

5G NR Simulation in NS-3 – Assignment 11

1 Objective

The objective of the project is to gain hands-on experience in simulating an 5G-NSA network using the Network Simulator 3 (NS-3) framework. Students will create a comprehensive network scenario, configure 5G NR parameters, and analyze network performance.

2 Task

2.1 Scenario Definition

Define a network scenario including, but not limited to, the following elements:

- At least two gNodeBs.
- A minimum of five User Equipment (UE) devices.
- At least one remote host (server) on the Internet.
- Appropriate IP addressing and routing configuration.

2.2 Mobility

Use the GridScenarioHelper to define the simulation scenario where the UEs are stationary.

2.3 NR Configuration

Set the configurations of the gNodeBs and UEs to satisfy the following requirements:

- Use the mmWave frequency band.
- Use at least two different numerologies for the bandwidth parts.
- Set appropriate Tx power for the gNodeBs.

2.4 Traffic Generation

Study the available applications in NS-3. Choose the suitable applications to generate and receive the traffic, where:

- Two UEs, each attached to a different gNodeB, is in a phone call with each other.
- Three UEs are browsing the web.

2.5 Simulation Run

- Execute the simulation with different sets of parameters and collect data on network performance.
- Run the simulation for a sufficient duration to observe network behavior.
- Capture and analyze key metrics, such as throughput, latency, and packet loss.
- Create the radio environment maps using the NrRadioEnvironmentMapHelper in LENA-5G to visualize network coverage, signal quality and interference.

2.6 Analysis and Report

Prepare a detailed report that includes the following:

- Description of your network scenario.
- Configuration settings, including NR and application parameters.
- Results and analysis of network performance.
- Any issues encountered during the simulation and how they were resolved.
- Recommendations for improving network performance (if applicable).

3 Submission

- Submit your report in a digital format, along with any necessary simulation scripts and configuration files.
- Prepare a presentation (max. 10 min) highlighting the key ideas and results of your project.