

Exercise: Round Robin Scheduling (ca. 1.5h)

1. Learning goal: Welcome to the world of scheduling!

In Real-Time Operating Systems (RTOS) the process scheduler is probably the most important component. In this first exercise on scheduling let us first get warm with a non-real time scheduling approach: Round Robin (RR) scheduling.

2. Read into and implement a Round Robin scheduler

First read about and understand how Round Robin scheduling works. Then implement a RR scheduler in C++.

For this, write a simple simulator that simulates five tasks where each task has a random execution time of 100, 200, 300, 400, or 500 msec. Then choose the tasks according to the RoundRobin approach.

Note: write a scheduler base class which can be reused in the following exercises for other scheduling approaches as well. Then derive your RoundRobin scheduler from this base class and pack the RoundRobin specific approach of choosing the next task to execute in the next time slot in a method `choose_next_task()` which returns the process id of the process the scheduler has chosen to be executed next.

Your simulation output on the console could look similar to this here:

```
scheduler base class constructor called.
round robin scheduler generated.
added task with id=0 that will have to compute for 100 msec.
added task with id=1 that will have to compute for 300 msec.
added task with id=2 that will have to compute for 300 msec.
added task with id=3 that will have to compute for 300 msec.
added task with id=4 that will have to compute for 200 msec.

Simulation time : 0
Quantum = 50
Scheduler choosed task with id=0
There are 5 tasks that have not yet finished their computation.
    Task id=1 : Time computed=0, Time needed: 300
    Task id=2 : Time computed=0, Time needed: 300
    Task id=3 : Time computed=0, Time needed: 300
    Task id=4 : Time computed=0, Time needed: 200
    Task id=0 : Time computed=50, Time needed: 100

Simulation time : 50
Quantum = 50
Scheduler choosed task with id=1
There are 5 tasks that have not yet finished their computation.
    Task id=2 : Time computed=0, Time needed: 300
    Task id=3 : Time computed=0, Time needed: 300
    Task id=4 : Time computed=0, Time needed: 200
    Task id=0 : Time computed=50, Time needed: 100
    Task id=1 : Time computed=50, Time needed: 300
```

```
Simulation time : 100
Quantum = 50
Scheduler choosed task with id=2
There are 5 tasks that have not yet finished their computation.
    Task id=3 : Time computed=0, Time needed: 300
    Task id=4 : Time computed=0, Time needed: 200
    Task id=0 : Time computed=50, Time needed: 100
    Task id=1 : Time computed=50, Time needed: 300
    Task id=2 : Time computed=50, Time needed: 300
```

```
Simulation time : 150
Quantum = 50
Scheduler choosed task with id=3
There are 5 tasks that have not yet finished their computation.
    Task id=4 : Time computed=0, Time needed: 200
    Task id=0 : Time computed=50, Time needed: 100
    Task id=1 : Time computed=50, Time needed: 300
    Task id=2 : Time computed=50, Time needed: 300
    Task id=3 : Time computed=50, Time needed: 300
```

```
Simulation time : 200
Quantum = 50
Scheduler choosed task with id=4
There are 5 tasks that have not yet finished their computation.
    Task id=0 : Time computed=50, Time needed: 100
    Task id=1 : Time computed=50, Time needed: 300
    Task id=2 : Time computed=50, Time needed: 300
    Task id=3 : Time computed=50, Time needed: 300
    Task id=4 : Time computed=50, Time needed: 200
```

```
Simulation time : 250
Quantum = 50
Scheduler choosed task with id=0
There are 5 tasks that have not yet finished their computation.
    Task id=1 : Time computed=50, Time needed: 300
    Task id=2 : Time computed=50, Time needed: 300
    Task id=3 : Time computed=50, Time needed: 300
    Task id=4 : Time computed=50, Time needed: 200
    Task id=0 : Time computed=100, Time needed: 100
Task with id=0 is finished with its computation!
```

```
Simulation time : 300
Quantum = 50
Scheduler choosed task with id=1
There are 4 tasks that have not yet finished their computation.
    Task id=2 : Time computed=50, Time needed: 300
    Task id=3 : Time computed=50, Time needed: 300
    Task id=4 : Time computed=50, Time needed: 200
    Task id=1 : Time computed=100, Time needed: 300
```

```
Simulation time : 350
Quantum = 50
Scheduler choosed task with id=2
There are 4 tasks that have not yet finished their computation.
    Task id=3 : Time computed=50, Time needed: 300
    Task id=4 : Time computed=50, Time needed: 200
    Task id=1 : Time computed=100, Time needed: 300
    Task id=2 : Time computed=100, Time needed: 300
```

```
Simulation time : 400
```

```
Quantum = 50
Scheduler choosed task with id=3
There are 4 tasks that have not yet finished their computation.
    Task id=4 : Time computed=50, Time needed: 200
    Task id=1 : Time computed=100, Time needed: 300
    Task id=2 : Time computed=100, Time needed: 300
    Task id=3 : Time computed=100, Time needed: 300

[...]
```