

Mini Project

*Handed Out: Nov 23th, 2020**Due: Dec. 18, 2020 (5:00pm)**TA: Yu-Lin Wei*

1 Project requirements

Select a topic from the list of topics below, survey the topic from articles and papers on the Internet, prepare slides, and finally create a 15-minute video presentation to explain the topic (like a mini-tutorial). This is an individual project, i.e., Every 4-credit student has to submit his work.

2 List of topics

- **Understanding the Roadmap of 5G, and 6G Networks:**
Discuss 5G networks and how they differ from 3G/4G; explain the reason for great excitement around 5G; discuss the key technical challenges; what are the new innovations to solve them? what are the next big changes in 6G? etc.
- **Deeper Look into BGP Routing:**
Explain the operations of BGP routing; explain why it is critical to the Internet; explain how various factors influence route choice; discuss case studies; discuss the challenges in designing this protocol; discuss key insights that keep this protocol running; are there security threats and vulnerabilities in this protocol? etc.
- **Software Defined Networking: The Basic Principles and Case Studies:**
What is SDN and how did it get started; what is the core departure from conventional networks; what are the technical and algorithmic challenges; how can these challenges be overcome; how is SDDN rolling out today; what differences should common network users see with SDNs? etc.
- **TCP for Data Centers: What's the Difference?**
What is a data center; why is there a need to re-think TCP for data centers; what are the core technical challenges in TCP design; why are simple modifications not enough; what solutions have been proposed; what benefits should common network users see once data centers run customized TCP? etc.
- **Router Scheduling Algorithms: A Mathematical Perspective:**
Discuss the role of scheduling algorithms for managing router queues; what are various classes of scheduling algorithms and what are the tradeoffs; what are running in routers today; what are more sophisticated algorithms; why are they not implemented? (Feel free to dive into some of the mathematics of scheduling algorithms)

etc.

- **V2X: What are the Networking Challenges around Autonomous Cars:**
An autonomous vehicle will be communicating with various components in the environment, such as other cars, infrastructure, cloud, etc – discuss the vision around such communications and networking; what are the major technical challenges; what has been developed in the past to solve these; what are shortcomings at this time; what open problems remain in the future; what sort of benefits will common users see once such capabilities are available in self-driving cars? etc.
- **Satellite Networks: Past, Present, and Future:**
What kind of satellite networks are available today; what are some of the ECE/CS 438 principles that apply to such networks; where do these networks depart from the way we think about the Internet; what are key challenges to solve with satellite networks; how are they solved; what is in the future roadmap for satellite and more generally space networks; what benefits will common people see with advances in satellite networking.

3 What and How to submit

Submit the video as a URL (either YouTube, Dropbox, or any other), as well as slides for the presentation as a PPT file.

Email the link and file to yulinlw2@illinois.edu with title “[ECE/CS 438] Mini project submission - #NetID”. Deadline is **Friday Dec 18, 5pm**.

4 Grading

- Technical depth and insights (30%).
- Technical breadth (20%).
- Flow of the presentation and quality of explanations (25%).
- Personal opinions/observations (10%).
- Citations and literature survey (10%).
- Aesthetics (5%).

5 Final notes

- Imagine the audience to be undergraduate seniors, so please discuss technical matters (not just high-level trivia or history). Share your personal thoughts and opinions anywhere you see fit.

- Please cite related papers and articles you have read in the last slide(s) of your presentation. The videos will be published on the course webpage so other students can watch and learn.