Operating Systems Laboratory

Assignment 4

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Scheduling Schemes:

1) Shortest Job First (SJF):

Shortest Job First Scheduler (SJF) is a non preemptive scheduler. It takes the shortest available at a given time and runs it completely and repeats the process until all the processes are done.SJF Non Preemptively executes all processes in the increasing order of the execution time. Since SJF is nonpreemptive, short jobs can still get stuck behind long ones **(Convery Effect)**.

2) Shortest Remaining Time First (SRTF):

Shortest Remaining Time First (SRTF) also called Shortest Time to Completion First (STCF) is almost like SJF but it is a preemptive scheduler. SRTF preempts running task if time left is more than that of new arrival (Preemptively execute job with smallest remaining execution time). Even SRTF can lead to starvation and it has many context switches happening which can lead to

Expected Job Characteristics of the schemes:

1) SRTF minimizes Waiting Time relative to SJF.

2) Shortest Job First (SJF) as it is not preemptive so response times are generally not that good for SJF relative to Shortest Remaining Time First (SRTF).

3) Throughput is expected to be more in SRTF than SJF, as SRTF generally takes less time to complete.

4) SRTF minimizes Turn Around Time relative to SJF

Test Process Data to show suitability of the schemes:

1) Test Data supporting SJF scheduler: (SupportingSJF.dat)

```
0 60 -1
0 10 -1
10 10 -1
```

The above data doesn't show any difference in the throughput between SJF and SRTF as both take the same time to run.

2) Test Data supporting SRTF scheduler: (SupportingSRTF.dat)

```
0 200 -1
2 5 -1
6 10 4 8 4 8 4 8 4 8 4 8 4 8 4 8 4 8 4 8 -1
```

The above data supports SRTF and shows the shortcomings of SJF clearly. Even the throughput difference is clearly visible in this case apart from the Response Time, Waiting Time, etc.

Tables Displaying the Results and Observations:

Note: Results are for the three given process files

Process File 1:

	SJF			SRTF		
Process	Waiting Time	Turnaround Time	Penalty Ratio	Waiting Time	Turnaround Time	Penalty Ratio
0	803	4097	1.243777	843	32056	1.027008
1	871	4579	1.234897	591	16744	1.036588
2	370	1893	1.242942	300	6270	1.050251
3	349	1454	1.315837	99	1164	1.092958
4	106	308	1.524752	16	38	1.727273
5	97	102	20.4	7	12	2.4
6	1214	2631	1.85674	1214	25257	1.050493
Average	544.285706	2152	4.116992	438.571442	11648.71387	1.340653
Throughput	0.004795			0.004442		

Process File 2:

