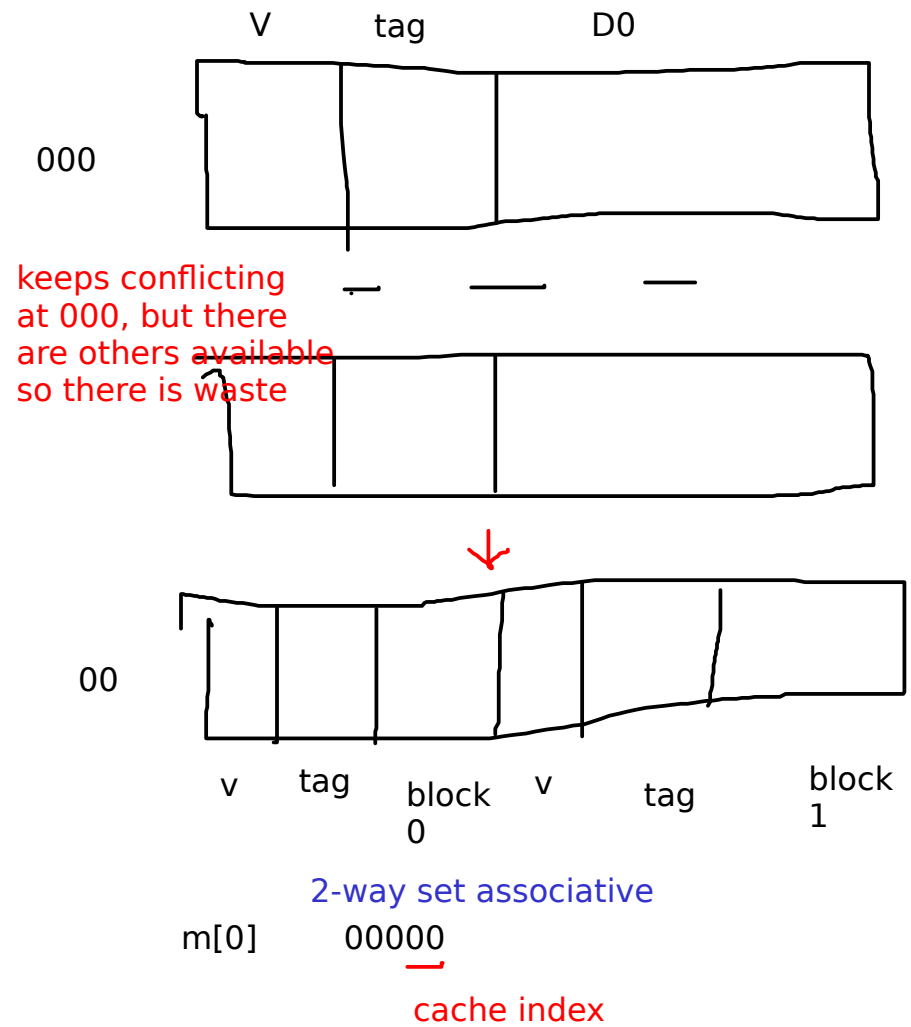
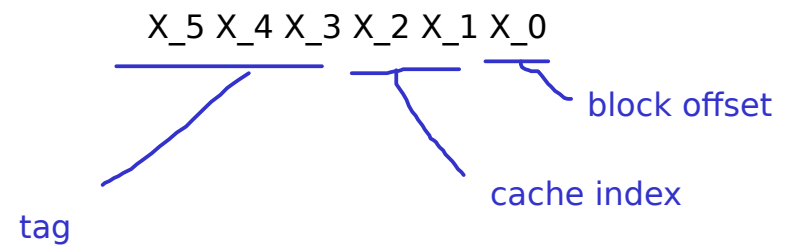
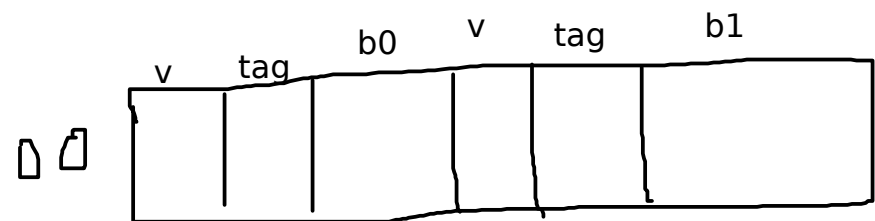
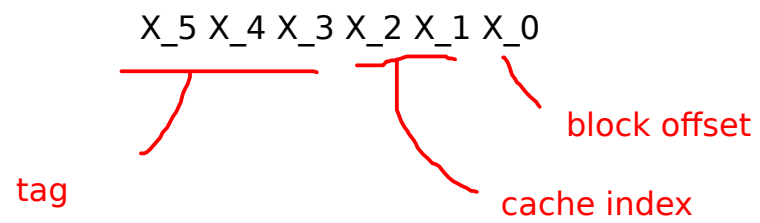
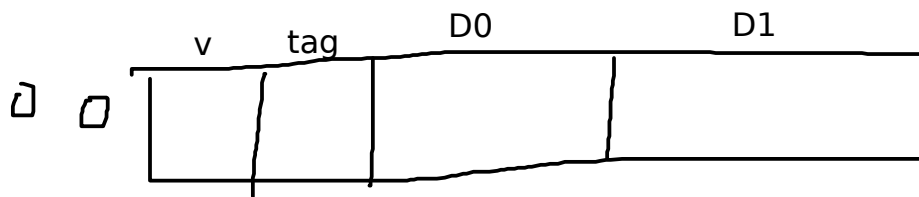


set: set of blocks that shares the same index



2-way, 4-way, 8-way, etc...



