

FAT - File allocation table

10ⁿ 9 6 3 -3 -6 -9

Filename First block Size

Metadata: owner, last open

Inode

- file metadata.

12 pointers X

direct pointers

4KB blocks
up to 481KB

Block FAT12 FAT16 FAT32
Next Block 12 bit 16 bit 28 bit

Boot | FSINFO | RESERVED | FAT1/2 | ROOT | FILES

Byte

0-0 1st Filename / 0x00 or 0x05 not used.

1-10 remaining char of file name. (7+3)

11-11 file attribute read only / hidden

12-12 reserved

13-19 Creation and access time info.

20-21 high 2 byte of the first cluster

22-25 write time info.

26-27 low 2 byte of first cluster

28-31 File size. ($2^{32} = 4G - 1$)

- 1, 2, 3 levels

(1024 pointers X 4KB blocks)

4MB @ 2

4GB @ 3

4TB @ 4

12×2^x

$+ 2^x / 4 \times 2^x$

2^x - block size

$+ (2^x / 4)^2 \times 2^x$

4 - 32 bits

$+ (2^x / 4)^3 \times 2^x$

0-1 file type and permission

2-3 user ID

4-7 lower 32 bit of file size in bytes

8-23 Time info

24-25 Group ID

26-27 Link count.

40-87 12 direct blocks

80-91 1 level

92-95 2 -

96-99 3 -

08-111 upper 32 bit of the file size

Dir entry

0-3 inode number

4-5 length of entry.

6-6 length of file name. 7-7 file type

8+ ASCII name. (255)

big little 0x00000000

a | 0A 0D long file name LFN

a+1 | 0B 0C byte

a+2 | 0C 0B

a+3 | 0D 0A

0-0 sequen Number

1-10 File name char. (5)

11-11 File attribute (0x00)

12-12 reserved

13-13 checksum

14-25 name (6)

26-27 reserved.

28-31 name (2)

0x40 or with 0x40

In - 硬链接. rm -f 删不掉

In - 软链接. rm -f 删了

NTFS New Tech - File system

B-Tree

bind addr

① compile time gcc

② load time unix "ld"

③ execution time dynamic lib

MMU = memory management unit

Base and bound cons: 外存地址

Segmentation: Code, Data, stack

Page table (each process have one)
in memory.

$\boxed{\text{Vpg}} \boxed{\text{offsec}} \Rightarrow \boxed{\text{Rpg}} \boxed{\text{offsec.}}$

cons, big to store.

multi-level - page table.

Cache [compulsory, Capacity, Conflict, Coherence] Bandwidth = $\frac{n}{S + \frac{n}{B}} = \frac{B}{1 + \frac{B \cdot S}{n}}$

Average Access time

= hit rate \times hit time + miss rate \times miss time

TLB "Translation lookaside Buffer"

$\frac{\text{Block Addr}}{\text{tag} \quad | \quad \text{index}} \quad \boxed{\text{block sec}}$

TLB 在 context switch 时清除

Synchronous exception - trap.

Asynchronous exception

Direct Mapping 2^n byte cache.

Tag / Index / Select.

entry index. byte in one entry.

N way set associative.

Fully Associative.

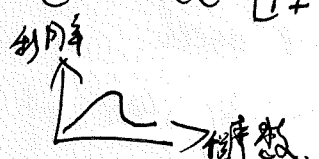
Write through / Buffer.
(缓冲)

Page Replacement Policies.

FIFO / MIN. Random

LRU

Second-chance [FIFO + LRU]

Trashing 

DMA - Direct memory Access

User program \rightarrow kernel I/O subsystem

Device Driver Top half \rightarrow

Device Driver Bottom half \rightarrow

Device hardware

latency (n) = $S + \frac{n}{B}$

S - start up

Cylinder - track - sector

Seek time, Rotation time, transfer time

Disk latency = Queue + Controller +
seek + Rotation + xfer

Little's Law arriving. response time.

$N(\text{jobs}) = \lambda(\text{jobs/s}) \times L(S)$

$\mu = 1/T_{\text{service}} \quad \lambda = 1/T_{\text{arrival}}$

$U = \lambda/\mu = \lambda \cdot T_{\text{service}} \quad T_g = T_{\text{ser}} \cdot \frac{U}{1-U}$

$\bar{N} = \frac{u}{1-u}$ 平均队列长度. $L_q = \lambda \cdot T_g$

$T_{\text{sys}} = T_g + T_{\text{ser}}$