

KuVS Newsletter

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Editor Message

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Editor Message

Dear KuVS members,

we welcome you to the 14th edition of the KuVS newsletter, which is our third overall newsletter in pandemic mode.

This newsletter is providing you with all information that you need to know about the KuVS community from the last half a year. This edition features reports, calls for papers and participations, as well as dissertations completed within the KuVS community. Amongst others you will find a detailed report of NetSys'21, our community meeting, that sadly had to take place digitally due to the pandemic. Even though the digital format worked out well, it cannot replace face-to-face meetings. Hence, we really hope that for the KuVS community there will be more opportunities next year to meet in person again.

At the end of the newsletter, you again find some riddles from Rolf Windenberg based on his mathematically oriented reform of English orthography.

More information and recent editions of our newsletter are available on <https://www.kuvs.de/newsletter/>.

We hope you enjoy reading this edition of the KuVS newsletter. We as editors wish you merry Christmas and a happy new year.

Ihre Newsletter Editoren,
Oliver Hohlfeld
BTU Cottbus–Senftenberg
Mathias Fischer
Universität Hamburg

Corinna Schmitt
Universität der Bundeswehr München
Andreas Blenk
TU München/University of Vienna



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Fachgruppe KuVS

Movement of persons

- Prof. Dr. Björn Scheuermann (HU Berlin) hat den Ruf auf die Professur Kommunikationsnetze an der TU Darmstadt zum 1. Okt. 2021 angenommen.
- Prof. Dr. Stefan Schmid (Universität Wien) hat den Ruf auf die Professur Internet Architecture and Management an der TU Berlin angenommen.
- Dr. Dr. Klaus-Tycho Förster, Universität Wien/Österreich, hat den Ruf an die Otto-Friedrich-Universität Bamberg auf die W2 t.t. W3-Professur für Informatik, insbesondere Vernetzte Intelligente Systeme, abgelehnt und den Ruf an die Technische Universität Dortmund auf die W2-Professur für Rechnernetze und verteilte Systeme angenommen und wurde mit Wirkung vom 1. Oktober 2021 zum Universitätsprofessor ernannt.
- Prof. Dr. Mathias Fischer, Universität Hamburg, hat Rufe an die Westfälische Wilhelms-Universität Münster (W2-Professur Rechnernetze) sowie an die Universität Leipzig (W2 Data Privacy and Security) abgelehnt und einen Ruf der Universität Hamburg auf die W2-Professur für Informatik, insbesondere Rechnernetze, angenommen.
- PD Dr.-Ing. habil. Andreas Reinhardt, Technische Universität Clausthal, hat einen Ruf an die Georg-August-Universität Göttingen auf die W2-Professur für Technische Informatik mit Schwerpunkt Sensorik abgelehnt und einen Ruf der Technischen Universität Clausthal auf die W3-Professur für Energieinformatik angenommen.
- Associate Prof. Dr.-Ing. Stefan Schulte, Technische Universität Wien/Österreich, hat Rufe an die Technische Universität Illmenau, die Universität Bamberg, die TU Bergakademie Freiberg, die Universität Paderborn sowie das Bleibeangebot der TU Wien abgelehnt. Er hat einen Ruf an die Technische Universität Hamburg angenommen und wurde mit Wirkung vom 1. September 2021 zum Universitätsprofessor, verbunden mit der Leitung des Institutes für Data Engineering an der TU Hamburg, ernannt.

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2.1 KuVS Award Winners 2020

Bachelor

- Johannes Deger (Universität Ulm): Evaluation of the Deployment Status of RPKI and Route Filtering (Advisor: Frank Kargl)

Master

- Katharina Dietz (Universität Würzburg): Identification and Evaluation of KPIs in SDN via Simulation for Establishing Topology Classifications and Prediction Models (Advisor: Tobias Hoßfeld)
- Florentin Putz (TU Darmstadt): Secure Device Pairing Using Short-Range Acoustic Communication (Advisor: Matthias Hollick)

PhD

- Florian Lau (Universität zu Lübeck): DNA-basierte Nanonetzwerke (Advisor: Stefan Fischer)

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Prof. Xiaoming Fu elected as IEEE Fellow

Prof. Xiaoming Fu have been elected Fellow of the prestigious Institute of Electrical and Electronics Engineers (IEEE) in the class of 2022 for his remarkable contributions to “resource management in edge computing and networking”. Prof. Fu is the first researcher at the University of Göttingen named as an IEEE Fellow.

Xiaoming Fu received the PhD degree in computer science from Tsinghua University, Beijing, China in 2000. He was then a research staff at Technical University of Berlin until joining the University of Göttingen in 2002, where he has been a professor in computer science and heading the computer networks group since 2007. He has spent research visits at the Universities of Cambridge, Columbia, UCLA, Uppsala, Sorbonne, Tsinghua, and Victoria (Australia). He has been named an IET Fellow (2017) and member of Academia Europaea (2018). His research interests include Internet-based systems, applications, and social computing. He is currently an editorial board member of IEEE Network, IEEE Transactions on Network and Service Management, IEEE Transactions on Network Science and Engineering and co-Editor-in-Chief of Journal of Social Computing.

About IEEE

The IEEE is the world’s largest professional organisation dedicated to advancing technological innovation and excellence for the benefit of humanity, with more than 430,000 members in over 160 countries. IEEE Fellow is the highest grade of membership and is recognized by the technical community as a prestigious honor and an important career achievement. Only less than 0.1

Best Paper Award Gibson Kimutai & Anna Förster

Gibson Kimutai, a PhD student of Prof. Anna Förster from the University of Bremen and Center of Excellence in Internet of Things in Rwanda, has received the best paper award at the IEEE Global Humanitarian Conference 2021! The title of his paper is ”Offloading an Energy Efficient IoT Solution to the Edge: A practical Solution for Developing Countries“ and is available online: https://www.youtube.com/watch?v=k74u0CIp2ls&list=PLK_Ujz7qXyqPFFDQNHCDwV_ssPJSC2ZGJ&index=4

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Preisträger der Telekom Challenge

Amr Osman (KIT / KASTEL / CeTI) und Jeannine Born (TU Dresden) erhielten den mit 150.000 Euro dotierten ersten Preis im "Development Stream" für ihre Idee zur "automatischen Netzwerkkisolierung von IoT-Geräten".

Mehr dazu (Volle Artikel):

<https://tu-dresden.de/ing/informatik/die-fakultaet/news/jeannine-born-gewinnt-telekom-challenge>

<https://www.telekom.com/de/medien/medieninformationen/detail/die-preistraeger-der-telekom-challenge-635066>

New Book on 6G Networking

A new book on "Shaping Future 6G Networks: Needs, Impacts, and Technologies" by Emmanuel Bertin (Editor), Noël Crespi (Editor), Thomas Magedanz (Editor) appeared in December 2021.

