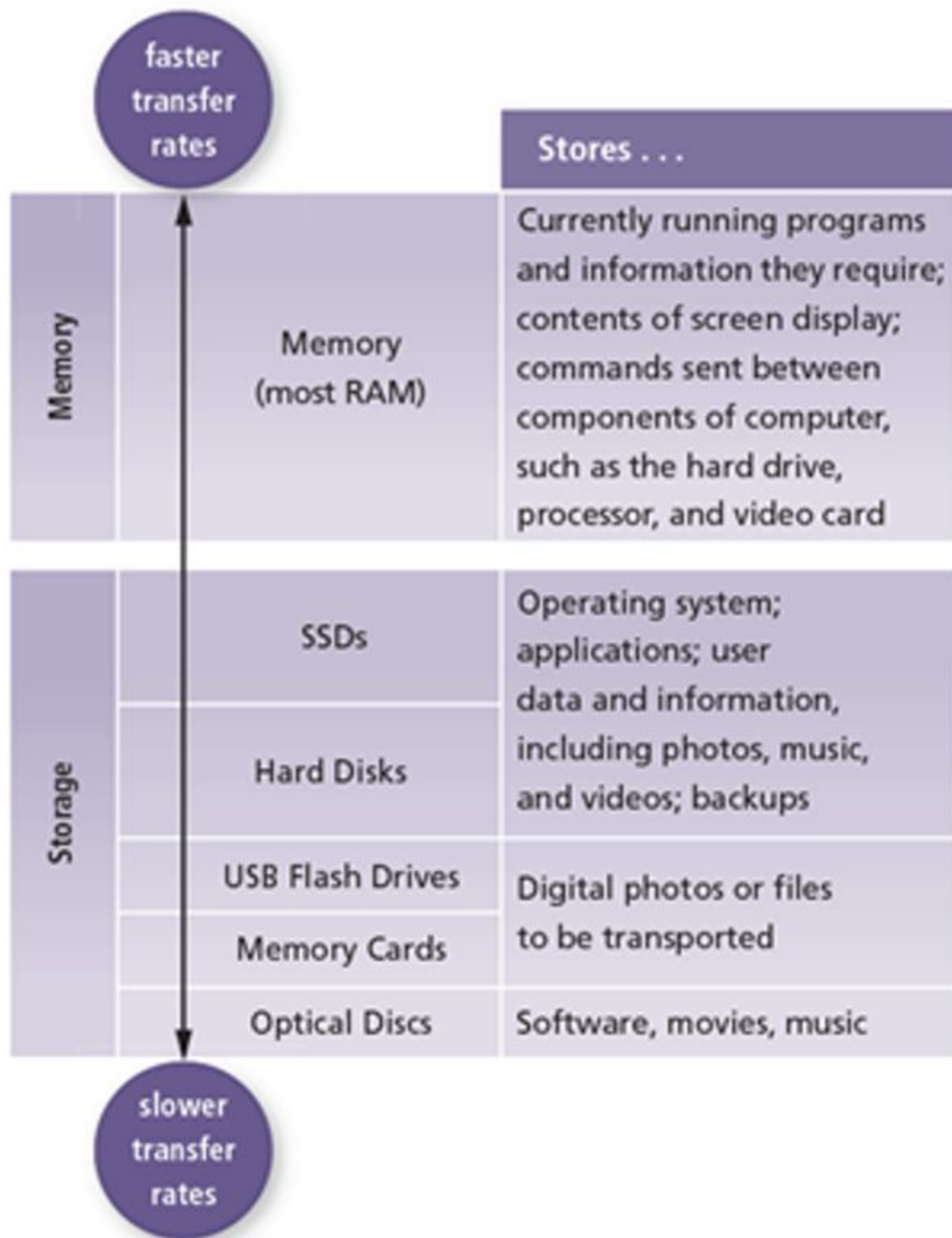


## ACCESS TIME



- The amount of time it takes a storage device to locate an item on a storage medium
- The time required to deliver an item from memory to the processor





# What's in the HDD?





# HARD DRIVE

- The storage capacity of hard disks varies and is determined by:
  - The number of platters the hard disk contains
  - The composition of the magnetic coating on the platters
  - Whether the disk uses longitudinal or perpendicular recording
  - Density



# How does it work?

## How a Hard Disk Works

### Step 1

The circuit board controls the movement of the head actuator and a small motor.

### Step 2

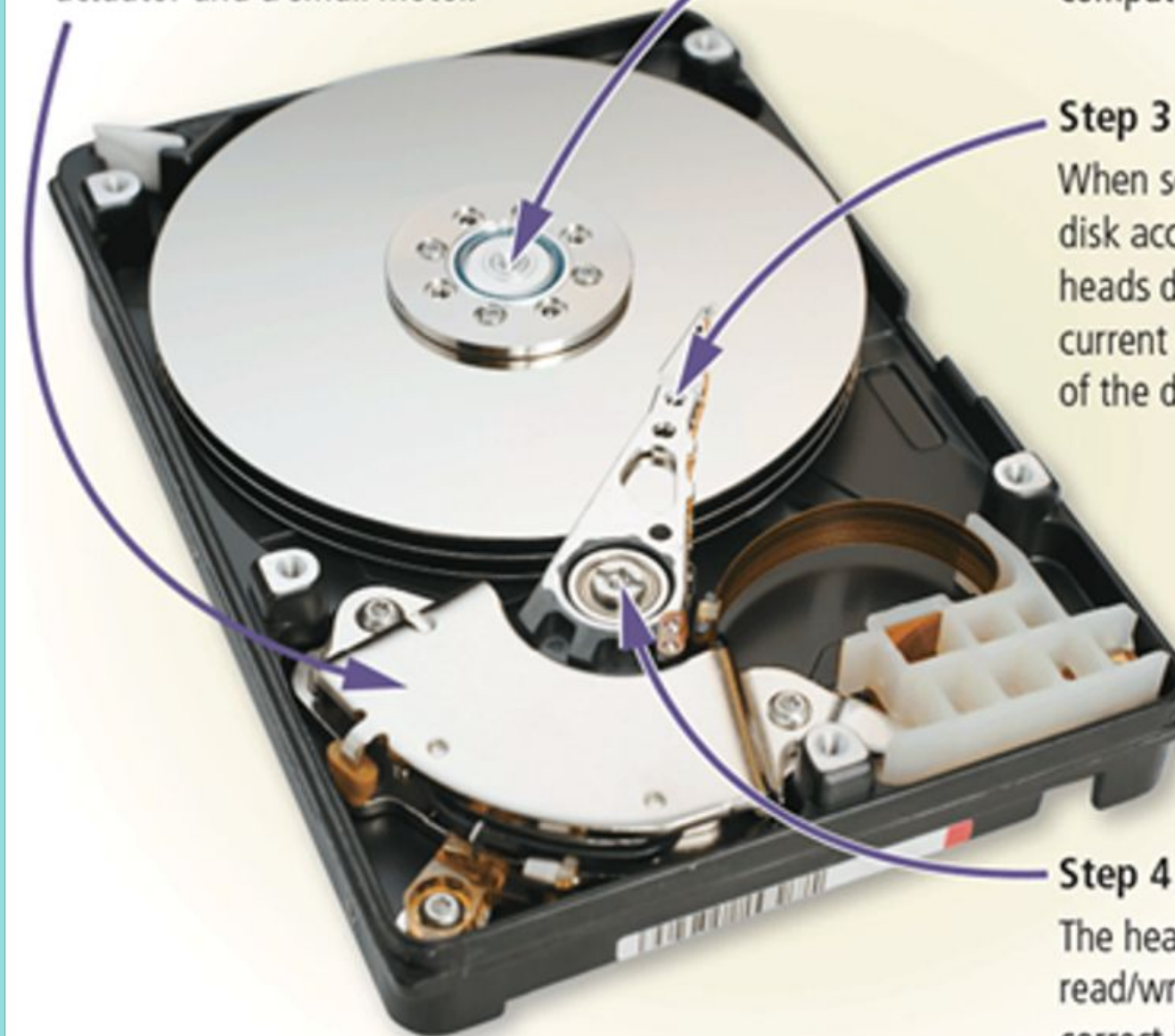
A small motor spins the platters while the computer is running.

