CSCI–Software-Defined Networking

Final Project

Summary

The Software-Defined Networking final project is composed of three parts: Proposal, Presentation, and Report. The objective of the final project is to encourage the student to explore a technology of interest related to Next Generation Networks (SDN/NFV) to increase further education and independent study beyond the course requirements.

Topics

Topics for the final project are related to Next Generation Networks (SDN/NFV). The project may expand upon topics discussed in class lectures and labs, or be a technology that was not incorporated into the course. See below for a list of recommended topics.

Final Project Proposal

The proposal should be a well written document (similar to the *Executive Summary* homework assignments). An ideal proposal should be about a page; with two-three paragraphs and bullets/numbered lists preferred. The proposal should include how you plan to approach the topic (such as a timeline with objectives), and what deliverables will result from the project (i.e. a lab that demonstrates "BGP functionality"). Please, note that after the proposal has been approved, changing topics (with permission) may lead to reduced grade.

Final Project Presentation

The final presentation should be four to six minutes about the topic: background, why it is relevant, benefits, how it works (demonstration if appropriate). The presentation should allow for questions from the audience (which is not included in the presentation time). There will be a hard cutoff time at eight minutes.

Final Project Report

The report should include the presentation slides, a five question quiz (with answers sheet), as well as a three page (double-spaced) written report of the topic: background, why it is relevant, benefits, etc. At the end of the written report, there should be a lab which can be an additional three to nine pages (with included answers). The lab format should follow the same format as the labs for this course: summary, objectives, questions, etc.

Extra Credit

After the presentations, students will vote on the top three presentations. The suggested criteria for voting are as follows: ability of presenter to clearly communicate the topic (easy for audience to understand the material presented; speed the material is presented; level of technicality of the presenter; etc.), the benefit of the topic to the students; how often the presenter smiles, etc. The top presentations selected by the peers will receive extra credit applied to their final project grade (as well as have bragging rights).

Alternate Submission (Research Paper)

Students can substitute a written report instead of the in class oral presentation. If this option is selected, then the Final Project Report will include a ten page (double-spaced) report instead the three page report. *(Note: The rest of the Final Project Report requirements are still due: presentation slides, quiz. Also, these students will not be allowed to be selected for the extra credit)*

Topics

Choose from the topics below. No labs from this course or other courses are allowed to be re-used. This will be considered plagiarism.

Controller Programming Based Project / Lab

This topic should involve coding a program that demonstrates the functionality, and then creating a lab based on the code/program you've created. The lab should be designed for the student to complete in Mininet or on hardware. For example, in the lab portion, you would remove part of the code you created and that is what the "student" would have to do in the lab. The topics:

- OpenDaylight Application: <u>Yang models</u>
- Debugging/Troubleshooting SDN or Virtualization Tools
- Faucet Controller Applications
- Federated SDN Controllers with Applications
- REST API Controller Abstraction
- Intent-based Networking
- Programming Protocol-Independent Packet Processors (P4) and P4Runtime
- SDN Network Automation
    - Hypervisor
    - Virtual Networks
    - Network Functions Virtualization
- Open Option – subject to professor approval

Software Application Project / Lab

This selection should be using a software to demonstrate SDN/NFV functionality and creating a lab based upon the software. You would choose the software, and show the steps of where to download/install it, and then demonstrate functionality of that software with SDN. The topics:

- Manage Docker hosts using SDN controller connected via OVS
- Orchestration with ONAP/OSM
- Quagga/FRR/ExaBGP and SDN routing
- NFV using Vagrant and AWS
- NFV Network Slicing
- CI/CD Testing Jenkins/Travis
- Virtualization Tools
- Open Option – subject to professor approval

Research Paper

This option would be research oriented and would not need a lab associated with it; however, in addition to the three page report, there should be an additional section/appendix that supports or demonstrates what you learned. The topics:

- The future of SD-WAN
- VMs vs. Containers
- Energy Efficient and "Green" SDN
- SDN, IOT, and 5G evolution
- Open Option – subject to professor approval