Sistemas de Operação / Fundamentos de Sistemas Operativos

Course Overview

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Sumário

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 most important mechanisms for interprocess communication and synchronization
  - To acquaint the students with the Unix internal organization

- Acquired competencies
  - 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

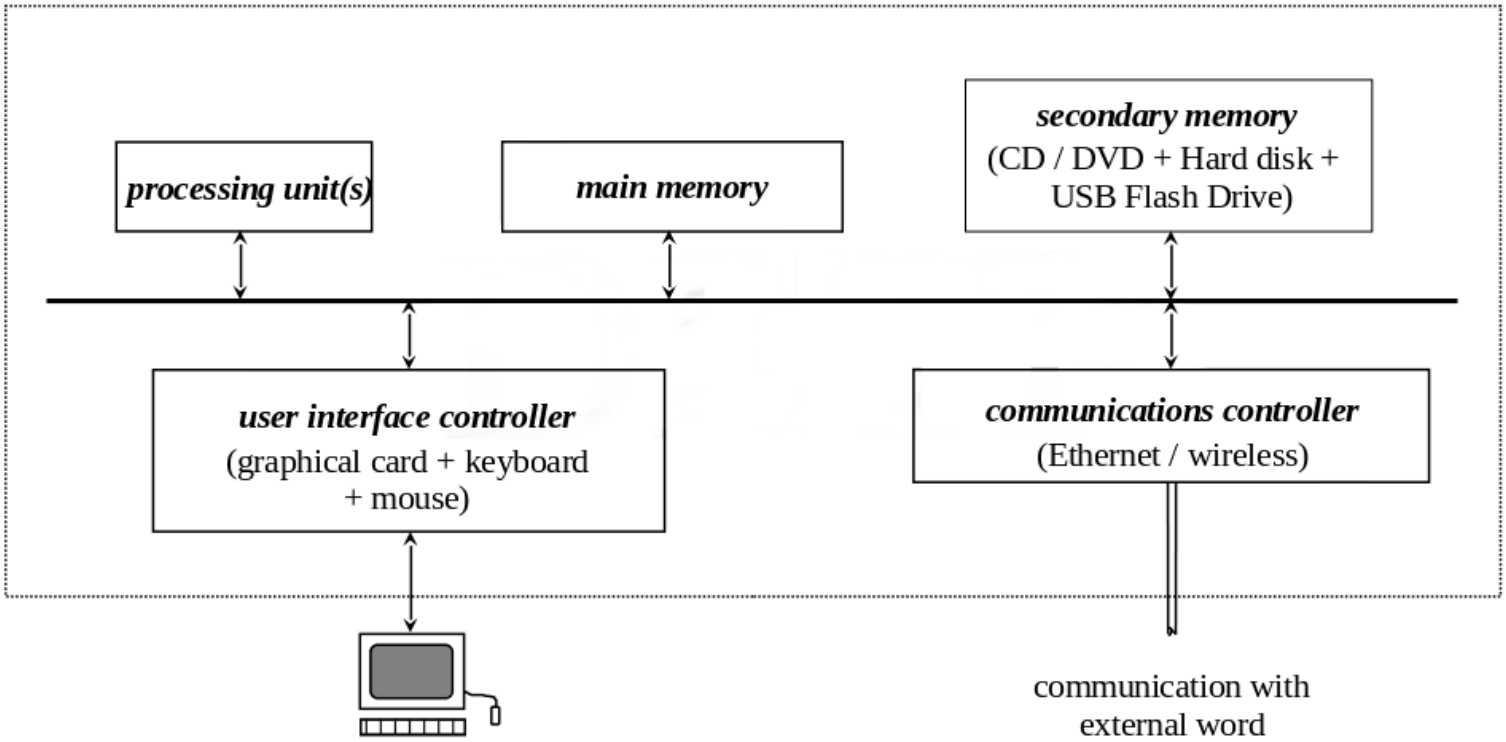
- At the computer architecture level:
  - basic notions on computer architecture
  - basic notions on communication protocols with input-output devices (pooled I/O, interrupt driven I/O and DMA based I/O)

- At the programming level:
  - programming skills in C/C++ language at a fair to good level

- At the data structures 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
Computational system

- Simple view 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:
  - File system development
  - Concurrent programming, involving inter-process/thread communication and synchronization

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

- General schedule:
  - Bash scripting - 1 session
  - File system project - 6/7 sessions
  - Inter-process communication and synchronization (IPC) - 6/7 sessions

- File system project:
  - Implementation of a file system, including its integration into the Linux operating system

- IPC and concurrent programming:
  - Exercise on concurrent programming, based on processes, shared memory and semaphores
  - Exercise on concurrent programming, based on threads, mutexes and condition variables
  - Training exercise for the practical exam

Assessment
General rules

- 2 components:
  - theoretical component: 45%, with a minimum of 7.0
  - practical component: 55%, with a minimum of 8.0
- all intermediate marks are rounded to one decimal place

- Theoretical component with 1 element:
  - written exam, at the exam periods

- Practical component with 3 elements:
  - a file system project: 20%
  - midterm quiz (on the file system project): 15%
  - practical exam on concurrent programming: 20%
  - Marks above 17 may required some extra work

- Repeating students:
  - Can inherit, but ...

Assessment
Appeal and special exam periods

- In the appeal and special exam periods, the assessment elements are exactly the same
- The following inheritance rules apply:
  - the grade of theoretical exam can be inherited from a previous exam period
  - the grade of practical exam can be inherited from a previous exam period
  - the grades of the file system project and of the midterm quiz can be inherited as a whole from a previous exam period
  - Repeating the file system project and of the midterm quiz involves a new file system, not the sofs20

Assessment
Inheritance rules for repeating students

- By default:
  - grades obtained in previous years are not inherited directly

- However, a grade can be inherited based on the following rules:
  - written exame: 100% of the grade
  - file system project: 90% of the grade, with maximum of 13.5
  - midterm quiz: 100% of the grade
  - concurrent programming exam: 100% of the grade
  - concurrent programming exam from concurrent programming project: 90% of the grade, with maximum of 14.0

- Deadline:
  - October, 10th, 2020