



Sistemas de Operação / Fundamentos de Sistemas Operativos

Course Overview

Artur Pereira <artur@ua.pt>

DETI / Universidade de Aveiro

Outline

- 1 Objectives and outcomes
- 2 Prerequisites
- 3 Course contents
- 4 Bibliography
- 5 Practical classes schedule
- 6 Assessment

Objectives and outcomes

- **Objectives**

- To present the most important concepts about the internal organization of present day operating systems
- To introduce concurrent programming and the core mechanisms for interprocess communication and synchronization
- To acquaint students with internal organization of Unix/Linux

- **Competencies to be acquired**

- To gain a good understanding of how multiprogramming works and of the general organization of present day operating systems
- To develop skills for the project and implementation of simple concurrent applications
- To be able to carry out productive work as a member of a team that develops system programming software

Prerequisites

- **At the computer architecture level:**

- Basic notions on computer architecture
- Basic notions on communication protocols with input-output devices (pooled I/O, interrupt driven I/O and DMA based I/O)

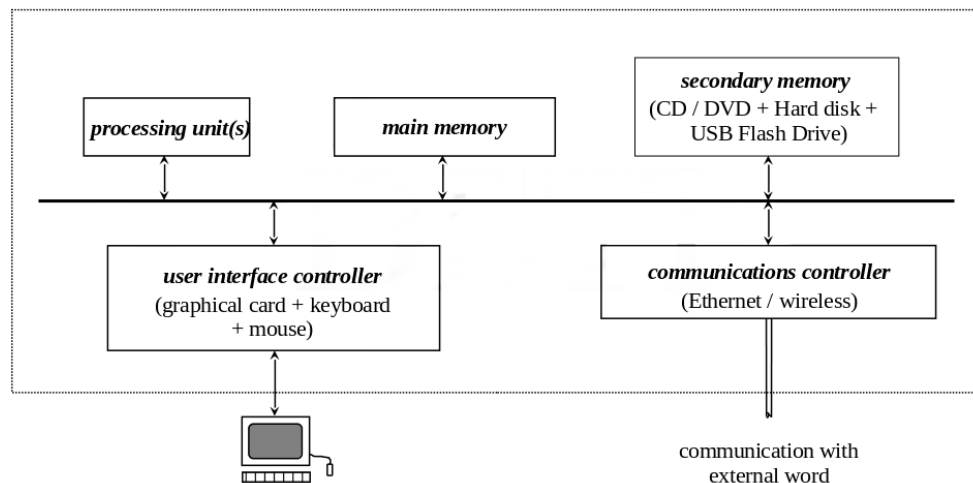
- **At the programming data structure level:**

- Programming skills in C/C++ language at a fair to good level
- Operational and conceptual knowledge of the most common static and dynamic data structures used to build different types of memory (RAMs, stacks, FIFOs and associative memories)

Course contents

Summary

- Contents are related to the components of a computational system



Course contents

Summary

- **Theoretical topics:**
 - Introductory concepts
 - Processor management in multiprogramming
 - Interprocess communication and synchronization
 - Memory management
 - Input / Output
 - File systems
 - Protection and Security (some introductory notions, if possible)
- **Practical and Lab topics:**
 - Concurrent programming, involving inter-process/thread communication and synchronization
 - Processor scheduling and memory management project

Bibliography

- **Support bibliography:**
 - Operating Systems: Internals and Design Principles, W. Stallings, Prentice-Hall International Editions, 7th Ed, 2012
 - Operating Systems Concepts, A. Silberschatz, P. Galvin and G. Gagne, John Wiley & Sons, 9th Ed, 2013
 - Modern Operating Systems, A. Tanenbaum and H. Bos, Pearson Education Limited, 4th Ed, 2015
 - Sistemas Operativos, J. Marques, C. Ribeiro, L. Veiga, P. Ferreira and R. Rodrigues, FCA, 2012
- *Lecture Slides*

- The lecture slides are not enough for a robust understanding of the course topics!

Practical classes

Schedule

- The Linux operating system will be used for both classes and evaluation
 - Students should have Linux installed in their computers
- **General schedule:**
 - C/C++ programming - 1 session
 - Inter-process communication and synchronization (IPC) - 6 sessions
 - Bash scripting - 1 session
 - Support for the development of the practical group project - 5 sessions
- **IPC and concurrent programming:**
 - Exercise on processes and signals
 - Exercise on processes, shared memory and semaphores
 - Exercise on threads, mutexes and condition variables
 - Training exercise for the practical exam
- **Group project:**
 - Development of a processor scheduling and memory management simulation application

Assessment

General rules

- **2 components:**
 - Theoretical component: 45%, with a minimum of 7.0
 - Practical component: 55%, with a minimum of 7.5
- All intermediate grades are rounded to **one decimal place**
- **Theoretical component with 1 element:**
 - Written exam, at the exam periods
- **Practical component with 2 elements:**
 - Practical exam on concurrent programming: 25%
 - Practical group project (may include a defense): 30%
 - Marks above 17 may required some extra work
- **Repeating students:**
 - Grades obtained in previous years are not directly transposed, but ...

Assessment

Appeal and special exam periods

- In the appeal and special exam periods, the assessment elements are exactly the same
- From the normal exam period to the appeal and special exam periods, the following **inheritance rules** apply:
 - The grade of the theoretical exam can be inherited from a previous exam period
 - but, if repeated, the previous grade expires
 - The grade of the practical exam can be inherited from a previous exam period
 - but, if repeated, the previous grade expires
 - The grade of the practical group project can be inherited from a previous exam period
 - repeating the practical group project is possible, but it means developing a new project, not improving the previous one

Assessment

Inheritance rules for repeating students

- **By default:**
 - Grades obtained in previous years are not directly transposed
- **However, grades for assessment elements of this academic year can be obtained from previous grades based on the following rules:**
 - Theoretical exam: 100% of the grade obtained in the previous one
 - Practical exam: 100% of the grade obtained in the previous one
 - Practical group project (TP):
$$0.5 * \min(0.9 * N_g, 14.0) + 0.5 * \min(N_i, 16.0),$$
where N_g and N_i are the group and individual grades obtained in the previous project
- **Deadline:**
 - An email will be sent ...