Project 3

Implementing Scheduling Algorithms

Algorithms to Implement

- First Come First Serve (FCFS) - 30 Points
- Shortest Job First (SJF) - 30 Points
- Shortest Time-to-Completion First (STCF) - 40 Points

Objective

- Each algorithm will take an input file and display the output on console
- Input:
    - A job description file from command line. Structure of input file is discussed in the next slides
- Output - Simulate the algorithm and return:
    - Average Response Time
    - Average Turnaround Time

Job Description File

```
2    ------> Number of jobs

0    ------> Arrival time of job 1
100  ------> Execution time of job 1

10   ------> Arrival time of job 2
10   ------> Execution time of job 2
```

- Assumptions
  - The input file is always well formed
  - $1 \leq$ Number of jobs ≤ 100
  - $1 \leq$ Arrival time ≤ 100
  - $1 \leq$ Execution time ≤ 100
  - Number of jobs, arrival time and execution time are all unsigned integers

Output

```
6.66667\n ------> Average turnaround time
0.00000\n ------> Average response time
```

- Requirements
  - Two lines of output
  - First is the average turnaround time
  - Second is the average response time
  - Both are floating numbers with precision of 5 decimal places

Submission

- Individual Submission
    - Top level directory name:
      <last-name>-<first-name>-Assignment-3
      e.g. Marley-Bob-Assignment-3
    - Top level directory should only contain three folders: FCFS, SJF and STCF and one file: PL
    - FCFS, SJF and STCF will have the code for respective algorithms and PL has programming language info described later
    - Zip the top level directory and submit on ICON

Submission

- Group Submission (2 students only)
  - Top level directory name:
    <last-name-1>-<last-name-2>-Assignment-3
    e.g. Marley-Chowdhury-Assignment-3 or Chowdhury-Marley-Assignment-3 for students: Bob Marley and Omar Chowdhury
  - Top level directory should only contain three folders: FCFS, SJF and STCF and two files: PL and Members
  - FCFS, SJF and STCF will have the code for respective algorithms, PL has programming language info described later and Members has team members full names
  - Zip the top level directory and submit on ICON

Programming Languages

- Feel free to use any language
- We don’t recommend .NET languages and C#
- The PL file in your project root directory should contain:
  - Programming language name
  - Compiler version (e.g. gcc (GCC) 5.3.1 20160406)
  - The command to compile your code (if using compiled language) (e.g. gcc FCFS.c -o fcs -O3 -Wall)
  - The command to run your code (e.g. python FCFS.py job.description)
- Your code must be compile and runnable from the command line interface

Assumptions, Hints and Pitfalls

- Assumptions
  - Different Start Times: Jobs may have different start times
  - No IO: Jobs do not perform any IO and are only CPU-bound
  - Different Execution Times: Job may have different execution time
  - Known Execution Times: Jobs' execution time are known
  - Preemptive & Non-preemptive: FCFS and SJF are non-preemptive while STCF is preemptive
- Instantaneous job start: If there is any pending job, CPU doesn't go idle
- Stable Sorting Jobs: Stable sort jobs in the ascending order of their arrival time to break ties

Breaking Ties

- First Come First Serve (FCFS)
    - If two (or more) jobs have same arrival time, pick the one that appeared first in the input
- Shortest Job First (SJF)
    - If two (or more) jobs have same arrival time and same minimum execution time, pick anyone
    - But if they have same minimum execution time but different arrival times, pick one with minimum arrival time
- Shortest Time-to-Completion First (STCF)
    - If two (or more) jobs have same arrival time and same minimum execution time, pick anyone
    - But if they have same minimum execution time but different arrival times, pick one with minimum arrival time