

## Example on Placement problem

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A) Using all placement techniques to determine the no. of bits in each field in the address depending on the following information:

Size of M.M= 64 KW.

Size of Cache= 2 KW.

Size of block = 16 W.

Size of set = 2 block.

Sol:

The first think you should take into account is the size of memories, they must be in word unit. In this question there is no problem .

Length of address = 16 bits.

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Direct method

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1- Word field : from the block size:

Size of block = 16 W=  $2^4$  --> 4 bit for this field.

2-Block field (it is computed from the no. block):

No .of block= size of cache/ size of block

$$= 2\text{kw} / 16 \text{ w}$$

$$= 2^{11}/2^4$$

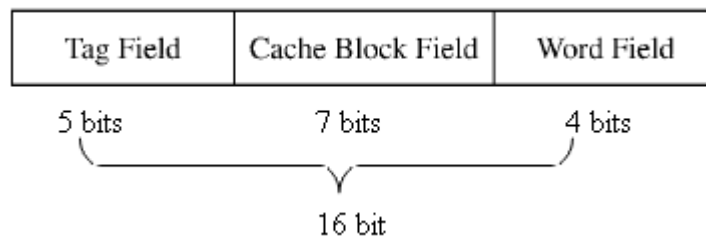
$$= 2^7 \text{--> } 7 \text{ bits in block field.}$$

3- tag field= address length- sum of other fields

$$= 16 - (\text{block} + \text{word})$$

$$= 16 - (7 + 4)$$

$$= 5$$



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2) Full associative

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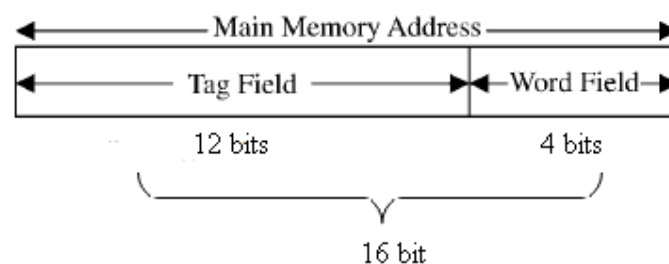
1- Word field : is constant in all methods = 4 bits

3- tag field= address length- sum of other fields

$$= 16 - (\text{word})$$

$$= 16 - (4)$$

$$= 12$$



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3) Set associative:

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1- Word field : is constant in all methods = 4 bits

2-set field (it is computed from the no. sets in cache):

No .of sets= no. of block in cache/ no. of block in set

$$= 2^7 / 2$$

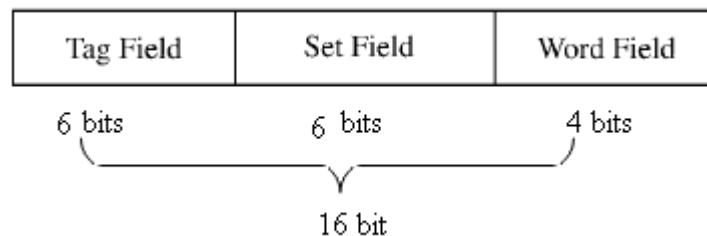
$$= 2^6 \rightarrow 6 \text{ bits in block field.}$$

3- tag field= address length- sum of other fields

$$= 16 - (\text{set} + \text{word})$$

$$= 16 - (6 + 4)$$

$$= 6$$



B) Draw the address format with pointing the number of bits for each field using the all placement algorithms. Suppose that:

Size of M.M= 1 MB.

Size of Cache= 4 KB.

The block contains 2W.

There are 4 blocks in each set.

Sol:-

The first think you should take into account is the size of memories, they must be in word unit. In this question we need conversion for both memories:

$$\text{Size of M.M} = 1 \text{ MB} = 2^{20} \text{ B} = 2^{20} \text{ B} / 2 \text{ B} = 2^{19} \text{ W}$$

$$\text{Size of cache} = 4 \text{ KB} = 2^{12} \text{ B} = 2^{12} \text{ B} / 2 \text{ B} = 2^{11} \text{ W}$$

Length of address = ----- bits. How?

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## Direct method

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1- Word field : from the block size:

Word field = ----- bit for this field.

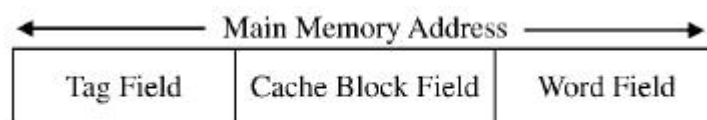
2-Block field (it is computed from the no. block):

No .of block = size of cache/ size of block

= ----- .so, there are ----- bits in block field.

3- tag field= address length- sum of other fields

= -----



Direct-mapped address fields

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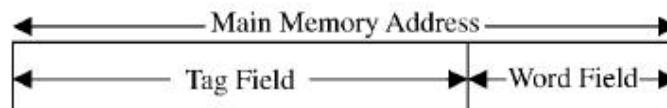
## 2- Full associative

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1- Word field : is constant in all methods = ----- bits

3- tag field= address length- sum of other fields

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Associative-mapped address fields

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## 3- Set associative:

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1- Word field : is constant in all methods = ----- bits

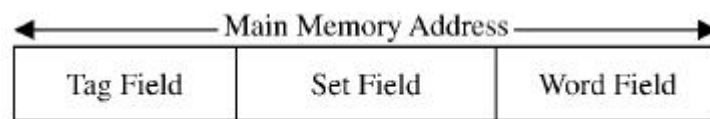
2-set field (it is computed from the no. sets in cache):

No .of sets= no. of block in cache/ no. of block in set

= -----,so, there are ----- bits in set field.

3- tag field= address length- sum of other fields

= -----



Set-associative-mapped address fields