

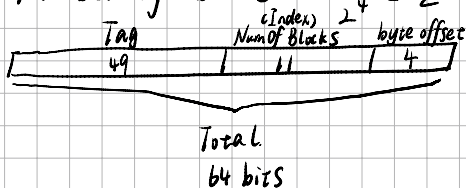
5.3

5.3.1

Cache's capacity = $32 \cdot 2^{10} = 2^{15}$ bytes.

One block = $2 \cdot 2^3 = 2^4$ bytes

Number of blocks = $\frac{2^{15}}{2^4} = 2^{11}$



Total number of bits = $(1 + 49 + 128) \cdot 2^{11} = 178 \times 2^{11}$

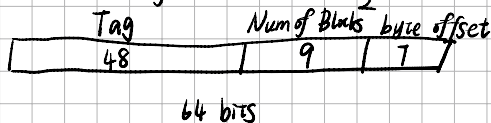
Valid bit Tag two-words data blocks number

5.3.2

Cache's capacity = $64 \cdot 2^{10} = 2^{16}$ bytes.

One block = $2^4 \cdot 2^3 = 2^7$ bytes

Number of blocks = $\frac{2^{16}}{2^7} = 2^9$



Total number of bits = $(1 + 48 + 16 \times 64) \cdot 2^9 = 1073 \times 2^9$

Valid bit Tag 16-words data blocks number

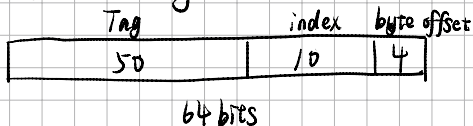
How much bigger? $\frac{1073 \times 2^9}{178 \times 2^{11}} \approx 1.507 < 2$

5.3.3

由于5.3.2中的Cache每个block为16个words, 因此虽然该Cache拥有更大的存储空间, 但是它在一个block中对word的寻址, 以及在单个block传输过程中可能有更大的时间延迟。因此5.3.2中的Cache可能性能表现不如前一个Cache。

5.3.4

32 KiB two-way set associate cache ② 5.3.1 ①



Read request:

0x61

0x10061

0x61

①:

miss Index 0x6 0x61

miss Index 0x6 0x10061

miss Index 0x6 0x61

三者index均相等

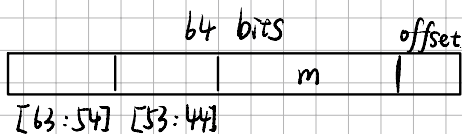
②:

miss Index 0x6 0x61

miss Index 0x6 0x10061

hit Index 0x6 0x10061

5.4



$$\text{total blocks} = 2^{20+m}$$

possible

共有 2^{10} 种运算结果 \Rightarrow 1024 Blocks

对于任意一个Index $\Rightarrow 2^{10} \cdot 2^m = 2^{10+m}$ Blocks

这样每个Index映射到的内存中Block Address 都是平均的。

Tag 变为 $m+10$ bits