Further information: <https://www.wiley.com/en-be/Shaping+Future+6G+Networks%3A+Needs%2C+Impacts+and+Technologies-p-9781119765516>

"Æternum" was Awarded the Best Paper Award at IEEE ICBC 2021

The 3rd IEEE International Conference on Blockchain and Cryptocurrency in 2021 (ICBC 2021) <https://icbc2021.ieee-icbc.org/> was planned to be held in the oldest and biggest Australian city, Sydney. However, the pandemic moved all presentations and session in the time of May 3-6, 2021 into an on-line mode.

The Communication Systems Group CSG of the University of Zürich UZH (<https://www.csg.uzh.ch/>) did show presence at ICBC with three accepted papers overall: The full paper on "Edge2BC: a Practical Approach for Edge-to-Blockchain IoT Transactions" by Eder Scheid, Andreas Knecht, Tim Strasser, Christian Killer, Muriel Franco, Bruno Rodrigues, Burkhard Stiller, a short paper entitled "SAMOS: a Smart Contract Access Management over Opaque and Substructural Types" by Markus Knecht (co-affiliated with the University of Applied Sciences Northwestern Switzerland, Windisch), Burkhard Stiller.

And additionally, the full paper from the CSG on "Æternum: a Decentralized Voting System with Unconditional Privacy" was recognized specifically at the ICBC 2021 closing session on May 6, 2021 via the TPC Co-chairs' selection out of 226 submissions to be awarded with the ICBC 2021 Best Paper Award. Researched and organized by Christian Killer and the team of Markus Knecht, Claude Müller, Bruno Rodrigues, Eder Scheid, Muriel Franco, and Burkhard Stiller, this work is part of the larger project on "E-Voting: Blockchain-based Remote Electronic Voting", which started in 2018 to design, prototype, and evaluate the feasibility of deploying

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a Blockchain-based Remote Electronic Voting (REV) system, serving as a fully decentralized and secure platform for running eVoting.

While in general REV systems allow voters to cast their votes in an uncontrolled, distributed environment, at the same time, the REV system must provide ballot privacy and the verifiability of the final tally. Research has proposed REV schemes offering ballot privacy based on computational intractability assumptions, but only a few provide unconditional privacy.

Therefore, *Æternum* proposes a REV system with a voting scheme providing unconditional privacy, but in contrast to related work, it neither requires trust in a central authority, nor does it assume computational intractability of an underlying mathematical problem to provide unconditional privacy. To satisfy unconditional privacy's minimal trust assumptions, *Æternum* uses a permissioned Distributed Ledger that forms a decentralized network of permissioned nodes, which serve as a transparent, tamper-proof Decentralized Public Bulletin Board. In turn, this board serves as a surface for posting public messages, here the final tallying results of an REV system in operation.

Æternum is the first Distributed Ledger-based REV system ever combining a voting scheme with unconditional privacy and a public permissioned Distributed Ledger.

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3.1 Finished PhD Theses

3.1.1 Johannes Blobel,

TU Berlin, Telecommunication Networks Group

Title: Energy Efficient Communications using Wake-Up Receivers

Wireless communication is the key enabler for the vision of an interconnected world. In many application scenarios like Wireless Sensor Networks (WSNs), Internet Of Things (IoT) or Industry 4.0 battery operated nodes monitor the environment and send the collected data over a wireless link. In order to ensure a long lifetime of such systems it is essential to design such systems as energy efficient as possible. In the past years a new technique called Wake-Up Receivers (WURs) has been proposed in the literature that promises ultra-low power communication without the drawbacks of traditional, duty cycling based protocols. In this thesis the WUR concept is studied towards its applicability in different scenarios: Wildlife animal tracking with small sensors, low power Wireless LAN (WLAN) for IoT devices and a more general communication system for devices with tight energy constraints. Also a new addressing scheme is proposed which allows a more flexible use of a WUR. The findings of this thesis show how the WUR concept can be used for energy efficient communication and how it can be integrated into existing systems with little additional overhead and in a way that is compatible with legacy devices. It offers very low energy consumption without degrading the performance or increasing delays in centralized and decentralized networks.

3.1.2 Muhammad Sohaib Amjad

TU Berlin, Telecommunication Networks Group

Title: Towards Low Latency and Bandwidth Efficient Communication in Wireless Systems

The densely utilized sub-6 GHz spectrum is reaching critical saturation levels due to the growing number of wirelessly connected devices and their increasing demand for high-speed real-time content access. The ubiquitous connectivity and high data rates in the existing wireless architecture are, therefore, struggling, with both limited link-capacity and channel access. In this regard, infrastructure relays have also been considered for maintaining high-speed wireless connectivity and improved user experience. Nevertheless, due to the existing relaying structure's half-duplex nature, higher latencies are typically experienced, especially in multi-hop scenarios. To address this issue, in-band Full-Duplex Relaying (FDR) has been proposed in the literature, which is still missing standardized implementations for experimentation and evaluation purposes. The first part of the thesis fills this gap and presents an IEEE 802.11 a/g/p compliant FDR implementation in the GNU Radio framework. We first evaluate FDRs' performance in a dual-hop scenario, with simulations and Software-Defined Radio (SDR)-based real-world experiments. We further consider FDR applicability in vehicular platooning and study its potential in sub-6 GHz and 77 GHz mmWave channels. Our results show that FDR substantially

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reduces the physical layer latency and transmission power requirements in a multi-hop system, provided that the looped self-interference is sufficiently suppressed. The second part of this thesis explores the spectrum beyond conventional RF for communications and investigate Visible Light Communication (VLC) as an access technology for bandwidth-efficient and low latency communications. We first present a flexible IEEE 802.11 compliant Vehicular-VLC (V-VLC) system, which utilizes commercial off-the-shelf hardware. Our real-time experiments in the outdoors during the daytime confirm that our system prevents the strong impact of daylight and demonstrates reliable communications for distances beyond 75 m, regardless of the time of the day. We then propose a novel indoor visible light-based communication and non-invasive sensing system with applications in industrial automation and Internet of Things (IoT) solutions. Our results show that integrating the two technologies only marginally lowers individual performance; however, the combined system is especially beneficial in radio-hostile and hazardous industrial environments.

