Cache Addressing

An Example

A computer uses 32-bit byte addressing. The computer uses a 2-way associative cache with a capacity of 32KB. Each cache block contains 16 bytes. Calculate the number of bits in the TAG, SET, and OFFSET fields of a main memory address.

Answer

Since there are 16 bytes in a cache block, the OFFSET field must contain 4 bits ($2^4 = 16$). To determine the number of bits in the SET field, we need to determine the number of sets. Each set contains 2 cache blocks (2-way associative) so a set contains 32 bytes. There are 32KB bytes in the entire cache, so there are 32KB/32B = 1K sets. Thus the set field contains 10 bits ($2^{10} = 1K$).

Finally, the TAG field contains the remaining 18 bits (32 - 4 - 10). Thus a main memory address is decomposed as shown below.