MAGISTER SIMLAB

System/network level simulators are often used to study and analyse communication networks as part of research or standardization work. Traditionally, the telecom as well as the SatCom industry are accustomed to producing simulators themselves. Building a usable simulator is a huge effort requiring both a lot of time and technical expertise in different areas. In addition, from user's perspective, the simulators produced for R&D purposes are often hard to use and require a high level of technical competence.

Magister SimLab service offers a possibility to use a user-friendly, vendor independent, high-class online simulation service. With detailed system simulators in the background, SimLab does not make any compromises in technical details or accuracy of modelling. Modern day cloud computing capabilities ensure service availability, scalability, and security as well as good usability through a user-friendly web user interface.

Magister SimLab simulation service enables easy-to-use access to the whole simulation workflow:

- Design of a simulation campaign, based on meaningful and highly customizable use cases.
- Launch and monitoring of the campaign and simulations within.
- Analysis of simulation campaign results (statistics) through statistics reports,
- Visualization of the simulation(s) run within an interactive 3D view.

Magister SimLab can be used for different customer use cases, e.g.

- Pre-Sales support through illustrative 3D visualizations
- R&D and standardization support through accurate simulators and powerful analytics
- Operational support through configuration of different simulation scenarios and loading conditions

Through a flexible API, the Magister SimLab can be interfaced with several simulators. The Magister SimLab 3GPP Non-Terrestrial Networks (NTN) service is interface with 5G NTN network/system/air interface simulator which as been validated within an ESA activity based on the 3GPP calibration process.

5G NTN SYSTEM LEVEL SIMULATOR

3rd Generation Partnership Project (3GPP) has been working on the 5G NTN from 2016 onwards. The objective is to develop technical specifications to support transparent payload-based spaceborne systems, i.e., Low Earth Orbit (LEO) and Geostationary Earth Orbit (GEO) scenarios.

The 5G NTN system level simulator (SLS) is based on the following design assumptions:

- SLS is a network level dynamic system level simulator operating on a packet level resolution.
- SLS is an extension module to Network Simulator 3 (ns-3) – ns-3 is a discrete-event network simulator for research and educational use.
- SLS is an extension module to 5G LENA - 5G-LENA is a GPLv2 New Radio (NR) network simulator developed by Centre Tecnològic de Telecomunicacions de Catalunya (CTTC), which focuses on terrestrial 5G deployments.
- SLS heavily based on 3GPP technical reports, i.e., TR 38.811 in terms of channel modelling and TR 38.821 in terms of simulation scenario and parameterization.
- Focus of modelling is on Radio Access Network (RAN), i.e., air interface.
- Focus of modelling is on uplink and downlink shared channels (PDSCH, PUSCH).

The 5G NTN TR 38.821 Magister SimLab use case enables e.g. the following configurations:

- The 3GPP TR 38.821 system level calibration use cases. The technical report defines in total 30 calibration cases, which vary as follows:
    - LEO satellite at 600 km altitude, LEO satellite at 1200 km altitude, and GEO satellite
    - S- and Ka-band frequency bands
    - Omnidirectional (handheld) and VSATs
    - Frequency reuse schemes
- Traffic modelling
    - Full buffer
    - UDP based constant bit rate
- Number of beams
- Number of terminals
- Channel modelling parameters, e.g. rural, urban scenarios, doppler
- Resource allocation parameterization, e.g. scheduling, ACM
- HARQ operation

The objective is that more 5G NTN related use cases shall be added to Magister SimLab in the near future, e.g.

- RAN4 calibration scenarios
- Hybrid TN+NTN scenario
- NTN Multi-connectivity scenario

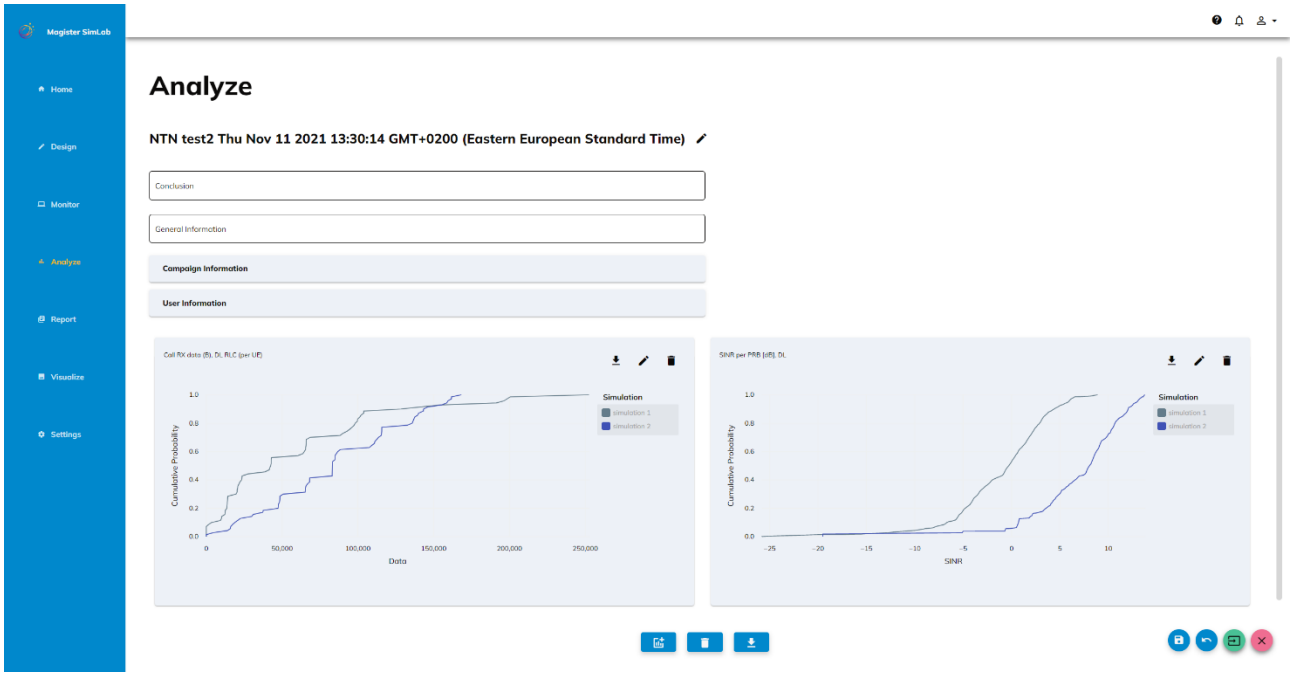

Figure shows as an example the analyze view of Magister SimLab. It shows real results comparing the effect of frequency reuse factor to the user throughput and SINR.