KuVS Newsletter

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Editor Message

Dear KuVS members,

we welcome you to the 15th edition of the KuVS newsletter.

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 on person movements, a summary on recent awards of KuVS members, finished PhD theses, project news, open positions, event reports, and in the fun section some riddles from our dear colleague Rolf Windenberg.

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

We hope that you enjoy reading this edition of the KuVS newsletter. We as editors wish you a successful half of 2022. This is of course done in self interest, as we would like to compile another at least as exciting next newsletter as this one in half a year again.

The newsletter editors,

Oliver Hohlfeld	**Corinna Schmitt**
BTU Cottbus–Senftenberg	Universität der Bundeswehr München
Mathias Fischer	**Andreas Blenk**
Universität Hamburg	Siemens

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KuVS Calls and Announcements

In this section you find an overview on calls for papers and participation in the german-speaking area.

Calls for Participation

- KuVS Fachgespräch - Würzburg Workshop on Next-Generation Communication Networks
  Date: 11 - 13 July 2022
  https://lsinfo3.github.io/WueWoWas2022/

Calls for Contributions

- KuVS Fachgespräch "Drahtlose Sensornetze"
  https://events.htw-berlin.de/forschung/fachgespraech-sensornetze-2022/
  Submission deadline: June 24, 2022

- KuVS Fachgespräch "Machine Learning & Networking"
  https://hpi.de/karl/research-and-projects/events/malene.html
  Submission deadline: August 31, 2022

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Movement of persons

- Prof. Dr. Christian Becker (full-professor at the University of Mannheim) accepted the offer for a full professorship (W3) on distributed systems at the University of Stuttgart.

Awards

2022 IETF/IRTF Applied Networking Research Prize   Christoph Dietzel, Anja Feldmann, Oliver Hohlfeld, Daniel Kopp, Georgios Smaragdakis, Daniel Wagner, and Matthias Wichtlhuber received the **2022 IETF/IRTF Applied Networking Research Prize** for their CCS 2021 paper *United We Stand: Collaborative Detection and Mitigation of Amplification DDoS Attacks at Scale.*

Best-Paper-Award at IFIP SEC 2022   Florian Wilkens, Steffen Haas, Johanna Amann, and Mathias Fischer received the **Best-Paper-Award of IFIP SEC 2022** for their paper *Passive, transparent, and selective TLS decryption for network security monitoring.* In addition, Florian Wilkens received the **Best-Student-Paper-Award** for the same paper.

Dr.-Ing. Tobias Meuser (TU Darmstadt) elected as Athene Young Investigator   Tobias Meuser, a PhD graduate of Prof. Ralf Steinmetz from the Technical University of Darmstadt, has been elected as Athene Young Investigator.

Goal of the programme is to promote the scientific independence of exceptionally qualified early career researchers, giving them the chance to qualify for the post of university professor by leading an independent junior research group. Based on the model of the DFG's Emmy Noether Programme, the Athene Young Investigator Programme was designed as a five-year, quality-assured programme in which the junior research group leaders obtain certain professorial rights and receive their own budget.

Figure 1: Picture credit: TU Darmstadt/Katrin Binner

In his research 28-year-old Tobias Meuser investigates how cellular communication networks can be made more resilient.

For more information and a portrait see
https://www.tu-darmstadt.de/universitaet/aktuelles_meldungen/einzelansicht_362496.en.jsp and
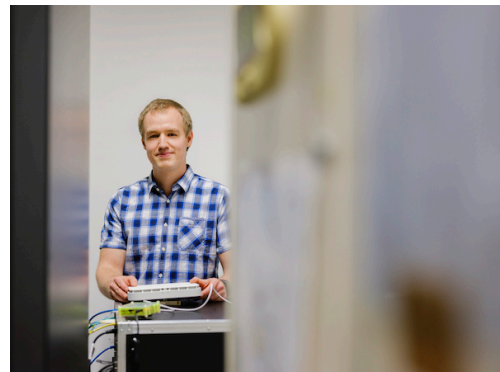https://blog.multimedia-communications.net/tobias-meuser-ist-athene-young-investigator/

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KuVS ELG Meeting June 2022 at TU Darmstadt and online

Picture credit: TU Darmstadt/KOM - Multimedia Communications Lab

In June 2022, members of the KuVS Extended Steering Board (ELG) met at a hybrid meeting at TU Darmstadt and online to discuss current topics related to KuVS. The meeting was hosted by Ralf Steinmetz and Björn Scheuermann.

Nachruf: Berthold Butscher

Am 04.01.2022 ist der Langjähriger Sprecher (1991-2001) der KuVS leider unerwartet verstorben.

Berthold Butcher hat sein ganzes professionelles Leben der Rechnerkommunikation in deren vielfachen Formen gewidmet. Sein Name ist verbunden mit einem der ersten Deutschen Rechnernetze das HMINet[1], das 1978 in Betrieb genommen wurde. Stationen seines beruflichen Lebens waren das Hahn-Meitner Institut, GMD (und später Fraunhofer) Fokus, welches er mitgegründete und wo er ab 1988 bis 2012 stellvertretender Leiter war, sowie die Mitwirkung bei den großen Vorhaben DFN-Netz und BERKOM (der Deutschen Telekom). Nach seiner Pensionierung war er – bis zum letzten Moment – aktiv als Gutachter für den Berliner Senat und als Mit-Gründer von Start-Ups (Details hier[2]).

Das Berthold Butscher sich für die KuVS stark engagierte, war kein Zufall. Er war überzeugt, dass es wichtig ist, für die deutsche Forschung und Technik eine nationale Plattform für „lokale Akteure", für deren Gedankenaustausch und für die Nachwuchsförderung, aufzubauen. Viele Beiträge zur Geschichte der KuVS (siehe https://www.kuvs.de/about/) kommen aus seiner Feder. Er suchte keine Auftritte auf den großen Bühnen, sondern seine Welt war das ruhige, effiziente Tun. Aber nicht nur im beruflichen Leben: Er war engagierter Familienmensch und aktiver Sportler (Segeln, Skilaufen, etc). Aber auch jemand, der immer bereit war anderen zu helfen, mit Unterstützung, mit gutem Rat, mit Kontakten.

Seine Verdienste für die KuVS wurden durch Zuerkennung der höchsten Auszeichnung – des Ehrenvorsitzender (2011) - honoriert.