### Step 3

When software requests disk access, the read/write heads determine the current or new location of the data.

### Step 4

The head actuator positions the read/write head arms over the correct location on the platters to read or write data.





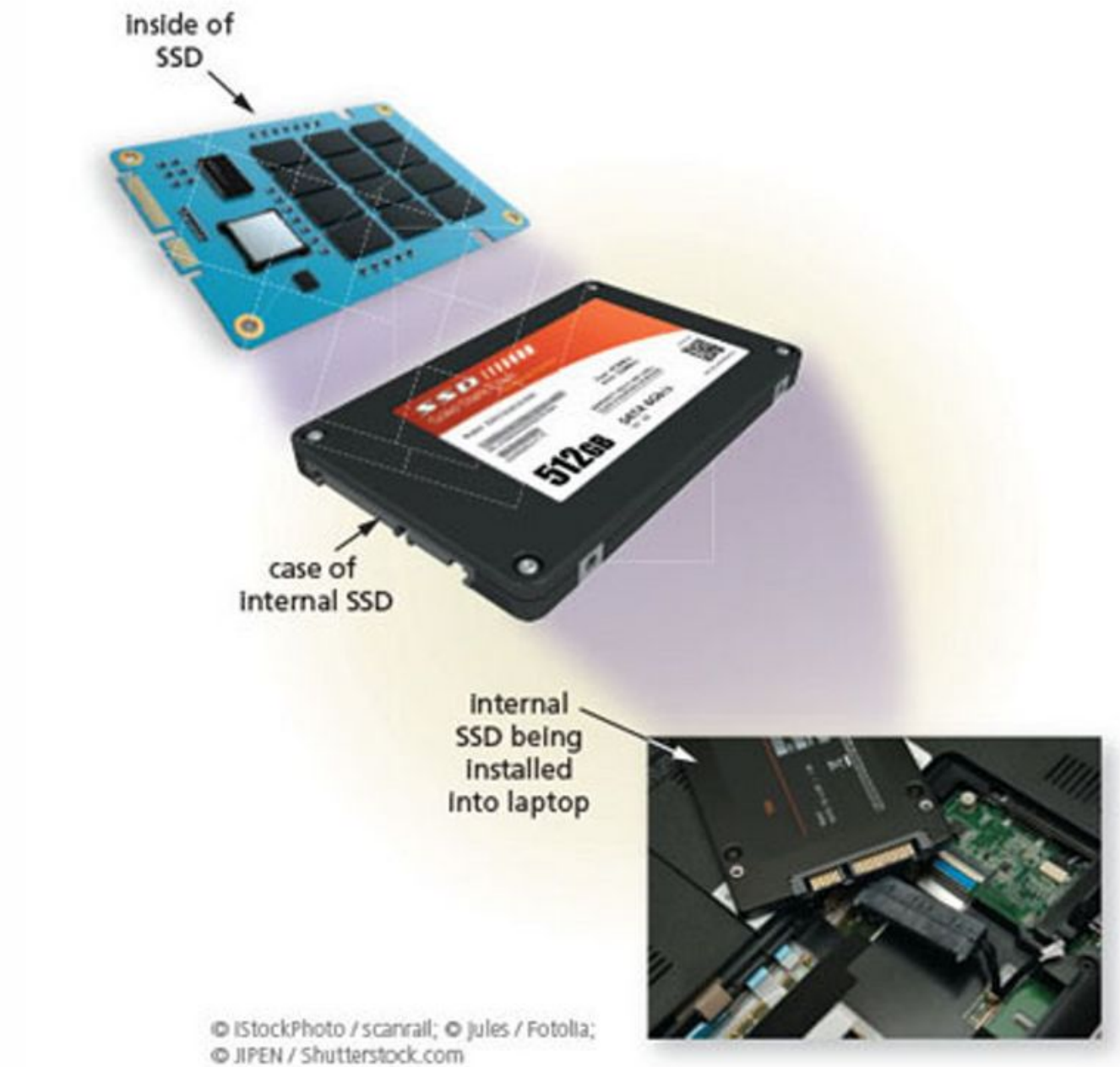
# What's in the SSD?





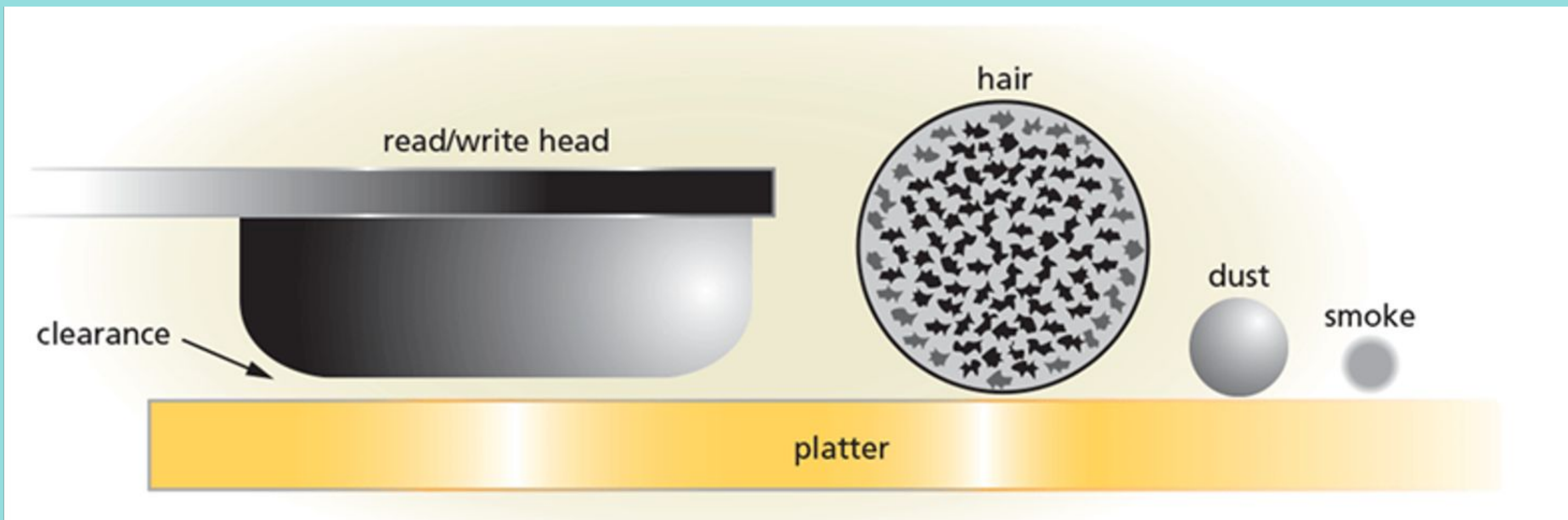
# SSD(Solid State Drive)

