

CS162 Section 4 Worksheet: CPU Scheduling & Address Spaces

Boolean answer

a. The lottery scheduler prevents CPU starvation by assigning at least one ticket to each scheduled thread.

True

b. Round robin scheduling provides a latency improvement over FCFS scheduling for interactive jobs.

True, since no process can hold the CPU longer than one quantum before a new job gets to run

c. One major difference between paging and segmentation is that memory is allocated in finer grained units with segmentation.

False, pages are generally smaller than segments

char[1024] answer

a. If a computer has 32 bit address space, and 1K (i.e. 2^{10} bytes) sized pages, how many page table entries does it have? (fine to express answer base-2).

$2^{22} = 4,194,304 = \text{like } 4 \text{ million}$

b. If you have a very large virtual address space, what are the benefits of using an inverted page table? What are the drawbacks?

The benefit is that the table's size is proportional to the size of physical memory---other page table's size is proportional to the size of virtual memory, which is often much larger than physical memory.

The drawback is implementing an inverse page table requires maintaining a hash table in hardware. That's a complex problem.

c. Give two ways to predict run-time for input to Shortest Remaining Time First (SRTF) scheduling:

1. Programmer provides best guess
2. Use past behavior to model run time, e.g., keep an exponential average of each process's burst lengths
3. Use multi-level feedback queues to automatically penalize longer running processes

CPU scheduling exercise

Consider the following process arrival times, and run time requirements:

Process Name	Arrival Time	Running Time
A	0	3
B	1	5
C	3	2
D	9	2

For each scheduling algorithm, fill in the table with the process that is running on the CPU (for timeslice-based algorithms, assume a 1 unit timeslice). For RR and SRTF, assume that an arriving thread is run at the beginning of its arrival time, if the scheduling policy allows it. The turnaround time is defined as the time a process takes to complete after it arrives.

Time	FIFO	Round Robin	Shortest Remaining Time First
0	A	A	A
1	A	B	A
2	A	A	A
3	B	C	C
4	B	B	C
5	B	A	B
6	B	C	B
7	B	B	B
8	C	B	B
9	C	D	B
10	D	B	D
11	D	D	D
Avg. turnaround time	$(3+7+7+3)/4 = 5$	$(6+10+4+3)/4 = 5.75$	$(3+9+2+3)/4 = 4.25$