3.1.3 Elnaz Alizadeh Jarchlo

TU Berlin, Telecommunication Networks Group

Title: Wireless Handover Solutions in Vehicular Visible Light Communications

A vast number of research works demonstrated the high potential of Visible Light Communications (VLC) as a complementary wireless communication technology that can be widely used in vehicular VLC (V-VLC) networks. V-VLC utilizes visible light spectrum in order to provide communication connections among vehicles. To guarantee coverage in V-VLC networks many Access Points (AP) can be used, which can result in intermittent connectivity between vehicles as the clients and their associated AP and lead to many handovers. In VLC-based vehicular communications the link may experience regular link failures due to shadowing, obstacle, and mobility in contrast to RF-based networks. Therefore, one of the main challenges of V-VLC is the frequent handover which causes outages and network disruption, evidently. This Ph.D. thesis aims enhancing the reliability and robustness of the indoor vehicular network communications by reducing the handover latency in the vehicular network. In this thesis, I propose handover solutions at different network layers using different wireless technologies. Note, in all proposed solutions, VLC acts as a primary connection link. To address the frequent link failures during handover in the V-VLC network, I propose Flexible Light Communications (Flight) and Frequency Diversity and Link Aggregation (FDLA) architectures which make use of link aggregation method and Frequency Division Multiple Access (FDMA) in data link layer to switch between available Light Access points (LAP) in case of handover during mobility or the link blockage in linear and two dimensional (2D) movements, respectively. Applying Flight and FDLA solutions decrease the handover delay from 15 s to 0.3, and 0.2 s, respectively compared with no handover technique. Moreover, in the transport layer I utilize the advantage of Multipath-Transmission Control Protocol (MPTCP) to provide network redundancy and load balancing during handover and minimize the number of packet lost caused by connection lose. This solution minimizes the handover delay up to 0.02 s. Additionally, in order to

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add robustness and increase network reliability and coverage, I propose Li-Wi, a system which utilizes the benefits of high data rates and link availability of VLC and Wireless Fidelity (WiFi), respectively. Li-Wi solution minimizes the handover latency significantly up to 0.03 s. In this thesis I introduce V-VLC network scenarios, where there are Automated Guided Vehicles (AGV) moving linearly and in 2D around the warehouse in an indoor environment and each AGV is equipped with several Light Clients (LC). The installed LC establish VLC link connections with their corresponding LAP which are installed on ceiling. Each pair of LC and LAP is assigned to non-overlapped frequency bands using FDMA technique. Therefore, each LC can establish a VLC link with its corresponding LAP. The main contributions of this thesis can be summarized as (i) Developed several upper layer handover solutions for indoor V-VLC networks, (ii) Assessed the effect of link aggregation and MPTCP methods in the data link and transport layers, respectively separately and together as a combined architecture in a hybrid vehicular network where VLC and WiFi act as a primary and backup links, respectively, and (iii) Demonstrated how applying proposed solutions decrease network latency in both horizontal and vertical handovers in a V-VLC network, which lead to provide an improved network in terms of coverage, reliability and robustness.

3.1.4 Piotr Gawłowicz

TU Berlin, Telecommunication Networks Group

Title: Towards Collaboration in Heterogeneous Wireless Networks

The wireless spectrum is getting crowded with heterogeneous technologies that are designed to satisfy various requirements of existing and emerging applications. Unfortunately, due to diverse operation principles, the channel access coordination methods that work well in homogeneous networks are not applicable or perform poorly in heterogeneous environments. Hence, coexisting networks suffer from frequent collisions and significant performance degradation. Furthermore, even homogeneous wireless networks operate independently and are adversaries to each other, i.e., they compete for limited radio resources. This dissertation aims to improve wireless coexistence by enabling collaboration between networks that are heterogeneous concerning technology and ownership. To this end, the key challenges and opportunities of collaboration are considered in three main parts. First, we address the issue of information exchange that is needed for collaboration but missing among heterogeneous technologies due to their incompatible physical layers. We describe two cross-technology communication (CTC) schemes. LtFi enables direct over-the-air data transmission from LTE-U to WiFi, while NOTCH is a generic CTC framework that can be parametrized for any pair of wireless technologies. As a proof of concept, we use NOTCH to enable bidirectional CTC between LTE-U/LAA and WiFi. Second, having the possibility of communication, we build a common control plane and create two collaboration schemes. In XZero, an unlicensed LTE base station uses its beamforming capabilities to reduce interference at neighboring WiFi nodes. To this end, the nodes collaboratively perform the null-beam search. NxWLAN enables collaboration among separately owned WiFi networks. Specifically, it enables secure infrastructure sharing and cross-network traffic

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delivery to form a composite network and serve wireless clients from the access point providing the best connectivity. Finally, to move the boundaries of wireless communication, we need to make networks to identify collaboration opportunities and autonomously optimize their parameters. Motivated by recent advances in robotics, we believe that also wireless networks can learn to collaborate from interactions with each other and an environment. Therefore, we build ns3-gym, the framework for learning-based approaches that can be used in a large scope of networking research problems. Then, using ns3-gym, we implement an online learning algorithm for the distributed optimization of channel access probabilities in coexisting WiFi networks.

3.1.5 Allan Mariano de Souza

Universität Bern

Title: Towards a Personalized Multi-objective Vehicular Traffic Re-routing System

Vehicular traffic re-routing is the key to provide better vehicular mobility. However, considering just traffic-related information to recommend better routes for each vehicle is far from achieving the desired requirements of a good Traffic Management System (TMS), which intends to improve mobility, driving experience, and safety of drivers and passengers. In this scenario, context-aware and multi-objective re-routing approaches will play an important role in traffic management, considering different urban aspects that might affect path planning decisions such as mobility, distance, fuel consumption, scenery, and safety. There are at least three issues that need to be handled to provide an efficient TMS, including: (i) scalability; (ii) re-routing efficiency; and (iii) reliability. Scalability refers to the ability of the system to deliver the desired performance without carrying about the vehicles' number or the scenario's size. On the other hand, re-routing efficiency refers to how good is the traffic management of the solution. Finally, reliability determines how reliable the system computes the routes regarding future changes in the urban dynamics. In this way, this thesis contributes to efficient and reliable solutions to meet future TMSs. The first contribution lies in developing a scalable architecture for traffic management based on distributed and cooperative algorithms for sensing the urban environment, estimating urban aspects, and re-routing vehicles in real-time. The second contribution relies on enabling an efficient multi-objective re-routing based on each user's preferences. Thus, each user can determine which urban aspects will be chosen to plan its route. Unlike other multi-objective approaches, our solution is non-deterministic, which decreases the chance of creating additional congestion spots since vehicles with similar origin and destination potentially will be re-routed through different routes. This thesis's last contribution lies in improving the reliability of the routes computed by the TMSs using a route planning algorithm that considers the future changes in the urban dynamics is proposed. The significant advantage of this solution regarding literature solutions is that the system predicts future urban dynamics (i.e., future changes in traffic conditions, safety risks, etc.). Thus, the system knows beforehand when some changes will happen and how long they will last, consequently computing more reliable routes. The proposed solutions were widely compared with other related works on dif-

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ferent performance evaluation metrics. The evaluation results show that the proposed solutions are efficient, scalable, and cost-effective, pushing forward state-of-the-art traffic management systems.