Autor: Adam Wolisz (TU Berlin)

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[1] https://www.computerwoche.de/a/20-rechner-online-zusammengeschaltet,1192126
[2] https://www.fokus.fraunhofer.de/de/fokus/news/berthold_butscher_2022_01

Finished PhD Theses

Susanna Schwarzmann

Technische Universität Berlin (advisor Thomas Zinner)

Title: Modeling and Design of Novel QoE Management Strategies for Adaptive Video Streaming

Abstract:

Today's Internet serves a huge variety of different applications with diverse and ever increasing demands on the underlying network. Among others, new trends going towards immersive entertainment like 8K video streaming or VR gaming impose new challenges on end-to-end bandwidth volume and stringent delay requirements. At the same time, the number of users is growing, as well as their expectations on the delivered service quality. As a consequence, delivering good Quality of Experience (QoE) becomes an ever more challenging task and, due to the steadily increasing number of providers, the satisfaction of subscribers and users is a substantial factor to remain competitive on the market. As a consequence, QoE management emerged as a key research topic over the past years which constantly gains importance for several stakeholders in the Internet ecosystem. This monograph examines relevant research questions related to QoE management on the example of HTTP Adaptive Streaming (HAS), which is to date the application contributing the most to the global IP traffic.

One of the major challenges of QoE management is to understand the complex interplay of application- and network-specific parameters and their impact on QoE. We show how QoE-relevant performance metrics for HAS can efficiently be retrieved for a given - and potentially huge - input parameter space by means of analytical modeling. More specifically, we use an existing approach relying on discrete-time analysis, which models an HAS client's video buffer, and extend it so to reflect the HAS-typical quality adaptation behavior. For given input network characteristics, such as the available bandwidth and its variation, and specified video- and player-specific settings, like the quality switching thresholds, it yields probabilistic outputs for the video buffer's filling state. From that, all relevant met- rics, e.g., the stalling behavior and the delivered video quality, can be derived, allowing to efficiently tune HAS in accordance with each other, so as to optimize the QoE.

The second part quantifies possible positive effects of using variable segment durations for HAS. Instead of relying on a content-agnostic video segmentation strategy, where all seg- ments have the same duration, the approach which has been proposed as shot-based encoding by Netflix, takes the video content into account by segmenting the video at scene-cuts. This results in segments of variable durations, but promises to reduce the number of costly I-frames during the encoding and hence, to increase the encoding efficiency. However, no comparative study highlighting the impact of this technique on the HAS ecosystem has been conducted, yet. Thus, we first provide a broad investigation on the bitrate reduction that can be achieved with the variable approach. In a second step, we evaluate by means of a measurement study the impact

on the streaming performance, taking into account three different adaptation heuristics. Our results show that variable segment durations can significantly reduce the bitrate requirements and as a result are capable of increasing the HAS QoE.

The third part of this thesis focuses on how mobile network operators (MNOs) can exploit new features provided by the 5G networking architecture to overcome current QoE monitoring limitations. More specifically, we propose to make use of its newly introduced Network Functions (NFs) dedicated for improved analytics, complex computations, and for the interaction with third parties, such as content providers. These capabilities enable a variety of potentials, like, for example estimating the QoE by applying Machine Learning (ML) techniques. From the perspective of an MNO, we elaborate on the involved chal- lenges of introducing such an ML-based QoE estimation in 5G networks and by means of a simulation-based feasibility study, we demonstrate that the QoE can reliably be estimated solely based on network KPIs. In this scope, we perform a quantitative comparison, addressing the estimation accuracy of different state-of-the-art regression techniques, and discuss them with respect to different relevant qualitative aspects.

Elias Rohrer

Technische Universität Berlin (advisor Florian Tschorsch)

Title: On the Scalability, Resilience, and Privacy of Decentralized Blockchain Networks

Abstract:

Cryptocurrencies such as Bitcoin or Ethereum promise to establish themselves as decentralized alternatives to financial infrastructures that so far have been reliant on centralized trust models. These decentralized blockchain networks are built around the foundational principles introduced with Bitcoin's consensus protocol, in which a peer-to-peer network manages a globally distributed ledger of transactions—the blockchain. While this new and rather unorthodox approach to achieve Byzantine agreement in open and decentralized networks offers a number of promising properties and features, it suffers from very limited throughput scalability. As distributed systems under the pressure to scale are often at risk of neglecting other essential qualities, improving scalability while considering resilience and decentralization poses a fundamental challenge for the research on open blockchain networks today.

This thesis is therefore dedicated to the study of blockchain scalability from a computer networking perspective. In this regard, we focus on the two main approaches towards blockchain scalability—on-chain and off-chain scaling—, study the currently deployed state-of-the-art protocols and architectures, and propose improvements that consider decentralization, security, and privacy first-class design goals. As on-chain scalability has been previously shown to be highly dependent on the reliability and performance of the underlying networking layer, the first part of this thesis studies the peer-to-peer networks utilized for block and transaction propagation. In the second part, we direct our attention to the notion of payment channel networks, which promise to improve scalability by processing most transactions off-chain. Lastly, we show how the foundational principles of blockchain networks may be applied beyond cryptocurrencies in order to create decentralized infrastructures with improved security properties and reduced trust requirements.

Claas Tebrügge

Paderborn University (advisor Falko Dressler)

Title: Towards Feasible Vehicular Visible Light Communication

Abstract:

This thesis investigates the suitability of Vehicular Visible Light Communication (V-VLC) for the implementation of intelligent traffic systems and identifies, applies, and evaluates solutions to achieve reliable communication. The general trend towards digitalization and networking offers opportunities to significantly increase efficiency and safety for future traffic. Among others, dynamic scenarios, the number of users, and the high demands on reliability and security result in extraordinary requirements on communication technologies. This is one reason why the question of the communication technology for networking vehicles is not solved at the time of this work. Different technologies and combinations thereof are being discussed. Besides traditional radio communication, V-VLC turned out to be a promising communication technology. Especially the combination of Visible Light Communication (VLC) and radio communication offers the potentials to achieve reliable communication for a diverse set of traffic scenarios. This thesis identifies challenges in the field of visible light communication for the use of Inter-Vehicle Communication (IVC). Special attention is given to the ap- propriate control of vehicle lighting to achieve sufficient bandwidth and bandwidth efficiency, the analysis of legal regulations, especially the radiation characteristics, and the handling of disturbances on the hardware level. For this purpose, analytical considerations, experiments, as well as field tests on prototypes are performed. On the one hand, our investigations show the feasibility of V-VLC in an application-oriented approach, and on the other hand, we develop novel concepts and methods, such as Space-Division Multiple Access (SDMA) on matrix headlights, which represent a further step towards practicable and reliable V-VLC.

