Operating System
ID: 519021911248
Name: Zhuohao Li

Homework 2

2022-5-9

1 Judgement

Solution.1

Correct

Solution.2

Correct

Solution.3

Wrong, wait only → partly execute

Solution.4

Wrong, then → after merging and fusion

Solution.5

Correct

Solution.6

Correct

Solution.7

Correct

Solution.8

Wrong, is influenced by → is not influenced by

Solution.9

Correct

Solution.10

Wrong, linear → 1-dimension, non-linear

2 Brief Answer

Solution.1

(1) **Jitter** might happen (interconnect between memories). To avoid it, we could add more phisical memory block or stall more processes.

(2) OS acts normally, we could level up numbers of process to improve parallelisim and utilization of resources.

(3) Processor and memory are working in a low level rate. We could improve the number of processes to execute.

Solution.2

a single page records the number of page table entry:

$$4KB/4B = 1024 = 2^{10}$$

64-bit VM needs the number of page

$$2^{64}/2^{12} = 2^{52}$$

so at least $2^{60} > 2^{52}$, 6 level page table

Solution.3

The number of page table entry is

$$2^{48}/2^{13} = 2^{35}$$

, 2^{35} inverted page table needs $2^{35}/2^{13} = 2^{19}$, 2^{19} page table entries.

Solution.4

Working Set is the processes we're gonna visit in a specific time of period(window). So, t_1: $\{1,2,3,6,7,8,9\}$, t_2: $\{3,4\}$

(Referred to Link)

Solution.5

(1) The size of **page** is $2^{12}B$.
The size of **page frame** is $2^{12}B$.
The size of **VM** is $2^{32}B$.

(2) To restore page content and page table, there's gonna need $\frac{2^{10}\times 8}{2^{12}} + \frac{2^{20}\times 8}{2^{12}} = 2050$

(3) 1, that's because the biggest 10 bits of `01000000H` and `01114096H` is both `0000000100` and they should only go to the same Page Directory due to principles of locality.

3 Analysis

Solution.1

4 conditions to cause deadclocks:

- Mutual Exclusion
- Hold and Wait
- No preemption
- Circular wait

Banker Algorithm:

We maintain `Available` and `Need` lists.

`Need(A,B,C)=(0,2,5),(3,0,0),(2,0,4),(3,1,2),(4,7,1)`

`Available(A,B,C)=(3,0,1)`

According to that, resoures could be allocated to P_1, after executing, available is `(4,1,3)`. Then resources could be allocated to P_3, after executing, available is `(4,3,4)`. Next, Then resources could be allocated

to P_2, after executing, available is `(4,6,4)`. At this point, both P_0 and P_4 is no longer to be satisfied. So deadclock happens inevitably.

Solution.2

(1)
- first-fit 212K - #2 417K - #5 112K - #2 426K - NULL
- best-fit 212K - #4 417K - #2 112K - #3 426K - #5
- worst-fit 212K - #5 417K - #2 112K - #3 426K - NULL

(2) Best-Fit is the best. The other 2 will have an allocation error.

Solution.3

There're $100 \times 100 = 10000$ data in total. Since the capacity of a single page is 200, the number of page is 50. The elements are scheduled in rows so every 2 rows will be included in a page.

For Program A, as it executes in rows so every 2 data rows take a page. In total, 50 page faluts are reserved.

For Program B, as it executes in columns so each column take 50 page faults, where $50,000$ is the cumulative lies.

Solution.4

- FIFO

  Page fault happens when there's no matching pages in the page table. In FIFO, there's total 14 page faults, so the missing rate is 30%. The pass process is: {1}, {1,2}, {1,2,3}, {1,2,3,4}, {5,2,3,4}, {5,6,3,4}, {5,6,2,4}, {5,6,2,1}, {3,6,2,1}, {3,7,2,1}, {3,7,6,1}, {3,7,6,2}, {1,7,6,2}, {1,3,6,2}

- OPT

  There's total 8 page faults, so the missing rate is 60%. The elaborate pass process is {1}, {1,2}, {1,2,3} {1,2,3,4} {1,2,3,5} {1,2,3,6} {7,2,3,6} {1,2,3,6}

- LRU.

  There's total 10 page faults, so the missing rate is 50%. The elaborate pass process is {1} {1,2} {1,2,3} {1,2,3,4} {1,2,5,4} {1,2,5,6} {1,2,3,6} {1,2,3,7} {6,2,3,7} {6,2,3,1}

- CLOCK

  There's total 10 page faults, so the missing rate is 50%. The elaborate pass process is {1} {1,2} {1,2,3} {1,2,3,4} {1,2,5,4} {1,2,5,6} {1,2,3,6} {1,2,3,7} {6,2,3,7} {6,2,3,1}