6 Solved Questions on Operating Systems - Final Exam | CS 3204

Operating Systems

Virginia Polytechnic Institute and State University (Virginia Tech)

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CS3204 Final 100/108 Arthur

There are a possible 108 Points. Work all problems. Be specific and concise in all answers. You have 120 minutes. Your answers are either right or wrong... be careful in your computations! Please use a pencil and answer each question in the space provided. Promptly hand in exams when asked.

(1) 30 Points

Consider the following set of processes and their resource acquisition/need:

Process	Current Loan				Maximum Needed				Current Claim			
	A	B	C	D	A	B	C	D	A	B	C	D
1	1	0	2	0	3	2	5	2	2	2	3	2
2	0	3	1	2	4	5	1	2	4	2	0	0
3	2	4	5	1	10	7	7	5	8	3	2	4
4	3	0	0	6	5	7	0	8	2	7	0	2
5	4	2	1	3	6	2	1	4	2	0	0	1
	10	9	9	12								

Total Resources				Resources Available			
A	B	C	D	A	B	C	D
13	13	9	13	3	4	0	1

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A B C D
3 4 0 1
4 2 1 3
7 6 1 4
0 3 1 2
7 9 2 6
3 0 0 6
10 9 2 12
2 4 5 1
12 13 7 13
1 1 0 2 0
13 13 9 13

(a) Based on the state of the system given above
(i) for each process/resource class pair provide the current resource claim
(ii) for each resource class provide in the numer of resources currently available.

(b) According to the Banker's Algorithm is the state of the system shown above safe?

Yes

(c) If the system is safe, provide the corresponding sequence of process completions. If the system is unsafe, show how deadlock might occur.

5, 2, 4, 3, 1

(2) 18 Points

Assume the following system configuration:

Page size = 1024

System time starts at 0

Job 1 PMT

0	
1	10
2	1
3	
4	7

Job 2 PMT

0	3
1	
2	
3	2

MBT

	Job	Page	Ref Bit	#Ref	Last Time Used
0	OS				
1	1	2	0	8	19
2	2	3	0	14	23
3	2	0	1	12	11
4	3	5	1	7	15
5	5	1	0	8	26
RP -> 6	4	0	1	14	31
7	1	4	0	3	21
8	6	1	1	3	32
9	6	0	0	9	14
10	1	1	1	1	24

Assume Job 1 accesses the compiled location 3196

(a) What is corresponding virtual address? <3, 17, 47>

(b) Using the LRU approximation algorithm given in class, which page in main memory (if any) is replaced using

Local page replacement? Frame 7

Global page replacement? Frame 7

Assuming the same initial system configuration, suppose that Job 2 accesses compiled location 1687

(c) What is the corresponding virtual address? <1, 663>

(d) Using the pure LRU algorithm with global page replacement, which page in main memory (if any) is replaced? 3

(e) Using the LFU algorithm with global page replacement, which page in main memory (if any) is replaced? 10

(3) 20 Points

Based on the following memory contents, for each of (a) - (d) provide the physical address that would be computed and returned by the Memory Management Sub-system. (Assume that memory addressing is word oriented)

Memory Addr		Contents
1055		11
1056	0	14
1057	1	13
1058	2	9
1059	3	7
		:
		:
3175		63
3176		8000
3177		11358
3178		11357
3179		22650
3180		22651
3181		11358
		:
		:
6101	0	6
6102	1	3
6103	2	8
6104		4
6105		2
		:
		:
17496		1055
17497		43
17498		5837
		:
		:
20479		4011
20480		9130
20481		42

(a) Fixed Partitioning, Aboslute Addressing
Compiled address 8102
Physical address 8102

(b) Fixed Partitioning, Relative Addressing
Compiled address 4310
Contents of Base Register 31623
Contents of Bounds (Limit) Register 40480
Physical address 35933

31623 + 4310 = 35933

(c) Dynamic Partitioning
Compiled address 11357
Contents of Base Register 20580
Contents of Bounds (Limit) Register 30240
Physical address 31937

20580 + 11357 = 31937

This would be in error the Unless it was accessing shared memory.

(d) Demand Paging (2048 byte pages)

i) PMTAR [3] [6101]
Compiled Address 3162
Physical address 7258

1114
(2048·3) + 1114 = 7258

ii) PMTAR [4] [1056]
Virtual Address <3, 2047>
Physical address 16383

(7·2048) + 2047 = 16383

(4) 15 Points

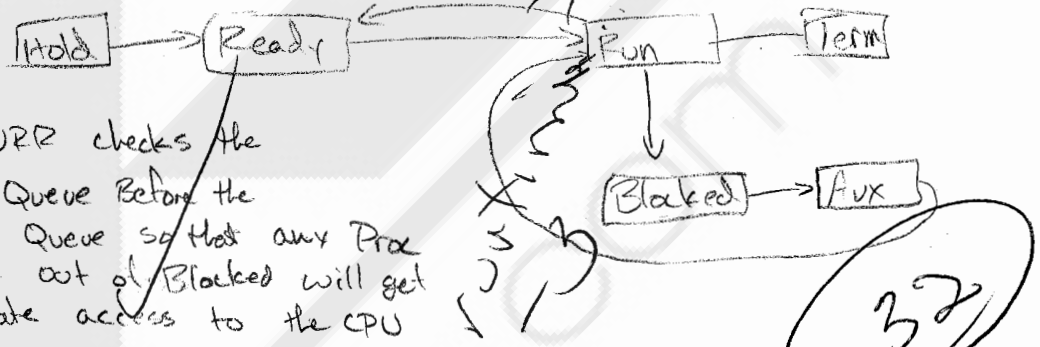
(a) What inequity does Virtutal Round Robin (VRR) address?

Problem

It address the problem that if a process has an I/O Request and is Blocked, once it comes off that Block, it will be put at the end of the Ready Queue even if it hadn't gotten CPU time before its I/O Request

also, most scheduling algorithms favor CPU bound processes over I/O Bound. VRR addresses this

(b) Draw one possible VRR queueing model and describe how it addresses that inequity.



The VRR checks the Aux Queue Before the Ready Queue so that any Proc coming out of Blocked will get immediate access to the CPU

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(5) 15 Points

Consider the following dinning philosopher scenario:

A hungry philosopher first picks up his left fork; if his right fork is available, he picks it up and starts eating; otherwise he puts down his left fork and repeats the cycle.

Can deadlock occur? Justify your answer.

Yes, If all Philosophers are at the table at once, then all the Left forks would be picked up at the same time and then all put down at the same time, thus No philosopher would ever get their Right fork.

(6) 10 points

What is the relationship between a process' resident (or working) set and locality.

A Process's working set is the Pages which are in main memory over a given Δ in time. This Relates to Locality, Because the Working set of a process is usually clustered together by Location. ie. going through a Loop, accessing an array etc.

Also, a Process's working set usually only consits of data which is being used.