Marie-Theres Suer

Technische Universität Braunschweig (advisor Lars Wolf)

Title: Multi-Connectivity for Wireless Reliable Low-Latency Communications

Abstract:

In the past, wireless communication systems mainly focused on user-centric applications and on throughput as main performance metric. Emerging machine-type communications and applications such as vehicular communications or wireless industrial control require low communication latency with high reliability. Contemporary wireless commu- nication standards are not able to fulfill all of these requirements. Therefore, the research community explores potential techniques and measures to improve the latency and reliability performance of wireless communication systems. In this context, this thesis investigates the suitability of multi-connectivity (MC), i.e., the usage of multiple communication paths at the same time. Three main research aspects are identified and addressed: (1) a system-level comparison of MC approaches on different layers, (2) an evaluation of the influence of different link and network properties on the latency and reliability performance of MC scheduling schemes and (3) the development of concepts for adaptive MC schedulers. This work focuses on MC approaches on MAC layer or above, in wireless one-hop networks with cyclic traffic patterns as suitable for industrial applications.

Analytic, simulative, and measurement-based evaluations of MC schemes have been carried out in the course of this thesis to address these central aspects. (1) The higher layer MC schemes were compared with Physical layer MC schemes in ns-3 simulations and evaluated in different scenarios. The PHY MC schemes are beneficial in scenarios with low SINR, while the gain of the higher layer MC schemes grows with increasing network load. (2) We identified three basic MC scheduling schemes that can be utilized for distributing packets over multiple links in presence of cyclic traffic, i.e., packet duplication, load balancing and packet splitting. The measurement-based evaluation shows a strong impact of different link and network properties, e.g., link correlation or network load, on the latency and reliability performance of the MC scheduling schemes. Different schemes achieve the best performance in different scenarios, which motivates the development of adaptive MC scheduling schemes that dynamically change the MC scheme depending on the prevalent scenario. (3) Based on these findings, two adaptive MC scheduling schemes are proposed in this work: A distributed adaptive scheduler and a novel cascaded MC scheduling scheme. The former was implemented on the MAC layer of 802.11be and the evaluation highlights the advantages of the adaptive scheduling algorithm over static MC schemes, especially in scenarios with medium relative network load. The cascaded MC scheduling scheme can be applied in scenarios where more than two communication links are available. The evaluation shows that the scheme can significantly outperform the basic MC scheduling schemes in several scenarios. Overall, this thesis provides a comprehensive analysis of MC schemes on higher layers for cyclic traffic patterns and presents concepts to improve the latency and reliability performance of wireless communication systems with MC. The findings are technology- agnostic and can thus be used to implement or improve MC approaches in wireless communication standards or to build MC controllers on higher layers.

Frederik Hauser

University of Tuebingen (advisor Michael Menth)

Title: Integration of Network Security Mechanisms in Softwarized Networks with Data Plane Programming and Software-Defined Networking

Abstract:

802.1X, MACsec, and IPsec are widespread and standardized protocols for hardening large campus and enterprise networks. Their setup and operation are complex due to distributed signaling protocols and lack of interfaces for external control on existing network devices. Software-defined networking (SDN) with centralized control of network elements and data plane programming break up those limitations and allow novel approaches for network operation.

P4sec is a first core contribution of the cumulative dissertation. It introduces automated network hardening with 802.1X, MACsec, and IPsec in distributed campus and enterprise networks. Data plane functionality is implemented on P4 switches; their runtime behaviour is managed by a novel 3-tier control plane that distributes tasks for workload and latency optimization to WAN, site, and local controllers. Implemented prototypes include three software and hardware target platforms. P4sec is compatible to existing infrastructure and allows incremental deployment strategies.

The dissertation contains an extensive literature study on data plane programming with P4. Besides an overview of technologies and their advancements, applications of P4-based data plane programming in a large number of use cases are categorized.

Finally, xRAC is proposed. It applies 802.1X for execution and network access control of applications that are encapsulated in virtualization containers. Authentication and authorization are applied to both the user and the virtualization container. As a result, secured network traffic from xRAC applications can be trusted by network components allowing fine-granular traffic control.

Daniel Bischoff

Technische Universität Darmstadt (advisor Ralf Steinmetz)

Title: Vehicular Communication for Cooperative Driving - Relevance-Aware Data Dissemination Strategies for Adaptive Cooperative Driving

Abstract:

According to the EuroNCAP Roadmap 2025, vehicular communication is expected to play a decisive role in increasing traffic safety and efficiency. Vehicles can improve their environmental awareness, exchange driving intentions, and cooperate with other vehicles in their communication range. That way, vehicular communication enables the cooperative coordination of driving maneuvers to prevent traffic jams, increase traffic efficiency, and maintain safety on urban roads and highways, particularly in congested scenarios with high vehicle density.

Cooperative driving requires high communication quality to coordinate maneuvers safely and efficiently. Providing high communication quality in congested vehicular networks, specifically for vehicles coordinating a cooperative maneuver, poses a significant research challenge.

Moreover, the context of cooperative driving continuously changes due to high vehicle mobility, which further complicates the provision of high communication quality for vehicles coordinating a cooperative maneuver.

Prioritizing information in congested vehicular networks improves the communication quality for vehicles coordinating a cooperative maneuver.

If information prioritization is insufficient to provide high communication quality in heavily congested vehicular networks, the cooperative driving application must adapt to the available communication quality for maintaining traffic safety. The joint consideration of information prioritization from the application and congestion control from the network perspective to provide high communication quality for cooperative driving remains an open research challenge. As our first contribution, we assess communication quality and information relevance for cooperative driving. Based on this, we present a relevance-aware resource allocation approach and an adaptive data dissemination strategy using heterogeneous vehicular access technologies to improve the communication quality in congested networks for vehicles coordinating a cooperative maneuver as our second contribution. With our third contribution, we propose communication-aware cooperative driving. In scenarios with impaired communication quality, our approach reduces traffic efficiency to maintain safety. Thus, our approach can respond to unexpected events to avoid accidents, even in scenarios with impaired communication quality.

We use numerical analysis and our simulation framework CoDA.KOM with a prototypical implementation of the cooperative driving use cases left-turning at an intersection to evaluate our contributions. Our evaluation demonstrates that relevance-aware resource allocation prioritizes information of vehicles coordinating a cooperative maneuver in scenarios with high vehicle density. Moreover, our adaptive data dissemination strategy with heterogeneous vehicular access technologies provides high communication quality to vehicles coordinating a cooperative ma-

neuver. Overall, we increase traffic efficiency and maintain safety for cooperative driving by adapting to the vehicular communication quality.

Wolf Posdorfer

Universität Hamburg (advisor Winfried Lamersdorf)

Title: Software-based Decentralization of Business Processes in B2B-Applications with Blockchain-Technology

Abstract: As know from, e.g. Bitcoin and its kindred, blockchain technology is increasingly used to manage trust amongst independent actors without need for other parties or intermediaries.

This is in contrast to traditional business process management which heavily relies on centralized services – where Blockchain technology ensures for creating trust that solely by decentralized consensus building.

