KuVS Newsletter

Inhaltsverzeichnis

KuVS Newsletter

KuVS Newsletter

Editor Message

Sehr geehrte KuVS Mitglieder,

wir möchten Sie recht herzlich zur siebten Ausgabe des KuVS Newsletters begrüßen. In diesem Rahmen möchten wir sowohl über aktuelle Geschehnisse der Fachgruppe, als auch deren Mitglieder berichten. Hierzu zählen insbesondere Geschäftsberichte der Fachgruppe, Neuigkeiten aus den Arbeitsgruppen (Promotionen, Auszeichnungen), Projektberichte, sowie Veranstaltungsberichte und Calls. Der Newsletter ist zur Zeit auf ein halbjährliches Erscheinen ausgerichtet. Die nächste Ausgabe erscheint im Juni 2019.

Weitere Informationen und Newsletter finden Sie unter `https://www.kuvs.de/newsletter/`. In der aktuellen Ausgabe finden Sie eine Fülle von Berichten zu vergangenen Veranstaltungen, Fachgesprächen, Summer Schools, Konferenzen, dem IMC Shadow PC, einem IETF Besuch und dem Heidelberg Laurate Forum. Neben Calls und Ankündigungen zu kommenden Veranstaltungen, finden Sie auch eine Kurzvorstellung von 15 Dissertationen aus diesem Jahr. Es ergibt sich also eine spannende Auswahl zum Schmökern über die Weihnachtsfeiertage.

Einreichungen für den nächsten Newsletter sind herzlich erbeten.

Wir wünschen viel Spaß bei der Lektüre des vorliegenden Newsletters.

Ihre Newsletter Editoren,

Kalman Graffi	Oliver Hohlfeld
Heinrich-Heine-Universität Düsseldorf	RWTH Aachen

Neues aus den Arbeitsgruppen

Awards und Preise

- **Björn Richerzhagen** erhält den **Dissertationspreis** der Informationstechnischen Gesellschaft (**ITG**) im VDE, sowie den **Dissertationspreis der Freunde der TU Darmstadt** für hervorragende wissenschaftliche Leistungen. Seine Arbeit zeigt, wie Mobilfunknetze durch den cleveren Einsatz von Transitionen erheblich entlastet werden können.

- **Christoph Rensing** wurde 2018 als einer von zwölf europäischen Wissenschaftlern zum **ACM Senior Member** ausgezeichnet. Als Senior Member zeichnet die ACM solche Mitglieder aus, die ihre Leistungsfähigkeit durch technische oder fachliche Beiträge nachgewiesen haben.

- **Ralf Steinmetz** wurde durch die Gesellschaft für Informatik zum **GI-Fellow** ernannt.

- **Falko Dressler** wurde als **ACM Distinguished Member** ausgezeichnet.

- **Paul Kuehn** und **Joerg Eberspaecher** wurden zum **ITG Fellow** ernannt.

- Tobias **Meuser et al.**, erhalten den **Best Student Paper Award** der 4th **International Conference on Vehicle Technology and Intelligent Transport Systems** zum Thema "Adaptive Decision Making Based on Temporal Information Dynamics".

- A team from Freie Universität Berlin (Prof. **Wählisch**) and HAW Hamburg (Prof. **Schmidt**) was awarded Best Demo awards for their work on

  ACM MobiSys'18 Seamless Producer Mobility for the Industrial Information-Centric Internet.

  IEEE LCN'18 Resilient Machine-to-Machine Communication for an Information-centric Industrial IoT.

  ACM ICN'18 HoPP: Publish–Subscribe for the Constrained IoT.

- Every year, the Editorial board of **ACM Computer Communication Review (CCR)** selects the two **best papers** that were published during the previous year (i.e. the July 2017, October 2017, January 2018 and April 2018 issues). This year, a paper from KuVS members was selected: **A. Reuter, R. Bush, I. Cunha, E. Katz-Bassett, T. C. Schmidt**, and **M. Wählisch**, "Towards a Rigorous Methodology for Measuring Adoption of RPKI Route Validation and Filtering," *ACM SIGCOMM Computer Communication Review*, vol. 48, no. 1, pp. 19–27, January 2018. The paper was presented during the CCR session at ACM SIGCOMM 2018 (`https://youtu.be/3uRpLrWvsNA?t=1500`), and is based on an international collaboration between Freie Universität Berlin, HAW Hamburg, Columbia University, UFMG, and IIJ.

- **Julien Gamba** (IMDEA, Universidad Carlos III de Madrid), **Oliver Hohlfeld** (RWTH Aachen University), **Jonas Jelten** (Technical University of Munich (TUM), **Quirin Scheitle** (Technical University of Munich (TUM), **Stephen D. Strowes** (RIPE NCC), **Narseo Vallina-Rodriguez** (IMDEA Networks Institute / ICSI) und **Torsten Zimmermann** (RWTH Aachen University) haben den **Community Contribution Award** der **ACM Internet Measurement Conference (IMC)** für ihre Arbeit A Long Way to the Top: Significance, Structure, and Stability of Internet Top Lists erhalten.

Neue Mitglieder im KuVS erweiterten Leitungsgremium

- Joerg Ott

- Tobias Hossfeld

- Oliver Waldhorst

- Frank Kargl

- Kalman Graffi

- Oliver Hohlfeld

Siehe `https://www.kuvs.de/about/`.

Calls und Berichte zu Veranstaltungen

3.1 3. GI/ITG KuVS-Fachgespräch Lokalisation

Horst Hellbrück (Technischen Hochschule Lübeck)

Am 12. und 13. Juli 2018 fand an der Technischen Hochschule Lübeck zum dritten Mal das Fachgespräch Lokalisation der Fachgruppe Kommunikation und Verteilte Systeme (KuVS) und der Gesellschaft für Informatik (GI) statt. Die Veranstaltung wurde gemeinsam mit der HafenCity Universität Hamburg, der Technischen Universität Braunschweig und der Universität Bern organisiert und vom Kompetenzzentrum CoSA durch Prof. Dr. Horst Hellbrück und seinem wissenschaftlichen Mitarbeiter Marco Cimdins vor Ort ausgerichtet. Insgesamt nahmen 18 Experten_innen an dem Fachgespräch teil. Das Gruppenfoto zeigt die Teilnehmer des Fachgespräches.

Einblicke in das 3. GI/ITG KuVS-Fachgespräch Lokalisation in Lübeck.

Nach der Begrüßung durch die Organisatoren und einer kurzen Vorstellungsrunde schlug die Keynote die Brücke zwischen der Forschung und den Herausforderungen in der industriellen Anwendung. Als Schwerpunkt des Vortrags wurden die Anforderungen und Wünsche der Kunden und Anwender an Ortungssysteme in der Praxis aus Sicht eines Anbieters für Ortungssysteme anschaulich dargestellt.

