Faculty of Mathematics and Natural Sciences
Department of Computer Science
Computer Engineering Group

Expertise
With his Computer Engineering research group, Prof. Scheuermann develops technologies for application-specific communication and computer systems that are efficient, secure, and reliable. The topics range from tailored communication protocols and application-specific digital circuits all the way to different aspects of online anonymity and privacy-preserving technologies. For instance, Prof. Scheuermann aims to interconnect automobiles to make best possible use of the available road network resources. Furthermore, he develops specialised circuitry for firewalls, so that within nanoseconds the firewall can decide what communication should be permitted. The research team models flow control and congestion control mechanisms for Internet anonymity systems, which for example allow political activists in totalitarian regimes to bypass Internet censorship. They design privacy compliant data collection algorithms, which grant detailed Internet traffic statistics without revealing information about individual users. His team's expertise encompasses the set-up of wireless communication in between manufacturing machines in factories, so as to optimize the production process. In the field of warehouse logistics, Prof. Scheuermann combines measurements from various types of sensors to allow for a more accurate positioning of goods. In all fields of operation, tailored solutions for communication protocols and circuitry are necessary. The challenges are rooted in the particular application area: for instance, very fast or particularly reliable communication may be needed. Or data exchange is limited due to inherent technical limitations, yet the respective application must function reliably. It could be the case that IT security requirements need to be taken into account in new application fields where standard solutions fail. There may be a trade-off between data protection requirements or user privacy concerns, and communication requirements for data transmission. In all mentioned examples, it is necessary to look beyond common solution strategies and to keep the whole picture in mind. This systems perspective characterises the Computer Engineering group and its projects.

Scientific Services
- extensive experience in analytical, simulative, and experimental Analysis of network protocols and digital circuits
- well-equipped network laboratory, which allows for realistic set-ups of scenarios and network topologies (for experimental assessments of wired and wireless communication protocols)
- workshops and laboratories for the design and evaluation of application-specific digital circuits, in particular of FPGA-based systems

Testimonials
- for a large German car manufacturer: the group developed application-specific communication protocols for the data exchange between automobiles, including analytical and simulative assessment
- for afinancial service provider: the group assessed the security of the IT and communication infrastructure
- together with an IT security solution provider: the group developed tailored processors for hardware-supported firewalls
- with a young start-up company: the group developes a secure system and communication architecture for highly distributed Smart City applications

Topics / Trends
Big Data & Data Management
Cloud Computing
E-Mobility / New Mobility
Vehicle Assistant Systems & Navigation Systems
Internet of Things
IT & Cyber Security
Communication(s) Systems
Sustainability & Ressource Efficiency
Peer-to-peer Communication
Privacy Protection
Smart City

Scientific Institution
Einstein Center Digital Future (ECDF)
Weizenbaum Institute
Alexander von Humboldt Institute for Internet and Society

Industries
Education
Energy, Utilities & Raw Materials
Information & Communication Technology
Aerospace
Machinery & Plant Engineering
Mobility & Logistics

Mentor for Startup
poqit.berlin UG (haftungsbeschränkt)
Seedtrace
shoutr labs UG (haftungsbeschränkt)