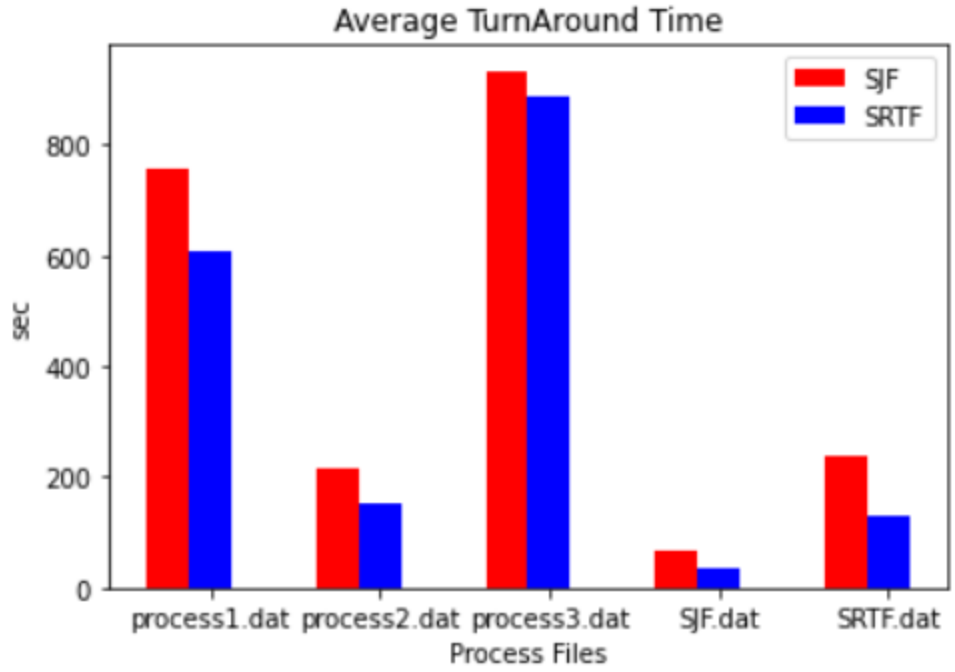
	SJF			SRTF		
Process	Waiting Time	Turnaround Time	Penalty Ratio	Waiting Time	Turnaround Time	Penalty Ratio
0	0	5	1	0	5	1
1	121	146	5.84	23	48	1.92
2	320	1148	1.386473	230	3351	1.073694
3	78	213	1.577778	25	57	1.78125
4	472	2305	1.257501	412	9406	1.045808
5	148	441	1.505119	92	267	1.525714
6	597	3878	1.181957	599	19233	1.032146
7	77	210	1.578947	54	120	1.818182
8	192	391	1.964824	122	499	1.323607
9	147	438	1.505155	100	303	1.492611
10	148	441	1.505119	89	258	1.526627
11	116	336	1.527273	24	54	1.8
12	117	339	1.527027	91	234	1.636364
13	103	294	1.539267	65	177	1.580357
14	106	303	1.538071	23	54	1.741935
15	65	174	1.59633	57	153	1.59375
16	67	180	1.59292	23	54	1.741935
17	68	183	1.591304	30	69	1.769231
Average	163.444443	634.722229	1.73417	114.388885	1907.888916	1.522401
Throughput	0.017476			0.016393		

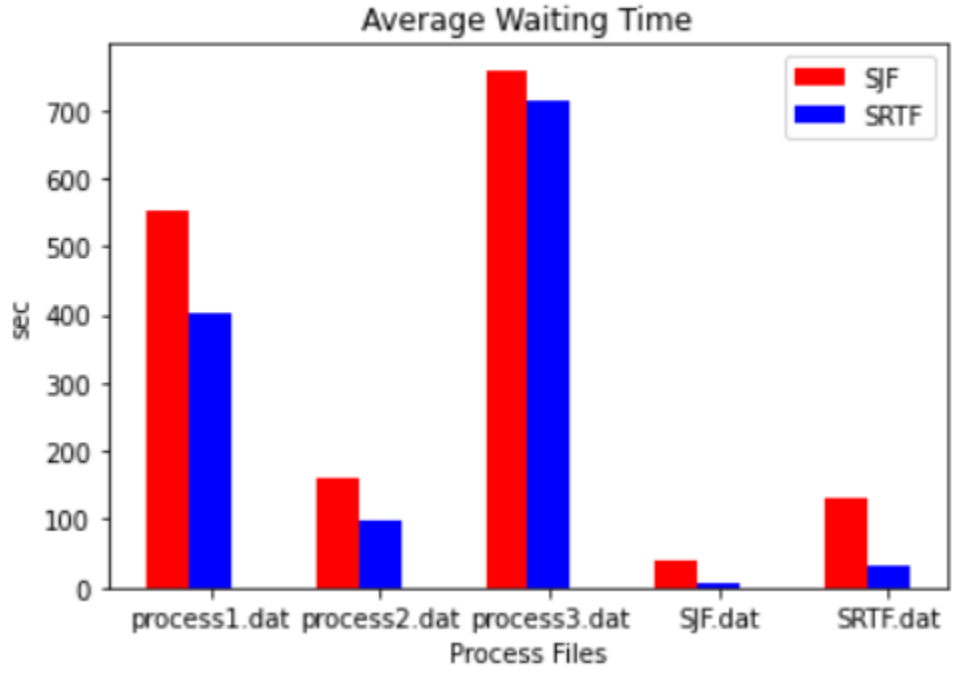
Process File 3:

