Operating Systems - Review Questions 3

Deadline: Nov. 25, 2022

1. Name two differences between logical and physical addresses.

   Answer. A logical address does not refer to an actual physical address; rather, it refers to an abstract address in an abstract address space. A physical address refers to an actual physical address in memory. Alogical address is generated by the CPU and is translated into a physical address by the memory management unit(MMU). Therefore, physical addresses are generated by the MMU.

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2. Consider a logical address space of 64 pages of 1024 words each, mapped onto a physical memory of 32 frames.

   a. How many bits are there in the logical address?

   b. How many bits are there in the physical address?

   Answer.

   a. Logical address: 16 bits

   b. Physical address: 15 bits

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3. Assuming a 1-KB page size, what are the page numbers and offsets for the following address references (provided as decimal numbers).

   a. 3085

   b. 42095

   c. 215201

   d. 650000

   e. 200000

   Answer. 1-KB = 1024 bits, so

   a. page = 3; offset = 13

   b. page = 41; offset = 111

   c. page = 210; offset = 161

   d. page = 634; offset = 784

   e. page = 195; offset = 320

4. Consider a logical address space of 256 pages with a 4-KB page size, mapped onto a physical memory of 64 frames.

   a. How many bits are required in the logical address?

   b. How many bits are required in the physical address?

   Answer.

   a. $12 + 8 = 20$ bits

   b. $12 + 6 = 18$ bits

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5. Under what circumstances do page faults occur? Describe the actions taken by the operating system when a page fault occurs.

   Answer. A page fault occurs when an access to a page that has not been brought into main memory takes place. The operating system veries the memory access, aborting the program if it is invalid. If it is valid, a free frame is located and I/O is requested to read the needed page into the free frame. Upon completion of I/O, the proc