OPERATING SYSTEM – LABORATORY 4: MEMORY MANAGEMENT

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In the file named *memory.conf*, I map the first 8 pages physical memory to the first 8 pages virtual memory, and the rest of physical memory page (24 pages) will be mapped by default.

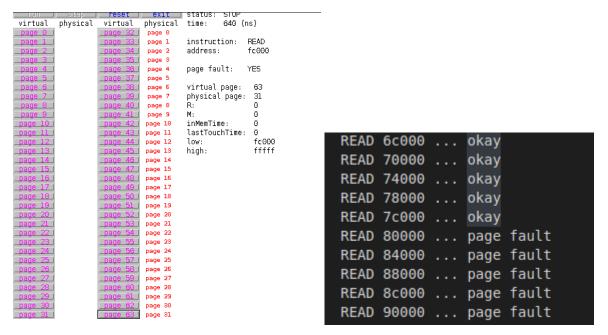
In the file named *command*, I read from one virtual memory address on each of the 64 virtual memory pages. Because the size of a page is 16384 (2¹⁴) bytes, the first virtual page will cover all address from 0 to 16383, the second virtual page will cover all address from 16383 to 32767, and so on, the final virtual page – the 64th page will cover all address from 1032192 to 1048575. The *memory.conf* and the *command* file should be like this:

memset	0	0	0	0	0	0	READ 0
memset	1	1	0	0	0	0	READ 16384
memset	2	2	0	0	0	0	READ 32768
memset	3	3	0	0	0	0	READ 49152
memset	4	4	0	0	0	0	READ 65536
memset	5	5	0	0	0	0	READ 81920
memset	6	6	0	0	0	0	READ 98304
memset	7	7	0	0	0	0	READ 114688

Because there are in total 32 pages of physical memory and 64 pages of virtual memory, so all 32 pages of physical memory are mapped to the first 32 pages of virtual memory. When simulator tries to read from one specified virtual memory address from the 1st page to the 32nd page, there is no "page fault", because all of these virtual pages are mapped to physical pages.

run	step	reset	exit	status:	STUP	
virtual	physical	virtual	physical	time:	320 (n	s)
page 0	page 0	page 32 l				
_page 1	page 1	page 33		instruct		READ
page 2	page 2	page 34		address:		7c000
_page_3_	page 3	page 35			_	
page 4	page 4	page 36		page fau	ilt:	NO
page 5	page 5	page 37				
page 6	page 6	page 38		virtual		31
page 7	page 7	_page_39_l		physical	. page:	31
page 8	page 8	page 40		R:		0
page 9	page 9	page 41		M:		0
page 10	page 10	page 42		inMemTim		310
page 11	page 11	page 43		lastTouc	:hTime:	310
page 12	page 12	page 44		low:		7c000
page 13	page 13	page 45		high:		7ffff
page 14	page 14	page 46				
page 15	page 15	page 47				
page 16	page 16	page 48				
page 17	page 17	page 49				
page 18	page 18	page 50				
page 19	page 19	page 51				
page 20 I	page 20	page 52				
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 l	page 30	page 62				
page 31	page 31	page 63				

But when the simulator tries to access the 33rd virtual page and further, it will be a "page fault" because these virtual pages are not mapped to any physical pages. And then, a page replacement algorithm will be called to replace this current physical page. In the simulator GUI, the physical pages are replaced in the same order from the oldest to the newest (page 0, page 1, ..., page 31). Thus, the page replacement algorithm follows "First in, First out" strategy.



In this algorithm, the simulator (the operating system) keeps track of all pages in the memory in a queue, the oldest page is in the front of the queue. When a "page fault" occurs, the current page needs to be replaced, the front of the queue will be removed to place right this position.