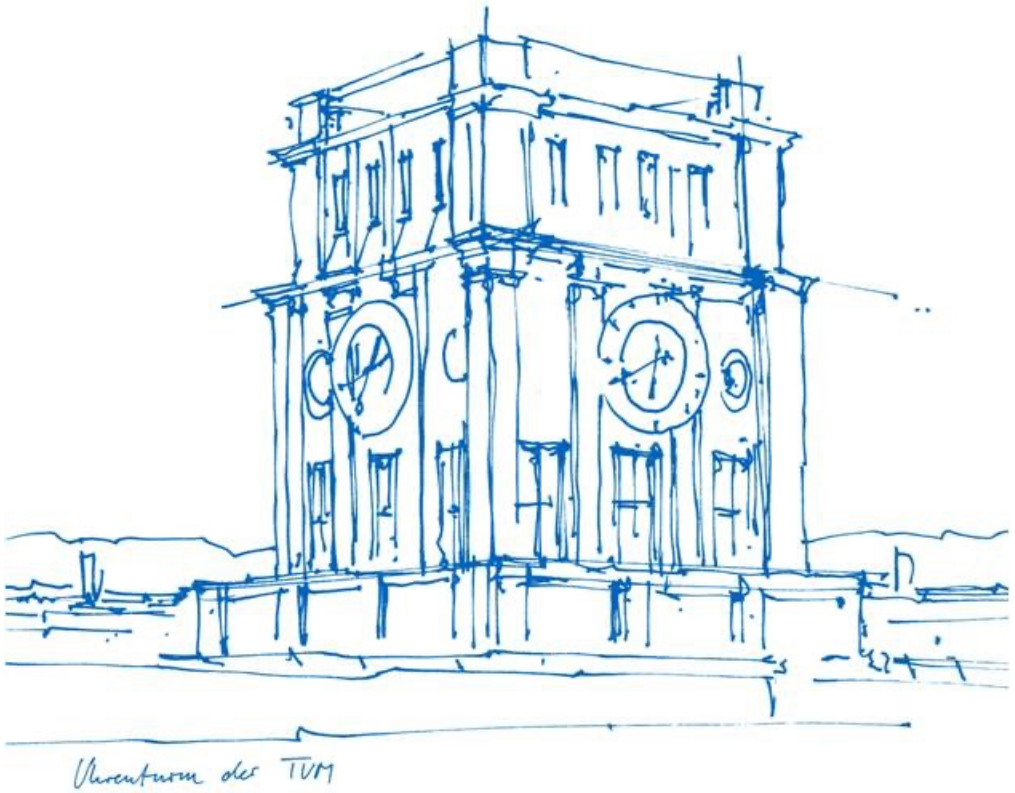
Chair of Connected Mobility
TUM School of Computation, Information and Technology
Technische Universität München

