

INTERNAL FRAGMENTATION

Ex. Pages = 2048 Bytes

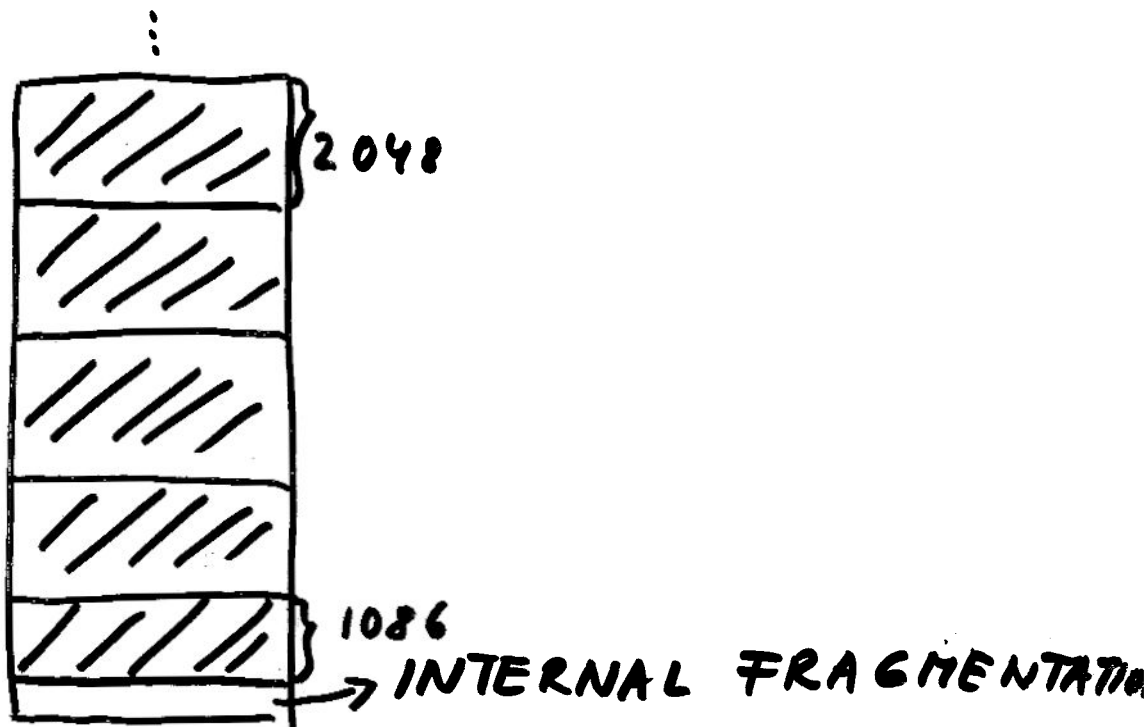
Process has = 72,766 bytes

⇒ needs 35 pages + 1086 bytes

⇒ physical memory allocation

36 frames with last frame

$2048 - 1086 = 962$ bytes free!



PAGING EXAMPLE

Take page = 4 bytes = 2^2

Take logical address space = 16 bytes = 2^4

Take physical memory = 32 bytes = 8 pages

⇒ logical address:



m - n n
4 - 2 2

consists of
2 bits representing
page number

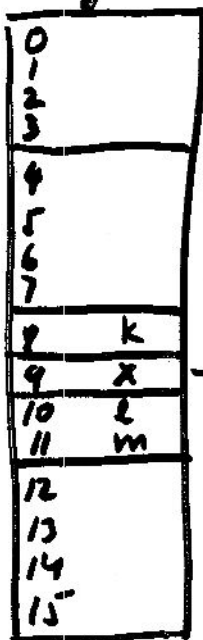
2 bits representing
page offset

Example: Page 1, Offset 3 will be represented



logical m.

P d

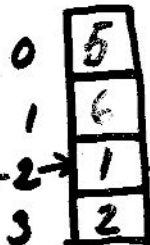


take log. address

9 1



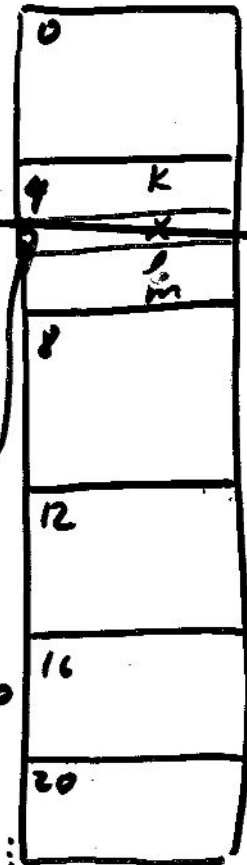
page 2
offset 1



page table

$$(1 \times 4) + 1 = 5$$

phys. address



Physical mem.

Effective Access Time

Ex. 1
Assume: 80% hit ratio

search in associative
registers

100ns access to memory

⇒ Effective Access time =

$$0.8 * (100 + 20) + 0.2 (2 * 100 + 20)$$

$$= 140 \text{ ns}$$

⇒ 40% slowdown in memory access time (from 100 ns to 140 ns)

Ex. 2 98% hit ratio

⇒ Ef. Acc. Time =

$$= 0.98 * (120) + 0.02 (220) =$$

$$122 \text{ ns}$$

⇒ 22% slowdown