Lab Exercise 3

On Memory Management and Allocation Strategies

Use the information that follows to complete this exercise.

JOB LIST

Job Stream #	Time	Job Size
1	5	5760
2	4	4190
3	8	3290
4	2	2030
5	2	2550
6	6	6990
7	8	8940
8	10	740
9	7	3930
10	6	6890
11	5	6580
12	8	3820
13	9	9140
14	10	420
15	10	220
16	7	7540
17	3	3210
18	1	1380
19	9	9850
20	3	3610
21	7	7540
22	2	2710
23	8	8390
24	5	5950
25	10	760

MEMORY LIST

Memory Block	Size
1	9500
2	7000
3	4500
4	8500
5	3000
6	9000
7	1000
8	5500
9	1500
10	500

At one large batch-processing computer installation, the management wants to decide what storage placement strategy will yield the best possible performance. The installation runs a large real storage computer under **fixed partition multiprogramming**. Each user program runs in a single group of **contiguous storage locations**. Users state their storage requirements and time units for CPU usage on their Job Control Card (it used to, and still does work this way, although cards are not used nowadays). The OS allocates to each user the appropriate partition and starts up the user's job. The job remains in memory until completion. A total of 50,000 memory locations are available, divided into fixed blocks as indicated in the table above.

a) Write an event-driven simulation to help you decide which storage placement strategy should be used at this installation. Your program would use the job stream and memory partitioning as indicated. Run the program until all jobs have been executed with the memory as is (in order by address). This will give you the **first-fit** type performance results.

b) Do the same as (a), but this time implement the **worst-fit** placement scheme.

c) Sort the memory partitions by size and run the program a second time; this will give you the **best-fit** performance results. For all parts (a), (b) and (c) you are investigating the performance of the system using a typical job stream by measuring:

1. Throughput (how many jobs are processed per given time unit)
2. Storage utilization (percentage of partitions never used, percentage of partitions heavily used, etc.)
3. Waiting queue length
4. Waiting time in queue 5. Internal fragmentation

d) Look at the results from the first-fit, worst-fit and best-fit. Explain what the results indicate about the performance of the system for this job mix and memory organization. Is one method of partitioning better than the other? Why or why not? Could you recommend one method over the other based on your sample run? Would this hold in all cases? Write some conclusions and recommendations.

FAQs:

+ Inig occupy sa usa ka job sa memory block ba nya dili niya mahurot ug gamit tanan memory ato na block, bale di na to pwede ma occupy ug lain nga job ang sobra nga space ato nga block? ni arise ni nga problem kay nag search kog resources online ba nya sa ako nakita ila ipa occupy ug lain nga job ang sobra nga space. Nya based sa lecture slides ang definition sa internal fragmentation kay Internal fragmentation – When a user job does not completely fill their designated partition – Lost memory caused by memory deemed allocation but is unused...Basically ako pangutana kay usa ra ba jud ka job maka occupy sa kada memory block at a time?
- Yes, if you will read the scenario of the machine problem, it's set during the early systems wherein it's under fixed partition and storage locations are to be done contiguously. If a job already occupies a certain block of memory, then it no longer allows another job to occupy that space, even if there is a big enough storage to accommodate another incoming job. Further, this assumes that memory management during this time is not that sophisticated enough yet that it cannot track or compute the memory address of another job occupying the same memory space occupied by another job. In short, if a memory has already occupied that block, no other job can occupy that block UNLESS it has finished execution.

+ Regarding the investigation of the performance of the system by measuring the throughput, storage utilization, etc. part, should our answers be 'maximum throughput', 'good storage utilization' or are there calculations involved?
- There will definitely be calculations involved. I am looking into the metrics here. Take note that for storage utilization, there are certain metrics being asked such as percentage of partitions never used, percentage of partitions heavily used, etc. That means you will have to show metrics, depending your results.

+ Should the investigation part be coded as well?
- You can indicate them in your submitted pdf file, since I expect it to be quite long.

+ For the performance of the different placement algorithms, does it need to be done in code or written same with the previous MP?
- For the metrics being asked, should be implemented in your code. However, for the investigation/evaluation of performance part, you can indicate them in your pdf file.

+ For the time for each card does this indicate the time of arrival or time na mahuman ang card?
- Time indicates the processing time. So meaning, if a job has 5 timestamp, it should be done executing after 5 timestamp and should vacate its occupied memory block after 5 timestamp to give way to other jobs requesting for a memory block.

+ With regards to the Storage utilization metrics, Waiting queue length, and Internal Fragmentation, are they to be computed per time unit or as a whole after the whole process (all jobs that can be handled by the partitions have been handled)?
- You can compute per time unit, then get the average. You can also show it after the whole process. However, in analysing the behaviour of the various placement algorithms, you can

answer more objectively when you are able to observe its performance per time unit.

+ Do we exempt jobs which have sizes greater than the maximum size of all partitions from the metrics?
- If a job has a memory requirement greater than what is available in the memory block, then that job will never be allocated a memory block, based on the description of the memory configurations during the early system.

+ Is it okay to include a literature review for the analysis of the different policies to supplement/support the results?
- Yes, of course please do.