EOPSY LAB 4

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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:

```
for(i = 1; i < 65; i++){
console.log(`READ ${10000 * 1.35 * i}`)
}
```

Stepping through the simulation, the mapping is done the way we specified in the input files up to virtual page 40 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 27000 ... okay	READ 202500 ... okay	READ 378000 ... okay	READ 553500 ... page fault	READ 729000 ... page fault
READ 40500 ... okay	READ 216000 ... okay	READ 391500 ... okay	READ 567000 ... page fault	READ 742500 ... page fault
READ 54000 ... okay	READ 229500 ... okay	READ 405000 ... okay	READ 580500 ... page fault	READ 756000 ... page fault
READ 67500 ... okay	READ 243000 ... okay	READ 418500 ... okay	READ 594000 ... page fault	READ 769500 ... okay
READ 81000 ... okay	READ 256500 ... okay	READ 432000 ... okay	READ 607500 ... page fault	READ 783000 ... page fault
READ 94500 ... okay	READ 270000 ... okay	READ 445500 ... okay	READ 621000 ... okay	READ 796500 ... page fault
READ 108000 ... okay	READ 283500 ... okay	READ 459000 ... okay	READ 634500 ... page fault	READ 810000 ... page fault
READ 121500 ... okay	READ 297000 ... okay	READ 472500 ... okay	READ 648000 ... page fault	READ 823500 ... page fault
READ 135000 ... okay	READ 310500 ... okay	READ 486000 ... okay	READ 661500 ... page fault	READ 837000 ... page fault
READ 148500 ... okay	READ 324000 ... okay	READ 499500 ... okay	READ 675000 ... page fault	READ 850500 ... okay
READ 162000 ... okay	READ 337500 ... okay	READ 513000 ... okay	READ 688500 ... page fault	READ 864000 ... page fault
READ 175500 ... okay	READ 351000 ... okay	READ 526500 ... page fault	READ 702000 ... okay	
READ 189000 ... okay	READ 364500 ... okay	READ 540000 ... okay	READ 715500 ... page fault	

run | step | reset | exit

status: STOP

virtual	physical	virtual	physical
page 0		page 32	page 0
page 1		page 33	page 1
page 2		page 34	page 2
page 3		page 35	page 3
page 4		page 36	page 4
page 5		page 37	page 5
page 6		page 38	page 6
page 7		page 39	page 7
page 8		page 40	page 8
page 9		page 41	page 9
page 10		page 42	page 10
page 11		page 43	page 11
page 12		page 44	page 12
page 13		page 45	page 13
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 21	page 53	
page 22	page 22	page 54	
page 23	page 23	page 55	
page 24	page 24	page 56	
page 25	page 25	page 57	
page 26	page 26	page 58	
page 27	page 27	page 59	
page 28	page 28	page 60	
page 29	page 29	page 61	
page 30	page 30	page 62	
page 31	page 31	page 63	

time: 630 (ns)

instruction: READ
address: 864000

page fault: YES

virtual page: 52
physical page: -1
R: 0
M: 0
inMemTime: 0
lastTouchTime: 0
low: 851968
high: 868351