

EEL4598/5718: Computer Communications

Project Outline

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Project Description: The project purpose is to help you understand the knowledge learned from the class, to make you familiar with modern computer communications and networking technologies and to provide you an opportunity to solve small practical problems as an engineer with depth. Unless you have your own selected topics, you could pick one problem below and work on it during the whole semester. At the end of the class, you should show your achievements via a written report and/or a demo. The project accounts for 10% of the final grade.

Project Problems: You can choose any one of the following project problems. Alternatively, you are strongly encouraged to solve the unsolved problems in the current literature apart from the given topics. However, those topics must be approved by the instructor or TA before you submit the project proposal.

- A comprehensive survey on a specific and timely topic in modern networks (such as 5G/6G networks, smart vehicular networks, smart and connected health, RFID systems, and social networks), preferably from a networking perspective. Choose at least 1 technical journal or conference paper and 1 magazine paper representing the current research trends and corresponding techniques that the authors use, and write a report on them. No survey on survey or duplicate the original paper is allowed!
- You are required to write a detailed report after reading the standard of a recently developed network technology or an emerging technology (e.g., IEEE 802.11x, IEEE 802.15 or IEEE 802.16, LTE-IoT). You are strongly encouraged to incorporate real examples in the current literature for better description. Further discussions from lectures are also acceptable in the report.
- Write a Berkeley Socket program to use TCP or UDP protocol to chat. The programming language can be C, C++ or Java. The program should include a server and clients, which can realize online chatting. Also, the server should be able to support multiple clients. Meanwhile, you are required to capture and analyze the transmitting packets using Wireshark. Apart from the report, you need to present a demo to the instructor/TA and submit the final report and the code.
- Using socket programming technique to write a program to realize end-to-end message transmission. Message (plain texts or files) can be sent from one end and correctly received at the other end. For security concerns, the transmitted message should be encrypted, using a standard such as AES256 for instance and you should also attach an HMAC to the file. (Adding digital signature will earn you extra bonus.) In the reception, you need to perform verification as well as decryption and examine the computational cost of your scheme. In the end, you are required to present a demo to the instructor/TA and submit the final report and the code.
- You are required to use ns-2 / ns-3 simulator (C++) to give a simulation result under at least two-hop scenarios with IEEE 802.11 protocols. The scenario design should be approved by the instructor. The final report should include all the source code of corresponding program and detailed analysis. The demo should also be presented.

Project Requirements:

- Group size: TWO TO THREE students in a group. The group is self-organized. A student who cannot find a team must inform the instructor/TA in order to help him/her form a team.
- Each group selects only one problem from the available problem set. The group establishment and project decision must be reported before midterm.
- Each group should write a report for the project and submit it before the last class.
- For non-programming project, the minimum number of pages of final report should be no fewer than 8; for programming project, there is no requirement for the number of pages.

Grading: Grade is based on technical content, completeness of report (project description, timeline of project progress, individual effort assignment, references used, code, etc.), demonstration if needed, and report writing. Code for socket programs or simulations must be written by yourself and any plagiarized code will not be tolerated (zero grade on project will be given and more severe punishment may follow if plagiarism is found).

Project Timeline:

- Before Mid-term: Project proposal and workload assignment should be reported and approved by the instructor/TA.
- Before last class: Demo for instructor/TA (if needed).
- On the last class: Final report due.

Project Report Format:

- Title page: title, team members.
- Second page: program time-line and responsibility of each team member.
- Report itself.
- Reference list at the end of the report.
- Copies of major references you used for the project.
- Code if applicable.