Danach folgten in den Fachsitzungen die im Vorfeld ausgewählten Vorträge mit anschließender lebhafter Diskussion. Inhaltlich reichte die Spanne der Beiträge von praktischen Erfahrungen mit großen Installationen, über die Navigation mit Smartphones, die Konfiguration und Auswahl von Systemkomponenten bis hin zu theoretischen Betrachtungen der Ortungsgenauigkeit mit Hilfe von Machine Learning. Im Rahmen des Fachgesprächs sind zehn wissenschaftliche Beiträge entstanden, welche unter folgendem Link erreichbar sind:
https://www.publikationsserver.tu-braunschweig.de/receive/dbbs_mods_00065890
Neben den Vorträgen gab es genügend Raum für den fachlichen Austausch und Diskussionen in kleineren Gruppen.

Das Programm des 3. GI/ITG KuVS-Fachgespräch Lokalisation ist unter https://cosa.th-luebeck.de/en/research/id-3rd-expert-talk-on-localization erreichbar.

Aufgrund der positiven Resonanz planen die Organisatoren das Fachgespräch im kommenden Jahr zu wiederholen.

3.2 1. VDE Fachtagung „Internet of Things / Industrie 4.0"

Ralf Lehnert (TU Dresden), Jörg Benze (T-Systems Multimedia Solutions GmbH)

Am 27./28. September 2018 fand in Dresden die 1. VDE Fachtagung „Internet of Things / Industrie 4.0" statt, die vom Mitgliedern des gleichnahmigen ITG Fachausschuss KT6 und dem Bezirksverein Dresden in den Räumen der T-Systems Multimedia Solutions GmbH veranstaltet wurde.

Beim Tagungsprogramm ist es gelungen, neben den technischen Aspekten, auch die durch den digitalen Wanden zu erwartenden juristischen und und gesellschaftlichen Veränderungen zu beleuchten. Für eine gesamtheitliche Betrachtung konnten hochkarätige Referenten gewonnen werden, die technologischen Entwicklungen, erfolgreiche neue Geschäftsmodelle und exemplarischen Praxisbeispiele gegangener Realisierungswege vorgestellt haben. Abgerundet wurde die Fachtagung durch eine Panelsdiskussion der Teilnehmer mit allen Referenten und einem Rundgang durch die Labore der T-Systems MMS.

Einblicke in die 1. VDE Fachtagung "Internet of Things / Industrie 4.0".

3.3   GI/ITG KuVS Summer School 2018

Nils Aschenbruck (Universität Osnabrück)

Die diesjährige GI/ITG KuVS Summer School "Industrial Internet" wurde in Kooperation mit dem DFG-Sonderforschungsbereich 1053 MAKI von der Arbeitsgruppe Verteilte Systeme der Universität Osnabrück unter der Leitung von Nils Aschenbruck organisiert. Die Wahl der Lokalität fiel auf das zu Osnabrück nahegelegene Burghotel im beschaulichen Dinklage. Im schönen und rustikalen Ambiente konnten hier Vorträge gehalten werden, auf die rege Diskussionen folgten. Es fanden unter anderem die folgenden Vorträge statt:

- Björn Scheuermann, HU Berlin: „Funknetze, Industrieumgebungen, Sensordaten und Du"
- Christoph Sommer, Universität Paderborn: „Cooperative Mobile Systems"
- Stefan Katzenbeisser, TU Darmstadt: „Remote Attestation for Lightweight Devices"
- Kay Römer, TU Graz: „ Dependable Internet of Things for Industrial Applications"
- Lutz Tröger, HARTING: „Industrie 4.0: Vision und Wirklichkeit"
- Andreas Wübbeke, CLAAS E-Systems: „Erntemaschinen und IOT - ein Netzwerkkonzept für eine fahrende Fabrik"
- Lars Wolf, TU Braunschweig: „Robust, Energy Efficient Wireless Sensor Networks"
- Matthias Wählisch, FU Berlin: „NDN, CoAP oder MQTT für das industrielle Internet"

Mit freundlicher Unterstützung der CLAAS E-Systems wurde passend zu den lauen Sommerabenden mit einem Grillevent auch auf das soziale Miteinander Wert gelegt.

Teilnehmerinnen und Teilnehmer der GI/ITG KuVS Summer School 2018.

3.4 2018 International Teletraffic Congress (ITC 30) Report

Tobias Hoßfeld (University of Würzburg) and Peter Reichl (University of Vienna)

The 30th International Teletraffic Congress (ITC 30) was held on 4-7 September 2018 at the Faculty of Computer Science, University of Vienna, Austria. It was the 30th edition of this international flagship congress in the field of networking science and practice. ITC was founded back in 1955 by enthusiastic scientists and engineers who were willing to deploy networks in a holistic way. Since then, it has established a multi-decade tradition as the primary forum for presenting and discussing the latest technical advances in the broad areas of teletraffic models, network systems, and measurements. ITC is the first international conference in networking science and practice and thus has witnessed the evolution of communications and networking from the very beginning. Its inherent root in solid methodological foundations has allowed ITC to constantly adapt its technological focus without losing its original identity.

The main theme of ITC 30 was on the future smart world and how to build it using recent advances in networking technology, science and practice, including key challenges arising from the upcoming interconnection of massive numbers of devices, sensors and humans.

In this spirit, Vienna and its genius loci was the perfect location for a wonderful event. The University of Vienna is one of the oldest universities in Europe, founded in 1365. At the same time, the city of Vienna blends its deep roots in history, music and arts with an open and modern approach towards technology and lifestyle, which is also reflected by the fact that, only two weeks before the start of ITC, Vienna has been chosen by the "Economist" as "world's most liveable city". This unique mixture was also celebrated in the social events of ITC 30, starting with a welcome reception and gala concert in the traditional Palais Eschenbach that was offered to all ITC participants. Peter Reichl, this time at the piano, and his wife Marena, who is an international opera singer, took an enthusiastic audience out to "A Night at the Opera", featuring music by Donizetti, Bellini, Verdi and others. The concert was devoted to the memory of Dr Richard Gibbens, a dear colleague from Cambridge who sadly had passed away some days before. The conference dinner took place at Vienna City Hall, where the participants spent a lovely evening, enjoying food and live piano music, exchanging ideas and

"Belcanto – A Night at the Opera" Gala Dinner at Vienna City Hall

plans, and – most importantly – just having fun. On this occasion, also several awards have been presented by Michela Meo, chair of the International Advisory Council of ITC, including the Arne Jensen Lifetime Award and, for the first time in ITC history, the ITC Rising Scholar Award.

In its technical program, ITC 30 aimed to bridge the gap between performance modelling and real-life operational aspects in a smart world, including research works which leverage measurement data to provide a better understanding of the wired and wireless networks' operation under realistic conditions. In that perspective, **Debasis Mitra (Columbia University, USA)** discusses the future smart world in his excellent keynote on **"An Engineer's Perspective on Some Societal Problems"**. In Debasis' view, this engineer relies on models, analysis and model-based experimentation to explore some societal problems, including the role of knowledge, its nurture and impact in high-tech industries, the survival of Best Effort services in the Internet in an uncertain regulatory environment, as well as inter-organizational working for content delivery in an increasingly content-centric Internet.