Based on some real-life industrial distributed B2B application scenarios, corresponding concepts for decentralized coordination of business processes are proposed. These are based on blockchain technology – however with a number of adjustments and technological advancements of current concepts and existing solutions.

In particular, necessary adaptations for decentralized business processes are identified as well as corresponding concepts and solution strategies. Specific focus is on decentralized coordination without need for any intermediaries for distributed decision making, including trust management.

Such an approach to realizing distributed B2B processes is not only more efficient and flexible but also easier to manage and more cost-effective and, therefore, more attractive for realizing a number of advanced distributed applications.

Franziska Lichtblau

Max Planck Institut for Informatics / Universität des Saarlandes (advisor Anja Feldmann)

Title: From the Edge to the Core: Towards Informed Vantage Point Selection for Internet Measurement Studies

Abstract:

Since the early days of the Internet, measurement scientists are trying to keep up with the fast-paced development of the Internet. As the Internet grew organically over time and without build-in measurability, this process requires many workarounds and due diligence. As a result, every measurement study is only as good as the data it relies on. Moreover, data quality is relative to the research question—a data set suitable to analyze one problem may be insufficient for another. This is entirely expected as the Internet is decentralized, i.e., there is no single observation point from which we can assess the complete state of the Internet. Because of that, every measurement study needs specifically selected vantage points, which fit the research question. In this thesis, we present three different vantage points across the Internet topology — from the e.g., to the Internet core. We discuss their specific features, suitability for different kinds of research questions, and how to work with the corresponding data. The data sets obtained at the presented vantage points allow us to conduct three different measurement studies and shed light on the following aspects: (a) The prevalence of IP source address spoofing at a large European Internet Exchange Point (IXP), (b) the propagation distance of BGP communities, an optional transitive BGP attribute used for traffic engineering, and (c) the impact of the global COVID-19 pandemic on Internet usage behavior at a large Internet Service Provider (ISP) and three IXPs.

Eder Scheid

Universität Zürich (advisor Burkhard Stiller)

Title: An Intent-based Blockchain-agnostic Interaction Environment

Abstract:

Blockchains (BC) are used in different fields of applications besides providing Trusted Third Party (TTP)-free financial transactions (i.e., cryptocurrencies). For example, BCs are employed in supply chain applications to increase transparency in the producer-to-consumer process and in the Internet-of-Things (IoT) scenario to provide an immutable and trusted database for sensor records. However, each application field has different requirements (e.g., access control or fast transaction processing) and not all BCs are able to meet such requirements. Thus, resulting in the increase of purpose-specific BCs implementations, each focused on addressing a specific requirement, e.g., providing better security or performance.

In this sense, selecting a BC platform that meets all the requirements of a given use-case becomes a cumbersome and non-trivial task due to the myriad of BC platforms available and their underlying technical differences (e.g., consensus mechanisms, transaction costs, and block time). Further, given the small amount of of standards regarding the development of such platforms, it is hard to compare and classify them and, ultimately, integrating the selected platform with existing systems. Therefore, the following challenges revolve around such a selection and integration process: (a) the multitude number of BC platforms hindering the selection process, (b) complex technical underlying details requiring deep technical knowledge of individuals to interact with BCs, and (c) the shortage of BC standards leading to heterogeneous and not interoperable solutions.

Given such challenges, this PhD thesis designed and developed an Intent-based BC-agnostic Interaction Environment, based on the concepts of Intent-based Networking (IBN), Policy-based Management (PBM), and notary scheme-based interoperability, where users are able to define requirements in the form of intents (i.e., abstract high-level policies) used to select the most suitable BC platform to store data while complying with cost or performance constraints. This environment is composed of three prototyped and evaluated solutions, (i) an intent refinement solution, (ii) an policy-based BC selection framework, and (iii) an BC-agnostic interoperability Application Programming Interface (API).

These solutions seamlessly interact to achieve the complete refinement of user-driven intents to a complete signed BC transaction sent to the most suitable BC platform in an automated fashion. Evaluations of the intuitiveness of the language defined for intent authoring and tests on the functionality of the environment's BC selection process revealed that the language is intuitive for nontechnical and technical users and accommodates the requirements for the correct operation of the BC selection algorithms. Further, performance tests of these prototyped solutions demonstrate a minimal introduced overhead to refine an intent to a policy, execute the BC selection algorithms, abstract technical details from the BC interaction (e.g., BC transaction creation signing), and provide a transparent process to the user. Thus, demonstrating that the

environment does not only address the posed challenges, but also provides an intuitive language, an efficient BC selection process, and a transparent BC interoperability solution.

Sina Rafati Niya

Universität Zürich (advisor Burkhard Stiller)

Title: Efficient Designs for Practical Blockchain-IoT Integration

Abstract:

Potential advances with Blockchains (BC) have reached various application areas beyond FinTech-oriented use cases. Since Internet-of-Things (IoT) based use cases being an important part of them, this thesis identifies and tackles key concerns of the interdisciplinary area of BC and IoT integration (BIoT). As many IoT devices interact in BC-IoT integrated applications, it is crucial to provide efficient measurement metrics and mechanisms for IoT data collection, transmission, and persistence within BCs. Due to salient features such as strong trust and decentralization, BIoT shows potentials in many use cases (applications) e.g., Supply Chain Tracking (SCT), smart cities, identity management, and data streaming and trading. This thesis resembles further potentials and incentives for BIoT, which leads via suitable use cases to respective challenges. The analysis of existing studies leads to the fact that BIoT faces various efficiency issues which can be associated with (a) scalability, (b) energy efficiency, and (c) security.

Solving these 3 important BIoT issues have to be considered proactively within the application layer, i.e., social and functional aspects of BC-IoT integrated applications, and technical layer, i.e., underlying BC, IoT, and the adaptation of these two realms. Hence, to address these 3 issues while considering the application and technical layers, this thesis specifies and pursues 3 goals, namely the Technical, Functional, and Social goals. To reach its goals, the experimental approach taken in this thesis include 3 main steps. At first, this thesis exploits the utilization of BIoT applications and focuses on defining and determining measures and criteria —to be met proactively for an efficient BIoT — by designing and prototyping 4 BC-IoT-integrated decentralized application (dApp). The fist step's outcome is a granular set of metrics and measures considering the specified technical, functional, and social goals for an efficient BIoT.

In the second step, this thesis introduces various BIoT methods that improve the performance of BC-IoT integrated systems, especially in using the LoRaWAN access method as the main IoT protocol considered throughout this thesis. In this step, the main focus is put on the performance enhancement of the BIoT systems by studying the maximal number of TXs submitted, reliability of transport schemes, and the energy efficiency. This thesis specifies a reliable data transmission scheme from IoT devices to the connected BCs. Driven by the performed evaluations and the state-of-the-art BIoT architectures, the new architecture — called BIIT — is proposed in this thesis to pave the path toward practical and efficient BIoT architectures.

