

792-038 (include all ECE combined sections)

Linux Networking

Instructor(s): Anand Singh (asingh16@ncsu.edu)

Objective or Description: The objectives of this course are to:

- Expose the students to the practical issues that arise in the design and management of Linux-based, virtual networks, with special emphasis on datacenter cloud environments. Such issues include, among others: virtualization requirements, server networking, and multi tenancy support
- Outline available methods for operating and managing such networks. Such methods include, among others: Virtualization (VMs, containers, overlays), and Automation (Openstack, Ansible, python, shell)
- Design and implement a mini cloud using Linux servers.
- Provide the students with practical experience on available languages and tools in the network design and management space. In-class demos and a series of lab exercises are used for that purpose. We use open source tools such as Openstack, collectd, and various traffic generators (e.g., iperf, pktgen, netem).

Prerequisites: Basic CN or IP course, user level knowledge about Linux system, and basic level of scripting skills with python and shell.

Textbook: We will use selected chapters from notes written by Anand Singh and Yannis viniotis. Additional Handouts and weblinks will be provided.

Topics: The tentative list of topics is:

- Linux Fundamentals (System design and admin view)
- Useful Linux commands and configuration, CLI automation using shell scripts
- System virtualization
- Linux virtualization
- Hypervisor networking (bridged, routed, tunneled)
- Managing virtual network using Ansible and python
- Tracing kernel/userspace, frameworks (eg collectd)
- IPtables for Firewall, NAT, load balancer, port forwarding, Connection tracking
- Isolation using network namespaces
- Containers, Container orchestration
- OpenStack
- Active linux networking open source projects (Example OVN, Kubernetes etc.)

Grading: A tentative grading policy:

Homeworks (~5 mini project type) - (40%)

Project (semester long with 3 milestones) (40%)

- Milestone 1 (5%), Milestone 2 (15%), Milestone 3 (20%)

Exam (20%)

Cross-listing in other departments: CSC 792 038