- It is a flash memory storage device that contains its own processor to manage its storage





# Hidden danger in HDD? !



# Advantages of SSD

- Less power consumption
- Less heat generation
- Longer life
- Defragmentation not required





So should you  
spend money to  
upgrade quickly?



# External Hard Drive

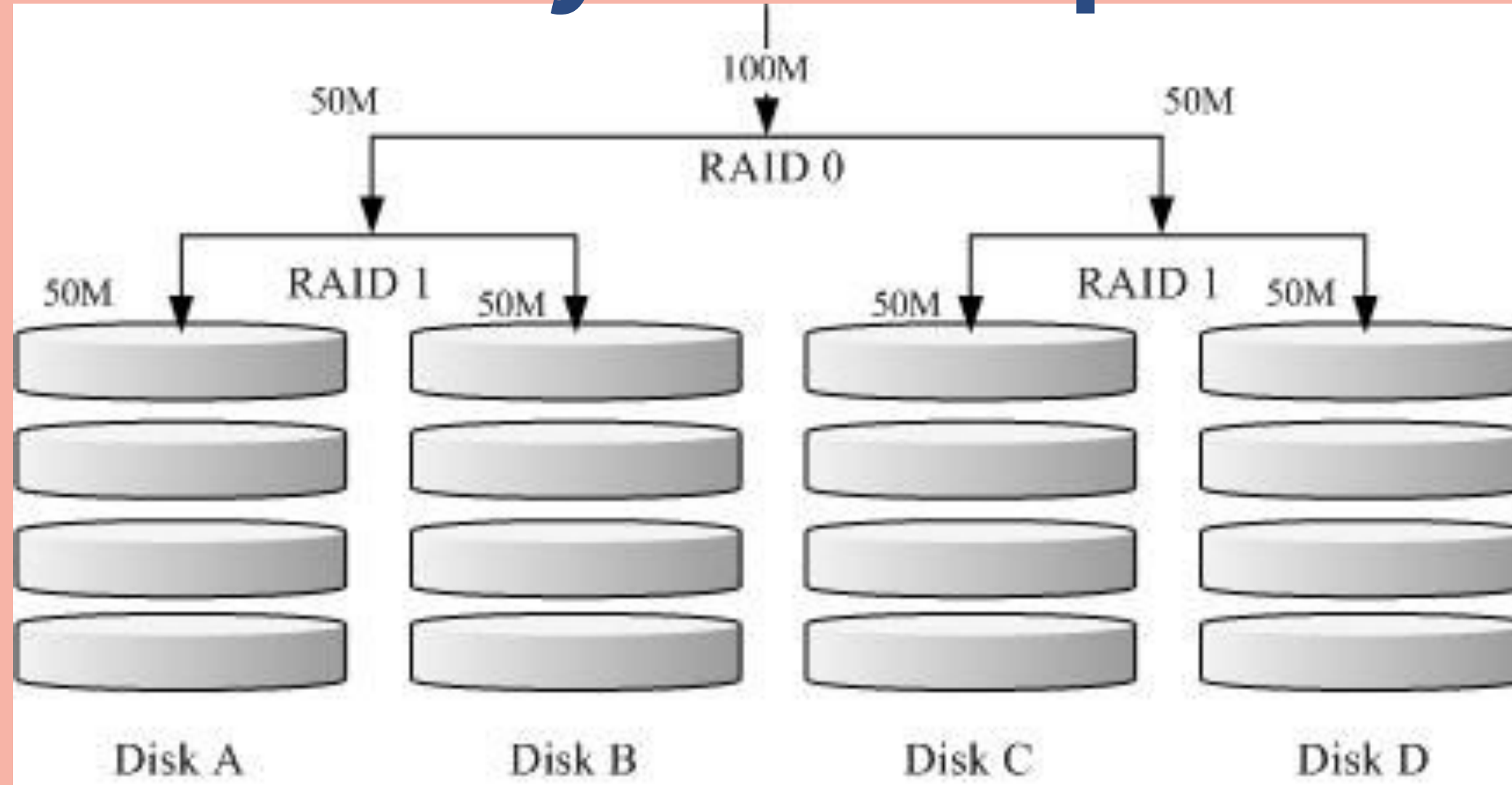
An external hard drive is a separate freestanding storage device that connects with a cable to a USB port or other port on a computer or mobile device

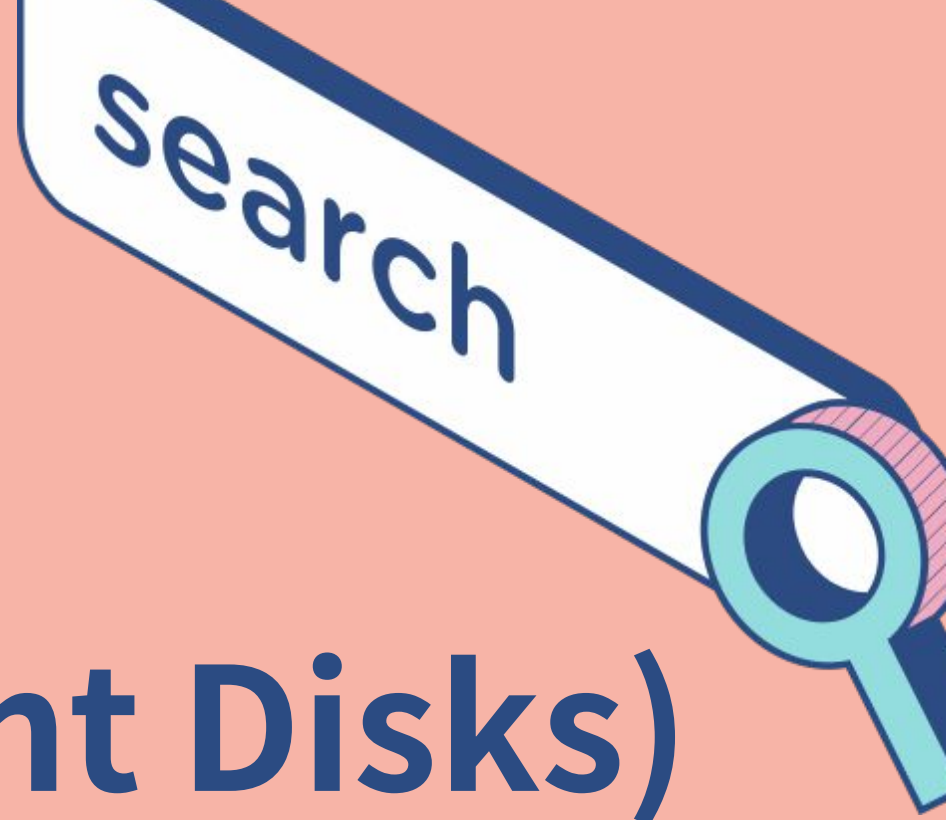




Search

# RAID (Redundant Array of Independent Disks)





# RAID

## (Redundant Array of Independent Disks)

It is a technology that combines multiple physical hard drives into one logical unit to improve performance, reliability, or both.

