0. Module III: Distributed Systems

Concurrence, Parallelism and Distributed Systems (CPDS)

Facultat d'Informàtica de Barcelona (FIB)

Universitat Politècnica de Catalunya (UPC)

2019/2020 Q1

FIB

Contents

1. Concepts underlying distributed systems

2. Distributed algorithms

   A. Time and global states

   B. Coordination and agreement

   - Paxy seminar

3. Distributed shared data

   A. Distributed transactions

   - Opty seminar

   B. Consistency and replication

Course organization

- 10 h/week of student work

1. Face-to-face classes (4 h/week)

   A. **Lecture classes**
      - Objective: Acquisition of theoretical knowledge

   B. **Practical seminar sessions**
      - Objective: Acquisition of knowledge through experimentation

   – See our calendar!

2. Independent learning (6 h/week)

Lecture classes

- Slide-based lectures

- Exercises (from previous exams)
  - Available in the Exam documentation area in the 'Racó'

- Online quizzes: **Quizizz**
  - http://quizizz.com/
  - Register if you want to keep your history of quizzes

Practical seminar sessions

- We will use **Erlang** programming language
  - Install it in your laptop: http://www.erlang.org/
- Lab work in teams of three students
  - Answer the post in the CPDS forum in the 'Racó' to indicate the team members before October, 4th
    - https://raco.fib.upc.edu/forum/posts/list/951605.page
- Follow-up work after the seminar
  - Elaborate a **seminar report** (deadline: 1 week)
  - Use Practicals area in the 'Racó' to submit
- Seminars content WILL be asked in the exam

Calendar

23/09 - 27/09		(27/09) 1a. Time and Global States
30/09 - 04/10	(01/10) 1a. Global States + 1b. Elections	(04/10) 1b. Multicast & Consensus
07/10 - 11/10	(08/10) 1b. Consensus	(11/10) 1 - Paxy
14/10 - 18/10	(15/10) 1 - Paxy	(18/10) 2a. Distributed Transactions
21/10 - 25/10	(22/10) 2 - Opty	(25/10) 2 - Opty
28/10 - 01/11	(29/10) 2b. Consistency & Replication	

16/12 - 20/12	(17/12) EXAM PREPARATION M3

13/01 - 17/01	(14/01) EXAM M3

Course material

- **https://mwiki.fib.upc.edu/cpds-miri**
  - Lecture slides
  - Practical assignments
  - Seminar report LaTeX template
  - Supporting documentation and references
    - Erlang slides and other reference material

- You have to log in using the same credentials as when you log into 'Racó'
  - Use VPN to connect from outside the UPC network
    - https://www.fib.upc.edu/en/fib/it-services/vpn-upclink

Grading

- Grade for M3 $= 0{,}6 * exam + 0{,}4 * seminars$

A. Written module exam 14/01/2020:

1. Multiple-choice test about the lectures
   ⇒ <u>Closed-book</u>: you are not allowed notes, books or any other reference material, including electronic devices

2. Exercises about the lectures
   ⇒ <u>Restricted open-book</u>: you are allowed a **single legible double-sided cheat sheet**

3. Questions/exercises about the practical seminars
   ⇒ <u>Closed-book</u>

Grading

B. Evaluation of practical seminars:

$$(R_1 + R_2 + Q_1 + Q_2)/4$$

- – R_i: grade of seminar report i
- – Q_i: grade of question in the exam about practical seminar i

Bibliography

- ## Basic textbooks
  - A. S. Tanenbaum, M. van Steen. *Distributed Systems: Principles and Paradigms*, 2nd edition, Prentice Hall, 2007
  - G. Coulouris, J. Dollimore, T. Kindberg, G. Blair. *Distributed Systems: Concepts and Design*, 5th edition, Addison-Wesley, 2011

- ## Additional books
  - S. Ghost. *Distributed Systems: An Algorithmic Approach*, Second Edition, Chapman and Hall/CRC, 2014
  - F. Cesarini, S. Thompson. *Erlang Programming: A Concurrent Approach to Software Development*, O'Reilly, 2009
  - J. Armstrong. *Programming Erlang: Software for a Concurrent World*, 2nd edition, Pragmatic Programmers, 2013
  - F. Hebert. *Learn You Some Erlang for Great Good!*, No Starch Press, 2013