EECS 428 Computer Communications Networks II:

Software-Defined Networking and Emerging Applications

An Wang

Introduction

- Research Interest: software-defined networking, data center and cloud security, IoT and edge computing, distributed machine learning

- Research Goal: address security and scalability issues through innovation in network architecture, cloud and data center systems

Class Information

- Instructor: An Wang
- Office: Olin 407
- Email: axw474@case.edu
- Office hours: by appointment
- Course page: **All materials and assignments will be updated in Canvas**
- Prerequisite: CSDS 425/325 (or equivalent)
- We will use emails for communications; you must have a Case account and check the account for messages periodically, if not daily.

Tentative Course Topics

- SDN Techniques:
  - API between Control Plane and Data Plane
  - Controller Design
    - ONOS, ONIX, POX, Floodlight and OpenDayLight
    - Frenetic and Maple
  - SDN Abstraction
    - Protocol Independent Forwarding
    - Verification & Network Update
    - Composition
- SDN Applications
  - Measurement in Networks
  - SDN Security
  - SDN Middleboxes and NFV

Textbooks & Resources

- Recommended: Kurose & Ross, Computer Networking – A Top-Down Approach Featuring the Internet, Wesley

- Software & Tutorial Resources
  - VirtualBox Environment
  - Course virtual machine image
    - Hints on VM Setup
  - Mininet: Virtual network emulation environment
    - Mininet Walkthrough
  - Ryu: open-sourced Network Operating System (NOS) that supports OpenFlow
    - Getting Started on Ryu
  - Pyretic: Python-based SDN programming language
  - Kinetic: Event-driven network control

- Readings
  - Christian Lumezanu's SDN Reading List

Important Dates

- First class: Aug 26th
- Last day to drop/register: Sep 6th
- Fall break: Oct 21th/22th
- Proposal due: Oct 20th (Tentative)
- Last class: Dec 6th
- Final project presentation: Dec 12th (8:00 -11:00 am)

Grading

- Programming assignments – 25%
  - *NO credit* if your code does not compile
  - Unless under prearranged conditions, late homework/projects lose 10% credit within 3 days after the respective deadlines and will not be accepted 3 days after due
- Paper reviews – 25%
  - About 12 papers. You are excused of 2 reviews
- Presentation & Participation – 20% (10% each)
- Final Project – 30%
  - In teams of 1 to 2 team members
- Grading is proficiency-based. Cutoffs will be in the vicinity of, but not higher than:

  $A \geq 90\%$, $B \geq 80\%$, $C \geq 70\%$, $D \geq 60\%$, $F < 60\%$

Paper Reviews

The reviews may contain:

Novel Idea	*Describe the new ideas presented in the paper*
Main Results	*Describe the main results obtained in the paper*
Impact	*What is the importance of these results. What impact might they have on theory or practice of Computer Systems*
Evidence	*What reasoning, demonstration, analytical or empiricial analysis did they use to establish their results*
Prior Work	*What previously established results does it build upon and how*
Competitive Work	*How to the compare their results to related prior or contemporary work*
Question	*A question about the work to discuss in class*
Criticism	*A criticism of the work that merits discussion*
Ideas for further work	*Did this paper give you ideas for future work, projects, or connections to other work? (Hint: this is not the paper's Future Work section, write here IF the paper inspired any ideas in you!)*

Here are tips for becoming a more efficient reader

Paper Discussions

- Each student will lead the discussion on two of the papers during the semester

- Talk to me before the class in which you will lead a discussion. Submit a summary of the discussions after the class

- Prepare slides for the presentation and discussions (~30 min for paper)
  - for guidelines on how to prepare your discussion, check Prof. Randy Katz' notes [pdf]

Research Project

- Precisely define the research problem
- Understand related work
- Propose novel techniques or systems
- System implementation
- Evaluate your solution, e.g. performance, scalability
- Write up and present your project (~10 pages)