# CS490 Windows Internals

# Assignment 4

## Due: Oct 25. 2013

1. Investigate the page-replacement algorithms FIFO and LRU. Let us assume a system with four physical page frames that are initially free. Develop a diagram illustrating for both algorithms the flow of physical memory usage when pages are accessed in the order given below. Mark the occurrence of page faults within the diagram.

9 1 10 9 6 3 14 9 2 1 4 6 8 2 13 13 14 13 4 0 13 1 1 6 4

1. Given is a 32-bit computer. Let the size of a page frame be 1kByte. The OS supports a maximum of 4Gbyte physical memory. The virtual memory management uses a single level of pages tables (i.e.; each process has a single page table that maps the entire virtual address space onto the physical address space). Let us further assume that page table cannot be paged out.

Our computer has a total of 64Mbyte of physical memory. The OS uses at least 3Mbyte memory that cannot be paged out. Answer the following questions:

* 1. How many entries does a page table have?
  2. How much physical memory does a page table use? (Each page table entry shall contain the page frame number and 2 control bits.)
  3. If there are two processes running, what is the maximum size of the working set for one of these processes?

1. Suppose the page size in a computing environment is 4Kbyte. Give the page number and the offset for the following:
   1. 513 (a decimal number)
   2. 234567 (a decimal number)
   3. 0xB457 (a hexadecimal number)
   4. 0xCDEF (a hexadecimal number)
2. Explain the role of **standby**, **modified**, **free**, and **zero** page lists in the Windows memory manager.