block size = 1

available

2-way

block size = 2

number blocks

$$\#sets = 8 / (2+2) = 2$$

-> cache index = 1 bit

fully associative

block size = 2

1 set: no cache index

#blocks = $8/2 = 4$ blocks

[v|tag|data| v|tag|data| v|tag|data| v|tag|data|

[v|tag|d0|d1| v|tag|d0|d1| v|tag|d0|d1| v|tag|d0|d1|

0,1,9,0,1,9,...

$$32 = 2^5$$

- memory addr: 5 bits

set

tag: x4x3x2

cache index: x1x0

direct

tag: x4x3

cache index: x2x1

block offset: x0

fully associative

tag: x4x3x2x1

block offset: x0

2-way

tag x4x3x2

cache index: x1

block offset: x0

accesses:

0 00000
1 00001
9 01001
0 00000
1 00001
9 01001

set associative

index	v	tag	b0	v	tag	b1
00	1	000	m[0]			
01	1	000	m[1]	1	010	m[9]

0 miss
1 miss
9 miss
no misses after

direct

index	v	tag	d0	d1
00	1	00	m[0]	m[1]
9-> replace in 00, becomes				
00	1	01	m[8]	m[9]

0 miss
1 hit
9 conflict, miss
keeps getting misses -> competing for the same block
miss rate = 2 / 3

fully associative

v	tag	d0	d1	v	tag	d0	d1	v	tag	d0	d1	v	tag	d0	d1
1	0000	m[0]	m[1]	1	0100	m[8]	m[9]								

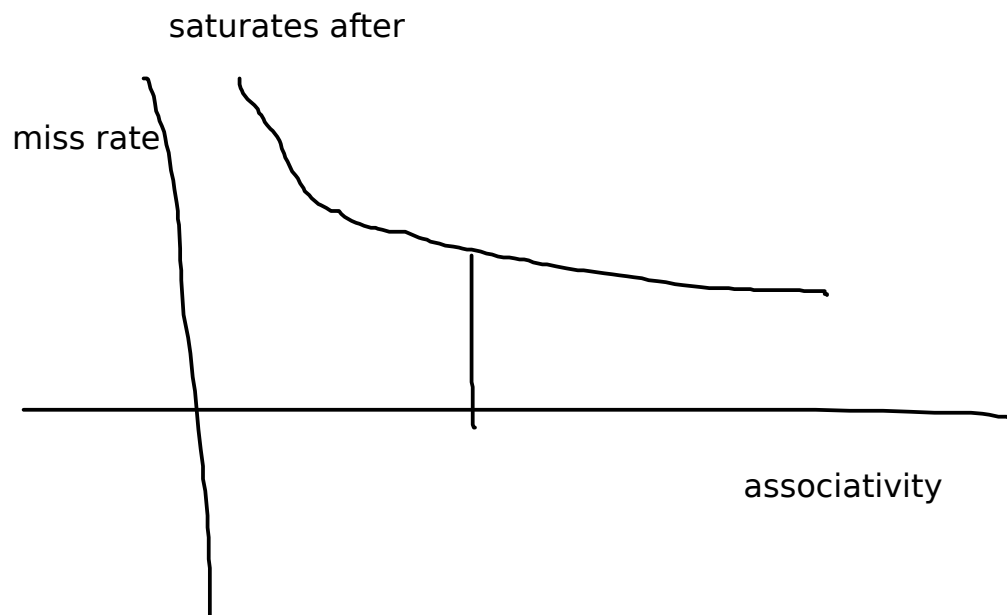
0 miss
1 hit
9 miss
no more misses

2-way

index	v	tag	d0	d1	v	tag	d0	d1
0	1	000	m[0]	m[1]	1	010	m[8]	m[9]

0 miss
1 hit
miss

block size = 1



cache sys 1
cpu
cache
memory

cache sys 2
cpu
L1 cache
L2 cache
mem

$$\begin{aligned} \text{AMAT}(1) &= 0.2\text{ns} + .02 * 100\text{ns} \\ &= 2.2\text{ns} \end{aligned}$$

$$\begin{aligned} \text{AMAT}(2) &= 0.2\text{ns} + .02 * (5\text{ns} + 0.05 * 100\text{ns}) \\ &= 0.31 \end{aligned}$$

$$2.2/0.31 = \sim 7.01$$