In the third step, to tackle the BIoT adaptation issues, especially the scalability-related concerns such as low TX validation rates of BCs in comparison to the centralized storage systems, a novel sharding mechanism is proposed to enhance the scalability of BCs. Since disconnections and delays of a BC's distributed network can cause concerns for intershard and inter-miner synchronizations, eventually preventing the BC from reaching a high throughput, this thesis

develops an IoT-oriented permissioned BC, which covers via a scalable Distributed Ledger (DL) the novel sharding mechanism for unstable distributed networks. Therefore, DLIT Distributed Ledger for IoT Data) offers a novel two-layered TX distribution, validation, and inter-shard synchronization, combined with authentication and verification mechanisms in support of a viable security level. Moreover, to enhance the scalability of the DLIT a TX aggregation mechanism is introduced. Having developed the TX aggregation, efficient prevention and control of the BC's size growth is observed in the evaluated scenarios.

Lastly, BIoT applications face many challenges to comply with the European General Data Protection Regulation (GDPR), i.e., enabling users to hold on to their rights for deleting or modifying their data stored on publicly accessible and immutable BCs. In this regard, to investigate further on the social goal of this thesis, requirements of BCs for being GDPR compliant in BIoT use cases is identified. Accordingly, an on-chain solution is proposed that allows fine-grained modification (update and erasure) operations on TXs' data fields within a BC. The proposed solution is based on a cryptographic primitive called Chameleon Hashing. The proposed novel approach lets BC users have the authority to update their data, which are addressed at the TX level with no side effects on the block or chain. By performing and storing the data updates, all on-chain, traceability and verifiability of the BC are preserved. Moreover, the compatibility with TX aggregation mechanisms that allow the compression of the BC size is maintained. The technical, functional, and social BIoT demands collected in step 1, were collectively addressed via the BIIT architecture, and DLIT due to the introduced set of scientific and practical approaches in steps 2 and 3.

KuVS Newsletter

Project News

The European Competence Center, the National Coordination Centers and the Cyber Security Community

Already today, there are extensive activities in the EU regarding research, technologies and industrial development in the field of cyber security. However, these activities are often limited to certain regions, company sizes, sectors or areas of society. In the future, these activities are to be more closely coordinated within the EU in order to bundle resources, create synergies and establish a balanced as well as competitive level of cyber security. The EU cyber security ecosystem with its existing areas such as measures against cyber crime (Europol), incident response (EU CSIRTs Network), protection of critical infrastructures (Cooperation Group on Security of Network and Information Systems, NIS) or crisis response/management (Cyber Crisis Liaison Organisation Network, CyCLONe) is to be supplemented by the aspect of cyber security research.

For this purpose, the European Commission has decided to establish a **European Competence Center for Cyber Security** in Industry, Technology and Research (ECCC) with Regulation 2021/887. In addition, a network of National Coordination Centers (NCC) will be established in the EU Member States. The ECCC is based in Bucharest and will become the main EU instrument for pooling investments in research, technology and industrial development in the field of cyber security. This includes, among other things, the realization of cyber security products, services and processes. In particular, the planning of the European funding programs "Horizon Europe" and "Digital Europe" in the area of cyber security will thus be better coordinated. In these activities, the concerns of small and medium-sized enterprises (SMEs) and start-ups in particular must be taken into account.
One of the key objectives of the ECCC is to strengthen the leadership role and strategic autonomy of the Union. This is done by maintaining and developing cyber security capabilities and capacities. Furthermore, the competence center focuses on increasing the global competitiveness of the cyber security industry and ensuring high cyber security standards.
The NCCs are the focal point for the ECCC at the state level. The NCCs, in turn, are networked with the cybersecurity community. This creates a network that intensifies the exchange between the member states so that potential international project partnerships can be found and cooperations concluded better and faster, thus strengthening digital sovereignty in Europe. In addition, the NCCs provide expertise and support in fulfilling the strategic tasks of the ECCC. The ECCC will foster exchanges between relevant national bodies in the research and business sectors in the field of cyber security and cyber defense within the Member States. This will bundle the flow of information to the ECCC to best support the respective national cyber security communities. At the same time, national interests can be placed in the European research programs in a targeted manner. Another goal of the NCCs is to promote and disseminate educational programs in the field of cyber security. This will counteract the acute shortage of specialists in this field in the medium and long term. The European Union Agency

for Cyber Security (ENISA) is also involved, providing advice to the ECCC and the NCCs.

The **German National Coordination Center for Cyber Security** in Industry, Technology and Research (NKCS, the German NCC) is a joint, virtual institution of the Federal Ministry of the Interior and Home Affairs (BMI), the Federal Ministry of Education and Research (BMBF), the Federal Ministry of Economics and Climate Protection (BMWK) and the Federal Ministry of Defense (BMVg) as well as other institutions such as the Federal Office for Information Security (BSI), DLR Project Management Agency (DLR-PT), and the Research Institute CODE of the Universität der Bundeswehr München (RI CODE). As the federal government's cyber security authority, the BSI acts as the head office and "single point of contact" (SPoC).

The NKCS has developed a comprehensive catalog of services for the cyber security community. This includes services such as consulting for those interested in funding, public relations, support in identifying topics for the EU's annual work programs, and other services. In this way, a German digital ecosystem is being created alongside the European one, for which the national coordination center provides all the relevant information needed to promote German cyber security research in a bundled form. In its role as the head office of the NKCS, the BSI will work closely with the ministries and institutions involved, as well as with the European competence center and the NCCs of other nations.

The goal of the NKCS is to provide a national information platform for all interested parties, to promote networking within the German cyber security community, to offer initial advice on topics of cyber security research and development, including project proposals with a European perspective, and to find and promote synergies in Germany in order to be able to place German interests in EU research programs in a more targeted manner.

The NKCS website as an information and networking platform is currently still under construction. For the time being, information on the NKCS can be found on the BSI website at https://www.bsi.bund.de/dok/nkcs. If you have any further questions or need information, you can contact the NKCS head office at the BSI at nkcs@bsi.bund.de. We look forward to the exchange!