Process	SJF			SRTF		
	Waiting Time	Turnaround Time	Penalty Ratio	Waiting Time	Turnaround Time	Penalty Ratio
0	560	6939	1.087788	455	6945	1.070108
1	1778	4938	1.562658	1597	46299	1.035725
2	806	9435	1.093406	611	13120	1.048845
3	1507	4231	1.553231	1317	19502	1.072422
4	322	4755	1.072637	295	4420	1.071515
5	1687	6226	1.371668	1689	57375	1.030331
6	590	5457	1.121225	612	11240	1.057584
7	0	6	1	0	6	1
8	22	42	2.1	17	37	1.85
9	1536	1636	16.360001	1446	14550	1.110348
10	9	19	1.9	9 19		1.9
11	714	11651	1.065283	864	32787	1.027065
Average	794.25	4611.25	2.607325	742.666687	17191.66602	1.189495
Throughput	0.00545			0.005098		

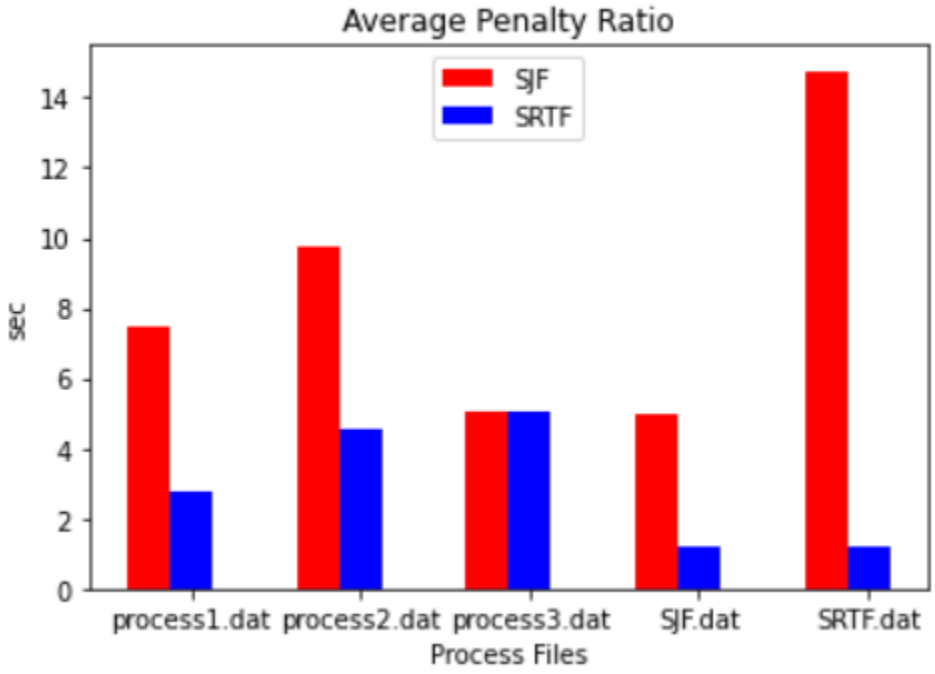
Graph Analysis and Observations:

