

Computer Systems – Activities 1 solved

# UD 05. FUNDAMENTALS OF OPERATING SYSTEMS

---

Computer Systems  
CFGS DAW

Sergio García / Alfredo Oltra

[sergio.garcia@ceedcv.es](mailto:sergio.garcia@ceedcv.es)

[alfredo.oltra@ceedcv.es](mailto:alfredo.oltra@ceedcv.es)

2022/2023

Versión:220602.1617

## Licencia

**Reconocimiento - NoComercial - CompartirIgual (by-nc-sa):** No se permite un uso comercial de la obra original ni de las posibles obras derivadas, la distribución de las cuales se debe hacer con una licencia igual a la que regula la obra original.

## Nomenclatura

A lo largo de este tema se utilizarán distintos símbolos para distinguir elementos importantes dentro del contenido. Estos símbolos son:

🔔 Actividad opcional. Normalmente hace referencia a un contenido que se ha comentado en la documentación por encima o que no se ha hecho, pero es interesante que le alumno investigue y practique. Son tipos de actividades que no entran para examen

👁 Atención. Hace referencia a un tipo de actividad donde los alumnos suelen cometer equivocaciones.

## UD05. FUNDAMENTALS OF OPERATING SYSTEMS

### Internal components. Activities

(1) A system has the following resources: a CPU, two disks (DISC1, DISC2) and a printer (PRN). There are two types of process according to the needs of resource utilization:

Process kind 1

| CPU | DISC 1 | DSC1 | DSC1 | CPU | CPU | PRN | IMP | PRN | PRN | PRN | PRN | CPU |
|-----|--------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0   | 1      | 2    | 3    | 4   | 5   | 6   | 7   | 8   | 9   | 10  | 11  | 12  |

Process kind 2

| CPU | CPU | CPU | CPU | CPU | CPU | DSC 1 | CPU | CPU | CPU | DSC 2 | DSC 2 | CPU | PRN | CPU | CPU |
|-----|-----|-----|-----|-----|-----|-------|-----|-----|-----|-------|-------|-----|-----|-----|-----|
| 0   | 1   | 2   | 3   | 4   | 5   | 6     | 7   | 8   | 9   | 10    | 11    | 12  | 13  | 14  | 15  |

Assuming that the system has a process of each type, calculate the CPU usage, the average system return time and the waiting time for each job with the following CPU planning algorithms:

- FCFS
- Round-Robin with quantum=1.

Suppose that the rest of the queues are managed with a FCFS algorithm and that the first process in this system is type 1.

### Solution Round Robin. Part I

Since the proposed activity is a little different, we will propose the solution (only a few steps).

To solve it, we will use the table on the next page, where for each moment of time we will write down where each process is located.

- At instant 0 both processes want to use the CPU, but only one can do it. Then P1 uses the CPU while P2 remains in the queue.

- At instant 1 the quantum ends so the P2 starts using the CPU. At that instant the P1 needs to use disk1. As he is free, P1 uses it.

- At instant 2 the quantum ends so the P2 has to go out the CPU. But the CPU queue is empty, because P1 continues working with the disc1, so another quantum is given to P2.

Can you continue?

**FCFS**

| Instant | Queue Process | Process in CPU | Queue DSC1 | DSC1 | Queue DSC2 | DSC2 | Queue PRN | PRN |
|---------|---------------|----------------|------------|------|------------|------|-----------|-----|
| 0       | P2            | P1             |            |      |            |      |           |     |
| 1       |               | P2             |            | P1   |            |      |           |     |
| 2       |               | P2             |            | P1   |            |      |           |     |
| 3       |               | P2             |            | P1   |            |      |           |     |
| 4       | P1            | P2             |            |      |            |      |           |     |
| 5       | P1            | P2             |            |      |            |      |           |     |
| 6       | P1            | P2             |            |      |            |      |           |     |
| 7       |               | P1             |            | P2   |            |      |           |     |
| 8       | P2            | P1             |            |      |            |      |           |     |
| 9       |               | P2             |            |      |            |      |           | P1  |
| 10      |               | P2             |            |      |            |      |           | P1  |
| 11      |               | P2             |            |      |            |      |           | P1  |
| 12      |               |                |            |      |            | P2   |           | P1  |
| 13      |               |                |            |      |            | P2   |           | P1  |
| 14      |               | P2             |            |      |            |      |           | P1  |
| 15      |               | P1             |            |      |            |      |           | P2  |
| 16      |               | P2             |            |      |            |      |           |     |
| 17      |               | P2             |            |      |            |      |           |     |
| 18      |               |                |            |      |            |      |           |     |

|      |      |
|------|------|
| P1   | P2   |
| CPU  | CPU  |
| DSC1 | CPU  |
| DSC1 | CPU  |
| DSC1 | CPU  |
| CPU  | CPU  |
| CPU  | CPU  |
| PRN  | DSC1 |
| PRN  | CPU  |
| PRN  | CPU  |
| PRN  | DSC2 |
| PRN  | DSC2 |
| CPU  | CPU  |
|      | PRN  |
|      | CPU  |
|      | CPU  |
|      |      |
|      |      |
|      |      |

P1 ends

P2 ends

P1 Return time: 16

P2 Return time: 18

Mean return time: 17

P1 queue waiting time: 3

P2 queue waiting time: 2

CPU usage:  $16/18 = 88\%$

**Round Robin Q=1**

| Instant | Queue Process | Process in CPU | Queue DSC1 | DSC1 | Queue DSC2 | DSC2 | Queue PRN | PRN | P1   | P2   |
|---------|---------------|----------------|------------|------|------------|------|-----------|-----|------|------|
| 0       | P2            | P1             |            |      |            |      |           |     | CPU  | CPU  |
| 1       |               | P2             |            | P1   |            |      |           |     | DSC1 | CPU  |
| 2       |               | P2             |            | P1   |            |      |           |     | DSC1 | CPU  |
| 3       |               | P2             |            | P1   |            |      |           |     | DSC1 | CPU  |
| 4       | P2            | P1             |            |      |            |      |           |     | CPU  | CPU  |
| 5       | P1            | P2             |            |      |            |      |           |     | CPU  | CPU  |
| 6       | P2            | P1             |            |      |            |      |           |     | PRN  | DSC1 |
| 7       |               | P2             |            |      |            |      |           | P1  | PRN  | CPU  |
| 8       |               | P2             |            |      |            |      |           | P1  | PRN  | CPU  |
| 9       |               |                |            | P2   |            |      |           | P1  | PRN  | CPU  |
| 10      |               | P2             |            |      |            |      |           | P1  | PRN  | DSC2 |
| 11      |               | P2             |            |      |            |      |           | P1  | PRN  | DSC2 |
| 12      |               | P2             |            |      |            |      |           | P1  | CPU  | CPU  |
| 13      |               | P1             |            |      |            | P2   |           |     |      | PRN  |
| 14      |               |                |            |      |            | P2   |           |     |      | CPU  |
| 15      |               | P2             |            |      |            |      |           |     |      | CPU  |
| 16      |               |                |            |      |            |      |           | P2  |      |      |
| 17      |               | P2             |            |      |            |      |           |     |      |      |
| 18      |               | P2             |            |      |            |      |           |     |      |      |

P1 ends

P2 ends

P1 Return time: 14

P2 Return time: 19

Mean return time: 16.5

P1 queue waiting time: 1

P2 queue waiting time: 3

CPU usage:  $16/19 = 84\%$