3.1.6 Matthias Bauer

TU Braunschweig

Title: Einsatzmöglichkeiten funkbasierter Datenübertragung in industriellen Kommunikationssystemen für Anwendungen mit Echtzeitanforderungen auf der Feldebene der Fertigungsautomatisierung

With an annual revenue of ca. 220 billion euros in 2019 the machine building industry represents the backbone of German industry. Continuous innovation has been a key driver for maintaining this leading market position. For this purpose, the use of wireless technologies in industrial communication has already proven to be a fruitful source of innovation, particularly in process automation. However, certain limitations in traditional approaches exist. The field level of factory automation comprises real-time critical applications with transmission latencies in the range of a few milliseconds, which is where existing wireless solutions fall short and novel approaches are necessary. Hence, this thesis proposes the concept of a hybrid industrial communication system, which systematically transforms application requirements into the design of a holistic communication scheme. As a solution this thesis presents an Industrial-Ethernet-Bridge composed of wired and wireless components, which can be flexibly configured and seamlessly connected to legacy field devices during the commissioning of industrial machines. Analyzing the mobility behavior of such machines shows only few machine parts are typically moving relative to each other; only for these the use of wireless technologies creates added value. E.g., a single wireless connection is possible to implement in a round table machine and the prototype implementation shows the feasibility and effectiveness of the hybrid system approach with off-the-shelf IEEE 802.11 chipsets. The limitations of the off-the-shelf approach together with proprietary extensions are first examined with a use case of a packaging machine and secondarily by means of a simulation study. In this context, mobile communication standards such as LTE are identified as de-facto ideal typical medium access schemes for real-time critical industrial applications. Moreover, 3GPP Release 16 and its private 5G campus networks represent powerful options explicitly addressing industrial applications. As long as regulatory questions on spectrum allocation and customer's autonomy when operating 5G campus networks are not satisfactorily solved, medium-sized customers such as machine builders prefer wireless technologies in the license free ISM bands to protect their economic interests. Finally, the holistic concept of a hybrid industrial communication system as proposed with this thesis holds regardless of the concrete wireless technology deployed.

<https://doi.org/10.24355/dbbs.084-202108111502-0>

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3.1.7 Sounak Kar

TU Darmstadt

Title: Performance Evaluation of Transition-based Systems with Applications to Communication Networks

Since the beginning of the twenty-first century, communication systems have witnessed a revolution in terms of their hardware capabilities. This transformation has enabled modern networks to stand up to the diversity and the scale of the requirements of the applications that they support. Compared to their predecessors that primarily consisted of a handful of homogeneous devices communicating via a single communication technology, today's networks connect myriads of systems that are intrinsically different in their functioning and purpose. In addition, many of these devices communicate via different technologies or a combination of them at a time. All these developments, coupled with the geographical disparity of the physical infrastructure, give rise to network environments that are inherently dynamic and unpredictable. To cope with heterogeneous environments and the growing demands, network units have taken a leap from the paradigm of static functioning to that of adaptivity.

In this thesis, we refer to adaptive network units as transition-based systems (TBSs) and the act of adapting is termed as transition. We note that TBSs not only reside in diverse environment conditions, their need to adapt also arises following different phenomena. Such phenomena are referred to as triggers and they can occur at different time scales. We additionally observe that the nature of a transition is dictated by the specified performance objective of the relevant TBS and we seek to build an analytical framework that helps us derive a policy for performance optimization.

As the state of the art lacks a unified approach to modelling the diverse functioning of the TBSs and their varied performance objectives, we first propose a general framework based on the theory of Markov Decision Processes. This framework facilitates optimal policy derivation in TBSs in a principled manner. In addition, we note the importance of bespoke analyses in specific classes of TBSs where the general formulation leads to a high-dimensional optimization problem. Specifically, we consider performance optimization in open systems employing parallelism and closed systems exploiting the benefits of service batching. In these examples, we resort to approximation techniques such as a mean-field limit for the state evolution whenever the underlying TBS deals with a large number of entities. Our formulation enables calculation of optimal policies and provides tangible alternatives to existing frameworks for Quality of Service evaluation. Compared to the state of the art, the derived policies facilitate transitions in Communication Systems that yield superior performance as shown through extensive evaluations in this thesis.

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3.2 Project News

A smart fence to protect livestock from wolves

The group of Prof. Förster, University of Bremen, has started a very exciting new research project in July 2021, “A smart fence to protect livestock from wolves”, financed by the Federal Ministry of Agriculture and Food and in cooperation with the University of Giessen and RoFLEX GmbH. In this project, we will be developing a smart fence to identify approaching wolves and to resell them with light and sounds techniques. Stay tuned on: <https://www.intelligenter-herdenschutz.de>

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3.3 PhD Positions



TU Clausthal

The Energy Informatics lab at Technische Universität Clausthal solicits applications for
one doctoral or postdoc researcher (m/f/d)

to support the group's research and teaching activities. The position is full-time, remunerated according to the German TV-L E13 scheme, and offered for an initial duration of 3 years. The willingness to complete an academic qualification (doctoral degree or habilitation) is expected. A part-time employment is generally possible.

Research Area

The increasing number of digital metering devices within the electrical power grid creates numerous possibilities to collect and process energy-related data. Many novel and innovative services can be constructed based on such data, including the detection of appliance states and activities, the recognition of usage patterns hinting at unexpected or faulty appliance states, or energy demand forecasting. The Energy Informatics lab actively conducts research into suitable ways for the methodological collection, transmission, and processing of such data. Activities encompass the design of sensor systems to collect energy-related data, the usage of resilient wireless communication protocols to forward data to dedicated processing devices, as well as the use of data processing techniques (including AI-based methods).