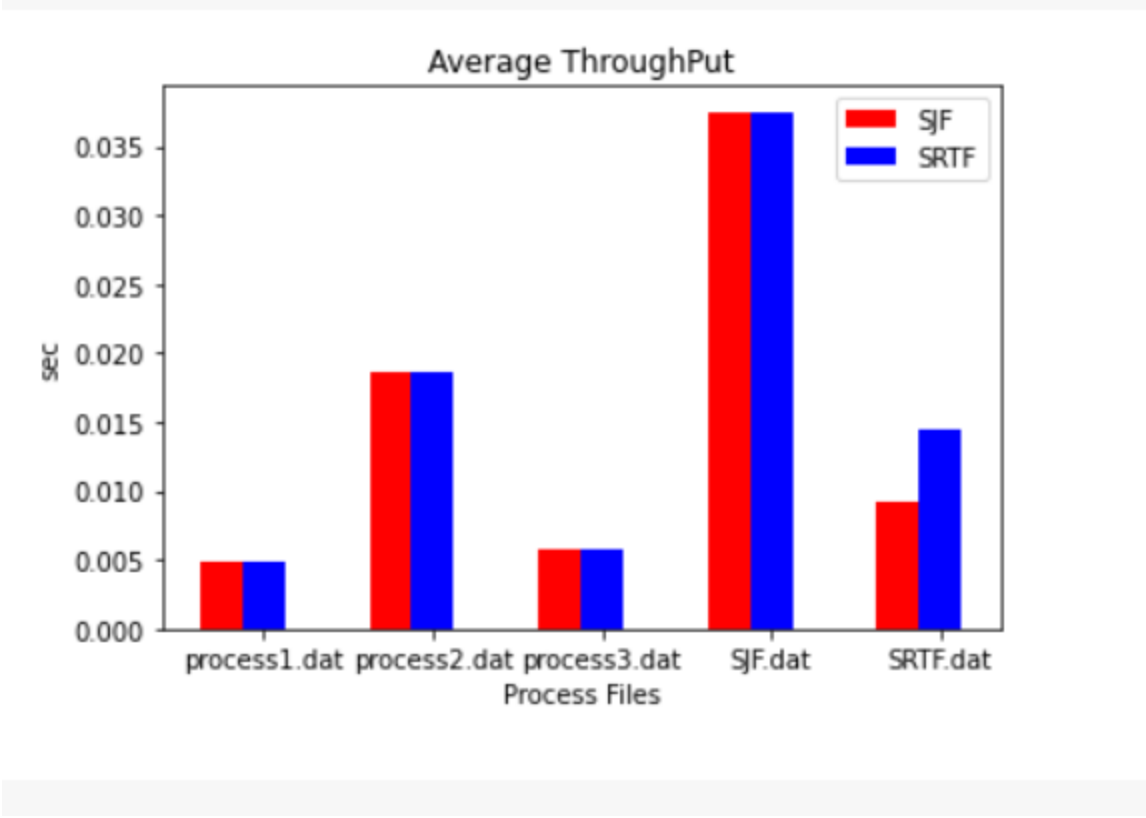
Note: Results are for the three given process files and test Processes.


Average TurnAround Time
SJF
SRTF
800
600
400
200
0
sec
process1.dat
process2.dat
process3.dat
SJF.dat
SRTF.dat
Process Files


Average Waiting Time
SJF
SRTF
700
600
500
400
300
200
100
0
sec
process1.dat
process2.dat
process3.dat
SJF.dat
SRTF.dat
Process Files


Average Response Time
SJF
SRTF
500
400
300
200
100
0
sec
process1.dat
process2.dat
process3.dat
SJF.dat
SRTF.dat
Process Files


Average Penalty Ratio
SJF
SRTF
14
12
10
8
6
4
2
0
sec
process1.dat
process2.dat
process3.dat
SJF.dat
SRTF.dat
Process Files



Analysis:

From the above Tables and Graphs on the test cases we can see that SRTF minimizes the average waiting times. SRTF turnaround time is less here because we didn't add the time for context switching here and it comes handy in the case of SRTF.In case of SJF, longer jobs spend more time in the waiting state and even short jobs that arrive later spend more time in the waiting state as the scheduler is non-preemptive. In SRTF, the job with the shortest time remaining is run preemptively; hence the waiting time is minimized for even short jobs which arrive later. However, in this scheme, the average turnaround times increase as jobs switch preemptively. SJF is not a good scheduler with respect to metrics like Waiting Time and Response Time unlike SRTF.