Air Mobility Integration U-Space (AMIUS)

The overall objective of the AMI-AMIUS joint project is to create the first integrated Bavarian U-space connecting the city of Ingolstadt with Manching Airport. In addition to the activities described here, this U-space is available as a real test field for use by Bavarian companies in the eVTOL and unmanned aerial systems (UAS) industry. The project investigates how a U-space based on digital services can integrate today's air traffic, including its processes and technologies, with future deployment scenarios of UAS and eVTOLs in a common airspace. For this purpose, the required air traffic management functionalities for safe, integrated and efficient operations, will be provided and demonstrated by the U-space services defined by the European Union Aviation Safety Agency (EASA). Based on these digital services, flights within the Manching control zone, for example from the Drone Center to Ingolstadt main station, are planned as concrete use cases. These practical demonstrations will be supported by

corresponding scientific model-based preliminary investigations, multimodal simulations with different traffic systems, feasibility studies as well as cost analyses by the participating universities. To guarantee safe and efficient integrated operations of UAS, eVTOLS and general aviation in the future, novel traffic concepts are required. For this purpose, the existing airspace management must be supplemented by an integrated UAS Traffic Management System (UTM) and thus expanded by the dimension of the previously uncontrolled airspace. The focus is on the design and technical implementation of the demonstrator using a UTM system and appropriate ground infrastructures, complemented by innovative communication technologies and a central control station. The project will also investigate how the data flow between the participating airspace users and the storage of relevant data can be secured by various measures against unauthorized external interference.

One of the academic partners - the UniBwM - has a bilateral cooperation established with the Institute of Air Transport Systems (ILT) at the Technische Universität Hamburg (TUHH), Germany. This alliance will pursue two goals in the field of UAS: (1) On the basis of a scalable model-based approach in close connection with real-world test approaches of the project partners, robust statements are to be made on the realization of the necessary command and control and communication infrastructure for urban air mobility. (2) Solutions for secure cloud-based data storage during operation and over the life cycle will be elicited to reduce the delay of data analysis and data communication.

TRESOR

Treuhandplattform für die sichere und privatsphäreschützende Sammlung, Speicherung und Vermittlung von Daten mobiler Geräte (TRESOR)

BMBF, Universität Hamburg - Mathias Fischer (Koordinator), Hannes Federrath, HIteC e.V., umlaut solutions GmbH

TRESOR is developing an organizational data trustee model and a technical data trustee plattform for the secure and privacy-preserving collection, storage, and processing of data obtained at/from mobile devices. The TRESOR application will act as a control instrument for the release of data by individuals that are stored at the TRESOR server. Authenticated data users should thus be able to obtain approval for the use of data collected by the sensors of smartphones of individuals. TRESOR will enable data-driven research and the economic use of data at the individual level, while ensuring data protection and the sovereignty of individual data providers. The pilot application of the app-based data trustee model is to take place in two application examples, with individual health and movement data as well as by using mobility and infrastructure data.

Event Reports

Report CONVERGENCE NEXT 2022

Corinna Schmitt

CyberSec4Europe, CONCORDIA, ECHO and SPARTA organized the CONVERGENCE NEXT 2022 Event this year in Brussels (Belgium) from June 1-3.

CONVERGENCE NEXT focused upon the future of the community, the European Cybersecurity Competence Centre (ECCC) and look at the key issues for cybersecurity in the future. This event is not to be missed if you are interested in European cybersecurity issues. High-level representatives from EU institutions will discuss the role of the ECCC and that of the wide stakeholder community in the next stages.

Convergence Next Community on the roof top of the Hessen Landesvertretung in Brussels

The agenda is available under https://cybersec4europe.eu/event/convergence-next/. In case you were not able to attend the event was recorded via YouTube:

- Wednesday, 1 June 2022: https://youtu.be/jQ0PptjZfd4

- Thursday, 2 June 2022: https://youtu.be/lrjdHJsPYaQ

- Friday, 3 June 2022: https://youtu.be/CuKZ4a1POF8

Hopefully you will join the next event in 2023 to become a member of the cybersecurity community!

Report 3rd KuVS Fachgespräch Network Softwarization

Michael Menth (University of Tuebingen)

Report: 3rd KuVS Fachgespräch Network Softwarization
<https://kn.inf.uni-tuebingen.de/kuvs-fg-netsoft/2022>

The 3rd KuVS Fachgespräch Network Softwarization was organized on 7./8.4.2022 by Michael Menth (Uni Tübingen) and Georg Carle (TU München) via Zoom. Program and presentation slides are available on the website. The workshop attracted 28 presentations on relevant already published papers or on original work published by the University Library Tübingen. Thursday was dedicated to software-defined networking (SDN) and data plane programming with P4. Friday focussed on Time-Sensitive Networking (TSN), network management, and self-driving networks with a special session on industrial and standardization efforts. International experts could be gained in particular for the latter session due to the online format of the workshop, which is not so common for Fachgespräche. The workshop attracted 105 registered persons, most sessions were attended by 50-60 participants. The presentations led to many intense discussions that continued during the breaks. One reason for the engaged participation was probably the focussed interest of the audience in network softwarization and management, which facilitated discussions in spite of the online format.

KuVS Newsletter

Fun

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]

$\sqrt{66}$ [meaning: Route 66]

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

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

The Riddles *(Solutions, see on next page)***:**

- *Beginners:* **he had 4got10 2 B gr8ful 4 the 1derful book**
- *Playing with Capital Letters:* **DlA**
- *Advanced Persons:*
  I 0 swEt f $\sqrt{s}$
- *Experts:* **Y R U ∀ways {up} ?**
- *Geniuses:* **40 • +y 0d 2 invite ∀ her plAm8s**

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

Open Positions

Two Research Assistants (m/w/d) at the Faculty of Computer Science at the Research Institute CODE

The University of the Bundeswehr Munich is firmly anchored in the national as well as international research landscape. The staff members conduct research together with external partners from science and industry within the framework of the funded research project **Air Mobility Integration U-Space (AMIUS)** under the leadership of Airbus Defense and Space. The research project is concerned with the development of a real-world laboratory to demonstrate the **operation of air cabs and drones in urban space in conjunction with a model-based assessment platform.** The work of UniBw M will be **carried out at the Hamburg** site in close cooperation with the Institute for Air Transport Systems at the TU Hamburg. The tasks are specifically adapted to the employees within the framework of the cooperation.

We want to make a difference with you and show new ways in aviation!

