CISC 434: Distributed Systems – Course Plan

- General information
  - Instructor and TA information
  - Course requirements and schedule
- Summary of course topics
- Project overview
General Information

- **Instructor**
  - Mohammad Zulkernine, PhD, PEng
    mzulker@cs.queensu.ca (Please put 434 in the subject)
    Office hour: Goodwin 535, Mondays 10:30 – 11:30 am

- **Teaching Assistant**
  - Shahrear Iqbal
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You Look at Me
I Look at You
About my Research & Teaching

► Teaching: Software quality assurance, Distributed systems, Software reliability and security
► Research: Building and monitoring trustworthy software – Queen’s Reliable Software Technology (QRST) Group
► For more information: http://cs.queensu.ca/~mzulker
General Information – contd.

- **Lectures**
  - Monday 11:30-12:30, Tuesday 1:30-2:30, Thursday 12:30-1:30
  - Location – Goodwin Hall 254
  - Lecture notes will be available on the web after each lecture day
  - Notes are from “Distributed Systems” by Tanenbaum and Steen
  - The lecture notes are taken from various copyrighted sources for the sole use of the students registered in CISC 434 in Fall 2015

- **Tutorials**
  - Informal: Please email the TA for making an appointment
  - Formal: See the lecture schedule on the course website

- **Laboratories**
  - No scheduled labs - Requires significant lab time for the project

- **Schedules are available on course web page** – www.cs.queensu.ca/~cisc434 – Plan ahead accordingly
General Information – contd.

Textbook

References
- George Coulouris, Jean Dollimore, Tim Kindberg, Distributed Systems: Concepts and Design, Addison Wesley
- Jim Farley, Java Distributed Computing, O’Reilly

Marking
- 2 Course Project Assignments 40% (a group of two)
- 4 Term Tests 60%
- There is no “test only” option in this course. You have to pass the project independently

Academic integrity
- http://www.queensu.ca/artsci/academics/undergraduate/academic-integrity
Distributed Systems

A distributed system is a collection of independent computers that appears to its users as a single coherent system

- Hardware – Machines are autonomous
- Software – Users think that they are dealing with a single system

Examples of Distributed Systems

- A network of workstations in a university or company
- A workflow information system that supports automatic processing of orders that involves multiple departments
- World Wide Web
Misconceptions in Developing Distributed Systems

- The network is reliable
- The network is secure
- The network is homogeneous
- The topology does not change
- Latency is zero
- Bandwidth is infinite
- Transport cost is zero
- There is one administrator
Course Objective

- In-depth discussions on a number topics and group projects
  - To convey insight into the principles underlying the design of distributed systems
  - To provide necessary tools for evaluating existing distributed systems or designing improved ones
  - To study the state of the art and practice in distributed computing
Lecture Topics – contd.

- Basic concepts
  - Goals and types of distributed systems

- Architecture
  - Organization of a distributed system – a distinction between the logical organization of the collection of software components and their actual physical realization

- Processes
  - How the different types of processes (a program in execution) play a crucial role in distributed systems
Communication

- Examine the ways that processes on different machines can exchange information

Naming

- The ways the names are used in distributed systems to share resources, to uniquely identify entities, to refer to location, etc.

Synchronization

- How processes cooperate and synchronize with each other to communicate with each other
Consistency and replication
- Data replication is required to improve reliability & performance – meaning and achievement of the consistency of replicated data

Fault tolerance
- To automatically recover from partial failures without seriously affecting the overall performance

Security
- Various mechanisms that are generally incorporated to support security in distributed systems
Lecture Topics – contd.

- Distributed systems based on data types object, file, (web) document*
  - Object-based systems
    - Principles of distributed systems applied to object-based systems
  - Distributed file systems
    - Distributed file systems as a model for building distributed systems
  - Distributed web-based systems
    - Principles of distributed systems to build web technology
  - Distributed coordination-based systems
    - Coordinating activities between components

* May not be covered
Group Project

Objective
- To complement the understanding of theoretical concepts and their applications to the real-world problems

Some Friendly Advice
- Requires active participation among group members in group projects.
- Groups of no more than two students
- Follow project descriptions while you can make reasonable assumptions
- Attend the tutorials on course project and contact the TA first for project related issues
- Meet the submission deadlines
Projects

Project 1: Comparison of Various Distributed Techniques

- Gain understanding of a number of distributed system techniques
- The performances of the following techniques will be compared and contrasted using a simple example problem described in the project description
  - Socket
  - RPC (Remote Procedure Call)
  - RMI (Remote Method Invocation)
  - SOAP (Simple Object Access Protocol)
  - REST (REpresentational State Transfer)
  - Apache Thrift
  - Google Protocol Buffer
Projects

- **Project 2: Design and Implementation of a Chat System**
  - To design and implement a collaborative system - a chat system for textual conversation between multiple participants communicating with each other.
  - You need to design the system by keeping in mind the requirements outlined in the project description.
Summary

- Course requirements and schedule
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- Project overview
- Cartoons – obtained from Dr. Bob Crawford