

3.1.2 Set-associative mapping

- 2 way SA cache

Example 1 - MM Size = 2^{24} words

Byte offset

1 block = 4 bytes = 2^2 B

Word offset

1 word = 1 B = 2^0 B

1 word = 1 byte words = 2 words

Cache = 1K blocks = 2^{10} blocks = $2^{10} \cdot 2^2$ B = 2^{12} B = 4K B

1K blocks set associativity = $\frac{2^{10} \text{ blocks}}{2^1 \text{ blocks/index}} = 2^9$ indexes

Tag	Index	Word offset
23	11 10	2 1 0
<13>	<9>	<2>

Address	M2	Block number
0	0 1 2 3	0
4	4 5 6 7	1
8		2
...		...
4092		1023
4096		1024
4100	2715	1025
...		...
8192	230	2048
...		...
12292	170	3073
...		...
$2^{24}-4$		$2^{22}-1$

$$2048 \bmod 512 = 0$$

$$2^{11} = 2048$$

$$2^{12} = 4096$$

$$2^{13} = 8192$$

$$2048 + 1024 = 3072$$

$$3073 = 3 \times 1024 + 1$$

$$= 6 \times 512 + 1$$

V	Tag	Data
0	<1>	<13>
1	<1>	<13>
...
511

Bank 0

0
1	1	6
...
511

Bank 1

Address	Tag	Index	Word offset
8192	0...000100	0000000000	00
4100	0...000010	0000000001	00
12292	0...000110	0000000001	00

$$8192 + 4096 = 12288$$

$$12288 + 4 = 12292$$

$$12292 = 2^{13} + 2^{12} + 4$$