WS 2023/24
Master Practical Course: Computer Network Simulation

Pre-Meeting

12.07.2023



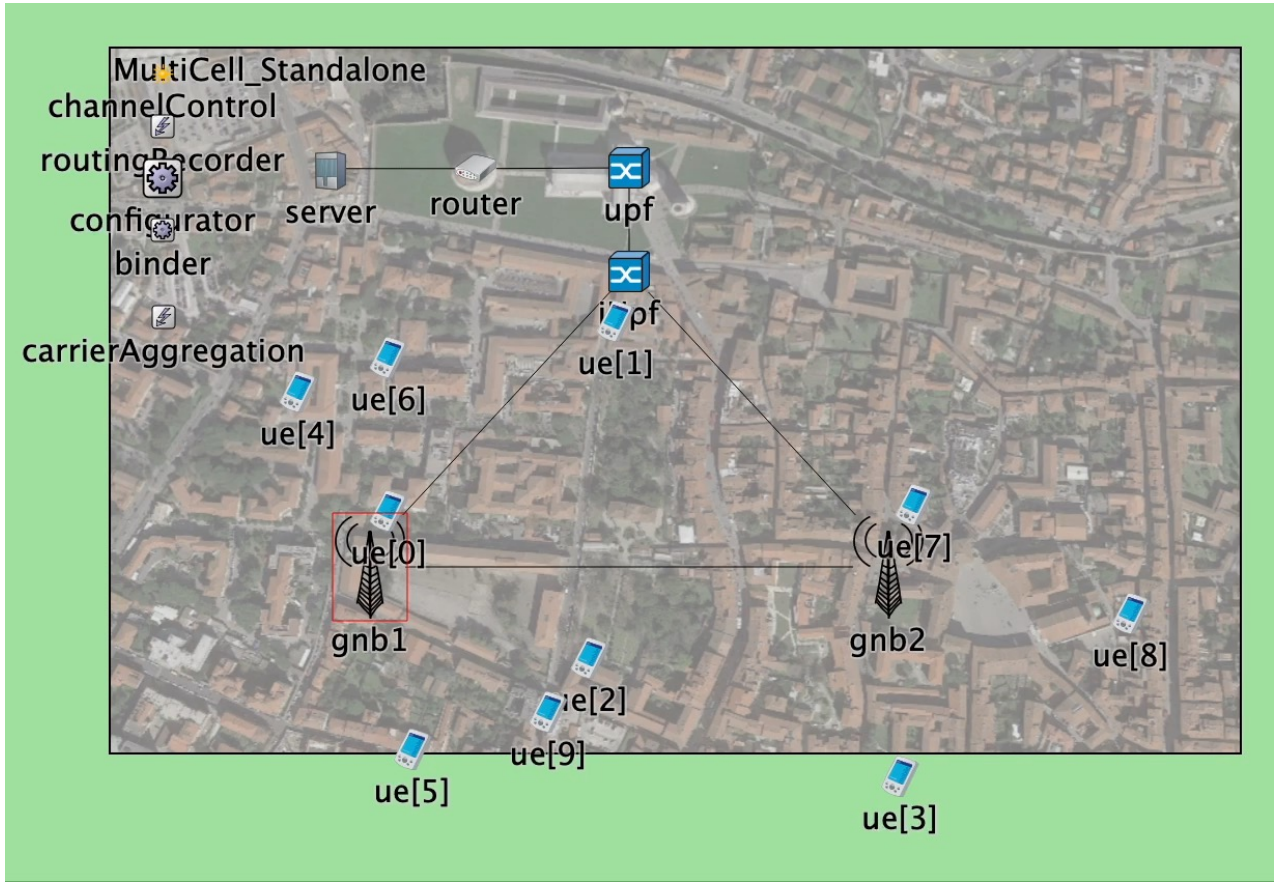
Marcin Bosk
Mehmet Mert Bese

What is a Simulation?

In most basic terms, “imitation of a real-world process or system”

Advantages

- Less Financial Risk (avoid costly mistakes)
- Gain Insights on System Behaviour
- Test Non-Standard Situations
- Examine Long-Term Impacts



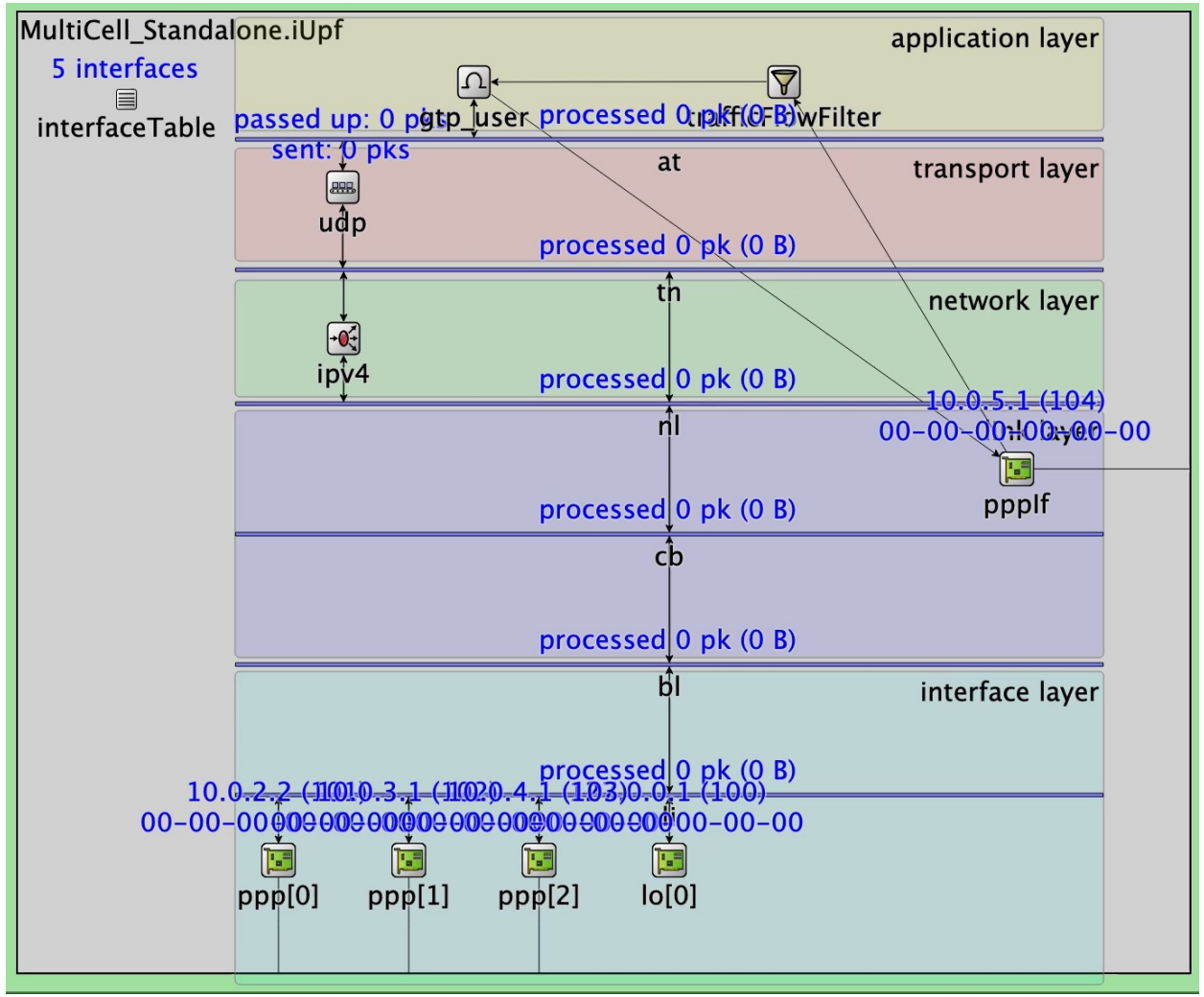
Why do we use network simulation?