RAID achieves this by **distributing (striping)** or **duplicating (mirroring/parity)** data across drives, allowing the system to keep running even if one drive fails.



# RAID

## (Redundant Array of Independent Disks)



這布局可說是堅若磐石

# Network-Attached Storage (NAS)

It is a dedicated file storage device that provides centralized data access to multiple users and client devices over a network. Unlike external drives that connect directly to a single computer, a NAS system operates as an independent unit connected to a local network, allowing data to be shared, backed up, and accessed simultaneously by various users.



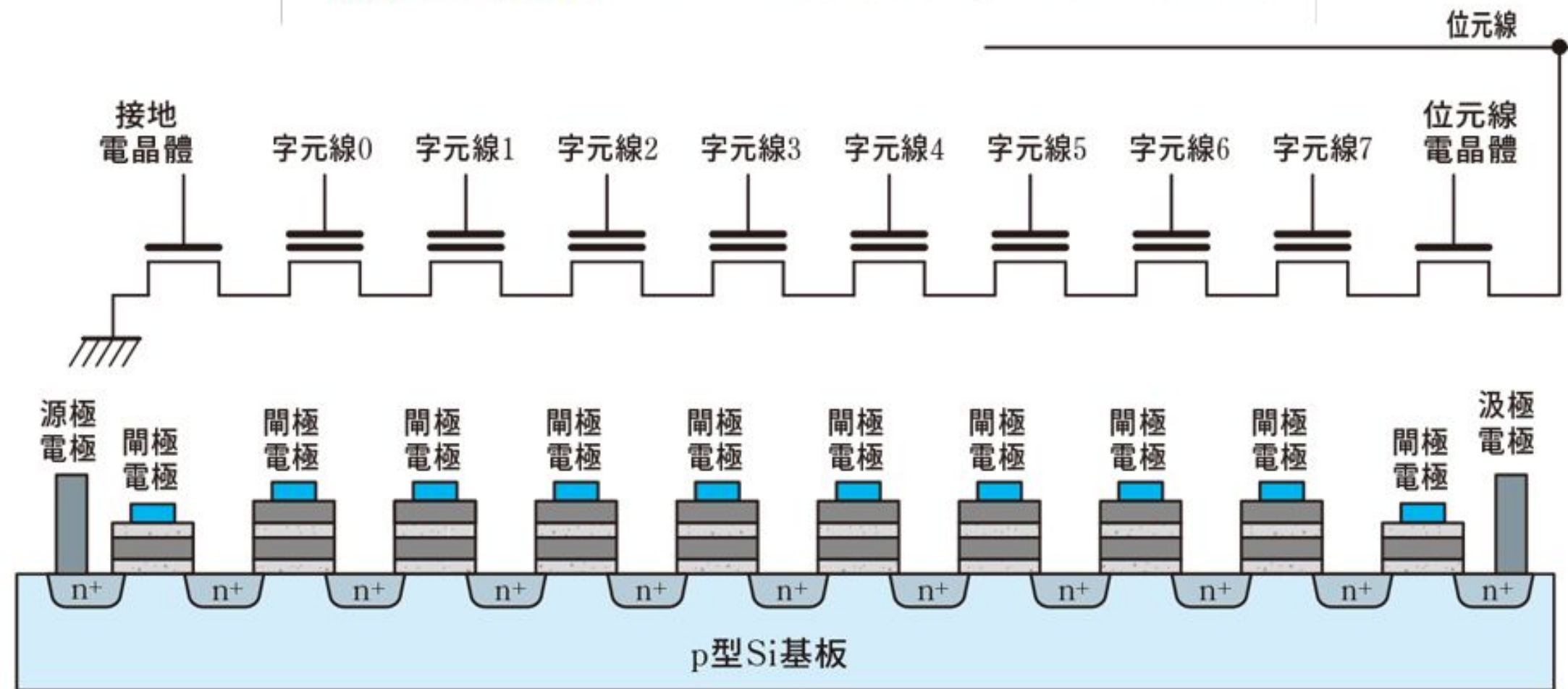
# MEMORY CARD

- A memory card is a removable flash memory storage device that you insert and remove from a slot in a computer, mobile device, or card reader/writer



