Homework 4
CENG431 – Building Software Systems

In this homework you are expected to implement a "***Process Management Application***". You should fulfill the concepts of:

- Strategy Design Pattern
- Observer Design Pattern

In this application, there will be processes which has the following attributes:
- id
- arrival time that is the time at which the process arrives in the ready queue
- burst time that is the time required by a process for CPU execution
- completion time which is arrival time plus burst time
- waiting time
- priority
- process state

Arrival time and burst time will be random integers which are between 1 and 20. Priority will be a random integer between 1 and 10, 1 will be the highest priority.

Process states are ***New***, ***Ready***, ***Running***, ***Blocked***, ***Terminated*** and ***Starved.***

In this application processes will be scheduled by using following scheduling algorithms:

- **First Come First Serve** that schedules according to arrival times of processes.
- **Shortest Job First** that schedules according to the shortest burst time.
- **Priority** that schedules according to the priority.

Imagine that this is a multiprogramming environment, therefore scheduling is putting processes in an order to be executed sequentially in CPU, there are no parallel processes. One single CPU executes processes one after the other. Do not try to follow real world operating system rules, only follow the rules defined here.

Also, there is an observer for each process state e.g. ReadyStateObserver, NewStateObserver. These will update process state when they are notified.

There will also be a **ProcessBatch** class which has a batch of processes and is responsible of:

- Scheduling processes in the batch
- Determining each process' waiting time.
- Waiting time will be determined after scheduling and according to burst times. For example, P1 with burst time 3, P2 with burst time 7, P3 with burst time 4 are scheduled in the given order.

P1 will have waiting time 0 since it is the first one. P2 will have waiting time 3 and P3 will have 10. If a process has waiting time more than 50, then its state must be notified as ***Starved***.

- Each time a new process is added to the batch, its state must be notified as ***New***.

- When the waiting time of a process is determined in batch, its state must be notified as *Ready,* unless it is in starvation.

A **Dispatcher** class will extract the scheduled processes which are in ready queue. These processes' states must be updated as *Running* and will be sent to the **CPU** class. After CPU runs the process, the process' state will be *Terminated*.

If the state of the process in ready queue is set as starved after determining the waiting time, it will be *Blocked*.

Assignment Rules

1. Cheating is not allowed. If any cheating has been detected, they will be graded with 0 and there will be no further discussion on this.
2. You are expected to submit your homework in groups. Therefore, only one of you will be sufficient to submit your homework.
3. Make sure you export your homework as Eclipse projects. You can use other IDEs as well, however, you must test if it supported by Eclipse.
4. If you are using an external library, make sure that ".jar" library is in your project after you exported it. Unfortunately, from our previous experiences we have encountered homework submissions that uses libraries from their "**Desktop**".
5. Please submit your homework through CMS.
6. Please export your Java Project as the given format with your assigned.
   Example:

   G02_CENG431_HW2.zip. (Your group IDs will be announced on CMS).

7. Please be informed that your submissions may be anonymously used in software testing and maintenance research studies. Your names and student IDs will be replaced with non-identifying strings. If you do not want your submissions to be used in research studies, please inform the instructor (Dr. Tuglular) via e-mail.