COMP 222 Computer Organization
Assignment #4—Virtual Memory to Physical Memory Address Mapping

Objective:

- To map a process (within virtual memory) to physical memory, translating a virtual address to a physical address, involving a custom-sized page table.

Inputs:

- The total size of physical memory (in words)
- The page size (words/page)
- The replacement policy (LRU=0, FIFO=1)

Outputs:

- The corresponding physical address for a virtual address
- A message indicating a page fault (if any) in the page table
- The current contents of the page table (virtual page, page frame, last accessed cycle)

Specification:

The program translates a virtual address within a process to a physical address based on selecting from a menu of choices. Each choice calls the appropriate procedure, where the choices are:

1) Set parameters for physical memory and page table
2) Map virtual address to physical address
3) Print page table
4) Quit program

Upon entering the parameters, the page table is to be dynamically allocated based on the total number of page frames. The pages of the process will be mapped to the page frames on demand in the page frame order 0,1,2,3,…

What NOT to do (any violation will result in an automatic score of 0 on the assignment):

- Do NOT modify the choice values (1, 2, 3, 4) or input characters and then try to convert them to integers--the test script used for grading your assignment will not work correctly.
- Do NOT turn in an outdated version of the assignment downloaded from the Internet (coursehero, github, etc.) or a version that was coded by someone else (former student, tutor, etc.)
- Do NOT use any self-created or external libraries that cannot be located/utilized by zylabs
- Do NOT turn in your assignment coded in another programming language (C++, C#, Java, Python, Perl, etc.)—it will NOT compile under zyLabs C compiler.

What to turn in:

The source code as a single C file uploaded to Canvas (http://canvas.csun.edu) by the deadline of 11:59pm PST (-20% per consecutive day for late submissions, up to the 4th day—note 1 minute late counts as a day late, 1 day and 1 minute late counts as 2 days late, etc.).

Sample test run

```
Virtual memory to Main memory mapping:
--------------------------------------
1) Set parameters
2) Map virtual address
3) Print page table
4) Quit

Enter selection: 1

Enter main memory size (words): 2048
Enter page size (words/page): 1024
Enter replacement policy (0=LRU, 1=FIFO): 0

Virtual memory to Main memory mapping:
--------------------------------------
1) Set parameters
2) Map virtual address
3) Print page table
4) Quit

Enter selection: 2
Enter virtual memory address to access: 5000
Page fault!

Virtual memory to Main memory mapping:
--------------------------------------
1) Set parameters
2) Map virtual address
3) Print page table
4) Quit

Enter selection: 3
---------------------------
| VP     | PF     | Access |
---------------------------
| 4      | 0      | 0      |
---------------------------

Virtual memory to Main memory mapping:
--------------------------------------
1) Set parameters
2) Map virtual address
3) Print page table
4) Quit

Enter selection: 2
Enter virtual memory address to access: 2048
Page fault!

Virtual memory to Main memory mapping:
--------------------------------------
1) Set parameters
2) Map virtual address
3) Print page table
4) Quit

Enter selection: 3
---------------------------
| VP     | PF     | Access |
---------------------------
| 4      | 0      | 1      |
---------------------------
| 2      | 1      | 0      |
---------------------------

Virtual memory to Main memory mapping:
--------------------------------------
1) Set parameters
2) Map virtual address
3) Print page table
4) Quit

Enter selection: 2
Enter virtual memory address to access: 4509
Virtual address 4509 maps to physical address 413

Virtual memory to Main memory mapping:
--------------------------------------
1) Set parameters
2) Map virtual address
3) Print page table
4) Quit
```

```
Enter selection: 3
---------------------------
| VP     | PF     | Access |
---------------------------
| 2      | 1      | 1      |
---------------------------
| 4      | 0      | 0      |
---------------------------

Virtual memory to Main memory mapping:
---------------------------------------
1) Set parameters
2) Map virtual address
3) Print page table
4) Quit

Enter selection: 2
Enter virtual memory address to access: 7160
Page fault!

Virtual memory to Main memory mapping:
---------------------------------------
1) Set parameters
2) Map virtual address
3) Print page table
4) Quit

Enter selection: 3
---------------------------
| VP     | PF     | Access |
---------------------------
| 4      | 0      | 1      |
---------------------------
| 6      | 1      | 0      |
---------------------------

Virtual memory to Main memory mapping:
---------------------------------------
1) Set parameters
2) Map virtual address
3) Print page table
4) Quit

Enter selection: 4
```