

CNI Research

The Communication Networks Institute (CNI) focuses on the research and development as well as the quantitative analysis of novel communication services, networks architectures and their protocols in order to realize highly dynamic & reliable networks.

Highly Dynamic Communication Networks are characterized by a high mobility of communication nodes and unpredictable network topologies, which are frequently and continually changing. This requires intelligent algorithms and protocols for a situation and application aware communication. Application areas are emergency response management and Unmanned Aerial Vehicles (UAV) communication.

Highly Reliable Networks mostly consist of stationary backbone nodes and mobile devices, which form ad-hoc connections and are able to transmit relevant sensor information. The parameters of signal strength and energy consumption are the key success indicators of the solution. Highly reliable networks open the way for new application areas like industrial automation and energy.

The research of CNI contributes to the design of future **5G networks**, the **Industrial Internet** and **Cyber Physical Systems**.

CNI Lectures and Education

CNI offers the students of Electrical Engineering & Information Technology, Applied Computer Science and Industrial Engineering the following courses:

- Communication networks
- Mobile networks and protocols
- Economics for engineers
- Modeling and simulation

All lectures are supported by practical experiments and numerous case studies, which help the students to apply their knowledge. Latest results from innovative research projects are also shared with the students in order to provide them with hands-on-experience with the latest advances in technology.

CNI Lab

CNI maintains, and is steadily expanding, a collection of cutting edge communication labs enabling students and researchers to test, understand, analyze and develop modern and innovative communication concepts, solutions and techniques. The key features and capabilities provided by our lab facilities are:

- Multiscale Simulation and Analytical Modeling Platforms
- Multi-Network Technology Platform (incl. base stations/network emulators (2G, 3G, 4G, TETRA) and wireless channel emulators)
- Communication Test Beds (SDN, SDR, Mobile IPv6, UWB, etc.) for defining and ascertaining performance benchmarks
- Stochastic simulation and analytic modeling (e.g. Markov chains) for quantitative performance estimations of services and network scenarios in realistically modeled environments
- Protocol Evaluation (ISO 15118, IEC 61850) and Conformance Testing (TTCN-3) Platforms for ease of development of highly reliable as well as standard compliant communication and protocol stacks



DFG SFB 876: Resource-constraint Data Analysis

DFG FOR 1511: Control & Protection Systems for future Smart Grids



H2020 AUTOMAT: Vehicle-to-Cloud-Communications



FP7 SmartC2Net: Software-defined Networking for highly reliable control networks



FP7 PlanGridEV: Integration of Electric Vehicles in the Smart Grid



FP7 SecinCore: Secure Cloud for emergency response and disaster relief



German-Franco research on networked mobile robotic systems for emergency response (Speaker)



BMW eNterop: International standards for the Vehicle to Grid Communication Interface (ISO/IEC)

CNI Publications

Examples of recent contributions to international journals and transactions:

- "Client-based Control of the Interdependence between LTE MTC and Human Data Traffic in Vehicular Environments", *IEEE Transactions on Vehicular Technologies*, 2014.
- "Analyzing Cyber-Physical Energy Systems: the INSPIRE Co-Simulation of Power and ICT Systems Using HLA", *IEEE Transactions on Industrial Informatics*, 2014.
- "Cloud Voice Service as Over-the-Top Solution for Seamless Voice Call Continuity in a Heterogeneous Network Environment", *ELSEVIER Journal of Network and Computer Applications (JNCA)*, 2014.
- "Cognitive Networking for UAV Swarms", Book chapter in "The Handbook of Unmanned Aerial Vehicles", Springer, 2014.
- „CoPoMo: A Context-Aware Power Consumption Model for LTE User Equipment.“ *Transactions on Emerging Telecommunications Technologies (ETT)*, Wiley, 2013
- „Role-Based Connectivity Management with Realistic Air-to-Ground Channels for Cooperative UAVs“, *IEEE Journal on Selected Areas in Communications (JSAC)*, 2012.
- "Cognitive Agent Mobility for Aerial Sensor Networks", *IEEE Sensors Journal*, 2011.

CNI Awards

CNI has received various prestigious awards in recent years, among them:

- Best Paper Award IEEE International Conference on Technologies for Homeland Security 2011, Boston, USA.
- Best Paper Award 3rd IEEE International Conference on Smart Grid Communications 2012, Tainan City, Taiwan.
- Best Student Paper Award 20th IEEE Symposium on Communications and Vehicular Technologies (SCVT) 2013, Namur, Frankreich.
- Editor's Best Paper of Issue Choice der Transactions on Emerging Telecommunications Technologies (Wiley), 2013.



CNI Team

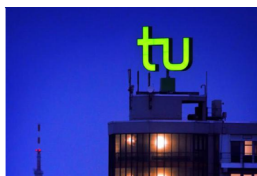


Since 2005 **Prof. Dr.-Ing Christian Wietfeld** is head of CNI. He has a long-term experience in leading research and development in the area of communication systems and Internet in renowned research institutions (RWTH Aachen University as scientific staff and lecturer from 1992, TU Dortmund since 2005) as well as industry (Siemens, 1997-2005). He is author/co-author of more than 180 peer-reviewed publications and holds several patents. He is the head of the committee on “Communication Networks and Systems” in the German sister organization of IEEE (ITG) and an editor for mobile network topics of the Transactions on Emerging Telecommunication Technologies (Wiley). Since 2013, he is co-founder and scientific advisor of the CNI spin-off comnovo.

CNI currently employs 15 scientists, 4 technical/administrative personnel and 15 student assistants. Furthermore, approximately 10-20 students per year complete their bachelor/master thesis at the institute.

TU Dortmund University

The TU Dortmund was founded in 1968. With its 300 professors, 7000 scientific, technical and administrative personnel and its over 30.000 students, the TU Dortmund is a driver for the digital transformation of the industry in the Rhine-Ruhr area and beyond.



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Short Profile

