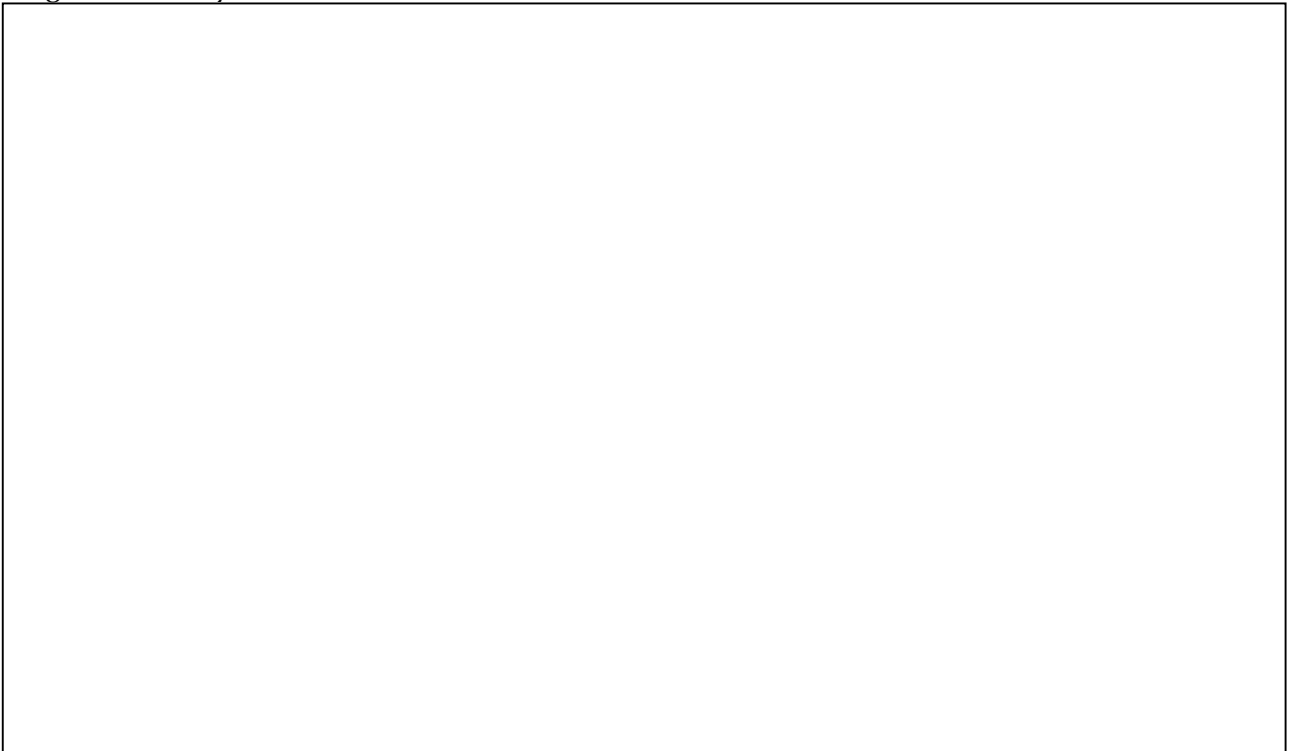


Tutorial 13: Virtual Memory

Problem 1: Virtual Memory with Paging

Consider a memory system with 32-bit Virtual Address and 2 KB pages and 16-bit physical address. Determine the number of bits in the fields corresponding to the Virtual Pages Number, Page Offset, and Physical Page Number. Also determine the number of bits in each Page Table entry.



Problem 2: Data Access in TLB

Consider a memory system shown in Figure 2, with 32-bit Virtual Address and 4 KB pages and 18-bit physical address. Determine the number of bits in the fields corresponding to the Virtual Pages Number, Page Offset, and Physical Page Number. If the TLB is 2-way set associative with 32 sets, compute the number of bits in TLB index, TLB VPN-tag and approximate number of bits in each TLB entry.

The memory system is also augmented with a 2K Byte, 16-Byte block, 2-way set associative cache that operates on physical addresses. Compute the number of bits in the offset, index, tag and the total number of bits in each cache entry.

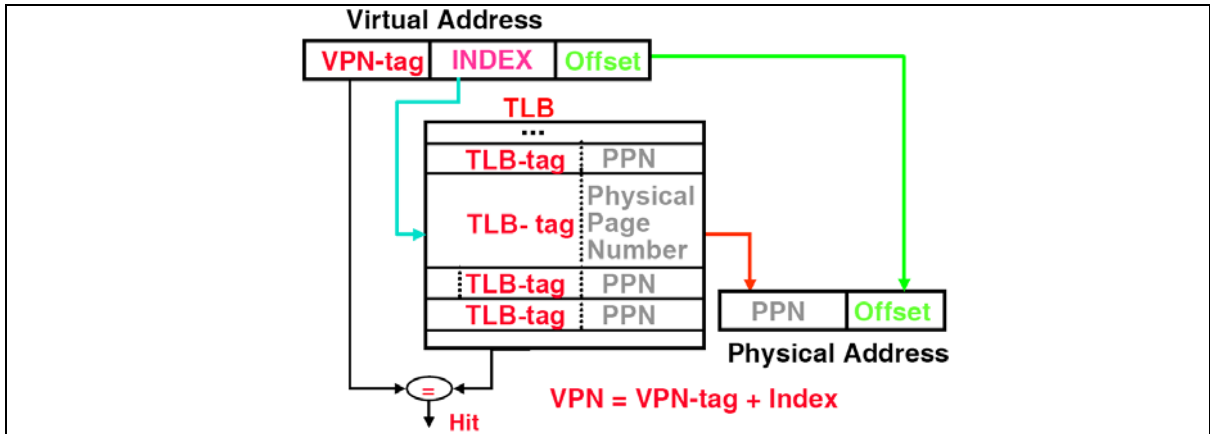


Figure 2: Organisation for 32 Set 2-Way Set Associative TLB