

# UNI CS 3430

## Operating Systems

### Suggested Exercise #7

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1. Suppose that you have a 32-bit machine with 4GB of physical RAM and a page size of 4 Kbytes. Assume that any unsigned integer can be a potential memory address. Also assume 4 status bits in each page table entry and segment table entry.
  - (a) How many page table entries do you need to map the entire address space of a process, with pure paging alone? What is the size (bytes) of your page table?
  - (b) Design a segmented-paging address translation scheme. Assume that a program has three segments—code, data, and stack.
    - (i) How many bits of a 32-bit virtual address are used for the offset?
    - (ii) How many bits of a 32-bit virtual address are used for the virtual segment number?
    - (iii) How many bits of a 32-bit virtual address are used for the paging?
    - (iv) Draw the flow chart of the address translation process.
    - (v) Assume that each segment currently uses 16 Kbytes, what is the total size (bytes) for your segmentation table and page tables?
2. Find a creative/funny example of caching that illustrates the benefits of caching and the types of cache misses.
3. Suppose that you have the following hardware characteristics, what is the effective access time of memory?

	Access time	Cache hit rate
L1 cache	1 clock cycle	98%
L2 cache	2 clock cycles	99%
Memory	6 clock cycles	100%