

# Computer Operating Systems Homework 3

**Deadline: 05.06.2023 23:59**

The Banker's algorithm is a resource allocation and deadlock avoidance algorithm used in operating systems. It is designed to prevent deadlocks by determining whether a particular resource allocation request from processes can be granted safely without causing deadlock.

The Banker's algorithm works by considering the available resources, the maximum resource needs of each process, and the already assigned resources. It performs a safety check to determine if granting the requested resources to a process would leave the system in a safe state, meaning that all processes can eventually complete their execution without getting into a deadlock situation.

When a new process arrives to the system, it has to specify how many instances of each resource type it will require. The total amount cannot exceed the entire number of system resources. When a user demands a set of resources, the system must decide if allocating these resources would keep the system secure. If it does, the resources are allocated; otherwise, the process must wait for another process to release sufficient resources.

In this assignment, you will implement Banker's algorithm with the given information. In a system, there are five separate sources (R1, R2, R3, R4, and R5). The 'All Resources' table shows the total number of resources available in the system. These resources are shared by five processes (P1, P2, P3, P4, and P5). Already allocated resources are listed in the 'Allocations' table. The resource allocation requests that the processes require to continue execution are listed in the 'Requests' table.

## All resources:

R1	R2	R3	R4	R5
5	7	10	2	6

## Allocations:

	R1	R2	R3	R4	R5
P1	3	0	1	1	0
P2	1	1	0	0	0
P3	0	3	0	0	0
P4	1	0	0	0	0
P5	0	1	4	0	0

## Requests:

	R1	R2	R3	R4	R5
P1	0	1	7	0	1
P2	0	0	1	0	3
P3	2	2	0	0	1
P4	1	0	1	0	2
P5	3	1	0	1	1

## Implementation:

- You will be given three input files: resources.txt, allocations.txt, requests.txt. You should read the necessary information from input files. **Your code will be tested with different input files as well.**
- First implement Banker's algorithm, and print the all necessary information **for each process respectively**: resource allocations, resource request and need vector. Example output format (All numbers are given as 0 to illustrate the output example.):

```
Information for process : P1:  
Allocated resources : R1:0 R2:0 R3:0 R4:0 R5:0  
Resource request : R1:0 R2:0 R3:0 R4:0 R5:0  
Need vector : R1:0 R2:0 R3:0 R4:0 R5:0
```

- State in what order processes run and terminate based on this information. If there is a deadlock in the system, explain which processes are involved and the causes for the deadlock. Example output format (Process names are given randomly as an example. Use process names P1, P2, P3 , P4 and P5 in your outputs.):

```
Running order for processes: PX PW PZ  
There is a deadlock. PQ and PS are the cause of deadlock.
```

## Submission:

- Submit a C code, makefile and 2 page report for this assignment. In your report, explain your answer and calculations step by step.
- Prepare your reports in LaTeX format to get full marks. You can use the following template: <https://www.overleaf.com/read/dqshxtrpthgh>
- Any form of **plagiarism** will not be tolerated. You must solve each question by yourself.
- You must implement your solution in the C programming language and it should work on a linux environment.
- For any question : cogaysultan@gmail.com