



Memory Management Tutorial — Solutions

1. (a) Compare *swapping* with *paging*.



- (b) Swapping is still used together with paging. Explain why.



- (c) Explain the term *dirty page* in a paging system.



- (d) Give one simple example of the use of a read-only memory page.



- (e) State one major difference between how a paging system deals with a read-only page compared with how it deals with a read-write page.



2. Referring to figure 1, briefly define the following terms:

- (a) *page*



- (b) *page table*



- (c) In figure 1 on the following page, there are additions performed indicated by a circle with a '+' inside. Where and why is this arithmetic performed?



3. A computer system has sixteen kilobyte pages and a 64-bit address bus, and 64-bit virtual addresses. In both the page table, and the page directory, entries are eight bytes in size. The system is shown in figure 1 on the next page. The following five parts of this question refer to this computer system.

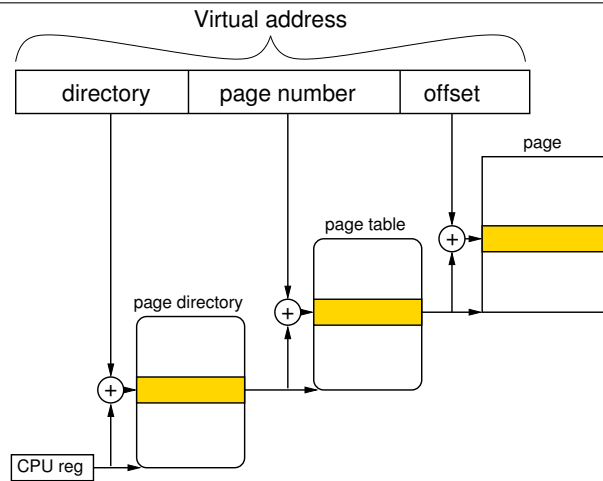


Figure 1: A method of paging.

- (a) Calculate the number of bits required for the offset part of the virtual address, showing your working.



- (b) Calculate the number of page table entries that are required.



- (c) If the page directory and page table are as nearly the same size as possible, determine the amount of RAM required to hold each one.



- (d) Briefly list one major problem with the paging scheme shown in figure 1 when used with this computer system.



- (e) Explain with the aid of a diagram an alternative paging method that overcomes the problem you listed in the previous part 3d. Show how your design overcomes the problem.



4. (a) List TWO important functions of a paging system in an operating system.

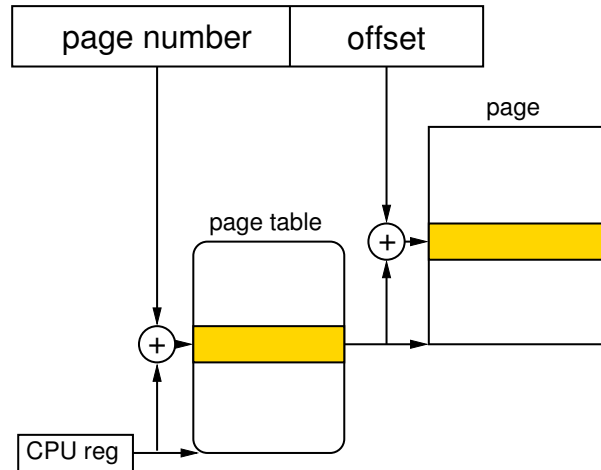


Figure 2: A method of paging.

5. A computer system has eight kilobyte pages and a 64-bit address bus. The following three parts of this question refer to this computer system.

- (a) Calculate the number of page table entries that are required.



- (b) Briefly list one major problem with the paging scheme shown in figure 2.



- (c) Explain with the aid of a diagram an alternative paging method that overcomes the problem you listed in the previous part 5b.