As one of the highlights of ITC 30, the **ITC 30 Networking Science Vision Day** was organized on Wednesday, September 5, 2018, presenting several top experts from the networking community who offered their views and visions on the future smart world and the role of networking research in it. The key question is "Networking Science – Where Are We Heading To?", and Philippe Jacquet (Nokia Bell Labs, France) focused his corresponding talk on "Wireless and the City". Despite being the place where the majority of the human population lives and interacts, cities are in general among the worst environments for radio communication. Hence, this talk reviews the theories of wireless networks at the scale of a full city. Alexandre Proutiere (KTH Stockholm, Sweden) considered "Data-driven Decisions in Communication Systems", surveying recent advances in the use of online learning methods on the design of optimal (and sometimes distributed) radio access protocols in wireless networks as well as enhanced resource allocation schemes for better Quality of Experience. Mikaël Touati (Orange Labs, France) discussed "Networks and Market Mechanisms", in particular, mechanisms used to match, allocate or trade resources in markets and survey mechanisms with and without money, their use-cases, properties and solution concepts. Piet Van Mieghem (TU Delft, The Netherlands) overviewed "Network Science and Telecommunications". From the perspective of telecommunications, his personal view on the history of Network Science and its fascinations is provided. Then, the epidemic spread on networks, a way of diffusing information in a network, is discussed. The sessions of the Vision Day were chaired by Helmut Leopold, Head of the Center for Digital Safety & Security at the Austrian Institute of Technology (AIT), who brought in his broad experience in the field.

This year's ITC is arranged around four different areas: Performance Evaluation, Control and Optimization Chairs; Network Measurements and Big Data; Networking Architectures and Paradigms; and Wireless and Cellular Networks. **The ITC technical program contained** 18 full papers and 5 demo and poster papers across these areas. ITC 30 has a dedicated session with 5 accepted papers on doctoral dissertations which were related to the ITC topics in the field of performance, traffic modelling, and control in communication networks and networking science. The idea of the dissertation session was to give PhD students a forum to present their

Best Paper Award Recipients & Award Chairs   ITC 30 Student Travel Grant Recipients

PhD to a larger audience during the ITC main conference. In addition, two PhD work-in-progress papers will be presented as part of the ITC conference. The three TPC Co-Chairs, Eitan Altman (INRIA Sophia-Antipolis, France), Giuseppe Bianchi (University of Rome Tor Vergata, Italy), and Thomas Zinner (TU Berlin, Germany) did a magnificent job in compiling this excellent technical program and put a lot of efforts and personal enthusiasm to make ITC 30 a lively and attractive event.

In addition to the ITC conference, a workshop dedicated to **"Network Calculus and Applications"** (NetCal 2018) was organized by : Yuming Jiang (Norwegian University of Science and Technology, Norway), Jens Schmitt (University of Kaiserslautern, Germany), and Markus Fidler (Leibniz Universität Hannover, Germany). Network Calculus is a branch of queueing theory which aims at exploring the bounding behavior for queues. The workshop was composed of 10 original papers reporting mature or early-stage results in network calculus theory and its applications to different areas. Jean-Yves Le Boudec (EPFL, Switzerland) gave a keynote talk on "Network Calculus: From Integrated Services to Deterministic Networking".

ITC 30 was technically co-sponsored by IEEE Communications Society (IEEE ComSoc), IFIP – International Federation for Information Processing, the Information Technology Society within VDE (ITG VDE), and in-cooperation with ACM SIGCOMM. In total, 76 delegates participated in the ITC 30 conference. ITC 30 had set up two prestigious awards: Best Paper Award and Best Student Paper Award. These awards were offered both on the scientific quality of the paper and the presentation of the oral contribution or demo presentation.

ITC 30 Best Paper Award
Statistical Delay Bounds for Automatic Repeat Request Protocols with Pipelining by Mark Akselrod; Markus Fidler

ITC 30 Best Student Paper Award
LENTA: Longitudinal Exploration for Network Traffic Analysis by Andrea Morichetta; Marco Mellia

ITC Rising Scholar Award
The ITC Rising Scholar Award has been created in order to recognize young researchers with significant contributions to the ITC Community in the field of performance, traffic modelling,

and control in communication networks and networking science.

Arne Jensen Lifetime Award: Luigi Fratta

The Arne Jensen Lifetime Achievement Award is given to an individual who has provided an exceptional contribution to traffic modelling, control and performance, and dedication to the teletraffic community.

The International Advisory Council (IAC) of the International Teletraffic Congress (ITC) is pleased to announce that the recipient of the 2018 Arne Jensen Lifetime Award is Dr. Luigi Fratta. He also gave a talk in the ITC 30 Award Session: "All Around Internet: Past, Present and Future".

ITC Student Travel Grants

This year five Student Travel Grants were issued. This year's recipients were as follows.

- Adriana Fernández-Fernández, Universitat Politecnica de Catalunya, Spain

- Sathiya Kumaran Mani, University of Wisconsin – Madison, USA

- Christian Moldovan, University of Duisburg-Essen, Germany

- Irena Orsolic, University of Zagreb, Croatia

- Daniela Renga, Politecnico di Torino, Italy

Contact and more information about ITC: http://itc-conference.org/

3.5 Researchers' first Encounter with the IETF Community: Measuring TCP, HTTP/2 and QUIC

Jan Rüth and Torsten Zimmermann (RWTH Aachen University)

As Ph.D. students, our typical encounter with the IETF community and their work is by stumbling over RFCs and Internet-Drafts that either relate to or are a fundamental basis for our research. Beyond that, for us, the Internet Engineering Task Force (IETF) has been a vague entity focused on standardisation. Therefore it was a great experience to attend the IETF 101 meeting in London earlier this year and to present our measurement results for TCP, HTTP/2 and QUIC at the Measurement and Analysis for Protocol Research Group (MAPRG)

Our Experience

We were both impressed by the professional organisation before (registration process) and during the meeting (agenda), compared to some of the research conferences we attended before. Thanks to the newcomers meet and greet with experienced members of the IETF community, we quickly realised that IETF standardisation is fueled by an open-minded community, similar to the research community.

During the actual sessions, we witnessed passionate technical as well as ethical discussions. We were especially impressed by the audience's broad knowledge with respect to consequences for existing systems, future considerations, and lessons learned from the past. Despite the level of detail or heated debates over, for example, a single bit, we were surprised that if a decision is to be made, the goal is to reach rough consensus within the session, thereby pushing the overall progress forward.

In contrast to the very technical discussions and (instant) solutions of IETF work, the Internet Research Task Force (IRTF) provides a broader forum for evaluating new ideas and to discuss the current state of protocols in the Internet. Compared to typical research conferences, the IRTF has the unique property that the audience features people actually operating, implementing, and maintaining the systems and protocols under discussion.

