BRNO UNIVERSITY OF TECHNOLOGY
FACULTY OF ELECTRICAL ENGINEERING AND COMMUNICATION

Semestral Thesis

Master's study program **Communications and Networking (Double-Degree)**

Department of Telecommunications

Student: Bc. Masauso Lungu ***ID:*** 209533

Year of study: 2 ***Academic year:*** 2024/25

TITLE OF THESIS:

NB-IoT Capacity Planning for Smart Metering Infrastructure

INSTRUCTION:

The main goal of this diploma thesis is to develop a simulation tool for the capacity planning of NB-IoT technology in Network Simulator 3. The developed tool will be based on a Lena-NB module designed to simulate NB-IoT network performance. By utilizing the developed tool, it will be possible to reveal the maximum capacity of a single base station, convergence time, or transmission delay. In addition, the toolbox will provide a simple user interface for simulation input parameters definition (e.g., number of users, message size, ECL classes) and results visualization. Due to the requirements of permanently connected smart metering devices, it will be possible to utilize both UDP and TCP for message transmission. The theoretical part will focus on a detailed description of NB-IoT technology (in all releases) and its competitors (i.e., Sigfox, LoRaWAN, LTE Cat-M).

Semestral project outcomes:
Description of currently available LPWA technologies, setup of NS-3 environment with Lena-NB module, simulation of initial scenarios

RECOMMENDED LITERATURE:

[1] Network Simulator 3: Documentation, A Discrete-Event Network Simulator [online], 2023. Available from: https://www.nsnam.org/doxygen/

[2] Novel Architecture for Cellular IoT in Future Non-Terrestrial Networks: Store and Forward Adaptations for Enabling Discontinuous Feeder Link Operation. IEEE Access. 2022, 2022(10), 68922-68936. ISSN 2169-3536.

Date of project specification: 17.9.2024 ***Deadline for submission:*** 11.12.2024

Supervisor: Ing. Martin Štůsek, Ph.D.

doc. Ing. Jiří Hošek, Ph.D.
Chair of study program board