Operating Systems
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Homework 4

Problem 4.1

Solution:

a) Every page has a fixed size of 1024 bytes, and that is 1 kilobyte. We know that the physical memory has a size of 256 kilobytes, so that means that the physical memory has 256 frames.

b) We know that the logical address space of the processes is limited to a maximum of 64 pages. And we also know that each frame can have 1024 entries. Those 64 pages and 1024 entries are actually the tuple of the logical address, and we can represent 64 with (p=)6 bits and 1024 with (d=)10 bits so that is 16 bits in total.

c) From a) and b) we know that the physical memory has 256 frames and that d=10 bits, and 256 can be represented by 8 bits and that makes a total of 18 bits.

d) We already found that the page number is represented by 6 bits, because there could be a maximum of 64 pages and that can be represented by 6 bits.

e) We also found that the offset is represented by 10 bits, because there could be 1024 entries and that can be represented by 10 bits.

Problem 4.2

Solution:

a)

reference string	1	2	3	4	1	1	4	2	1	2
frame 0	1	1	3	3	1	1	1	1	1	1
frame 1		2	2	4	4	4	4	2	2	2
Faults	*	*	*	*	*			*		

There are 6 faults.

b)

reference string	1	2	3	4	1	1	4	2	1	2
frame 0	1	1	1	4	4	4	4	4	4	4
frame 1		2	2	2	1	1	1	1	1	1
frame 2			3	3	3	3	3	2	2	2
Faults	*	*	*	*	*			*		

There are 6 faults.

c)

reference string	1	2	3	4	1	1	4	2	1	2
frame 0	1	1	1	1	1	1	1	1	1	1
frame 1		2	3	4	4	4	4	2	2	2
Faults	*	*	*	*				*		

There are 5 faults.

d)

reference string	1	2	3	4	1	1	4	2	1	2
frame 0	1	1	1	1	1	1	1	1	1	1
frame 1		2	2	2	2	2	2	2	2	2
frame 2			3	4	4	4	4	4	4	4
Faults	*	*	*	*						

There are 4 faults.

e)

reference string	1	2	3	4	1	1	4	2	1	2
frame 0	1	1	3	3	1	1	1	2	2	2
frame 1		2	2	4	4	4	4	4	1	1
Faults	*	*	*	*	*			*	*	

There are 7 faults.

f)

reference string	1	2	3	4	1	1	4	2	1	2
frame 0	1	1	1	4	4	4	4	4	4	4
frame 1		2	2	2	1	1	1	1	1	1
frame 2			3	3	3	3	3	2	2	2
Faults	*	*	*	*	*			*		

There are 6 faults.

Problem 4.3

Solution:

The working set at an instance of time would track all processes that haven't been active in the last N iterations. If we take the example from problem 2 that would look like this. N = 3

$A = \{1, 2, 3, 4, 1, 1, 4, 2, 1, 2\}$

time	0	1	2	3	4	5
Working set	1, 2, 3	2, 3, 4	1, 3, 4	1, 4	1, 2, 4	1, 2
Faults	*	*	*	*	*	*

reference string	1	2	3	4	1	1	4	2	1	2
frame 0	1	1	1	4	4	4	4	4	4	4
frame 1		2	2	2	1	1	1	1	1	1
frame 2			3	3	3	3	3	2	2	2
Faults	*	*	*	*	*			*		

We can clearly see that both the working set and the LRU have same number of faults.
According to me, more preferable is LRU because we don't discard unless we need to, and with the working set we are ending up at points of time with less than N processes.