Measurement studies on QUIC, TCP Initial Windows, and HTTP/2 Server Push

In the scope of the IRTF's MAPRG, we presented measurement results for IETF-standardised protocols, TCP and HTTP/2, and the QUIC protocol which is currently making its way through the IETF standards process.

Measuring TCP

For TCP, we investigated the use of its performance-critical startup parameter: the initial congestion window (IW) that governs the amount of unacknowledged data in the first roundtrip of a connection. Small windows lead to suboptimal performance, while too large windows can lead to losses. We found (see our IMC 2017 paper for further details) that for IPv4 most people adhere and adopt the current experimental standard of an initial window of ten segments

from RFC 6928. Yet, we also found some hosts that use much larger windows. We extended this investigation to Content Delivery Networks (CDNs) in a follow up paper (published at TMA 2018) and found that CDNs customise their IWs and utilise values beyond the current recommended standard. These are typically below 30 segments of data but we also found instances of up to 100 segments.

Measuring HTTP/2

Regarding HTTP/2, we focused on the server push feature that allows a server to proactively push content without an explicit client request, thereby promising to save round trips and thus enabling faster page loads (see our IFIP Networking 2017 paper for further details).

While we observe that, for example, already 11.8 million out of 155 million .com/.net/.org websites are HTTP/2 enabled, only 5,000 use server push (as of January 2018, for up-to-date numbers, see `https://http2.netray.io`). We attribute this to the fact that server push requires active configuration, whereas HTTP/2 can be enabled by simply updating a web server. By comparing websites in different configurations (HTTP/1, HTTP/2, HTTP/2 without server push) and using Page Load Time and Google's SpeedIndex as performance metrics, we observe that, although some websites benefit from using HTTP/2 and server push, some websites perform worse. To grasp the impact of HTTP/2 server push on human perception, we conducted a follow up study (published at SIGCOMM Internet-QoE 2017). In this study, we show side-by-side videos of the loading process of websites in different protocol configurations, and observe similar results as before: some websites are perceived to load faster, while others are perceived to load slower. Moreover, we see that performance metrics do not necessarily correlate with human perception and that voting decisions are highly website specific. At IRTF MAPRG, we concluded that HTTP/2 server push is no silver bullet and its usage for websites should be handled with care and a lot of testing before actual deployment, which was also confirmed in discussions with web engineers and developers after the talk.

Measuring QUIC

Finally, we examined the prevalence of QUIC on the Internet (see our PAM 2018 paper for details). Since IETF-QUIC is still in standardisation process, we focussed on the original Google proposal. In October 2017, we found around 600,000 QUIC-capable IPs in IPv4 which has massively increased since then to over 5 million (as of July 2018, see `https://quic.netray.io` for up to date numbers). In August 2017, we analysed network traces from a European Tier-1 ISP, a major European IXP and from a University's uplink and found that QUIC on average already accounts for 6%-9% of the Internet traffic.

More recently, we observed peaks of up to 30% QUIC traffic. Our findings backed the discussions in the QUIC working group that discussed the SPIN-bit proposal which should tackle the protocol's challenging manageability and measurability for network operators.

KuVS Newsletter

Summary

Overall, being part of the IETF 101 meeting was a fantastic experience, as we both gained insights into the standardisation process within in the IETF, received valuable and professional feedback regarding our research, and got to know a lot of interesting people.

From our perspective as Ph.D. students, we highly recommend taking part in IETF meetings, as it provides a unique opportunity to gain a view on real-world technical problems that are often not considered in the university environment.

This article was originally published on the IETF blog.

3.6   17. Fachgespräch Sensornetze an der TU Braunschweig

Felix Büsching and Lars Wolf (TU Braunschweig)

Kombinierte Demo-Session und Kaffeepause auf der Plaza des Informatikzentrums.

Die Wanderpokal des Kickerturniers geht in diesem Jahr nach Braunschweig.

Mit vielen spannenden Vorträgen und jeder Menge guter Diskussionen fand am 13. und 14. September das nunmehr 17. Fachgespräch Sensornetze statt. Mit insgesamt 32 Teilnehmerinnen und Teilnehmern sowie 15 Fachvorträgen war das FGSN an der TU Braunschweig gut besucht, was die anhaltende Aktualität des Themas unterstreicht.

Böse Zungen mögen behaupten, dass das Oberthema "drahtlose Sensornetze" mittlerweile in die Jahre gekommen sei; die Tatsache, dass dieses Fachgespräch nun bereits zum siebzehnten Mal in Folge stattgefunden hat, scheint diese These zunächst auch zu stützen. Bei genauerem Hinsehen merkt man allerdings schnell, dass eher das Gegenteil der Fall ist: Drahtlose Sensornetze – Wireless Sensornetzworks – ist längst kein Buzzword mehr. Der Hype hat sich zwar gelegt, die Aktualität aber bleibt. So ist es auch nicht weiter verwunderlich, dass scheinbar aktuellere Themen wie Cyberphysical Systems oder das Internet-of-Things eine sehr große Schnittmenge mit dem Begriff "drahtlose Sensornetze" haben – schließlich teilen sich diese Domänen sehr ähnliche Fragestellungen, die mit Skalierbarkeit, Robustheit, Energieeffizienz und Quality-of-Service noch lange nicht hinreichend beschrieben sind.

Diese Breite zeigte sich auch in den qualitativ hochwertigen Einreichungen – nach jedem der 15 Fachvorträge gab es angeregte Diskussionen zwischen den Präsentierenden und dem Auditorium. Die praktische Anwendung der vorgestellten Themen wurde auf 7 Demos eindrucksvoll gezeigt – auch hier zeigte sich die Bandbreite der Anwendungsgebiete: Von der Kommunikation unter Wasser über Weidezäune bis hin zu Fledermäusen.

Auf der Abendveranstaltung im Keller einer Studentenkneipe wurde in zahlreichen spannenden Spielen das Gewinnerteam des traditionellen Kicker-Turniers gefunden: Zum ersten Mal kommt der Wanderpokal nach Braunschweig und bleibt dort bis zum nächsten FGSN, welches in Magdeburg stattfinden wird - wahrscheinlich wieder am Ende des Sommers.

Die angenommenen Paper und Demo-Abstracts wurden als Technical Report veröffentlicht und sind hier frei verfügbar: https://doi.org/10.24355/dbbs.084-201809121401-1

3.7 Flashback GI-Dagstuhl Seminar: "IoT Hackathon: From Research to Practice"
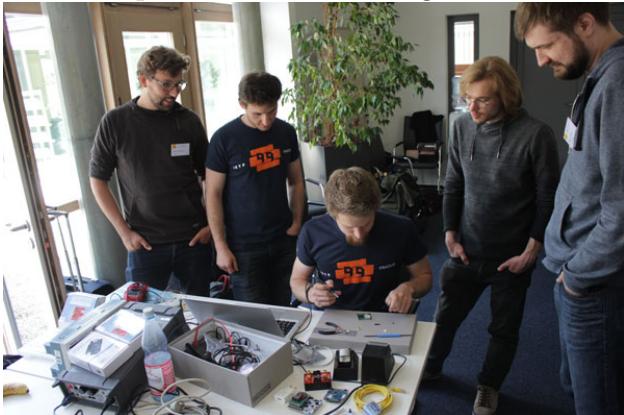
Matthias Wählisch (FU Berlin)

Last year, the first GI-Dagstuhl Hackathon took place from July 23-28, 2017. This event was a rousing success and indicates that our community should think about new formats at well-established venues. The event was organized by Alexander Afanasyev (Florida International University, US), Oliver Hahm (Zühlke Engineering GmbH, DE), and Matthias Wählisch (Freie Universität Berlin, DE). Below we briefly summarize our experiences. For more details about the Hackathon, see https://dagstuhl-hackathon17.github.io/.

