

CSCI-GA.2250-001
Operating Systems
Homework 3

1. A 128 MB memory is allocated in units of n bytes. For keeping track of free memory we can use either linked list or bitmap. For the linked list, assume that the memory consists of an alternating sequence of segments and holes, each 64 KB. Also assume that each node in the linked list needs a 32-bit memory address, a 16-bit length, and a 16-bit next node field. How many bytes of storage is required for each method? Which one is better?
2. Suppose that a machine has 38-bit virtual address and 32-bit physical addresses.
 - (a) What is the main advantage of a multilevel page table over a single-level one?
 - (b) With a two-level page table, 16-KB pages, and 4-byte entries, how many bits should be allocated for the top-level page table field and how many for the next-level page table field? Explain.
3. A student in a compiler design course proposes to the professor a project of writing a compiler that will produce a list of page references that can be used to implement the optimal page replacement algorithm. Is this possible? Why or why not? Is there anything that could be done to improve paging efficiency at runtime?
4. Systems that support sequential files always have an operation to rewind files. Do system that support random access files needs this too? Why or why not?
5. Some operating systems provide a system call *rename* to give a file a new name. Is there any difference at all between using this call to rename a file and just copying the file to a new file with a new name, followed by deleting the old one?