Your Tasks:

- Collaboration in the research project Air Mobility Integration U-Space (AMIUS)
- Management of work packages; reporting, work coordination
- Development of a techno-economic model to determine and evaluate Communication Navigation Surveillance (CNS) infrastructure model
- Execution of scenario-based variation calculations to determine cost structures and sensitivities
- Enhancement and development of a distributed model environment to represent drone and air taxi operations in regional space
- Execution of scenario-based simulation studies to evaluate feasibility and utility in the use case
- Publication of the results at recognized conferences and/or in renowned journals

Qualification Requirements:

- Very good scientific university education (master/diploma) in aerospace engineering, transportation engineering, computer science, electrical/communications engineering or a comparable university degree
- Good knowledge in modeling of sensor and communication systems
- Experience and knowledge in setting up and operating model systems
- Good programming skills, preferably in MATLAB, C++, Java or Python
- Very good written and spoken German and English skills are essential

We expect:

- Willingness to cooperate in university teaching
- Willingness for interdisciplinary cooperation, here especially high interest in the topics of flight guidance, modeling, communication and guidance systems,
- Ability to work in a team, openness and interest in scientific exchange
- Initiative, ability to work on one's own responsibility, independence and enthusiasm
- Willingness to work in a multinational team with external collaborations
- Analytical thinking, creativity and careful work

We offer:

- Optimal research and supervision environment for doctoral studies
- Active promotion of your scientific development and the possibility to do a doctorate
- Opportunity for further education and certification in higher education didactics
- Independent work, creative and varied activities in a committed, highly motivated and competent environment with a pronounced team spirit and appreciative, respectful interaction
- Familiarization with a complex, technologically highly relevant subject area that offers diverse, lucrative and long-term career opportunities in industry, research or at space agencies
- Excellent networking opportunities
- Involvement in teaching and supervision of student research projects
- Flexible working hours
- Mobile working is possible after consultation with project management
- Excellent hardware equipment for workstations, server and lab rooms, state-of-the-art IT and lab equipment
- Attractive sports and leisure facilities on a family-friendly campus (including in-house creche and kindergarten (parent initiative))
- Grouping into pay group 13 is carried out in compliance with § 12 TVöD with regard to the actual activities to be performed and the fulfillment of the personal and collective agreement requirements.

The office is located in Hamburg. The possibility of partial work in the home office is given. The employment can also be part-time if desired. The University of the Federal Armed Forces Munich aims to increase the proportion of female scientists and employees; applications from women are expressly welcomed. Persons with disabilities will be given special consideration if they are equally qualified.

Have we aroused your interest? **Then send your application with the usual documents (cover letter, resume, certificates, certificates) in PDF format by e-mail with the subject line: "Job advertisement AMIUS" to:**
Dr. Corinna Schmitt (corinna.schmitt@unibw.de)

Wissenschaftliche Mitarbeiterin bzw. Wissenschaftlicher Mitarbeiter (m/w/d) mit der Möglichkeit zur Promotion am Forschungsinstitut CODE (TVöD 13)

zum nächstmöglichen Zeitpunkt befristet bis Mai 2026 in Vollzeit gesucht.

Die Universität der Bundeswehr München (UniBw M) ist in der nationalen wie auch internationalen Forschungslandschaft fest verankert. Als Campusuniversität mit sehr guter Grundausstattung bietet sie beste Voraussetzungen für hochqualitative Lehre und Forschung.

An der UniBw M wird das Forschungsinstitut Cyber Defence und Smart Data (FI CODE) zu einem der größten Forschungsinstitute im Bereich IT-Sicherheit in Europa ausgebaut. Das FI CODE wurde mit der Zielsetzung gegründet, fakultätsübergreifend Expertinnen und Experten aus unterschiedlichen wissenschaftlichen Disziplinen sowie Kompetenzen aus Wirtschaft und staatlichen Einrichtungen in der Forschung im Bereich des Cyber- und Informationsraums zusammenzubringen. Es verfolgt das Ziel, innovative technische Neuerungen und Konzepte zum Schutz von Daten, Software und IT-Systemen zu verwirklichen. Weitere Information über CODE erhalten Sie unter https://www.unibw.de/code.

Die angebotene Stelle ist in einem Forschungsprojekt angesiedelt, das **IT-Sicherheitsanalysen von Microsoft-Windows-Systemen** durch Automatisierung unterstützen soll.

An der UniBw M gibt es zudem zahlreiche Möglichkeiten, sich aktiv in das Campusleben einzubringen, ob z.B. durch soziales Engagement oder der Beteiligung im universitätseigenen Chor oder der BigBand oder durch Nutzung der zahlreichen Sportangebote auf dem Campusgelände. Zudem gibt es Betreuungs- angebote für Kinder, um Familienleben und Berufstätigkeit bestmöglich vereinbaren zu können.

Ihre Aufgaben:

- Weiterentwicklung eines Software-Frameworks, das Windows-Systeme in spezifizierbaren Zuständen bereitstellt und IT-Sicherheits-Analysewerkzeuge automatisiert anbindet
- Mitarbeit an der Präsentation der Projektergebnisse (z.B. wissenschaftliche Konferenzen und Workshops, Beiträge zu wissenschaftlichen Journalen)
- Mitarbeit in der deutschsprachigen Lehre im Rahmen von Übungen und der Betreuung studentischer Arbeiten

Qualifikationserfordernisse:

- Sie verfügen über eine erfolgreich abgeschlossene wissenschaftliche Hochschulbildung (Master- /Diplom) in Informatik oder einer vergleichbaren Fachrichtung.
- gute Kenntnisse rund um das Betriebssystem Windows
- gute Programmierkenntnisse
- grundlegende Kenntnisse von Virtualisierungstechnologien
- Kenntnisse im Bereich IT-Sicherheit sind von Vorteil
- sehr gute Deutsch- und Englischkenntnisse in Wort und Schrift für die Mitarbeit in der Lehre und die Zusammenarbeit in einem internationalen Umfeld

Was erwarten wir:

- Eigeninitiative bei der Mitarbeit im Projekt und Bereitschaft zum wissenschaftlichen Arbeiten
- Offenheit und Begeisterung für innovative Technologien und Lösungsansätze, verbunden mit der Bereitschaft, sich in individuelle Spezialgebiete einzuarbeiten

Was bieten wir:

- aktive Förderung Ihrer wissenschaftlichen Entwicklung und die Möglichkeit zur Promotion, sowie zur hochschuldidaktischen Weiterbildung und Zertifizierung
- Gestaltungsfreiraum in der Forschung in einem internationalen erfahrenen Team von hoch motivierten Kolleginnen und Kollegen mit vielen Praxiskontakten und hervorragende Möglichkeiten zur Vernetzung
- Nutzung einer hervorragend ausgestatteten Forschungsinfrastruktur mit internationaler Sichtbarkeit
- modernste IT- und Labor-Ausstattung
- attraktive Sport- und Freizeitmöglichkeiten auf einem familienfreundlichen Campus (inklusiv betriebseigener Kinderkrippe und Kindergarten (Elterninitiative))
- Eine Eingruppierung in die Entgeltgruppe 13 erfolgt unter der Beachtung des § 12 TVöD im Hinblick auf die tatsächlich auszuübenden Tätigkeiten und der Erfüllung der persönlichen bzw. tariflichen Anforderungen
- Flexible Arbeitszeitgestaltung
- Mobiles Arbeiten ist nach Absprache mit den Vorgesetzten möglich

Die Beschäftigung kann auf Wunsch auch in Teilzeit erfolgen. Die Universität der Bundeswehr München strebt eine Erhöhung des Anteils von Wissenschaftlerinnen und Arbeitnehmerinnen an, Bewerbungen von Frauen werden ausdrücklich begrüßt. Personen mit Handicap werden bei gleicher Eignung besonders berücksichtigt.