# How it Works?

圖 4-18 • NAND 型快閃記憶體的剖面圖

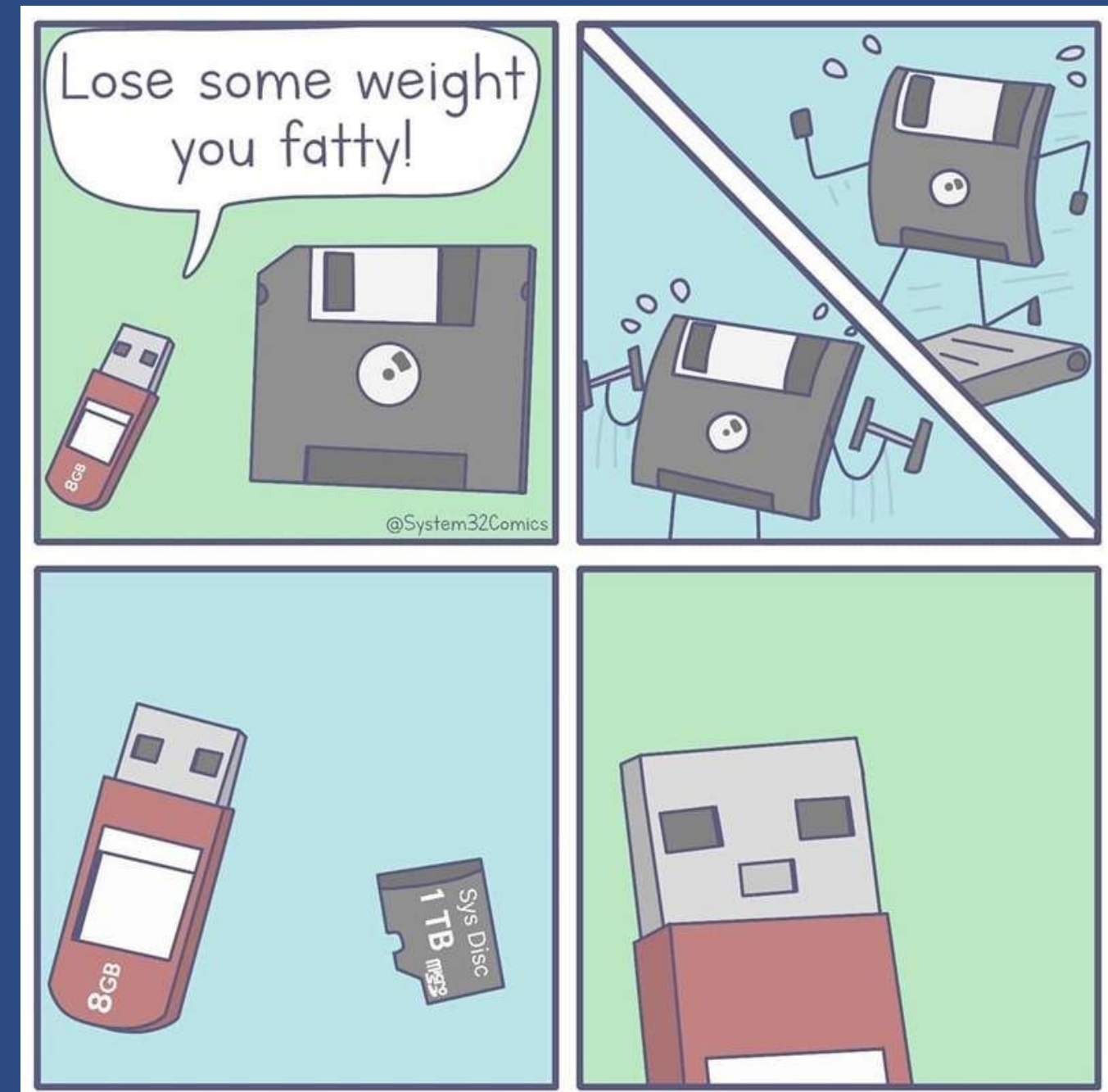




# How it Works?

A memory card is a type of **non-volatile storage device**, meaning it retains data even when power is off.

Its core technology is **flash memory**, which stores information by trapping electric charges inside microscopic cells.



# How it Works?

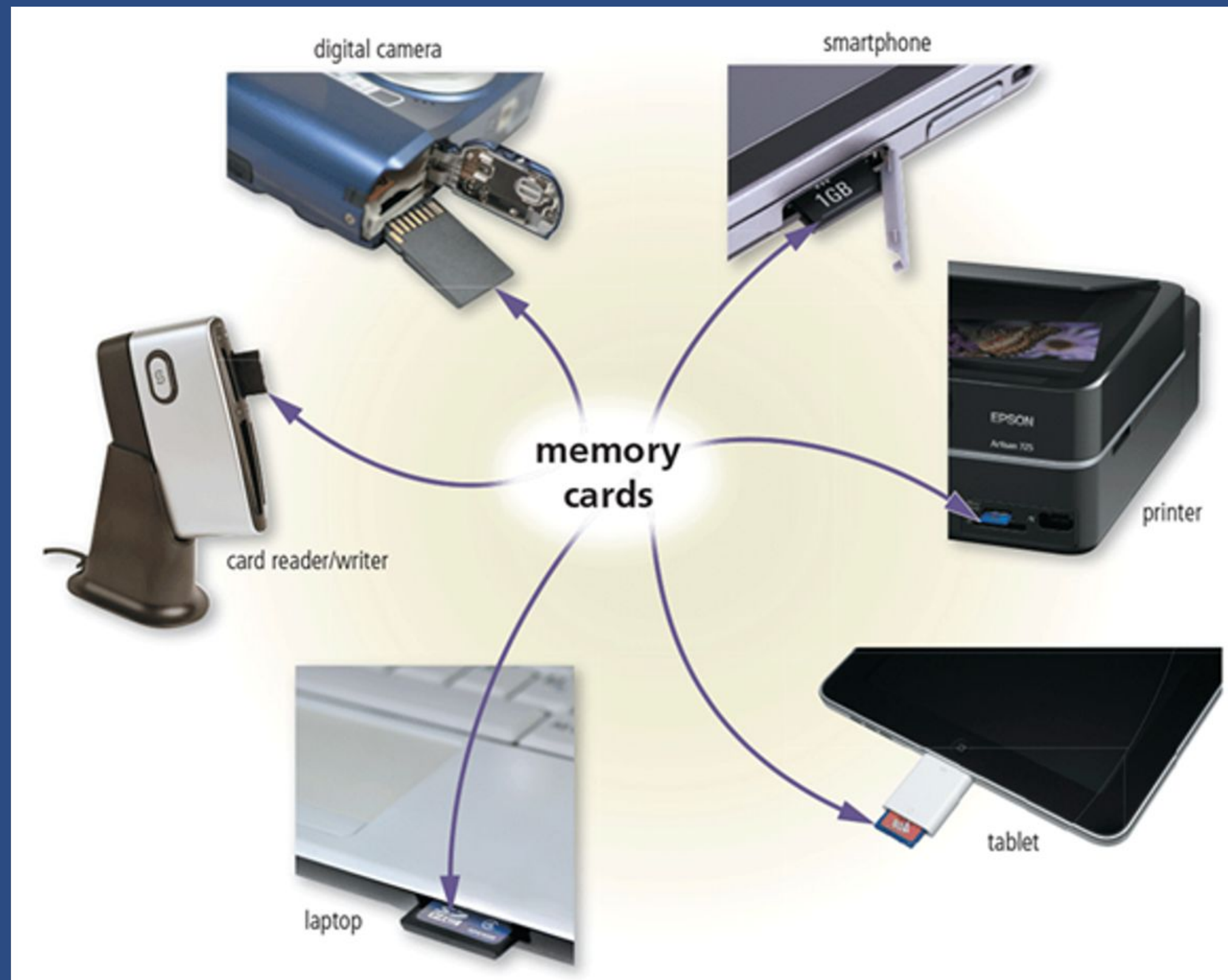
Each cell holds a specific amount of charge, representing binary data (0s and 1s).

By controlling the charging and discharging of these cells, the card performs read and write operations.

A typical memory card includes three main components:

1. **Controller** – Manages data access, error correction (ECC), and wear leveling.
2. **Flash Memory Chip** – Where the actual data is stored.
3. **Interface** – Connects the card to devices like cameras, phones, or computers (e.g., SD, microSD, CF).

