檔案處理期中

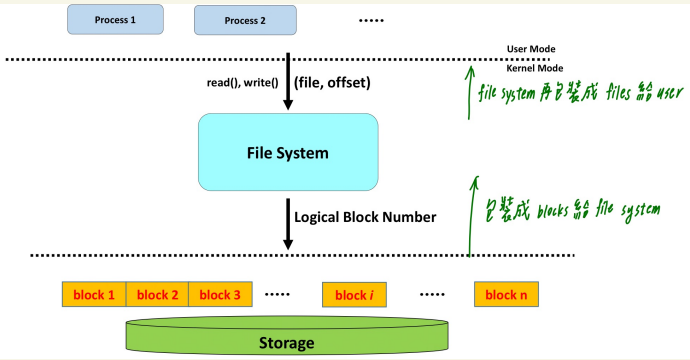
Chapter 11

一、Mass Storage Structure

1. Disk interface：對 OS 而言，硬体看起來的樣子

① Logical blocks ⇒ Logical Block Number (LBN)、LBA

②



2. Hard Disk Drives

① Delay 的part：speed：rotation per min (RPM)

(a) rotational delay (b) transfer time (c) Seek time ← 將 arm 移到 desired cylinder

⇒ access time = seek time + rotational delay + transfer time

⇒ 計算：該要送 4KB 的 file

	Cheetah 15K.5
Capacity	300 GB
RPM	15,000
Average Seek	4 ms
Max Transfer	125 MB/s
Platters	4
Cache	16 MB
Connects via	SCSI

若是 sequential 就不用再找一次 (值就可以固定)

$T_{seek} = 4ms$

$T_{rotation} = \frac{1}{2} \times \frac{1}{15000} \times 60 \times 1000 = 2ms$

$T_{trans} = \frac{4 \times 2^{10}}{125 \times 2^{20}} = 0.032 \times 2^{-10} s$ → 小到可忽略

$\therefore T_{I/O} = 4ms + 2ms = 6ms$

$Throughput = 4KB / 6ms = 0.66MB/s$

② 總結：傳愈多愈好 (最好還是 sequential)

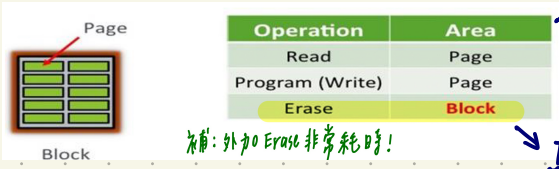
3. Nonvolatile Memory Devices (NVM)：斷電後資料仍存在 ex. ROM、Flash

① Sol：NAND flash memory，forms：SSD

② pros：因為沒有機械裝置，phlx.....

cons：貴、less capacity、block 被 erase 的次數有限

③ 一些特性：



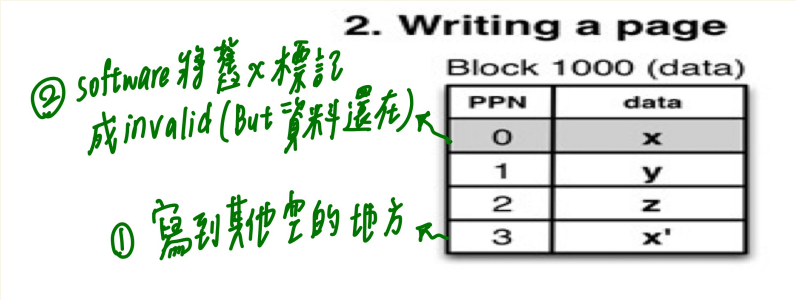
只能 read / write / erase，不能 overwrite (傳統 HDD 可 overwrite)

甚至 erase 只能一次 erase entire block

④ How to handel overwrite?

(a) In-place update X 要copy 2次

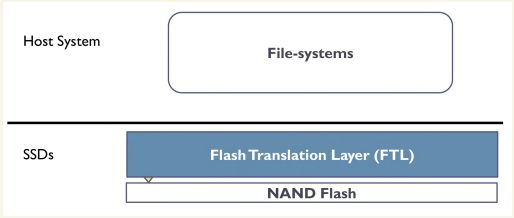
(b) Out-of-place update V ∴ logical block的位置會變



⇓

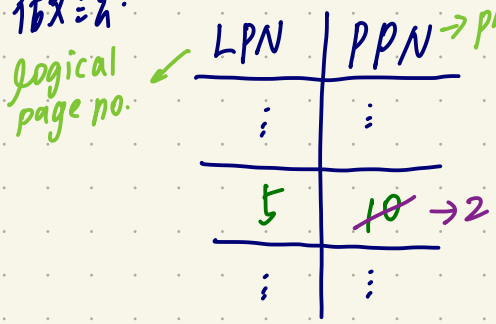
File system for HDD不能直接用在SSD.

⑤ FTL (Flash Translation Layer): 把SSD的out-of-place包裝成 in place 給 O.S. (file sys.)



(a) 做 address mapping: 把 logical block ⇒ physical page location

(b) 做法:



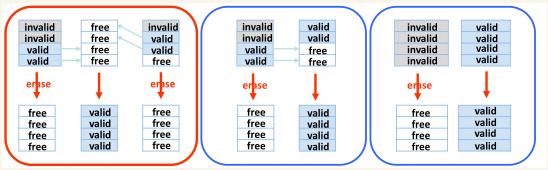
① OS發出 write (5, A) → 寫A到file裡

② OS又發 write (5, B)

(會有software將 page 10 記為 invalid)

(c) Garbage collection (when No free space available)

會造成write Amplification → user發一個write request, 但實際上可能伴隨其他 read/write/erase



∴ 要準備 over provisioning space for GC

4. Volatile Memory → ex. RAM (SRAM、DRAM)

① DRAM used as 高速 temporary storage device

5. Secondary Storage connection Method

① 連接方式：Bus，又分成

(a) system bus (memory bus)：handeled by northbridge ⇒ memory controller hub

↳ 連接 CPU、memory、高速的device

(b) I/O bus：handeled by southbridge ⇒ I/O controller hub

↳ 連接周邊的slow devices (ex. SATA、USB)