EOPSY LAB 4

Mohammed Nabeel Al-Mufti

Warsaw/Poland

5/24/2021

TASK

Create a command file that maps any 8 pages of physical memory to the first 8 pages of virtual memory, and then reads from one virtual memory address on each of the 64 virtual pages. Step through the simulator one operation at a time and see if you can predict which virtual memory addresses cause page faults. What page replacement algorithm is being used?

Locate in the sources and describe to the instructor the page replacement algorithm.

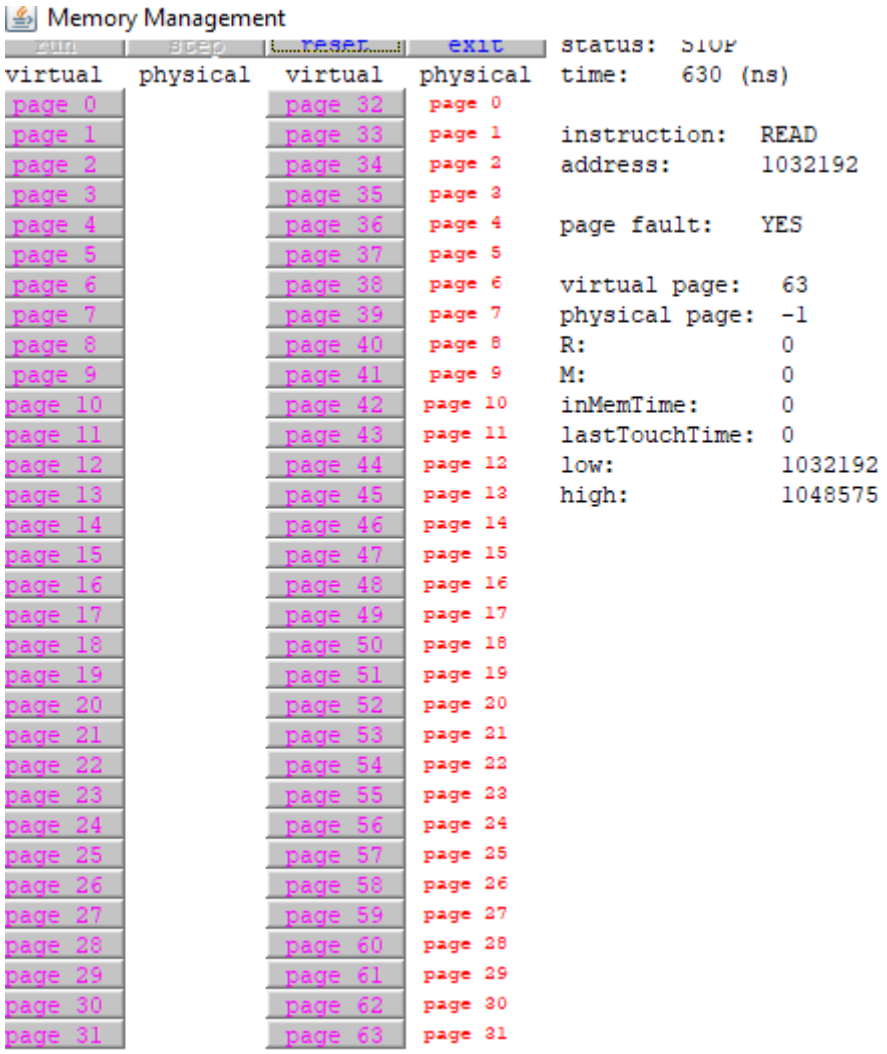
Firstly, I configure the memory.conf file assigning the first eight virtual pages to 8 physical pages 0 to 7 and the `addressradix` to 10 for easier observation. Secondly I configure the commands file to contain 64 READ instructions to allow us to read from each of the 64 virtual pages. I chose the values for those read values arbitrarily through a simple loop putting in mind the size of a default page being 16384:

```
for(i = 1; i<65; i++){
console.log(`READ ${16384 * i}`)
}
```