# MEMORY CARD





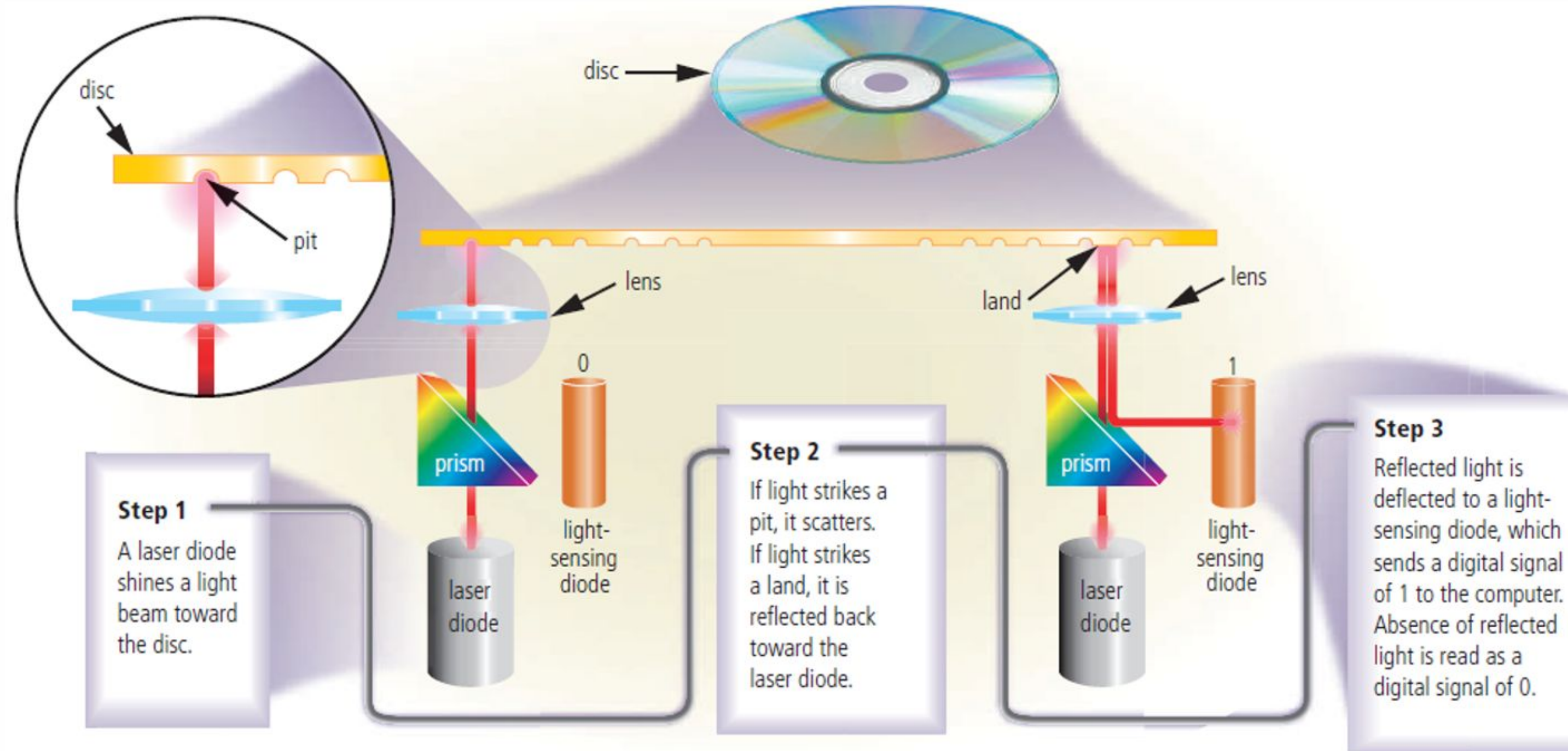
# USB

## (Universal Serial Bus)

USB 一覽表						
名稱	USB Type-A	USB Type-B	USB Type-C	Micro-USB	Mini-USB	Lightning
接頭						
應用範圍	電腦	掃描器、印表機等	電腦、手機、平板	手機、平板等	舊式可攜式裝置	Apple手機、平板

IT IS A STANDARD  
INTERFACE USED FOR  
DATA TRANSFER AND  
POWER DELIVERY  
BETWEEN COMPUTERS  
AND PERIPHERAL  
DEVICES SUCH AS MICE,  
KEYBOARDS, AND FLASH  
DRIVES.

# Optical Disc



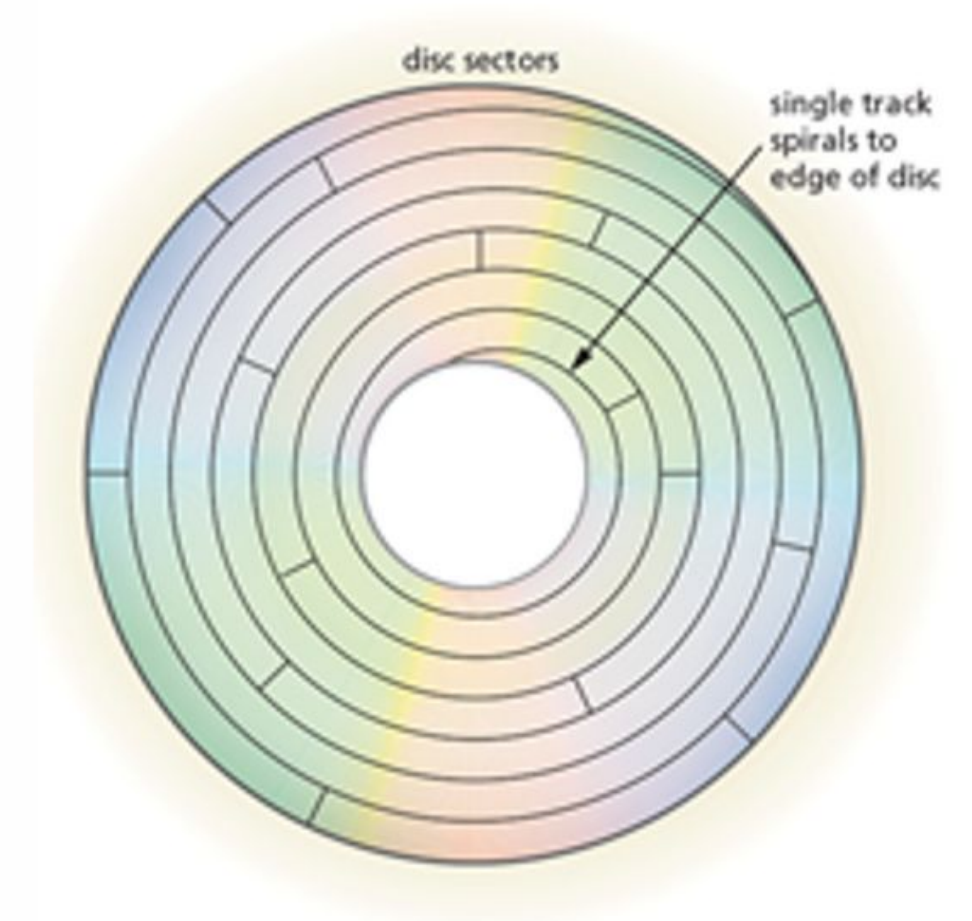
# Optical Disc

**An optical disc is a type of data storage medium that uses laser light to read and write data.**

**Its surface contains microscopic patterns of “pits” (tiny depressions) and “lands” (flat areas), which represent binary data (0s and 1s).**

**When the disc spins, a laser beam shines onto its surface:**

- **Light reflected from a land is detected as a 1**
- **Light reflected from a pit interferes destructively and is detected as a 0**





# magnetic stripe card



磁帶卡

## MAGNETIC STRIPE CARDS

磁帶卡是一種磁記錄介質卡片。它由高強度、耐高溫的塑料或紙質塗覆塑料製成,能防潮、耐磨且有一定的柔韌性,攜帶方便、使用較為穩定可靠。



# magnetic stripe card

A magnetic stripe card is a plastic card with a **magnetic stripe** on its back that stores data.