Tasks

- ▷ Research and development of next-generation energy data collection, networking, and processing tools and devices to contribute to the realization of truly smart power grids
- ▷ Publication of research results as well as presenting them at international conferences
- ▷ Teaching support, incl. supervision of thesis students

Required prerequisites

- ▷ Completed academic degree (M.Sc or equivalent for doctoral candidates; PhD for habilitation candidates) in computer science, information technology, electrical engineering, or a related subject
- ▷ Very good programming skills as well knowledge of the essential aspects of electronics, measurement technology, and/or power engineering
- ▷ Independent, structured and goal-oriented way of working and fast comprehension skills
- ▷ Capacity to conduct self-guided scientific work and team player
- ▷ Enjoyment of interdisciplinary application problems and exchange with scientists from other disciplines
- ▷ Very good written and spoken communication skills in English and basic proficiency in German
- ▷ Teaching experiences (e.g., as lab tutor) are a benefit

Support by TU Clausthal

The position is remunerated according to the German TV-L salary scheme and includes an annual bonus payment at the end of each year. In addition, we offer a supplementary pension scheme (VBL). TU Clausthal seeks to reconcile work and family life through flexible work time models and is member in the University association „Familie in der Hochschule“. Equal opportunities, diversity, and family friendliness are important concerns for TU Clausthal. Applicants with disabilities are given preference if equally qualified. Applications from people of all nationalities are welcome.

Application procedure

If interested in this position, please submit your application pack (motivation letter, current CV, certificates) as a single PDF file to Prof. Dr.-Ing. Andreas Reinhardt, andreas.reinhardt@tu-clausthal.de. When applying for a postdoc position, please also attach PDF copies of your three most influential publications.

Deadline

Application deadline: 22 December 2021. Late applications will not be considered.

Please also regard the privacy statements at <http://www.tu-clausthal.de/info/stellenangebote/>. Application-related costs cannot be reimbursed. Submitted application documents will be destroyed once an applicant has been appointed.

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One Ph.D. Student Position in "Networking in Immersive Communications"

We are looking for a Ph.D. student in an upcoming SNSF project on "Networking in Immersive Communications" based on augmented or virtual reality.

The project includes the investigation of concepts to improve Quality-of-Experience by advanced viewport prediction algorithms considering psychological effects.

Moreover, communication latencies have to be minimized using advanced hardware and software platforms as well as communication protocols in mobile network environments.

Requirements

The ideal candidate has a good understanding of networked systems, machine learning, and software engineering. We only consider excellent applications from excellent universities. You should hold a master's in computer science or related fields. Very good English (written and oral) is mandatory; knowledge of German is beneficial.

More information about our research group is available at www.cds.unibe.ch

We offer

The position is available from March 1, 2022 and comes with a competitive salary. The University of Bern conducts excellent research and lives up its vision that "Knowledge generates value." The city of Bern lies in the centre of Switzerland and offers some of the highest quality of life worldwide.

Candidates are requested to send a short letter of motivation, their CV, Master thesis, publications, and transcripts from Bachelor and Master studies to the email address given below.

Details

https://www.cds.unibe.ch/about_us/open_positions/phd_position

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The Institute of Data Engineering at Hamburg University of Technology is looking for a:

Postdoc (m/f/d)

The position is funded by the Christian Doppler Laboratory for Blockchain Technologies for the Internet of Things (CDL-BOT) www.cdl-bot.at. The position is initially offered for a duration of 21 months. An extension of the contract for another 36 months is possible and foreseen after a positive intermediary evaluation of CDL-BOT. The remuneration is in accordance with TV-L 14.

Your Tasks:

- Research in blockchain interoperability concepts and solutions, e.g., token transfer, data access, and smart contracts
- Research in lightweight blockchain technologies for the Internet of Things
- Realization of according prototypes
- Participation in teaching activities

Your Profile:

- PhD in computer science, informatics, business informatics or a related discipline
- Experience in distributed systems research is a necessity
- Experience in blockchain, cryptography and/or Internet of Things research is beneficial
- In-depth interest in scientific problems and the motivation for independent and goal-oriented research
- The willingness to contribute to an industry-oriented scientific project aiming at fundamental research results
- Very good programming skills
- Very good knowledge in English communication and writing

Our offer:

- The possibility to pursue a postdoctoral qualification (habilitation)
- The chance to pursue your research (theoretical and experimental) within a young and international team, which is delivering very important contributions to blockchain and Internet of Things research

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- The possibility to present your research results at international top conferences
- The opportunity for stays abroad at international partner universities
- To become part of a creative team at an aspiring university and in one of the most livable cities of the world
- A highly competitive salary. Entry level salaries as a Postdoc are at a minimum of 4400 €per month (gross; 12 times per year; depending on the previous experience)

For further information please contact Prof. Stefan Schulte (stefan.schulte@tuhh.de) and see www.cdl-bot.at/en.

Please provide your complete application pack - including a motivation letter, a current CV, academic transcripts and certificates, and a digital copy of your latest thesis (either Master or PhD) - via the online application system <https://stellenportal.tuhh.de/xcw78> The preferred starting date is February 2022, but a later start is also possible.

We particularly encourage women to apply. Due to their underrepresentation, they will be given priority in cases of equal suitability, qualifications and professional performance.

We look forward to receiving your online application by 16.12.2021.

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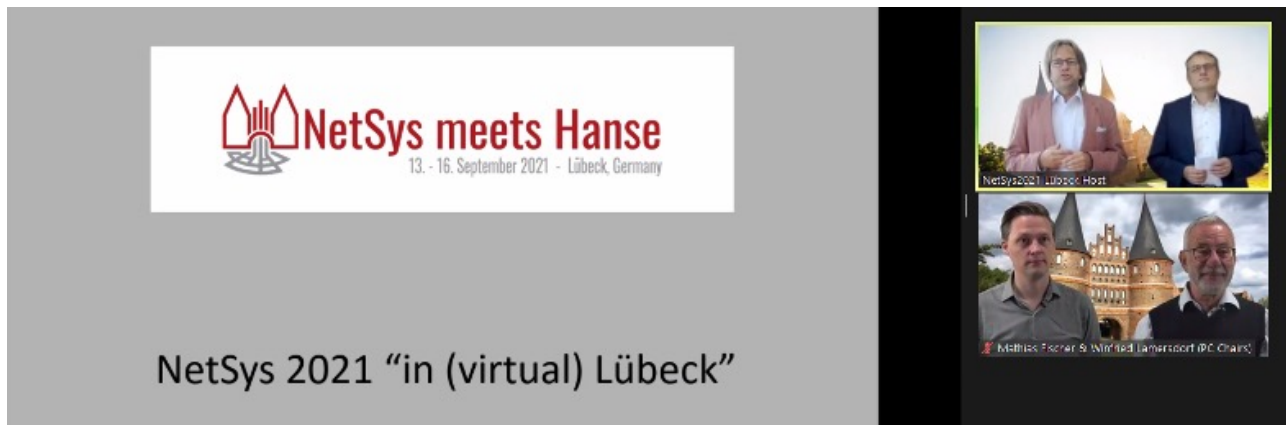
4.1 Report NetSys 2021 in (virtual) Lübeck

Mathias Fischer, Stefan Fischer, Horst Hellbrück, Winfried Lamersdorf

The Conference on Networked Systems (NetSys 2021) is an international forum for engineers and scientists in academia, industry, and government to exchange ideas on recent innovations in the field of networked systems.