Why a Hackathon at Dagstuhl?   In the past, our research community learned that solid solutions for challenging problems require real-world experiences, in particular in the context of wireless and embedded systems. To be successful on a short time scale, a tight feedback loop of conceptual and implementation work needs a noiseless environment, allowing the participants to interact immediately face to face, in smaller and larger groups. The facilities of Dagstuhl provide exactly this. Furthermore, the atmosphere of Dagstuhl allows junior researchers to easily get in contact with senior scientists.

Topics of the GI-Dagstuhl Hackathon 2017   The objective of the first GI-Dagstuhl Hackathon was to explore challenging problems in the Internet of Things (IoT) by both design discussions and practical prototyping of technical solutions. A special focus was on potentials of information-centric networking for the IoT.

The organizers proposed a list of topics that needed exploration and practical work. This list was distributed among the participants, as well as basic system requirements to conduct the hands-on coding. The organizers also solicited additional topics from the participants. Additional topics that arose during the seminar were dynamically included.

Soldering in room Kaiserlautern   Pekka Nikander gives a lightning talk about "Towards a Federated Web of Things"

Group work and plenary talks

The topics of interest for this GI-Dagstuhl Hackathon included but were not limited to

- application of ICN concepts to IoT.

- extending, enhancing, unifying existing ICN codebases for well-known IoT operating systems such as RIOT.

- exploring data-centric security in IoT, trying out various security methods, evaluating feasibility, etc.

- other non-ICN topics for IoT.

At the end, we had seven groups analyzing time slotted channel hopping, constrained resource discovery, ICN to cloud integration, header compression in ICN and low-power wireless personal area networks, power management, and lightweight security approaches.

The Success of the GI-Dagstuhl Hackathon 2017   During one week, 20 international participants from academia and industry tackled very challenging research questions about IoT and information-centric networking. This GI-Dagstuhl hackathon was a unique experience not only for the participants but also for the organizers. Dagstuhl proved to be a very perfect place to organize such events. In this seminar, we experienced lively discussions and 100% dedication to solve challenges.

Every day included a recap from previous coding sessions, one lightning talk, and coding. It was hard to convince participants to make a break. Dinner, for example, was considered as a necessary interrupt and was followed by coding until midnight every day. This even happend when the organizers invited the participants to Landgasthof Paulus on Thursday, nicely illustrating that the seminar achieved its goals in the spirit of Dagstuhl: intense research and focus on results.

The outcome of this seminar did not only result in code contributions to open source projects (e.g., CoAP extensions in RIOT) but also in new on-going collaborations between research groups (e.g., on energy harvesting). Junior researchers have been perfectly interconnected.

TSCH and ICNLoWPAN Group

Coding groups

Conclusions   A hackathon is the right format to tackle very challenging research questions in practice. It does not conflict with scientific events (or with the objective to gain scientific insights) but *complements* well-known formats such as seminars and workshops. In fact, a hackathon fosters scientific exchange and helps to overcome inhibitions of junior researchers because of joint coding. I highly encourage our community to continue with this type of event in the context of GI-Seminars at Dagstuhl.

Breakout: The Hackathon orchestra

3.8 SFB MAKI – Industry Workshop 2018: Next-Generation Networks – An Industrial View

Since 2013, the German Research Foundation DFG is funding the Collaborative Research Centre 1053 MAKI – Multi-Mechanisms Adaptation for the Future Internet. MAKI is one of DFG's largest collaborative research activities in computer science, with more than 19m Euro funding approved to date. Over 60 PIs, postdocs and doctoral researchers participate, representing 14 research groups from Technische Universität Darmstadt plus labs from Aachen, Frankfurt, Mannheim and Marburg. A steady stream of short and long-term international visitors assures the influence of experts from across the world.

The overarching goal of MAKI is to make the Internet, its applications and platforms more adaptive and flexible – most notably at runtime. While many activities of the first phase emphasized better support for mobile applications under changing conditions (user mobility, load fluctuations, etc.), a good deal of the researchers of the current phase exploit the 'softwarization' of core and wireless networks in order to allow for large scale adaptation. A category of adaptations denoted as 'transitions' is of key importance in MAKI. Transitions replace a 'mechanism' by another one of equivalent functionality at runtime, where 'mechanism' may denote a protocol, protocol function, strategy, topology, etc.

The workshop brought top industrial researchers and developers together, working in areas related to the MAKI theme. The key results of MAKI were presented, research ideas exchanged and an industrial view on next-generation networks was provided. The workshop addressed the following four topics with respect to large scale adaptability and transitions:

1. in-network processing / edge computing,

2. next-generation wireless communications,

3. advanced network protocols, and

4. machine learning / big data analytics in future communication systems.

The ultimate goal was to establish connections and future collaborations between MAKI and the relevant industry partners. More than 70 participants attended the workshop, including 12 participants from industry partners. The one-day workshop comprised five talks given by invited industry experts, a MAKI overview presentation and poster presentations of MAKI results and ongoing project. There were ample opportunities for lively discussions and open exchange during the day.

Further information: `https://www.maki.tu-darmstadt.de`.

3.9   RIOT Summit 2018

Matthias Wählisch (Freie Universität Berlin)

Keynote speaker Jaime Jiménez talking about open standards in commercial products

More than 100 participants joined the RIOT Summit 2018

The RIOT Summit is the yearly get-together of the community around the RIOT operating system for the Internet of Things (IoT). It aims at bringing together RIOTers, beginners and experts, as well as people interested in the IoT in general. After two successful events in 2016 and 2017, the RIOT Summit moved out of Berlin for the first time. With the kind assistance and sponsorship of the RIPE NCC we were able to host this year's event in Amsterdam in September 2018, which was enjoyed by more than 100 participants.

Background on RIOT   RIOT (https://riot-os.org) is a free and open source operating system for the IoT, which was founded by Freie Universität Berlin, HAW Hamburg, and INRIA in 2013. It is aimed towards low-power IoT devices and microcontrollers and supports a wide range of 8-, 16-, and 32-bit architectures, including AVR, MSP430, ARM Cortex-M, and MIPS. In a nutshell, if you cannot run Linux because of constrained hardware resources, you should run RIOT. RIOT is based on a real-time- and multi-threading-capable microkernel, ships a hardware abstraction layer, and supports high energy efficiency—everything implemented from scratch. RIOT provides multiple networking stacks, which support common IoT protocols. RIOT is used in teaching, development, and products.