Testing and prototyping for new ideas

Experimentation when it’s infeasible to build new network infrastructure

Verification of things that cannot be run in a testbed environment

Method for rapid prototyping



Available Network Simulators

Ns3

OMNeT++

Simulink

OPNET

NetSim

GloMoSim

Mininet [emulator]

And many more…

Focus of the Course (Study Goals)

Understand the usefulness of the simulation in the computer networking field

Learn how to operate simulator software (OMNeT++) and extend it

Learn how to obtain and visualize meaningful results

Learn cutting-edge networking technologies

Understand the limitations of simulation

Course Contents – Networking Technologies

General Computer Networking Recap

Various Networked Applications

5th Generation Mobile Networks (5G)

Edge Computing

Time-Sensitive Networking (TSN)

Structure of the Course

~5 weeks of lectures covering

- Introduction to Simulation Environment
- Computer Networking Recap
- Introduction of Relevant Technologies [Edge Computing, 5G, TSN, etc.]
- **Graded individual homework and feedback discussion associated with each lecture!**

~10 weeks of project work in groups of 3 people

- You choose your project – with our help
- Use OMNeT++ and custom modules implemented by you to simulate a complex network
- Provide visualized results covering various metrics
- **Three mandatory presentations**
  - **Initial project meeting and discussion**
  - **Mid-term project meeting and discussion**
  - **Final project presentation**

Structure of the Course

Five Lecture Weeks – Two Sessions per Week

Week 1

- Lecture – Introduction to Discrete Event Simulation and OMNeT++ Simulator
- A hands-on exercise with OMNeT++

Week 2

- Lecture – Computer Networking Recap and Introduction to the INET Framework
- Homework Discussion and Feedback

Week 3

- Lecture – 5th Generation Mobile Networks and Introduction to the Simu5G Framework
- Homework Discussion and Feedback

Week 4

- Lecture – 5th Generation Mobile Networks and Introduction to Mobile Edge Computing
- Homework Discussion and Feedback

Week 5

- 2 Short Lectures – Introduction into 5G Radio; Excursion on Time-Sensitive Networking
- Homework Discussion and Feedback

Week 6

- Homework Discussion and Feedback

Structure of the Course
Project Work

Use OMNeT++ as a simulation tool to implement and validate a networking concept

→ Implement something new - e.g., an application

Your testing environment and application must include

- Mobility of users and wireless networks (5G)
- Automatic execution and processing pipeline
- Multiple distinct scenarios

You can choose your own topic!