NetSys is a biennial event that originates from the key scientific conference on networked systems in German-speaking countries KiVS (Kommunikation in Verteilten Systemen) – which was initiated 41 years ago and has international orientation since 2013. NetSys is organized by the special interest group “Communication and Distributed Systems” (KUVS), which is anchored both in the German Computer Science society (Gesellschaft für Informatik (GI)) and in the Information Technology society (Informationstechnische Gesellschaft im VDE (ITG)).

With the slogan “NetSys meets Hanse”, NetSys 2021 was co-hosted by the northern universities from September 13 - 16, 2021.



Snapshot of the welcome session

General Chairs: Prof. Stefan Fischer and Prof. Horst Hellbrück (top)

PC Chairs: Prof. Mathias Fischer and Prof. Winfried Lamersdorf (bottom)

Prior to the main conference, three tutorials and four workshops were offered on September 13. The workshops covered topics such as the application of machine learning in networks, vehicular networking, molecular communications, and network forensics. The tutorials provided knowledge on time-critical communication in networks, novel programming languages, and new programming paradigms.

The two-day main conference Netsys21 started on September 14 with a warm welcome from the Hanseatic City of Lübeck by the General Chairs Prof. Stefan Fischer (University of Lübeck)

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and Prof. Horst Hellbrück (Technische Hochschule Lübeck) as well as the PC Chairs Prof. Mathias Fischer and Prof. Winfried Lamersdorf (both University of Hamburg) as well as with greetings from the prime minister of Schleswig-Holstein Ministry, Daniel Günter.

Special highlights were the keynote contributions on Distributed Systems by Prof. Christian Becker from the University of Mannheim and on Networks by Prof. Ralf Steinmetz from the Technical University of Darmstadt. In addition, the two panels were very popular: the one organized by Prof. Anna Förster from the University of Bremen dealt with "Best Practices in supervising and guiding PhD students"; in the second one, organized by Prof. Matthias Hollick and Holger Karl, on "From 5G to 6G", participants discussed particular challenges of the upcoming 6G mobile communications standard.

For the main program of Netsys21, a total of 18 extended abstracts were accepted, which were presented in a best paper and a poster session. Paul Walther of Dresden University of Technology and his co-authors received the Best Paper Award with their article on "Ray-tracing based Inference Attacks on Physical Layer Security". The Best Poster Award was given to Lucas Pacheco, Denis Rosário, Eduardo Cerqueira and Torsten Braun for their contribution on "Federated User Clustering for non-IID Federated Learning".

Furthermore, ten exciting demos were presented in a virtual demo session. The Best Demo Award was granted to Matthias Frank for his demo on "IDN Laser Tester: A Framework for Detecting and Testing ILDA Digital Network Consumers for Laser Projection". Especially for young scientists, a PhD forum as well as a virtual early-work poster session were hosted. For the poster session, seven extended abstracts were accepted and presented as posters. In addition to all these original contributions, the best publications of the last two years in the areas of networks and distributed systems were presented in two well-attended hot-topic sessions.

On Thursday, the VDE/ITG organized the traditional workshop ZdN (Zukunft der Netze/Future Of Networks) which completed the main program of NetSys21. ZdN has a strong focus on networks and communication systems with strong industry participation. Speakers from research and industry presented current research topics and results. The main topics for ZdN in 2021 were 5G and 6G research, implementation and deployment activities.

Although, unfortunately due to Corona, the conference had to take place virtually, NetSys21 was a full success on all four days. Netsys21 impressively demonstrated the diverse activities and achievements of the community from universities and industrial companies. A total of 220 participants attended the live program with a total of about 4,000 minutes online time during all four days. In parallel to the live stream, participants were supported by screenshots and texts via a Slack forum. In this way, participants were able to network, exchange ideas and discuss also during coffee breaks.

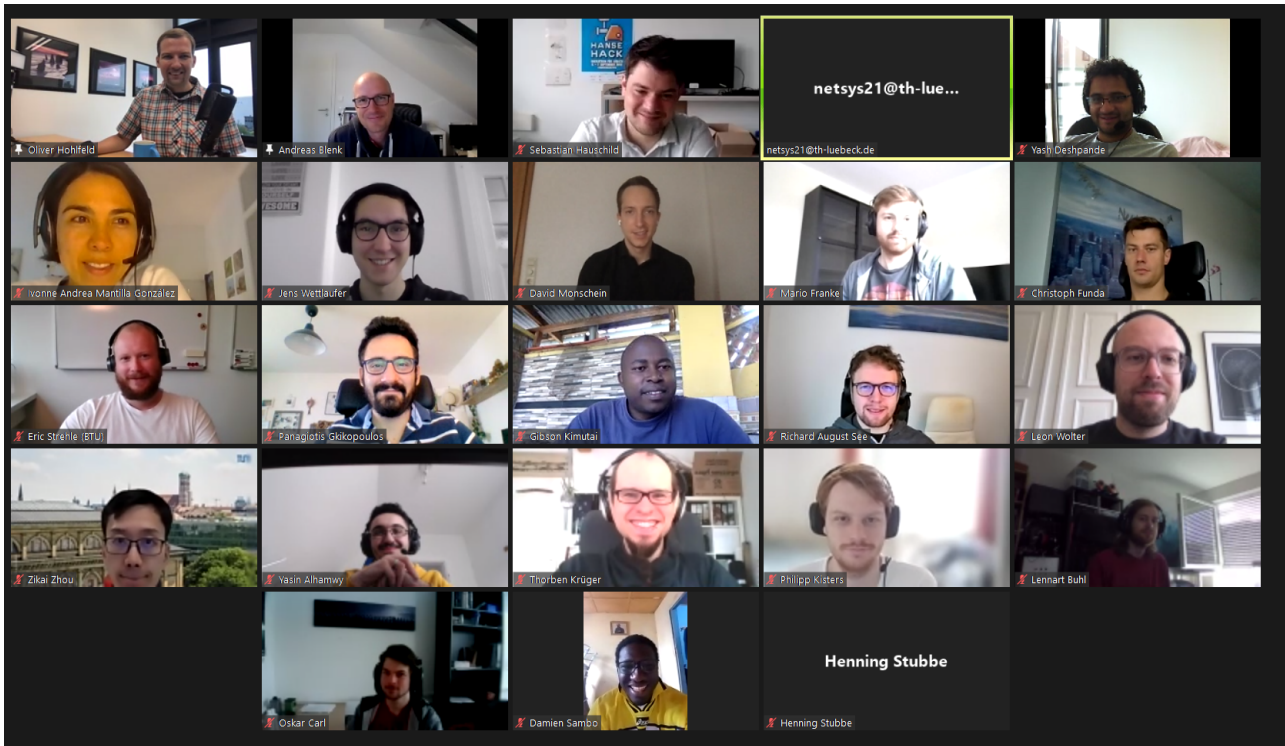
We - the organizers - hope you enjoyed the conference. We certainly did. We sincerely thank everyone who contributed to its success.