It's widely used in credit cards, debit cards, access badges, student IDs, and transit cards.

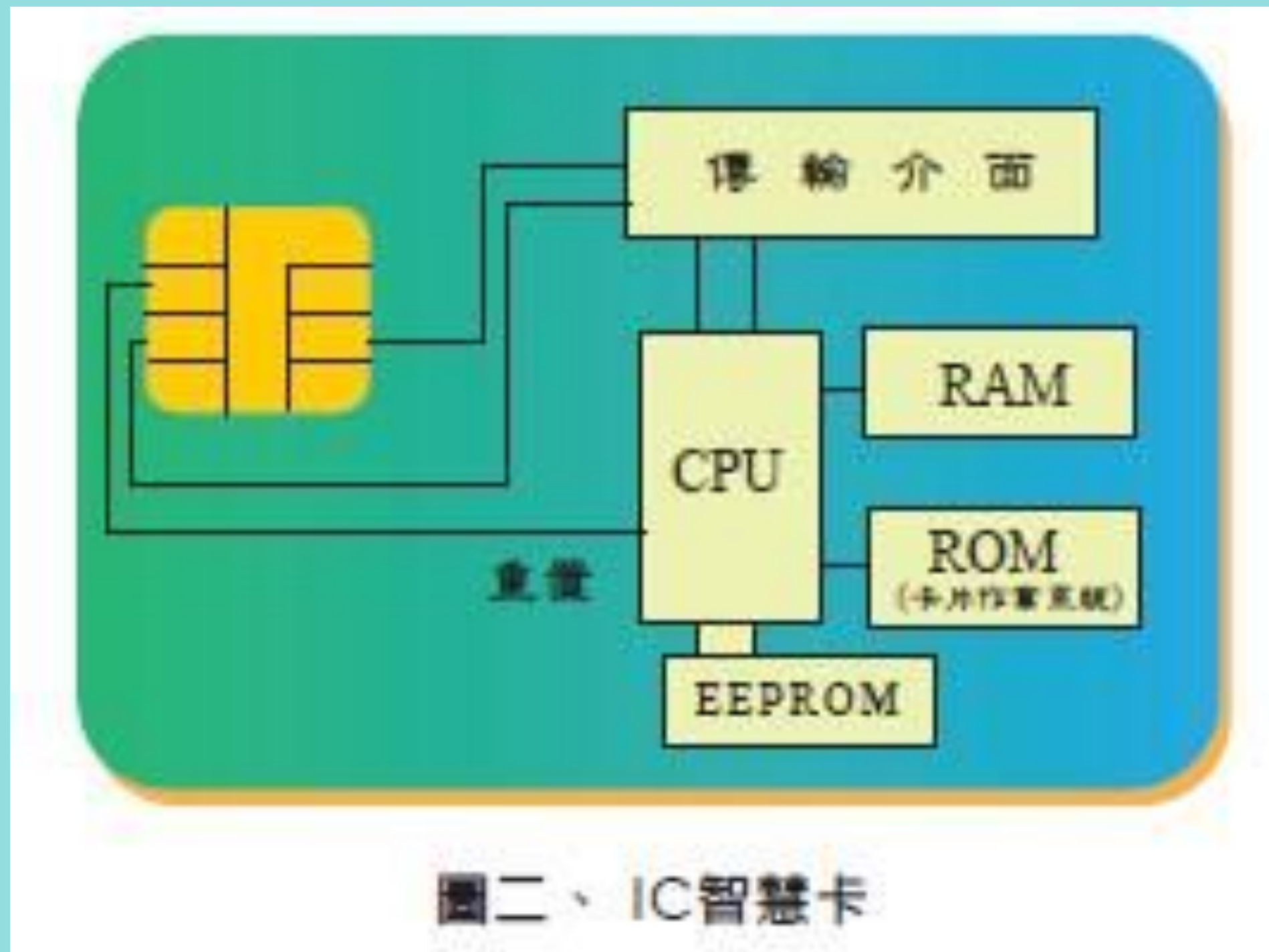
The magnetic stripe is made of **tiny ferromagnetic particles**,

which can be magnetized in different directions to represent binary data (0s and 1s).

When the card is swiped through a magnetic card reader, the read head detects the changing magnetic fields and converts them into electrical signals, which are then decoded into digital information.



# smart card





# smart card

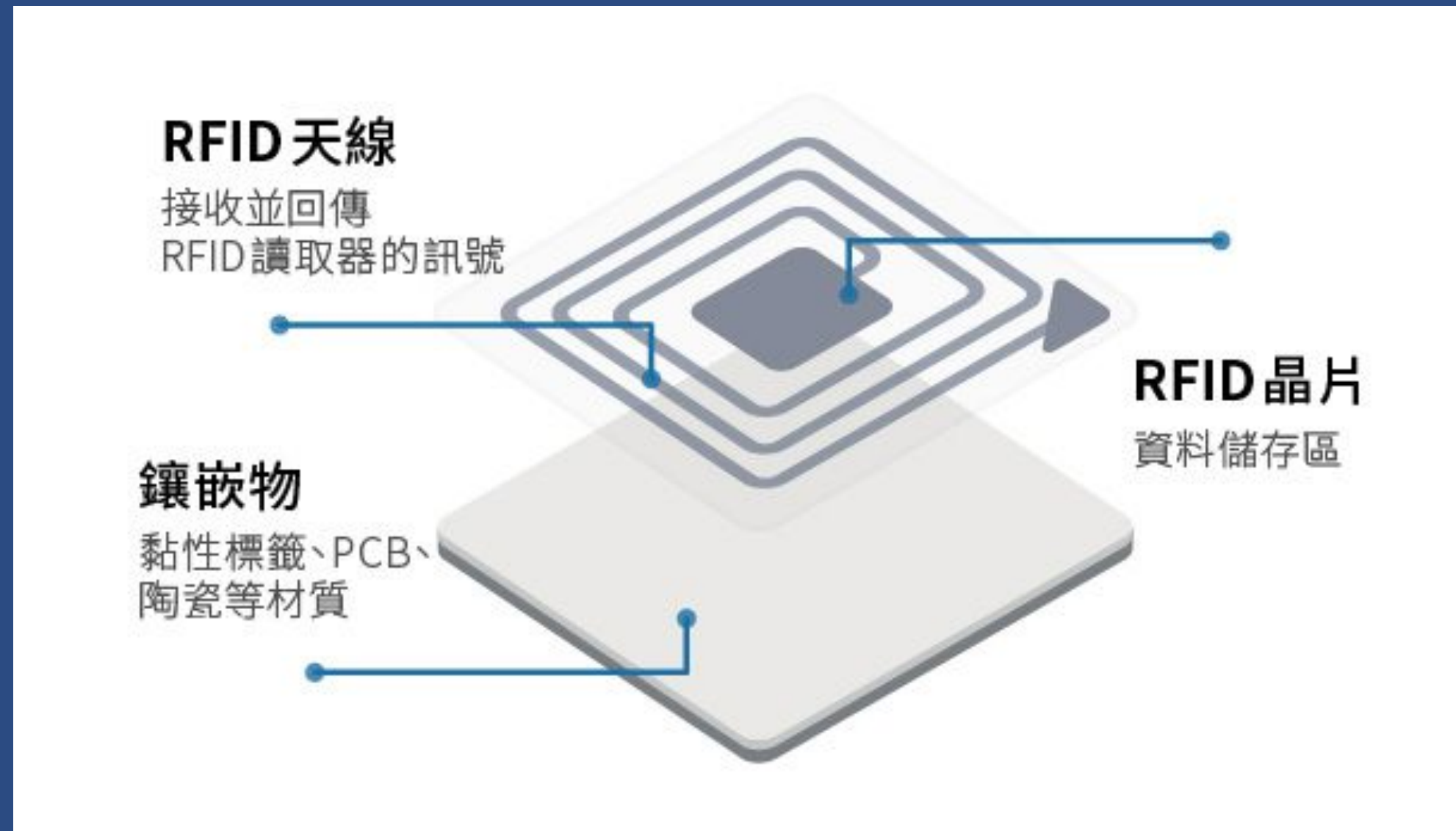
A smart card is a plastic card embedded with a microchip that can store data, process information, and perform secure authentication.