The community around RIOT is a grassroots community of users, developers, and experts in the field, which follows the IETF model of openness and rough consensus. While the development and discussions are mostly happening via mailing lists and GitHub, the community also meets face-to-face at the yearly RIOT Summit. Participating in the RIOT Summit is always free-of-charge thanks to the generous support of multiple companies and research institutions.

Overview of the RIOT Summit 2018   The first day of the RIOT Summit was dedicated to plenary talks, which covered a great range of topics all around RIOT and the IoT, while
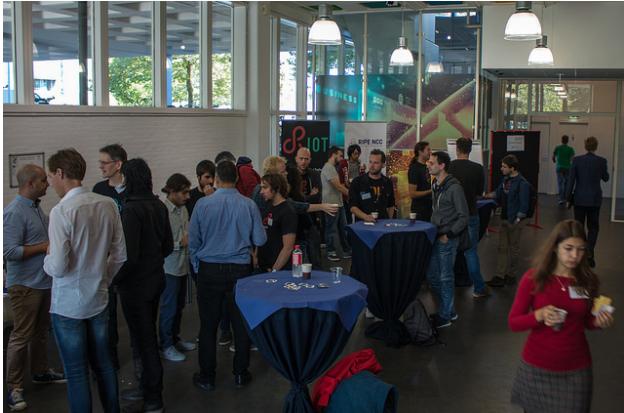
during breaks contributors had the opportunity to show-case their personal projects involving RIOT. On the second day, newcomers and long-term contributors had the chance to learn more about RIOT in the morning tutorials and discuss the future of RIOT during the break-out sessions in the afternoon.

The keynote was presented by Jaime Jiménez, Master Researcher at Ericsson Research and co-chair of the IETF CoRE working group, talking about "From R&D to Product Via Open Source and Standards"

Further presentations covered the topics IoT networking (e.g., bluetooth low energy and constrained application programming via CoAP), IoT applications (e.g., home automation and robotics), IoT security (e.g., transport layer security and physical unclonable functions), and ethics.

A more extensive summary, from the perspective of one of the participants and core maintainers, was published on RIPE Labs, see https://labs.ripe.net/Members/martine_sophie_lenders/riot-in-amsterdam.

All slides and video recordings of the presentations at the RIOT Summit 2018 are available via http://summit.riot-os.org/2018/.

Liveley discussions during the breaks

Social event

3.10   ACM IMC Shadow TPC 2018

Matthias Wählisch (Freie Universität Berlin)

The ACM Internet Measurement Conference (IMC) is the premier conference on Internet measurements. This year's Shadow TPC was organized by Aruna Balasubramanian (Stony Brook University), Gareth Tyson (Queen Mary University of London), and Matthias Wählisch (Freie Universität Berlin). Shadow PCs allow students and others interested in future PC service to read submitted papers and go through the reviewing process, ultimately arriving at a shadow conference program. This opportunity allows future PC members to learn first-hand about the peer-review process and gain experience as a reviewer. Note that a Shadow TPC will have no impact on the actual program committee process

What differed from common Shadow TPCs?   We used the IMC Shadow PC 2018 as a means to experiment with new approaches to managing the TPC decision process. We implemented an A/B experiment to compare the experience of in-person versus remote meetings. As part of this, the IMC Shadow PC was split in two groups. (i) Those who attended an in-person Shadow PC meeting, which was held at the end of July in Berlin; (ii) Those who attended an online meeting via professional video conferencing distributed among two or more remote sites, also held at the end of July. Every participant needed to decide up front which group he or she would like to join. We assumed that members based in Europe can travel easier and expect from them to attend the one-day in-person meeting.

Results   21 members have been selected to participate in Group A (those who met in-person) and 60 members to participate in Group B (those who conducted the remote Shadow TPC meeting). Overall 147 papers were forwarded to the IMC Shadow TPC. To balance the two round review process, we assigned 50 papers to Group A and all 147 papers to Group B. The in-person meeting took place at Freie Universität Berlin on July 23, and the remote meeting at the last day of IETF 102. During the TPC meetings, 32 and 85 papers have been discussed in Group A and B respectively.

Common mistakes during the review process included late declaration of conflicts of interests as well as bad time management resulting into late review submissions—not too dissimilar to real TPCs ;). At the end, however, the quality of reviews was extremely good. Combining real reviews and reviews from the Shadow TPC, some paper authors received overall more than twelve substantial reviews.

Even though more than 57 participants attended the remote meeting, connected from all over the world, the conferencing system worked very well. It is very important to share communication policies in advance such as using headsets or conference mic/speakers and to mute the mic until speaking.

The biggest advantage of an in-person TPC meeting is the social interaction. In particular, for students and junior researcher in-person meetings are essential to connect to the community and to leverage discussions about papers. A more detailed report will be published in an

upcoming issue of ACM CCR. Thoughts from one of the PhD students who participated in Group A are available via http://eecs.qmul.ac.uk/~boettget/imc18-shadowpc/.

Participation at the in-person meeting in Berlin, as well as participation at the ACM IMC to discuss experiences between both group members was financially supported by ACM SIG-COMM.

3.11　6th Heidelberg Laureate Forum

<div align="center">Martin Henze and Roman Matzutt (RWTH Aachen University)</div>

On September 25, 2018, COMSYS researchers Roman Matzutt and Martin Henze gave an invited talk at the 6th Heidelberg Laureate Forum, a special conference bringing together awardees of the highest prizes in mathematics and computer science (Abel Prize, ACM A.M. Turing Award, ACM Prize in Computing, Fields Medal, and Nevanlinna Prize) and young researchers from all over the world.

This year's edition of the Heidelberg Laureate Forum featured a special hot topic session on blockchain technology, which investigated the current state of its current technical foundations as well as recent applications that benefit from utilizing a blockchain. In this hot topic session, Roman and Martin discussed challenges and potential remedies regarding the actual content stored on a blockchain. In the first part of the talk, Roman talked about the problems stemming from arbitrary and thus potentially illicit or objecitonable content being stored directly on the blockchain (see here for further details). Afterwards, Martin presented our research on blockchain truncation, a current topic that was also brought up by the previous hot topic presentations by IBM Fellow C. Mohan and Donald Kossmann, director of the Microsoft Research Lab in Redmond.
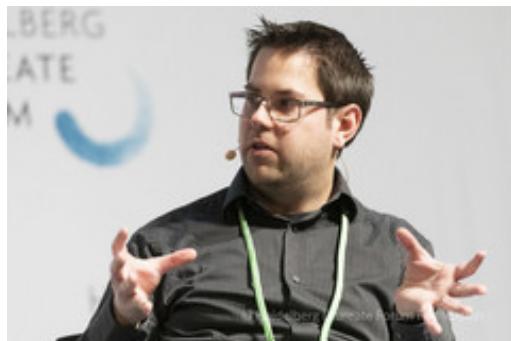
Following the presentations, Roman and Martin joined a panel discussion with C. Mohan, Donald Kossmann, and ACM A. M. Turing Award laureate Silvio Micali, who presented his scalable public blockchain, Algorand, earlier that day. The panel discussion was moderated by Eva Wolfangel, who was recently awarded Europe's science writer of the year 2018. The panel mainly focussed on the potential of blockchain technology and what makes a scenario where application of blockchain technology yields true benefits.