- We will help you define the scope and requirements
- We will also give some suggestions in the lectures

Your project submission will cover

→ 3 presentations, code, and final report

Week 6
- Initial project meeting and discussion

Week 10/11
- Mid-term project meeting and discussion

Week 15
- Final project presentation

Course Grading

Total of **100 points**

6 points for each homework assignment = **30 points**

- **4 points** → submitted solution
- **2 points** → feedback discussion

70 points for the project assignment

- **5 points** → mid-presentation
- **10 points** → final presentation
- **10 points** → final report
- **45 points** → implementation, including demo and idea realization

Course Registration

Registration using the matching system

- Duration: 14.07.2023 – 19.07.2023

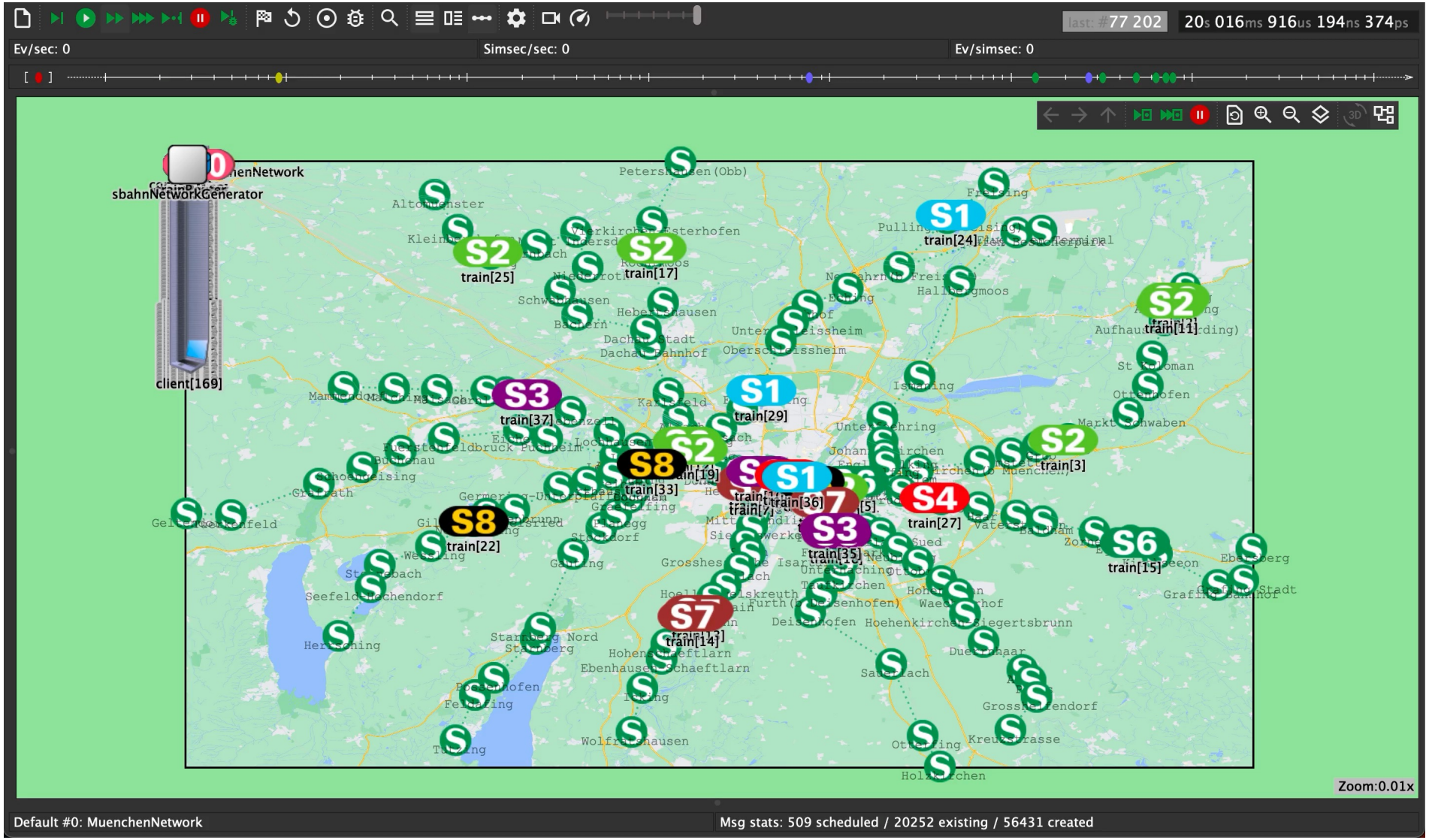
To increase your chances, please send us your CV and a short motivation letter

- Email: bosk@in.tum.de and mehmetmert.bese@tum.de
- **Always address your messages to both emails!**

In case of acceptance

- We will contact you between 28.07 and 11.08 with more information
- Course deregistration is possible until 30.09.2023
- We will register you for the course in TUMOnline in the beginning of October

Some Projects from the Past



Thanks for attending. Any questions?

Check the website
for more information

Feel free to contact us!
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Mert – mehmetmert.bese@tum.de