Subject : ~ Sheet 6 ~ Date :

(11) word address = 8 bit Cache = 16 byte

n. blocks = $\frac{16}{4}$ = 4 blocks

tag	block	offset
4	2	2

(a) * what is the hit ratio ?!

0x66 : 0110 1110 M
0x17 : 0001 0111 M
0x4E : 0100 1110 M
0x50 : 0101 0000 M
0xAB : 1010 1000 M
0xAB : 1010 1011 H
0x93 : 1001 0011 H

0xB9 : 1011 1001 M
0xE0 : 1110 0000 M
0x4f : 0100 1111 H
0x91 : 1001 0001 M
0xA9 : 1010 1001 H
0xAD : 1010 1101 M
0x94 : 1001 0100 M

B0 → 1110 → 0100 → 1001
B1 → 0001 → 1001
B2 → 1011 → 1010
B3 → 0110 → 0100 → 1010

∴ hit ratio = 4 hit out of 14 accesses = $\frac{4}{14}$ % = 28.6%

(b) what memory block will be in the cache after the last address has been accessed?

B0 , with tag 1001 Contain: 0x90, 0x91, 0x92, 0x93
B1 , ~ ~ 1001 ~ : 0x94, 0x95, 0x96, 0x97
B2 , ~ ~ 1010 ~ : 0xA8, 0xA9, 0xAA, 0xA8.
B3 , ~ ~ 1010 ~ : 0xAC, 0xAD, 0xAE, 0xAF.

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(12) memory size: 256 = 2^8 byte.
address: 8 bit , cache = 4 blocks.

tag	block	offset
3	2	3

		direct	fully	set-way
0X2C	0010 1100	M	M	M
0X6D	0110 1101	M	M	M
0X86	1000 0110	M	M	M
0X29	0010 1001	M	H	H
0XA5	1010 0101	M	M	M
0X82	1000 0010	M	H	H
0XA7	1010 0111	M	H	H
0X68	0110 1000	M	H	H
0X80	1000 0000	M	H	H
0X2B	0010 1011	M	H	H

Direct:

B_0	00	~~100~~	~~101~~	~~100~~	~~101~~	100 → 0X80
B_1	01	~~001~~	~~011~~	~~001~~	~~011~~	001 → 0X28
B_2	10					
B_3	11					

B_0 of cache contain ~~the~~ memory block with address 80 , tag of 100.
B_1 ___ 2B ___ 001
hit ratio = 10 misses out of 10 access = 0

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* fully associative :-

tag	offset
5	3

00101
01101
10000
10100

hit ratio = 6 hit out of 10 accesses.
= 60 %

* set associative :-

tag	set ~~tag~~	offset
4	1	3

set [0]

B0	1000
B1	1010

set [1]

B0	0010
B1	0110

hit ratio = 6 out of 10 accesses.

« Virtual memory »

لو عاوز أشغل أكثر من Program في نفس الوقت أو أشغل Program حجمه كبير والـ RAM صغيرة فالـ operating system بيوهم الـ Processor إن الـ RAM كبيرة بإنه يحط جزء من الـ disk كأنه virtual memory.

يعني لو الـ Program حجمه 6GB والـ RAM = 4GB فالـ operating sys هيوهم المعالج بإن الـ RAM حجمها 6GB (ويكتب الـ 2G الباقيين على الـ disk أو أي ذاكرة ثانوية تانية) مع إن في الأصل الـ RAM متسجل عليها 4GB فقط.

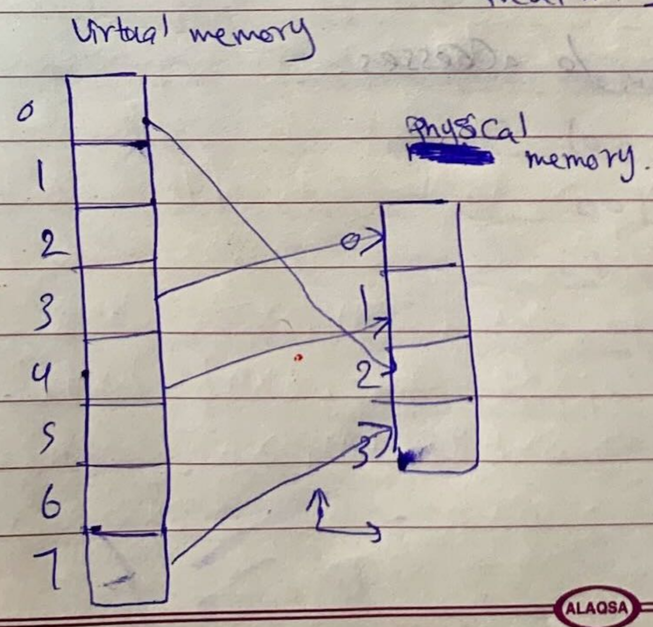
Virtual address / logical address.

الـ address اللي بـ الوهم دا.

- الـ main memory بتتقسم لجوء من الـ frames (
  الـ virtual " " " Pages

frame size = Page size

Page table: بيحدد كل Page في الـ virtual هتروح لأنهي frame في الـ main.



	fram	valid bit
0	2	1
1	–	0
2	–	0
3	0	1
4	1	1
5	–	0
6	–	0
7	3	1

العملية دي بيسموها → Paging.

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* Process of size 8 byte , Page size = 2 byte.

∴ n of Pages = $\frac{8}{2}$ = 4 Pages

Virtual address →

Page	offset
2	1

Physical address →

frame	offset

* Page fault → Valid bit = 0.

eX: Virtual address space = 8 K , Physical address space = 4 K

Page size = 1K = 1024 = 2^{10}

∴ n.of Pages = $\frac{8K}{1K} = \frac{2^3 * 2^{10}}{2^{10}} = 2^3$ Pages

Virtual address

Page	offset
3	10

n. of frames = $\frac{4K}{1K} = \frac{2^2 * 2^{10}}{2^{10}}$ = 4 frames

Physical address

frame	offset
2	10

	frame	valid bit
0	–	0
1	3	1
2	0	1
3	–	0
4	–	0
5	1	1
6	2	1
7	–	0

logical address : 101 0101001011 (101 = 5)

∴ Physical address هيروح لل

01 0101001011

لأن ال Page (5) 101 راحت لل frame (1) = 01 .

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ex (20) in sheet (6)

n.of Pages = 8 Page , Page size = 64 byte.

- Virtual size = $2^3 * 2^6 = 2^9$ byte.
- Virtual address bits = 9 bits.
- Physical memory size = $2^2 * 2^6 = 2^8$ byte.
  n. of frames ↵
  = n.of bits of Physical address
  = 8 bit

0X00 = 000 00 0000 → Physical address 0100 0000

0X44 = 010 00 0100 → 1100 0100

0XC2 = 110 00 0010 → 0000 0010

0X80 = 100 00 0000 → generate Page fault.