Both the presentation and the panel discussion are available on YouTube.

For further information see `https://blockchain.comsys.rwth-aachen.de/`.

<div align="center">

Roman Matzutt　　　　　　　　　　　Martin Henze

Photo Credits

</div>

3.12   Calls

Auf den folgenden Seiten finden Sie aktuelle Calls.

3.12.1 International Conference on Networked Systems 2019

March 18 till March 21, 2019 – Garching b. München, Germany

The Conference on Networked Systems (NetSys 2019) provides an international forum for engineers and scientists in academia, industry, and government to discuss recent innovations in the realm 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 37 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)).

Bringing together the **community in the area of networking and distributed systems** is a main goal of NetSys 2019. Hence, a number of events are planned within the NetSys 2019 programme to foster community building for all participants in addition to two social events and numerous coffee and lunch breaks. In particular, both expert communities of the two German societies ITG and GI are joined in NetSys 2019 as the ITG expert symposium "Future of Networking" is part of NetSys 2019 for the first time. Also, a joint meeting between the expert groups of both societies is planned. Further events such as Hot Topics Sessions target the information exchange on very recent research results within the community. More details on the programme are given in the following.

In NetSys 2019 the annual 1-day **ITG expert symposium "Future of Networking"** (Zukunft der Netze, ZdN) will be an integral part of the programme featured on the first day. The ZdN 1-day programme consist only of invited presentations by major industry and academic experts. In 2019 the focus will be on 5G. It is organized by the ITG expert group (Fachausschuss) Communication Networks.

The **NetSys main track (full and short papers)** solicits submission of high-quality, original scientific papers presenting novel research on the wide range of networked systems. In addition, NetSys 2019 provides a novel format to stimulate discussions on hot topics in networking or perspectives from the industry. To this end, there will be dedicated sessions on hot-topics-in-networking, separate workshops, tutorials.

- **Hot Topic Session**: The aim is to present very recent and highly significant results, as well as new ideas and proposals that move the networked systems community forward. The proposed hot topics should be highly innovative, thought provoking and stimulating in terms of content. Ideas can target new research topics, directions and methods that the NetSys community should address. This explicitly includes also recently published papers at top journals which are of high interest for the NetSys community. Only a one-page abstract is required for the Hot Topic Session which will be reviewed by the NetSys organizers.
  Idea submission deadline: Thursday, December 20, 2018

- **Industry Session**: The purpose of the Industry Session is to present new concepts, architecture realizations and up to date experience reports from industry with networked systems. The proposed presentations should be in a clear industrial context including system architectures, experience with system rollout as well as operation, evaluation reports and business models and should stimulate questions to research and academia. The submission format is a half page abstract outlining the content of the presentation which will be evaluated by the industry session chair, Marco Hoffmann, Nokia Bell-Labs.
  Idea Submission deadline: Thursday, December 20, 2018

- **Posters and Demos**: The NetSys 2019 poster and demo sessions showcase works-in-progress in an informal setting. We strongly encourage student and industry submissions. Demo and Poster papers must be 2 pages including all content + 1 extra page for references and acknowledgments.
  Submission deadline: Friday, December 14, 2018

- **AIComNets2019** Workshop on "Advanced Communication Networks for Industrial Applications": The Workshop will be a full day event with two main sessions: (1) a scientific track which will address recent progress in industrial communication networks and (2) an experience track which will address applications in industry and use cases, which are enabled by new technologies.
  Submission: November 30, 2018

- **QTOP'19** Workshop on "Quantum Technology and Optimization Problems": The scope of this dedicated workshop is to explore the opportunities for the application of quantum technology and optimization problems in networked systems.
  Submission: 17th November, 2018

- **SDNFlex**: 3rd Workshop on "Software-Defined Networking and Network Function Virtualization for Flexible Network Management": Network management currently undergoes changes towards more flexible network management. This trend is stimulated by Network Virtualization and Software Defined Networks (SDN) that emerged in recent years. The newly achieved flexibility in network management, particularly for NFV, opens a set of currently unresolved key questions concerning i) reliability, ii) service orchestration iii) function placement, and iv) performance.
  Submission: November 30, 2018

- **The PhD Forum** has the following goal. First, it should provide PhD students in any phase of their career with an opportunity to discuss their topics with experts and gain general feedback as well as specific comments on their proposal. Second, the PhD Forum is an excellent opportunity for young researchers to start a personal network with other PhD students as well as with already established experts. Prospective participants should prepare an application that includes the following information: two-page research statement and a brief CV.
  Submission deadline: Monday, January 7, 2019

KuVS Newsletter

Program:

A rough overview on the program can be found below.

Monday	Tuesday	Wednesday	Thursday
Workshops & Tutorials,	Future of Networking	NetSys Technical Sessions	NetSys Technical Sessions
Workshops & Tutorials	Posters/Demos		
	Future of Networking	NetSys Technical Sessions	NetSys Technical Sessions
FA5.2 Sitzung	Gemeinsame FA Sitzung: 5.2 & KuVS ELG	Awards KuVS Community Session	
Conference Reception	Conference Dinner	TPC Dinner	

International Conference on Networked Systems 2019
www.netsys2019.org

March 19-21, 2019 – Munich, Germany

The Conference on Networked Systems (NetSys 2019) is a biennial event that provides an international forum for engineers and scientists in academia, industry, and government to discuss recent innovations in the realm of networked systems. The NetSys conference proceedings and will be submitted for inclusion to IEEE Xplore.

NetSys 2019 is co-organized by GI KuVS and ITG. Included in the conference is the annual 1-day ITG expert symposium "Future of Networking" (Zukunft der Netze, ZdN), with presentations organized on an invitation-only basis. NetSys 2019 will also feature a session on hot-topics-in-networking, separate workshops, tutorials, and a PhD forum. See the NetSys 2019 website for details and separate calls for papers.

NetSys solicits submission of high-quality, original scientific papers presenting novel research on the wide range of networked systems, including but not limited to:

- Network architectures and protocols
- Transport- and application-layer protocols
- Peer-to-peer and overlay networks
- Software-defined networking and network function virtualization
- Mobile, ad-hoc, opportunistic, vehicular and sensor networks
- Middleware architectures and platforms for networked systems
- Internet of Things (IoT)
- Cloud computing, mobile cloud computing, edge computing
- Network/cyber security and privacy

- Information-centric networking, content distribution and retrieval
- SOA, web services, and mobile services
- Consistency, reliability, availability, and programming support
- Social networks, social computing, data-intensive computing (big data)
- Methods for design, implementation and analysis of networked systems
- Cyber-physical networked systems
- Green networks and green networked systems
- Emerging networked applications

Important dates

Paper Registration: September 24, 2018   Paper Submission: October 1, 2018

For other dates (Hot Topics, workshop proposals, PhD Forum, etc.) see **www.netsys2019.org**

Submission guidelines

All submissions must be original, unpublished, and not considered elsewhere for publication. Papers must be 8 pages (full paper) or 4 pages (short paper), including references, figures and tables (at least 10pt font, 2-column format).

