PROJECT 1

Topic: 5G

Description:

In the project, students will instantiate a complete 5G System, made of a 5G Core and a 5G access. This will allow the students to get familiar with the overall 5G System architecture, its main functional blocks and processes. The project will be implemented using opensource software (Open5GS and UERANSIM).

General objectives:

1. get an hands-on understanding on the internals of a cellular network
2. be able to identify and configure the main parameters of a cellular networks
3. identify and check the main procedures required for a mobile terminal to obtain connectivity over a cellular network
4. be able to understand additional network features, via the implementation of complementary scenarios

Components to be used:

1. 5G Core: Open5GS
2. 5G Access: UERANSIM
3. Wireshark

Project proposed initial steps:

1. Instantiate the 5G Core according to the instructions present in URL1
2. Check the yaml configuration files applicable to the 5G Core elements
3. Restart the 5G Core components, if needed
4. Instantiate the 5G Access (UE RAN SIM) according to the instructions present in URL2
5. Check the gNB and UE configuration files for usage with the Open5GS
6. Start the UERANSIM gNB
7. Analyze the gNB NG-AP exchanged messages
8. Start the UERANSIM UE
9. Analyze the exchanged NAS messages

Use Wireshark in the loopback interface to capture exchanged messages.

Suggested additional steps:

10. Add UEs and a gNB running at a different server/PC
11. Change the configuration of the core and access to match the MNC and MCC reserved by ITU-T for testing or private 5G networks (999/99)
12. Add an additional profile and a UE on that profile via the provided WebGUI, playing with traffic and QoS parameters
13. Add DNN networks (URL3)
14. Add UPFs based in the configuration in URL4
15. Check whether slicing is working in the core and simulated access network

For all the experimentations above, annotate and explain the messages exchanges between the involved components.

URLs:

1: https://open5gs.org/open5gs/docs/guide/01-quickstart/

2: https://github.com/aligungr/UERANSIM/wiki

3: https://github.com/s5uishida/open5gs_5gc_ueransim_sample_config

4: https://github.com/s5uishida/open5gs_5gc_ueransim_nearby_upf_sample_config