CMPT431 Distributed Systems Project Instructions

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1 Important dates

- (31 January or) 2 February: proposal presentations
- 3 February: proposal submission
- end of 1st week of March: aim to have a complete prototype for testing and revision
- 1st week of April: demo system to TA by appointment
- 11 April: report submission

2 Goals

The goal of your CMPT431 class project is to design, build and test a working real-world distributed system, or to experiment with distributed algorithms in a suitable simulation. Consider the example ideas below, but you can propose any project idea.

You should select a project such that a prototype can be completed by beginning of March, and can be iteratively improved during March. The aim is to produce a high-quality mature system. Decide your scope with this in mind.

You may use any language or platform, but remember that the instructor and TA’s expertise may be limited if you choose something very new and/or unusual or domain-specific.

3 Proposals: due by email Friday 3 February

Project proposals will be in the form of a short (around 5 minutes) presentation in class on (Tuesday 31 January or) Thursday 2 February.

1. Prepare a presentation to describe your idea, related work, approach and your plan for testing your system.

2. After the presentation, revise your presentation based on feedback received, then Email your presentation to the instructor.

The proposal will not be graded, but you should take them seriously as a useful way to ensure progress towards a good project.

4 Progress reports

Each team will give a 20 minute presentation on progress, approaches and problems, roughly every 2 weeks in a tuesday class, followed by discussion. Three teams per week. The order will be determined once the proposals are accepted.

Progress reports are graded at 20% of final mark.
5 Demo: first week of April by appointment

You will probably have run some demos in class, but a final demo will allow us to better assess your project and give feedback for the report. The TA will make appointment times available for a 30 minute demonstration session for your team in the lab. The whole team must attend.

The demo is not graded directly, but the TA will report to the instructor on the demo quality and the evidence of participation and knowledge of each team member.

6 Report: due by email on 11 April

Your team’s report should be around 10-15 pages, and include at least these sections:

1. Team member names, student IDs and email addresses on cover page
2. Goals
3. Description of Distributed System challenges addressed
4. Related work
5. Major design decisions
6. Implementation details
7. Demonstration of example system run
8. Analysis of expected performance (growth rate of major algorithms, etc).
9. Design of performance testing
10. Testing results
11. Conclusions, lessons learned possible improvements, etc.

7 Example project ideas

The keys to a successful project are (1) choosing a suitable idea, with sensible, realistic scope but still challenging; (2) starting right away; (3) really starting right away.

7.1 DOS components / middleware

1. Distributed file system (recommend doing this in userspace using FUSE project http://fuse.sourceforge.net. See the Google File System for inspiration.
2. Cluster computing process scheduler (you probably should simulate this rather than attempt to build a real one).
3. Distributed shared memory system: allow processes on multiple hosts to share portion of address space.
5. A virtual filesystem like Dropbox without central storage.
6. Robot-to-robot communication tools, perhaps as Player http://playerstage.org or ROS http://ros.org plugins:
   (a) RTO-multicast
(b) semaphores / mutexes
(c) elections
(d) auctions

7.2 Applications

1. Distributed N-body simulation: take Vaughan’s universe or Antix code http://github.com/rtv and make it faster by doing some computation in parallel. This could mean multiple threads and/or processes and/or hosts, to exploit multiple CPU cores or a group of hosts.

   Characterize the speed improvements you achieve by empirical experiments, and compare the results to your expectations.

2. Bittorrent without the central tracker

3. Distributed real-time game (e.g. pong, pacman). Allow players on multiple hosts to share a common game world.

4. Simple Map/Reduce implementation

5. If you already know iOS, XNA, etc, a multi-player handheld/console casual game.

6. A collaboration web app based on peer-to-peer comms.

8 What to submit

These deliverables are due at or before the last class of the semester

1. A report on paper by hand to the instructor in class. One report from each group.

2. A 5-to-7 minute presentation in the final class, explaining your goals, DS problems tackled, major design decisions and results. Use slides to illustrate your presentation.

9 Grading

Your project will be graded as follows:

1. Report 80%. Of which

   (a) 20% for project idea and implementation
   (b) 30% on report quality, including clarity and completeness
   (c) 30% for suitable testing regime and analysis of results

2. Progress presentations 20%. Focus on clarity and understanding of DS issues.