DESIGN OF NETWORKS AND COMMUNICATION SYSTEMS – PROPOSED PROJECTS A.Y. 2019-20

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GENERAL INFORMATION

- To pass the "Design of Networks and Communications Systems" course, you need to successfully deliver:

1. Project on L2/L3 configuration w/vagrant (assigned by Nicola Arnoldi)
2. Group project (assigned by Fabrizio Granelli or Claudio Sacchi)

- Group projects can be developed at anytime by 2-3 students
- How to present the outcome of the project:
- Short powerpoint presentation, demo and report (max 10 pp.) describing the design choices and achieved results
- The presentation + discussion is organized in agreement with the related professor.
- All group members must be present at the discussion

NETWORK SLICING USING MININET & FLOWVISOR ALTERNATIVES

- To deploy network slicing solutions in mininet (similar to those presented during the hands-on sessions) by using FlowVisor alternatives
- To discuss about potential limitations / differences from FlowVisor
- Suggested alternatives (to be checked) include:
  - DelftVisor https://github.com/TUDelftNAS/Delftvisor
  - FlowSpace Firewall https://github.com/GlobalNOC/FlowSpaceFirewall/releases/tag/1.0.6

- Proposer: Fabrizio Granelli (fabrizio.granelli@unitn.it)

REMOTE SDR CONTROL USING SOAPY FRAMEWORK

- To deploy and test the software package Pothos/Soapy for remote access to SDR platforms (NI USRPs)
- To build an infrastructure for remote deployment of experiments (including resource reservation, etc.)
- To monitor the corresponding network requirements
- References:
- https://github.com/pothosware/SoapySDR/wiki
- https://github.com/pothosware/SoapyRemote/wiki

- Proposer: Fabrizio Granelli (fabrizio.granelli@unitn.it)

DOCKERIZED LTE

- To test a minimal dockerized emulation and monitor the different containers (e.g. memory, CPU, etc.)
- Your choice about how to monitor the system (different docker monitors are available)
- Suggested software:
- https://github.com/pgorczak/srslte-docker-emulated/

- Proposer: Fabrizio Granelli (fabrizio.granelli@unitn.it)

MANAGING DOCKER SWARMS

- To activate a docker swarm and monitor the status of the active containers
- You can define your own scenario (e.g. IoT with dockers operating as sensors, processin units and MQTT brokers)
- Suggested monitoring software:
- https://swarmpit.io/

- Proposer: Fabrizio Granelli (fabrizio.granelli@unitn.it)

DEPLOYING VIRTUAL NETWORK FUNCTIONS ON MININET

- To install and test a software able to integrate VNFs inside mininet
- To deploy a sample VNF scenario
- You can define your own scenario (e.g. IoT with dockers operating as sensors, processin units and MQTT brokers)
- Suggested software:
- https://github.com/josecastillolema/mini-nfv

- Proposer: Fabrizio Granelli (fabrizio.granelli@unitn.it)

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CLAUDIO SACCHI

SDR TRANSMISSION OF AN AUDIO FILE

- To develop and test an end-to-end transmission system for a short-duration audio file (e.g. in MP3 format), using basic BPSK modulation with raised cosine waveform and variable-rate channel coding.
- Proposer: Claudio Sacchi (claudio.sacchi@unitn.it)

- References will be provided at the project starting.

SDR-BASED DIGITAL MODULATION TESTING

- To test the BER performance of end-to-end transmission of M-ASK, M-PSK and M-QAM signals over real channels (comparison of different modulation formats with different number of levels).
- Proposer: Claudio Sacchi (claudio.sacchi@unitn.it)

- References will be provided at the project starting.

SDR-BASED TEST OF PRESENCE/ABSENCE OF STANDARD WIRELESS SIGNALS

- To develop and test a system that aims at detecting the presence/absence of standard wireless signals (WiFi, 4G, etc.) in the environment, based on the knowledge of their transmission frequencies, and using the LabView blocks of spectral analysis.
- Proposer: Claudio Sacchi (claudio.sacchi@unitn.it)

- References will be provided at the project starting.

SDR-BASED SIGNAL-TO-NOISE RATIO ESTIMATION

- To develop and test a LabView block capable at estimating the signal-to-noise ratio at the digital receiver side, using pilot symbols.
- Proposer: Claudio Sacchi (claudio.sacchi@unitn.it)

- References will be provided at the project starting.