Stepping through the simulation, the mapping is done the way we specified in the input files up to virtual page 31 where it starts causing page faults. The reason why page faults happen is that a running process is accessing a memory page that is mapped to the virtual address space but not loaded in physical memory (no mapping to real hardware) and so the operating system needs to replace an already existing page with a new one, satisfying the needs of a running program. Page replacement algorithms aim to solve this issue, such as the one in this simulation: First-in First out. This algorithm serves each request sequentially. Meaning as new pages are brought in, they are added to the tail of the queue setting the page at the head of the queue to become the next target. We can observe the description and implementation of the FIFO page replacement algorithm in PageFault.java file.

Tracefile's output:

READ 16384 ... okay	READ 229376 ... okay	READ 442368 ... okay	READ 655360 ... page fault	READ 868352 ... page fault
READ 32768 ... okay	READ 245760 ... okay	READ 458752 ... okay	READ 671744 ... page fault	READ 884736 ... page fault
READ 49152 ... okay	READ 262144 ... okay	READ 475136 ... okay	READ 688128 ... page fault	READ 901120 ... page fault
READ 65536 ... okay	READ 278528 ... okay	READ 491520 ... okay	READ 704512 ... page fault	READ 917504 ... page fault
READ 81920 ... okay	READ 294912 ... okay	READ 507904 ... okay	READ 720896 ... page fault	READ 933888 ... page fault
READ 98304 ... okay	READ 311296 ... okay	READ 524288 ... page fault	READ 737280 ... page fault	READ 950272 ... page fault
READ 114688 ... okay	READ 327680 ... okay	READ 540672 ... page fault	READ 753664 ... page fault	READ 966656 ... page fault
READ 131072 ... okay	READ 344064 ... okay	READ 557056 ... page fault	READ 770048 ... page fault	READ 983040 ... page fault
READ 147456 ... okay	READ 360448 ... okay	READ 573440 ... page fault	READ 786432 ... page fault	READ 999424 ... page fault
READ 163840 ... okay	READ 376832 ... okay	READ 589824 ... page fault	READ 802816 ... page fault	READ 1015808 ... page fault
READ 180224 ... okay	READ 393216 ... okay	READ 606208 ... page fault	READ 819200 ... page fault	READ 1032192 ... page fault
READ 196608 ... okay	READ 409600 ... okay	READ 622592 ... page fault	READ 835584 ... page fault	
READ 212992 ... okay	READ 425984 ... okay	READ 638976 ... page fault	READ 851968 ... page fault	


Memory Management
run
step
reset
exit
status: stop
virtual
physical
virtual
physical
time: 630 (ns)
page 0
page 32
page 0
page 1
page 33
page 1
instruction: READ
page 2
page 34
page 2
address: 1032192
page 3
page 35
page 3
page 4
page 36
page 4
page fault: YES
page 5
page 37
page 5
page 6
page 38
page 6
virtual page: 63
page 7
page 39
page 7
physical page: -1
page 8
page 40
page 8
R: 0
page 9
page 41
page 9
M: 0
page 10
page 42
page 10
inMemTime: 0
page 11
page 43
page 11
lastTouchTime: 0
page 12
page 44
page 12
low: 1032192
page 13
page 45
page 13
high: 1048575
page 14
page 46
page 14
page 15
page 47
page 15
page 16
page 48
page 16
page 17
page 49
page 17
page 18
page 50
page 18
page 19
page 51
page 19
page 20
page 52
page 20
page 21
page 53
page 21
page 22
page 54
page 22
page 23
page 55
page 23
page 24
page 56
page 24
page 25
page 57
page 25
page 26
page 58
page 26
page 27
page 59
page 27
page 28
page 60
page 28
page 29
page 61
page 29
page 30
page 62
page 30
page 31
page 63
page 31