

# *Documentation*

## ENDSEM Assignment Bonus Assignment

### Cache Memory

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# Cache Assignment

Cache is a very integral part of processor. This is a part of CPU. Since, data stored in hard disk are at very large quantity. But for fast functioning of processor, we need a device which stored frequently coming data easily and provide this to the processor whenever ask. So the cache is constructed. This has less storage capacity but work as a linker between processor and hard disk. Cache stored address as a block and block is a collection of data. Cache mapped data in 3 way.

1. **Direct Mapping**
2. **Associative memory**
3. **n-way set associative memory where n is a power of 2**

## Direct Mapping

In this type of mapping every block has specific line in cache. Means, every block follow the rule of " **$n \bmod k$** " where n is the place of block and k is the length of cache.

## Associative memory

In this type of mapping, Associative mapping store address and content. The speciality of this mapping is that every block can go in any line.



# n-way set associative memory

This type of mapping is a mixture of both direct mapping and associative mapping. First of all cache size is divided into  $n$  set. In this type of mapping every block has specific set but in that specific set we can place block in any line.

## Assumption

1. The address you take input should be in binary number.
2. All things that is taken as input in terms of bit.
3. The bit length of word should be greater than cache line bit.
4. Read stands for loading and write stands for searching.

## What Is Inside The Programming

In my program first of all I take all input number such that all number should be written in terms of length of max bit. In my program first of all I take address in binary number. If we remove offset part then it become its block number. As I get block number so easily. In direct mapping part line number can be easily separated from block number and as I get line number in cache than it is easy to store corresponding block number in cache. Now whenever read or write program call we separate line number and went to that place in cache and compare and respective result of “**Cachehit**” and “**Cachemiss**” printed. In associative mapping we go to cache line and search linearly and compare block number with Cache list element.

Similarly to the direct mapping in this type also we repeat same thing if we get corresponding block number print “Cachehit” and corresponding data else print “Cachemiss”. In n-way set associative memory type, as we know that it is a mixture of direct mapping and associative mapping, So we separate block number from the address and with block number we get the information of set. After knowing the set we easily apply associative method and get the same result as in previous case.

## **Files inside it**

1. Rohit\_2019269\_Final\_Assignment.py - Main coding file
2. Rohit\_2019269\_Final\_Assignment\_Bonus.py - Bonus part of assignment coding part

## **Bonus part**

In this part I use exclusion policy. In this policy address is first searched in cache1 and then in second cache. Now we have three case. In first, if in cache 1 we got the block then simply print “Cachehit” and cache2 got that block than brought that block int cache 1 with various mapping and print “Cachehit”. In last case if we didn’t get block in both of cache then store that block in cach1 with various mapping and do other work and print “Cachemiss”.

## **Reference**

1. Youtube
2. [https://en.wikipedia.org/wiki/Cache\\_inclusion\\_policy](https://en.wikipedia.org/wiki/Cache_inclusion_policy)

