

University of Edinburgh
School of Informatics

Distributed Systems - Fall term 2011

Instructor: Dr. Richard Mayr

Course Projects (for level 11 students only)

Assigned date: 17. Oct. 2011

Due date: 24. Nov. 2011. 4 PM at the ITO.

Choose ONE of the following two possible projects.

Project 1: Implement the Bully algorithm for leader election (see part 4 of the course) in Java.

Use (at least) 8 parallel threads P_1, P_2, \dots, P_8 . Each can spontaneously start the election. To make it interesting for observation, use a random number generator in each process to make it ‘fail’ with a certain probability in every step. A ‘failed process’ P_i should output “Process i has failed” and then never reply to messages from other processes.

Let the processes output status messages about what they are doing, e.g., “Process i requests permission from Process j ”, or “Process i announces his leadership to Process j ”, or “Process i recognizes Process j as leader”, etc. Thus you obtain a protocol of what has happened in a run of the algorithm.

Deliverables:

1. The Java code: Ready to compile (with javac from the command line) and to do some test runs. To be submitted electronically with the ‘submit’ command (submit ds 1 filename).
2. A brief description of your program, design decisions (e.g., failure rates, timeouts), documentation, etc. (1-2 pages). Protocols of some test runs (at least 3 different outcomes). To be submitted **on paper at the ITO.**

Project 2: (To be submitted on paper at the ITO only) This project is related to Chapter 10 (Peer-to-Peer Systems) and Section 7.4.3 (Security) in the course text (Coulouris, Dollimore, Kindberg), but mostly about new material on the web.

Bitcoin (www.bitcoin.org) is a project with the goal to create a digital currency. Study the design of this system, using the above website and other resources on the web. Then answer the following questions (in some detail, 3-4 pages).

1. What are the main goals of the bitcoin project? What are the fundamental ideas behind its design?
2. How are bitcoins created?
3. In what sense does bitcoin differ from other means of electronic payment over the internet, e.g., credit cards?
4. How does bitcoin compare to cash transactions? In what sense are bitcoins and bitcoin accounts anonymous, and in what sense are they not anonymous?
5. As digital information can be copied arbitrarily, what prevents you from copying a bitcoin and spending it several times?
6. Compared to traditional means of exchange/currency, what are the main advantages and disadvantages of bitcoin?

(Note: Do not start any miners on university machines. By now, CPU-based miners are almost useless anyway. Only large pools of modern GPUs have a chance.)