A Master Course on Network Softwarization: Lectures and Practical Assignments
KuVS FG Network Softwarization, 12.10.2017, Tübingen

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Summer Term 2017

http://kn.inf.uni-tuebingen.de
bwNET100G+ research project
- Flexible and intelligent network operation using SDN and NFV
- Master theses with prototypical implementations
  - 4 concluded
  - 4 running

Autodidactic approach to get familiar with SDN
- Read selected papers from the ONF reading list
- Start with SDN programming using web tutorials
- Problems
  - Individual supervision still required
  - Self-familiarization difficult for (some) students
## Current Teaching Activities

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New Master Course

► Strongly limited workload of 3 ECTS (~ 90 hours)

► Three parts
  ▪ Seven lecture chapters
    – 90 min per lecture
    – PPT slides and demonstrations
  ▪ Two course projects
    – Interview + programming parts
    – Exam admission with 60% assignment score
    – Exam bonus with up to 10% bonus for scores > 60%
  ▪ Final exam
    – Written exam or oral exam with 25 minutes per student
Chapter 1: Introduction to network softwarization
- Transition from legacy to softwarized networks
- Legacy management and active networking concepts
- Software defined networking

Chapter 2: OpenFlow
- OpenFlow architecture and protocol in version 1.0 and 1.5.1
- Development from the first to the latest feature set

Chapter 3: SDN controllers
- SDN application and control layer
- Architecture and design principles of SDN controllers
- Northbound, southbound, east-/westbound interfaces
- Overview of popular controllers
Chapter 4: SDN switches
- Recap: hardware architecture of legacy routers and switches
- Hardware and software switches (OF-only, hybrid, whitebox)

Chapter 5: SDN use cases
- Datacenter, enterprise, WAN network use cases

Chapter 6: Virtualization techniques
- Hypervisor-based and OS-level virtualization technologies
- Orchestration

Chapter 7: Network function virtualization
- ETSI NFV architecture
- ETSI NFV use cases
Course Projects

► Two course projects
  ▪ Work in groups of two students

► Project structure
  ▪ Interview questions
    – Pool of 15 to 20 questions on the assignment’s topic
    – Oral test: 5 answers as requirement for assignment grading
  ▪ Programming assignment
    – Infrastructure: Netsoft-VM for VirtualBox
    – Software: Mininet, Miniedit, Ryu
Programming Tasks

► Method
  ▪ Define the network topology in Miniedit
  ▪ Implement network logic for Ryu

► Project I
  ▪ L2 switching
  ▪ Port-based ACLs
  ▪ Simple IPv4 routing

► Project II
  ▪ LP IPv4 / IPv6 routing
  ▪ Packet- and flow-based IP Anycast

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Master course ”Network Softwarization” (3 ECTS)
- Prerequisites: good knowledge of Internet basics and programming skills
- Introduction of SDN and NFV concepts
- Overview of related work and research activities
- Practical programming experiences

Experience from summer term 2017
- Well feasible for advanced students
- Too demanding for students missing prerequisites
- Highly specialized – great preparation for Master theses