Haben wir Ihr Interesse geweckt? **Dann schicken Sie Ihre Bewerbung mit den üblichen Unterlagen (Anschreiben, Lebenslauf, Zeugnisse, Bescheinigungen) bis zum 30. Juni 2022 in PDF-Form per E-Mail mit dem Betreff: „Stellenausschreibung Windows-Analyse" an: Prof. Dr. Wolfgang Hommel (wolfgang.hommel@unibw.de)**

Wissenschaftliche Mitarbeiterin bzw. Wissenschaftlicher Mitarbeiter (m/w/d) mit der Möglichkeit zur Promotion am Forschungsinstitut CODE der Fakultät für Informatik (TvÖD 13)

zum nächstmöglichen Zeitpunkt vorerst befristet auf zwei Jahre in Vollzeit gesucht (mit der Möglichkeit zur Verlängerung).

Die Universität der Bundeswehr München (UniBw M) ist in der nationalen wie auch internationalen Forschungslandschaft fest verankert. Als Campusuniversität mit sehr guter Grundausstattung bietet sie beste Voraussetzungen für hochqualitative Lehre und Forschung.

An der UniBw M wird das Forschungsinstitut Cyber Defence und Smart Data (FI CODE) zu einem der größten Forschungsinstitute im Bereich IT-Sicherheit in Europa ausgebaut. Das FI CODE wurde mit der Zielsetzung gegründet, fakultätsübergreifend Expertinnen und Experten aus unterschiedlichen wissenschaftlichen Disziplinen sowie Kompetenzen aus Wirtschaft und staatlichen Einrichtungen in der Forschung im Bereich des Cyber- und Informationsraums zusammenzubringen. Es verfolgt das Ziel, innovative technische Neuerungen und Konzepte zum Schutz von Daten, Software und IT-Systemen zu verwirklichen. Weitere Information über CODE erhalten Sie unter `https://www.unibw.de/code`.

Die angebotene Stelle ist in einem neu beginnenden Forschungsprojekt angesiedelt, das die **Analyse der IT-Sicherheitseigenschaften des Linux Kernel** untersucht. Das Projekt ist insgesamt auf 3,5 Jahre ausgelegt

An der UniBw M gibt es zudem zahlreiche Mö glichkeiten, sich aktiv in das Campusleben einzubringen, ob z.B. durch soziales Engagement oder der Beteiligung im universitä tseigenen Chor oder der BigBand oder durch Nutzung der zahlreichen Sportangebote auf dem Campusgelände, sowie, Familienleben und Berufstätigkeit bestmöglich vereinbaren zu können.

Ihre Aufgaben:

- aufbauend auf der vorhandenen Literatur zur statischen Analyse soll ein Konzept für automatische Erreichbarkeits- und Programmanalysen entwickelt werden
- darauf aufbauend ist ein Proof-of-Concept zu implementieren
- Mitarbeit an der Präsentation der Projektergebnisse (z.B. wissenschaftliche Konferenzen und Workshops, Beiträge zu wissenschaftlichen Journalen)
- Mitarbeit in der deutschsprachigen Lehre im Rahmen von Übungen und der Betreuung studentischer Arbeiten

Qualifikationserfordernisse:

- Sie verfügen über eine erfolgreich abgeschlossene wissenschaftliche Hochschulbildung (Master- /Diplomstudium) in Informatik oder einer vergleichbaren Fachrichtung
- fortgeschrittene Kenntnisse rund um Linux Betriebssysteme mit Wissen im Bereich Linux Kernel

- solide Programmierkenntnisse, idealerweise in der Programmiersprache C, und im Umgang mit Debugging-Werkzeugen.
- Kenntnisse im Bereich IT-Sicherheit, insbesondere zu statischen Programmanalysen, sind von Vorteil
- sehr gute Deutsch- und Englischkenntnisse in Wort und Schrift für die Mitarbeit in der Lehre und die Zusammenarbeit in einem internationalen Umfeld

Was erwarten wir:

- Eigeninitiative bei der Mitarbeit im Projekt und Bereitschaft zum eigenverantwortlichen wissenschaftlichen Arbeiten
- Offenheit und Begeisterung für innovative Technologien und Lösungsansätze, verbunden mit der Bereitschaft, sich in individuelle Spezialgebiete weitgehend selbstständig einzuarbeiten

Was bieten wir:

- aktive Förderung Ihrer wissenschaftlichen Entwicklung und Möglichkeit zur Promotion sowie zur hochschuldidaktischen Weiterbildung und Zertifizierung
- Gestaltungsfreiraum in der Forschung in einem erfahrenen Team mit vielen Praxiskontakten
- Nutzung einer hervorragend ausgestatteten Forschungsinfrastruktur mit internationaler Sichtbarkeit.
- modernste IT- und Labor-Ausstattung
- flexible Arbeitszeitgestaltung
- hervorragende Möglichkeiten zur Vernetzung
- attraktive Sport- und Freizeitmöglichkeiten auf einem familienfreundlichen Campus (inklusiv betriebseigener Kinderkrippe und Kindergarten (Elterninitiative))
- Eine Eingruppierung in die Entgeltgruppe 13 erfolgt unter der Beachtung des § 12 TVöD im Hinblick auf die tatsächlich auszuübenden Tätigkeiten und der Erfüllung der persönlichen bzw. tariflichen Anforderungen.
- Mobiles Arbeiten ist nach Absprache mit der Projektleitung möglich.

Die Beschäftigung kann auf Wunsch auch in Teilzeit erfolgen. Die Universität der Bundeswehr München strebt eine Erhöhung des Anteils von Wissenschaftlerinnen und Arbeitnehmerinnen an, Bewerbungen von Frauen werden ausdrücklich begrüßt. Personen mit Handicap werden bei gleicher Eignung besonders berücksichtigt.

Haben wir Ihr Interesse geweckt? **Dann schicken Sie Ihre Bewerbung mit den üblichen Unterlagen (Anschreiben, Lebenslauf, Zeugnisse, Bescheinigungen) bis zum 31.07. 2022 in PDF-Form per E-Mail mit dem Betreff: „Stellenausschreibung Linux-Kernel" an:**
Prof. Dr. Wolfgang Hommel (wolfgang.hommel@unibw.de) und Prof. Dr. Gunnar Teege (gunnar.teege@unibw.de)

KuVS Newsletter

Next Newsletter - Deadline November 15th

Next newsletter : 12/2022

Deadline for submissions and contributions : 15th November 2022

We ask you for submissions in English. Topics can be from the following time frame: June 2022 - December 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