CSE5306 Distributed Systems

Fall 2021, Credit Hrs: 3, Section 002, CSE Dept/College of Engineering

Instructor: Dr. Jia Rao   Time: Tu/Th 3:30pm-4:50pm
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Course Description

Distributed systems help programmers aggregate the resources of many networked computers to construct highly available and scalable services. With the recent advances in cloud computing, a specialized form of distributed computing, and the proliferation of mobile devices, the frontier of computing at the edge of networks, it is important to understand the fundamental concepts and learn the design and implementation techniques of distributed systems. However, building a highly efficient, scalable, and reliable distributed system is challenging due to the complexity large-scale networked systems, including hardware heterogeneity, dynamic network topology, unreliable network interconnection, and the ever growing user needs of multitenancy.

This course is designed to provide students with the understanding of fundamentals of distributed systems. In this course, we will first introduce the basics of distributed computing, including distributed architectures, processes and threads, communication, naming, synchronization, consistency and replication, fault tolerance, and later move onto the discussions of representative distributed systems, such as distributed computing systems and file systems.

Student learning outcomes

Upon completion of this course, students are expected to be familiar with the fundamentals of distributed computing, be able to analyze and evaluate the performance of distributed systems, to write simple distributed programs, and to understand the inherent tradeoffs of distributed system design.

Prerequisites

- Operating Systems, Computer Networks, and Computer Organization and Architecture.

- Knowledge of UNIX/Linux systems and high-level language C/Java/Python.

Textbook

- Andrew S. Tenenbaum and Maarten Van Steen
  Distributed Systems: Principles and Paradigms, Second Edition, Prentice Hall, 2007. A free digital copy of the third edition of this textbook can be requested at `https://www.distributed-systems.net/index.php/books/gtcn/gtcn/`.

- This course may include additional readings from technical papers, tutorials, and other textbooks.

Homework Assignments

There will be 2 homework assignments focusing on basic concepts, algorithms, and design principles. Submissions should follow:

- Homework assignments are to be completed individually, no teamwork is allowed

- Submit homework assignments electronically through Canvas on the due day

- No email submission, keep your own record.

Project Assignments

There will be 3 team project assignments related to distributed systems and programming. The project policies are:

- Project assignments are to be completed in teams. 2-person teams are required, though 1-person teams are possible. If you want to work on your own, you need instructor's permission. No bonus will be granted for working on your own (i.e., 1-person team).

- Projects may have different turn-in requirements, which will be announced when released.

- In class (virtual) demo of project results may be required for some project(s)

Exams

There is no midterm exam in this class. The final exam will be a close-book and close-note exam and be administered online. However, you are allowed to carry one letter-size, double-sided, hand-written cheat sheet. The exam schedule is:

- Final exam: 2:00pm - 4:30pm, Tuesday, Dec. 14, 2021.

NO MAKE-UP EXAMS. Please make arrangements to meet the schedule. If you miss an exam or quiz due to unavoidable circumstances (e.g., health), you must notify the instructor via email or meeting with him as soon as possible and request a makeup approval. PLEASE let the instructor know ahead of time! Do NOT ask for make up exams or other components if you missed an exam or a project due to travel (except when you are required to travel to represent the university or the department).

Grading Policy

Grading scale

- A: [90, 100]

- B: [80, 90)

- C: [70, 80)

- D: [60, 70)

- F: below 60

Distribution of Points

- In-class discussion and attendance: 5%

- Homework assignment: 20%

- Project: 40%

- Final exam: 35%

Course Policy

Americans with Disabilities Act

The University of Texas at Arlington is on record as being committed to both the spirit and letter of federal equal opportunity legislation; reference Public Law 93112 – The Rehabilitation Act of 1973 as amended. With the passage of new federal legislation entitled Americans With Disabilities Act - (ADA), pursuant to section 504 of The Rehabilitation Act, there is renewed focus on providing this population with the same opportunities enjoyed by all citizens. As a faculty member, I am required by law to provide "reasonable accommodation" to students with disabilities, so as not to discriminate on the basis of that disability. Student responsibility primarily rests with informing faculty at the beginning of the semester and in providing authorized documentation through designated administrative channels.

Academic Integrity

It is the philosophy of The University of Texas at Arlington that academic dishonesty is a completely unacceptable mode of conduct and will not be tolerated in any form. All persons involved in academic dishonesty will be disciplined in accordance with University regulations and procedures. Discipline may include suspension or expulsion from the University. "Scholastic dishonesty includes but is not limited to cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or in part to another person, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts." (Regents' Rules and Regulations, Part One, Chapter VI, Section 3, Subsection 3.2, Subdivision 3.22)

Please acknowledge the following Honor code in all submissions:

- *I pledge, on my honor, to uphold UT Arlington's tradition of academic integrity, a tradition that values hard work and honest effort in the pursuit of academic excellence. I promise that I will submit only work that I personally create or contribute to group collaborations, and I will appropriately reference any work from other sources. I will follow the highest standards of integrity and uphold the spirit of the Honor Code.*

Drop Policy

Students may drop or swap (concurrently add and drop) classes through MyMav self-service throughout the registration period. After the late-registration period, students must see their academic advisor to drop a class or withdraw. Undeclared students must see an advisor in the University Advising Center. Drops can continue through a point two-thirds of the way through the term or session. It is the student's responsibility to officially withdraw, if he/she does not plan to attend after registering.

Emergency Exit Procedures

Should we experience an emergency event that requires us to vacate the building, students should exit the room and move toward the nearest exit. When exiting the building during an emergency, one should never take an elevator but should use the stairwells. Faculty members and instructional staff will assist students in selecting the safest route for evacuation and will make arrangements to assist individuals with disabilities. How best to exit the building will be explained on day one. (See also `http://www.uta.edu/campus-ops/ehs/fire/Evac_Maps_Buildings.php` and `http://www.uta.edu/police/EvacuationProcedures.pdf`.)

Student Support Services

UT Arlington provides a variety of resources and programs designed to help students develop academic skills, deal with personal situations, and better understand concepts and information related to their courses. Resources include tutoring, major-based learning centers, developmental education, advising and mentoring, personal counseling, and federally funded programs. For individualized referrals, students may visit the reception desk at University College (Ransom Hall), call the Maverick Resource Hotline at 817-272-6107, send a message to resources@uta.edu, or view the information at `http://www.uta.edu/universitycollege/resources/index.php`.