Unlike traditional magnetic stripe cards, a smart card doesn't just store data — it contains a microprocessor and memory, allowing it to perform computations such as encryption and identity verification, providing much higher security.

Smart cards are widely used in banking, SIM cards, ID cards, access control, and transportation systems.

# RFID

## (Radio Frequency Identification)



# RFID

## (Radio Frequency Identification)

RFID (Radio Frequency Identification) is a technology that uses radio waves to identify, track, or manage objects.

It consists of three main components:

1. **RFID Tag** – contains a microchip and an antenna to store information such as product ID or identification codes.
2. **RFID Reader** – sends out radio signals and receives data transmitted from the tag.
3. **Host System** – processes and manages the collected data.

The key advantage of RFID is its contactless nature — the tag can be read without physical contact or line of sight.

This makes it widely used in logistics management, access control, electronic tickets, animal tracking, and smart retail systems.





# NFC (Near Field Communication)

It is a short-range wireless communication technology that enables data exchange between two devices when they are very close (typically within 4 cm).

It evolved from RFID technology, but offers more advanced, two-way communication, allowing both reading and writing of data.

# Cloud Storage

GOOGLE:每個雲端硬碟只有15GB  
沒了你必須花錢買擴充容量

我：\*辦很多GOOGLE帳號  
開共用雲端硬碟\*



by 梗圖魔術師

現代問題使用現代手段  
Modern problems require modern solutions



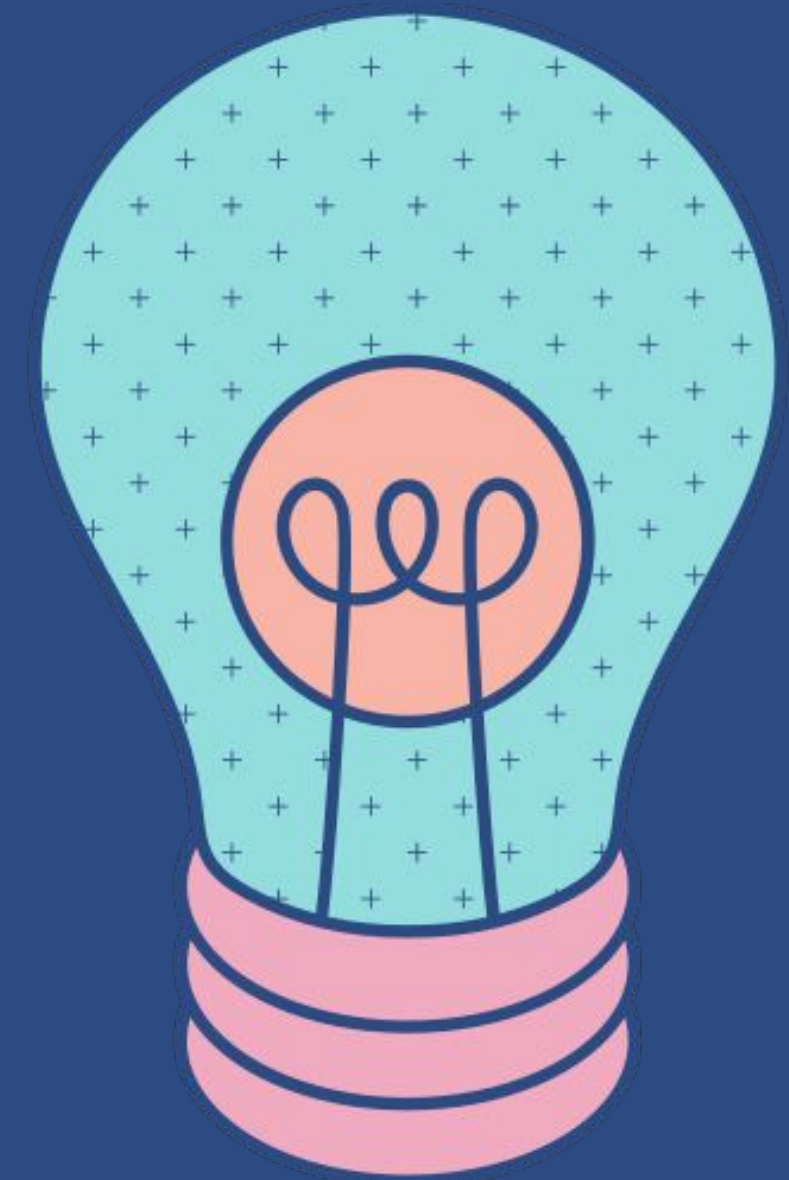
# Cloud Storage

Cloud storage is a model of data storage in which digital information is saved on remote servers accessed through the internet. These servers are managed, operated, and maintained by cloud service providers. Instead of storing files on local devices, users upload and retrieve data from distributed data centers located in different regions.



# SUMMARY

- Variety of storage options
- Storage capacity and storage access times
- Characteristics of hard disks, SSDs, external hard drives, and RAID
- Portable flash memory storage
- Advantages and various uses of cloud storage
- Characteristics of optical discs
- Enterprise storage options
- Magnetic stripe cards, smart cards, RFID tags, and NFC chips and tags





Windows - 應用程式錯誤



0x00402b06 指令參考的 0x00000004 記憶體，該記憶體不能為 written。

請按 [確定] 終止程式。

確定

遊戲未儲存死當  
Kill me now pleeeeeeze



**THE END**  
**THANK YOU!**