We hope to see you again, hopefully F2F, at the next NetSys conference in Potsdam in 2023.

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Impressions of NetSys 2021 - Participants of the PhD forum

4.2 NetSys PhD Forum & Early Work Track

Andreas Blenk, Oliver Hohlfeld

For the 2021 edition, we continued to evolve the format of the NetSys PhD Forum. The major change? We announced *two* calls: *i*) a call for participation in the meta discussion on how to do a PhD (i.e., the PhD Forum), held on Friday and *ii*) a second call for early work to be presented as poster during the main session (i.e., the Early Work Track). Traditionally, these two components were combined. This split into attending a tutorial on how to do a PhD and presenting early work worked out very well. We received 11 abstracts for the early work track, of which we accepted 7 for presentation. Yet, we received 21 applications for participation on the tutorial on how to do a PhD, of which we accepted all 21. These applications also included one master student interested in pursuing a PhD and four applicants from abroad (Czech Republic, Switzerland, Spain, and Kenya). Likely, not all of these participants might have joined if NetSys would have been held in-person.

The tutorial was a full-day workshop on Friday on all aspects on how to do a PhD. As in the previous years, we asked all applicants to include at least three questions on this topic in their application. We then manually structured these questions into topic and build the program around them, so that we can address more than 80% of the questions in great detail. As in the years before, the submitted questions were of high quality and covered all topics that concern the life of a PhD student: what is a research question? How to write better papers? How to manage time/students/myself/your advisor? Etc.

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Using digital tools enabled us to make the PhD Forum a very interactive event—by experience, substantially more interactive than in-person PhD Forums in 2017 and 2019. We used two channels for interactions: *i*) asking questions orally and *ii*) asking questions *anonymously* via an online forum. Both channels were used very frequently throughout the entire day. Most notably, the anonymous channel was used to ask more controversial questions or questions that—as it turns out—many participants had but did not dare to ask (e.g., I have problems managing my time in situation X). So the anonymous way to ask questions turned out to be a very valuable addition to the oral discussion.

Further, we assigned participants *at random* to Zoom breakout rooms to discuss one of the pre-defined topics (e.g., student management, paper writing) and prepare a short presentation on their outcome. The group work was done early on the day and before we presented our prepared material. The goal was to highlight that all of the participants already have well-established and working practices on how to deal with the challenges of pursuing a PhD, although they might not think so. The second goal of the group work was to enable the participants to network and better get to know the other participants, thereby paving the path for potential collaborations in the future.

As established in 2019, we kicked off the PhD forum with a invited talk by a former PhD to tell everyone about the unspoken challenges of a PhD (e.g., which papers got rejected how many times and what other perceived struggles were). This time, we invited Dr. Moritz Müller from the University of Twente / SIDN Labs as our keynote speaker.

The 2021 edition of the PhD Forum was an intensive and very enjoyable event. For us as organizers, the addition of digital tools and methods to foster more interactivity made the entire event way more interactive and intense as in prior years. Yet, the high quality of the discussions and the very good feedback we received suggests that the effort paid off and resulted in a enjoyable and valuable event to the participants.

Andreas Blenk, Oliver Hohlfeld
PhD Forum & Early Work Track Co-Chairs

4.3 Machine Learning in Networking (MaLeNe)

Michael Seufert, Andreas Blenk

The First International Workshop on Machine Learning in Networking (MaLeNe, <https://netsys2021.org/workshops/malene>) was a successful full day event held online on September 13, 2021, where it was co-located with the Conference on Networked Systems (NetSys 2021). After the success of the previous two KuVS workshops (Fachgespräche) on “Machine Learning and Networking” held in February 2020 and October 2020, respectively, with fruitful discussions about ongoing research, the participants endorsed the creation of the MaLeNe workshop in order to present and discuss peer-reviewed research works within the international community. It was organized by workshop co-chairs Michael Seufert (University of Würzburg, Germany) and Andreas Blenk (Technical University of Munich, Germany). The workshop attracted nine

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full paper submissions. The Technical Program Committee consisted of 23 experts in the field of machine learning for networking, which provided at least three reviews per submitted paper. Eventually, 5 full papers were accepted for publication, which gave an acceptance rate of 55%.

On the day of the workshop, the co-chairs welcomed 50 participants. The workshop started with an industry keynote given by Laurent Ciavaglia (Rakuten Mobile, Japan) who elaborated on “Evolving Autonomous Networks”. He presented a novel architecture framework for autonomous networks based on population-based artificial intelligence techniques and evolutionary computing, which he supported with an overview of the autonomous networks standardization landscape.

Afterwards, the first technical session started. Patrick Krämer (TU Munich, Germany) presented a system that uses deep reinforcement learning to automatically design a distributed routing protocol tailored to a specific network. Hassan Fawaz (Telecom SudParis, France) proposed an active queue management system based on weighted fair queueing, which uses deep reinforcement learning for optimal weight selection. Sebastian Lindner (Technical University of Hamburg, Germany) discussed a machine-learning-supported version of dynamic spectrum access in a mobile ad-hoc network, where future medium accesses of a legacy system could be predicted in an aeronautical coexistence scenario.

After the lunch break, Pedro Casas (AIT Austrian Institute of Technology, Austria) gave an academic keynote, entitled “AI4SEC - Tackling Cybersecurity through AI/ML”. He used the main leitmotiv of network security, and elaborated on past works and the most important technical show-stoppers when applying AI/ML to network security in order to motivate and to strengthen future research in that area.

