



**2022**, a moving year, is drawing to a close. It's time to pause for a moment and look back. The invasion of Ukraine by Putin's troops, power outages, acts of sabotage – not only at Deutsche Bahn – and not to mention natural disasters all show that we are facing extreme challenges to the **interconnectedness of our world**. We are joining forces at the Multimedia Communications Lab and the Communication Networks Lab to **further develop** this achievement of mankind.

Ralf Steinmetz has been recognized for his lifetime of work in science with an **honorary doctorate from RWTH Aachen**. He has always focused on designing communication systems and multimedia applications that meet the needs of users. For example, the concept of "transition" helps navigate the complex landscape of different technologies and protocols, avoiding data congestion and disruptions in networks.

The next generation of talented scientists is continuing this work. For example, Tobias Meuser has been named an **Athene Young Investigator**. Along with the Ph.D. students he supervises, Meuser is using his privileges to make the future 5G mobile network more resilient, drawing on findings from the SFB MAKI research project. Excellent research conditions are provided by the fully functional **5G O-RAN radio network** set up by Ralf Kundel and others of our team at TU Darmstadt as part of the BMBF project "Open6GHub" in collaboration with Deutsche Telekom. On behalf of Deutsche Bahn, we are also involved in research projects that aim to ensure the security and reliability of the future railway-owned 5G network.

In the **DFG Collaborative Research Center "MAKI – Multi-Mechanism Adaptation for the Future Internet"**, the **foundations for resilient and fluid data transmission** are being laid. Especially at high data rates – as required for the point clouds we are looking at – extremely high adaptivity is essential and is enabled by machine learning methods. Another MAKI project focuses on **application-based data transmission**, using machine learning to teach the components of the network to prioritize information and work together effectively in order to provide applications at the right time with the required data

In the **collaborative research center FONDA**, we are also shaping, planning, and optimizing data streams. Ansgar Löffler is researching how to better process large volumes of scientific data in **scientific workflows** through mechanisms in the network.

Tobias Meuser won the **Collaboration Award of the LOEWE center emergenCITY** for safeguarding digital cities against crises. Together with researchers from other fields, he developed the "coreemu-lab" network emulation tool, which makes it easier to set up network environments in disaster scenarios. Another emergenCITY project brings us to the Andes, where Benjamin Becker is working with Prof. Christian Oberli from the Pontificia Universidad Católica de Chile to develop a new communication protocol to ensure that critical data can be transmitted from measuring stations to the valley within a certain timeframe in the event of a **risk of flash floods**. On the hardware level, Jan Götte is working on **techniques for physical access protection** for sensitive data as part of emergenCITY. These techniques could be used for a resilient distributed authentication infrastructure that remains usable even in the event of large-scale failures during crises.

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**Communication in satellite networks** currently poses a particular challenge. For this purpose, Olga Kondratova is developing network protocols that can be used to process data directly in orbit - an advance that will enable efficient Earth observation, among other things. Again on the ground, people often have the problem of **disconnections during video conferences** under difficult network conditions. Sebastian Rust, therefore, is working on a special transport protocol.

Björn Scheuermann brings a new breeze into **teaching** with the **new master modules** "Transport Protocols and their Design" and "Application Protocols on the Internet". Further modules are already being planned. In **this year's industry colloquium** our students gained insights into how the train traffic of the future can be made safe. We are particularly happy that we were able to welcome the **best students of the semester** at the lab again this year for coffee and casual exchanges.

Traditionally, some of our KOM and TU Darmstadt alumni vote for the **best final theses of the year**: in 2022, these referees were Sonja Bergsträßer, Andreas Reinhardt and Delphine Reinhardt. The best bachelor thesis was "Modular Energy-Aware Simulation Environment for Wireless Sensor Network" by Lukas Wehrstein, and the best master thesis was "Generative Adversarial Network-based Robustness Evaluation of Machine Learning Classification Algorithms for DDoS Attacks" by Stefan Stegmüller.

Daniel Bischoff, Ralf Kundel, Tim Steuer and Julian Zobel **successfully completed their PhDs**. From KOM we had to say goodbye to: Sonja Bergsträßer (Deutsche Forschungsgemeinschaft), Doreen Böhnstedt (Management of the Department of Computer Science at TU Darmstadt), Monika Jayme (retired), Thomas Tregel, Tim Steuer (Digital Science/Holtzbrinck), Daniel Bischoff (Stellantis). We welcome Fridolin Siegmund as a new member. A warm welcome!

Again, we have delivered **excellent research this year**. A selection:

- Best Paper Award at the 14th IEEE International Symposium on Embedded Multicore/Many-core Systems-on-Chip (MCSOC 2021) for "Host Bypassing: Direct Data Piping from the Network to the Hardware Accelerator" by Ralf Kundel, Rhaban Hark et al.
- Tiburtius Prize for the dissertation of Björn Scheuermann's PhD student Philipp Schoppmann, now working at Google in New York. In it, he brings together the field of machine learning, data communication and technical data protection with new methods for secure distributed computing.
- Best Paper Award at the 17th Wireless On-Demand Network Systems and Services Conference (WONS) for "CAMELAMA: Cooperative Awareness and spaceborne Monitoring Enabled by Location-Assisted Medium Access" by Holger Döbler and Björn Scheuermann.
- Best Paper Award at the 22nd IEEE International Conference on Advanced Learning Technologies (ICALT 2022) for "Towards A Vocalization Feedback Pipeline for Language Learners" by Anna Filighera, Tim Steuer, Leonhard Bongard and Thomas Tregel
- One of the two prizes for the best master theses 2021 will be awarded to Marvin Härdtlein (supervised by Christoph Gärtner and Ralf Kundel) from the KuVS group in the VDE/ITG and the GI.
- One of the two prizes for the best dissertations 2021 will be awarded to Manisha Luthra by the KuVS group in the VDE/ITG and the GI.



Our **retreat in Kleinwalsertal** was definitely a highlight! After two years of Corona-related abstinence, we really enjoyed meeting again in an analogous way, playing ring tennis and discussing our research and teaching. For a glimpse, check out the video on [www.blog.multimedia-communications.net](http://www.blog.multimedia-communications.net). There's nothing like face-to-face interaction! In this spirit, we hope to stay in touch – be it by letter, by mail, or in person at our chair.

We wish you a peaceful Christmas, good health and optimism.

Björn Scheuermann and Ralf Steinmetz as well as the whole KOM team