Sistemas de Operação

Course Overview

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Outline

Objectives and outcomes

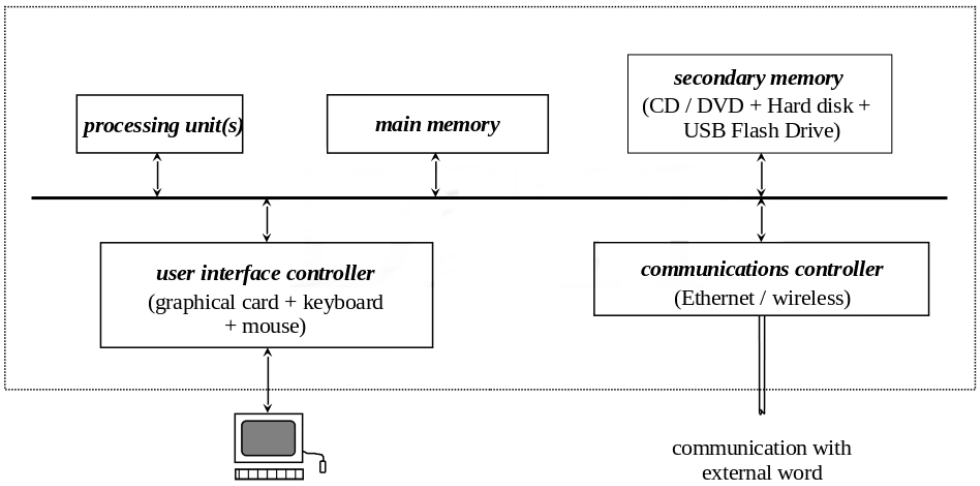
- Objectives
  - To present the most important concepts about the internal organization of present day operating systems
  - To introduce concurrent programming and the core mechanisms for interprocess communication and synchronization
  - To acquaint students with internal organization of Unix/Linux
- 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 - 5/6 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
    - but, repeating 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 exame: 100% of the grade obtained in the previous one
  - Practical exam: 100% of the grade obtained in the previous one
  - Practical group project:

    $$f(\min(0.9 * N_g, 14.0), \min(N_i, 16.0), P_i),$$

    where N_g, N_i and P_i are the group grade, the individual grade and the participation ratio obtained in the previous one

- Deadline:
  - An email will be sent ...