The last technical session was focused on applications of machine learning to higher layers. Yassin Alkhalili (TU Darmstadt, Germany) elaborated on the components required to create a system for improving Quality of Experience of multi-dimensional content streaming by adapting multiple streams of different content types simultaneously using reinforcement learning. Finally, Katharina Dietz (University of Würzburg, Germany) presented a machine-learning-based passive browser fingerprinting method based on explainable features and evaluated two privacy protection mechanisms, namely differentially private classifiers and differentially private data generation.

The workshop co-chairs closed the day with a short recap and thanked all speakers and participants, who joined in the fruitful discussions. To summarize, the first edition of the MaLeNe workshop proved to be very successful, as it brought together researchers from both academia and industry to discuss emerging concepts and challenges related to applying machine learning to networking problems. As the workshop has proven to foster active collaborations in the research community, a second edition will be considered in the future. We would like to thank all the authors, reviewers, and attendants for their precious contributions towards the successful organization of the workshop!

Michael Seufert, Andreas Blenk
MaLeNe 2021 Workshop Co-Chairs

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4.4 CTF 2021 - Report

Capture the Flag 2021 - Game of Trons

Leader: Research Institute CODE, Universität der Bundeswehr München, Germany

Am 26. und 27.11. fand auf dem Campus der Universität der Bundeswehr München und online der erste hybride "Capture the Flag"-Hacking-Wettbewerb des Forschungsinstituts CODE statt.

Freitag, 22:00 Uhr: Dunkle Räume, leuchtende Bildschirme, lockere Stimmung – und trotzdem herrscht weitgehend konzentrierte Stille im Unicasio: Diesen ungewöhnlichen Eindruck konnte man als einer der wenigen registrierten Gäste des 7. Capture the Flag-Events des Forschungsinstituts CODE mit Unterstützung von ITIS e.V. und Team locals auf dem Campus der UniBw M gewinnen. Ende November kamen – natürlich unter Einhaltung der geltenden Corona-Schutzmaßnahmen – 14 Teams, die das Online-Qualifying im Oktober als Beste von 60 teilnehmenden Teams absolviert hatten, auf dem Campus der UniBw M zusammen. Weitere 15 Teams kämpften in einem separaten Track mit leicht veränderten Aufgabenspektrum um den Sieg im Onlinewettbewerb, der ebenfalls unter dem Motto "Game of Trons" stand. Insgesamt 18 Stunden lang lösten die Teilnehmenden anspruchsvolle Aufgaben aus dem Gebiet der Cybersicherheit. Auf die Teams vor Ort wartete am Ende noch eine Überraschung.

Wie in jedem Jahr stand das CTF des FI CODE unter einem Motto, das Storyline und Gestaltung der Challenges bestimmte. Gemäß dem Titel "Game of Trons" – eine Anspielung auf die erfolgreiche Fantasy-Serie "Game of Thrones" und das SciFi-Epos "Tron" – lautete die Zielvorgabe, Kontinente zu besiedeln und Herrschaft über diese zu erlangen. Statt Mord und Intrigen galt es jedoch, mörderische Herausforderungen zu lösen.

Das siegreiche Team konnte nach 18 intensiven Stunden die meisten Flags und die höchste Gesamtpunktzahl vorweisen. Bis zum Schluss blieb es spannend: Während Team T5 lange vorne lag, startete Nemesis gegen Ende eine Aufholjagd – für alle Anwesenden auf dem Scoreboard live zu verfolgen. Um Punkt 12.00 Uhr am Samstag stand dann fest: Die vier glücklichen Gewinner kamen aus dem Team Nemesis. Platz 2 erreichte Team T5, der dritte Platz ging an Sabobatage. Den Online-Track konnten die Careless Eagles vor 0x90 und Ignorital für sich entscheiden.

Mehr Informationen zu CTF sind zu finden unter

<https://www.unibw.de/code/news/ctf-2021-game-of-trons>.

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How 2 Shor10 English Texts

Riddles Based on a "Mathematically Oriented Reform" of English Orthography

Rolf Windenberg (alias: Nigel Fred Brown)

The Rules:

1. Usage of mathematical symbols and of numbers
2. Capital letters are pronounced as in the alphabet

Examples:

(Trafalgar)² [meaning: Trafalgar Square]

√66 [meaning: Route 66]

Y R U so Z 2dA ? [meaning: why are you so sad today ?]



The Riddles (Solutions, see on next page):

- *Beginners:* a paste 40th
- *Playing with Capital Letters:* acTVT
- *Advanced Persons:*
V spNt a 1derful n8 2gether
- *Experts:*
@ breakfast • he √ways voted 4 coffee, not 40
- *Geniuses:*
s+ra + +y, do U plan 2 (2 • go)² > 1ce, 2n8 ?

Fig. 1: Illustration to assist the reader in solving the third riddle (source: [1])

[1] Windenberg, R., Hasselfang, R.W.: How 2 Shor10 English Texts. Shaker Media Verlag, Düren, ISBN 978-3-95631-590-9, 2017



Solutions of the riddles (by Rolf Windenberger):

- a paste for teeth [because: a-paste-for \acute{t} eth]
- activity [because: ac-T-V-T]
- we spent a wonderful night together [because: V-sp-N-t-a-one-derful-n- \acute{e} ight-two-gether]
- at breakfast time she always voted for coffee, not for tea [because: @-breakfast-times-he-all-ways-voted-four-coffee,-not-forty]
- Sandra and Andy, do you plan to go to Time Square more than once tonight? [because: s-and-ra-and-Andy,-do-U-plan-two-go-two-times)-square-more-than-one-ce,-two-n- \acute{e} ight?]



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Next newsletter : 06/2022

Deadline for submissions and contributions : 15th May 2022

We ask you for submissions in English. Topics can be from the following time frame: November 2021 - May 2022.

- Fachgruppe KuVS
 - Geschäftsberichte der GI – KuVS – Fachgruppe
 - ...
- News from the working groups
 - Dissertations
 - Awards
 - News form persons
 - Open positions
 - ...
- New projects (DFG, BMBF, KMU, etc.)
 - Initiatives
 - Larger projects
 - ...
- Calls and news from events, conferences, etc.
 - Reports (Conferences, workshops, Fachgespräche, Dagstuhl, doctoral summer/winter schools, ...)
 - Call for papers and participation (conferences (supported by or hosted in Germany/Austria/Switzerland), Fachgespräche, Summer Schools, ...)
 - ...
- Announcements and important dates

The preferred submission format is text, e.g., using markdown language. Call for papers can also be submitted as PDFs.

Submissions should be done by sending emails to the editors:

<mailto:oliver.hohlfeld@b-tu.de>

<mailto:mathias.fischer@uni-hamburg.de>

<mailto:corinna.schmitt@unibw.de>

<mailto:andreas.blenk@tum.de>