National University of Singapore
School of Computing

CS2106 **Tutorial 9** Semester 1 11/12

1. Give two advantages of building an application that is statically linked.

2. Suppose process A uses mmap() and map a file into memory. Another process B opens the same file using conventional method (open()/read()/write()).

   What could go wrong? Suggest a way to prevent the error without limiting the functionalities of memory-mapped files.

3. To reduce the size of the swap area on disk, a new OS is designed such that the program text is not saved in the swap area at all, but just page it in and out directly from the binary file whenever it is needed. Does it work? Does it work for data?

4. In recent versions of Linux kernel, the kernel maintains a new data structure where each memory frame has a linked list of entries pointing to every page table entries referencing the frame.

   How is this new data structure useful?

5. The x86 processor architecture supports multiple page sizes (in the form of 2^i bytes). In Linux, the kernel exploits this feature and uses pages larger than 4 KB to store kernel code and data.
   (a) Why is hardware support needed to support multiple page sizes?
   (b) Why is it useful for the kernel to use pages larger than 4 KB?
   (c) Briefly describe changes to OS memory management to support pages with variable size.