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Pg 458 Programming project

HW 5

9.21 Consider the following page reference string:

7, 2, 3, 1, 2, 5, 3, 4, 6, 7, 7, 1, 0, 5, 4, 6, 2, 3, 0, 1

Assuming demand paging with three frames, how many page faults would occur for the following replacement algorithms?

• LRU Replacement - 17

• FIFO Replacement - 14

• Optimal replacement - 11

(9.27) Consider a demand-paging system with the following time-measured utilizations:

• CPU utilization 20%

• Paging disk 97.7%

• Other I/O devices 5%

For each of the following, indicate whether it will (or is likely to) improve CPU utilization. Explain your answers.

(a) Install a faster CPU

- No, CPU isn't the bottleneck

(b) Install a bigger paging disk

- No. Paging disk size does not help.

(c) Increase the degree of multiprogramming.

No. Adding more programs will just further spread out limited memory.

(d) Decrease the degree of multiprogramming.

Yes. would free up memory to improve utilization

(e) Install more main memory.

Yes. Would reduce need to page data to disk.

⑧ Install a faster hard disk, or multiple controllers with multiple hard disks.

Maybe. Would increase disk read/write times but otherwise not really.

⑨ Add prepaging to the page-fetch algorithms

Maybe. Pages could be loaded into memory ahead of time, reducing the time waiting for the paging disk

⑩ Increase page size

No. A larger page could take up more memory.

Q.30 A page replacement algorithm should minimize the number of page faults. We can achieve this minimization by distributing heavily used pages evenly over all of memory, rather than having them compete for a small number of page frames. We can associate with each page frame a counter of the number of pages associated with that frame. Then, to replace a page, we can search for the page frame with the smallest counter.

① Define a page-replacement algorithm using this basic idea. Specifically address these problems;

I What is the initial value of counters? 0

II When are the counters increased? When a new page is associated with a frame

III When are counters decreased? When a page associated with a frame is no longer required.

IV How is the page to be replaced selected? LRU

- ⑤ How many page faults occur for your algorithm for the following reference string with four page frames? 3 page faults.
- ⑥ What is the minimum number of page faults for an optimal page replacement strategy for the reference string in part b with four page frames. 11 page faults.