Manuscripts will undergo a thorough process of peer reviews by at least three members of the technical program committee. Accepted and presented papers will be published in the conference proceedings and submitted for inclusion to IEEE Xplore. Submission implies that at least one author will register and attend the conference to present the publication if the paper is accepted.

IEEE LaTeX and Microsoft Word templates and formatting instructions will be available on the conference website.

Contributions should be submitted electronically as PDF, using the IEEE conference publishing template, via the conference submission website given on the conference website.

Different rules apply for hot-topics-in-networked-systems, some workshops and PhD Forum papers.

NetSys 2019 Committee

General Chairs

Georg Carle   Technical University of Munich, IN

Wolfgang Kellerer   Technical University of Munich, ECE

TPC Chairs

Tobias Hossfeld   University of Würzburg

Jörg Ott   Technical University of Munich

Workshops Chairs

David Hausheer   Universität Magdeburg

Lars Wolf   Technische Universität Braunschweig

PhD Forum Chairs

Matthias Wählisch   FU Berlin

Oliver Hohlfeld   RWTH Aachen University

KuVS

Kommunikation und Verteilte Systeme

SDNFlex 2019

Organizing Committee

Oliver Hohlfeld
RWTH Aachen University
Thomas Zinner
TU Berlin
David Hausheer
OVGU Magdeburg

Technical Program Committee

Thomas Bauschert
Andreas Blenk
Oggy Dobrijevic
Patrick Eugster
Aaron Gember-Jacobson
Claas Lorentz
Gerhard Haßlinger
Wolfgang Kellerer
Roman Lapacz
Jeroen Famay
Nicolai Leymann
Diego Lopez
Michael Menth
Michael Jarschel
Ihsan Ayyub Qazi
Julius Rückert
Christian Esteve Rothenberg
Fabian Schneider
Maja Sulovic
Florian Wamser
Rafal Stankiewicz

3RD WORKSHOP ON SOFTWARE-DEFINED NETWORKING AND NETWORK FUNCTION VIRTUALIZATION FOR FLEXIBLE NETWORK MANAGEMENT (SDNFLEX)

Co-located with NetSys, March 18-21, 2019 – Munich, Germany

CALL FOR PAPERS

Network management currently undergoes changes towards more flexible network management. This trend is stimulated by Network Virtualization and Software Defined Networks (SDN) that emerged in recent years. These technologies allow networks to be run in a more flexible and cost efficient manner, e.g., by increasing network resource utilization and by decreasing operational costs. As an emerging topic, Network Function Virtualization (NFV) allows even further flexibility by migrating network functions (e.g., DHCP, PPPoE) from dedicated hardware to virtual machines running on commodity hardware. Virtualized network functions are appealing to network operators since they can be migrated and flexibly adapted to current demands.

The newly achieved flexibility in network management, particularly for NFV, opens a set of currently unresolved key questions concerning i) reliability, ii) service orchestration iii) function placement, and iv) performance. How to operate virtualized network functions in a reliable manner by providing redundancy and load balancing? Can virtualized network functions provide performance figures required for network operations and how can such virtualized services be benchmarked and compared? Where should network functions be placed to optimize the network subject to different design criteria? How can services be orchestrated? How can network monitoring be adapted to such flexible networks? This workshop aims at addressing these and similar questions in virtualized networks.

Topics of interest for submissions include, but are not limited to:
* SDN/NFV architectures, applications, and use cases
* Network monitoring and QoE
* Reliability of virtualized network functions
* SDN/NFV-based service orchestration
* SDN/NFV-based network deployment and management
* Business considerations and economic aspects
* SDN/NFV security
* Theoretical foundations of SDN/NFV networks
* Network Operating Systems and Languages
* SDN in Mobile and Wireless Networks
* Network Service Chaining
* Programmable data planes

Paper Submission:
November 15th, 2018

Notification of Acceptance:
December 20th, 2018

Final Manuscript:
January 15th, 2019

Workshop Date:
March 18th, 2019

Submission guideline: ≤ *6 pages, IEEE style*
http://www.netsys2019.org/workshops/sdnflex2019/

3.12.2   NetSys 2019 PhD Forum

March 18 till March 21, 2019 – Garching b. München, Germany

The PhD Forum at the Networked Systems 2019 follows the tradition and format of similar events at international conferences such as ICNP, PerCom, UbiComp, and Pervasive. The aim is twofold. First, it should provide PhD students in any phase of their career with an opportunity to discuss their topics with experts and gain general feedback as well as specific comments on their proposal. Second, the PhD Forum is an excellent opportunity for young researchers to start a personal network with other PhD students as well as with already established experts.

What can I expect?

A full-day event of discussions and fun with your direct peers, and visibility at the main conference.

The aim of the PhD Forum is to discuss research topics and PhD projects at different stages (early to senior). The PhD forum involves the discussion of meta aspects and experiences in course of a PhD. To tailor the discussion of meta aspects, we will request input from the participants in advance of the PhD Forum.

In contrast to previous years, we will also have two keynote speakers who will report about their research journey from a PhD student to a leading expert. Dr. Johann Schlamp (Leitwert) will talk about building an Internet-scale measurement infrastructure and Dr. Heiko Will (Safety io) will talk about innovation and development of advanced solutions from a software perspective.

In addition to the PhD Forum, a presentation of all participants will take place during a poster session at the main conference. A brief introduction of the topics (One-Minute-Madness) is used to attract attention of conference participants to this poster seesion.

The PhD Forum is a special opportunity to discuss research plans and results face-to-face with professors and senior researchers in individual groups outside of the own lab.

What should I submit?

Prospective participants should prepare an application that includes the following information:

- Research Statement: a two-page abstract (IEEE, at least 10pt font, 2-column format) that sketches the research proposal of the PhD student, the contribution to knowledge, and how the research will advance the state of the art. The research proposal will not appear in the official conference proceedings but is planned to be published on the conference web page.

- Curriculum Vitae: a brief CV that lists the education and research interests of the PhD student.

Please provide us with a single PDF document. Upload your application via `https://phdforum.netsys2019.org`.

In addition, a poster has to be presented at the main conference in a special PhD poster session.

Important Dates

- Submission deadline: Monday, January 7, 2019

- Notification of acceptance: Monday, January 28, 2019

- PhD Forum: Monday, March 18, 2019

PhD Forum Chairs

- Oliver Hohlfeld – RWTH Aachen University, Germany

- Matthias Wählisch – Freie Universität Berlin, Germany

Keynote Speakers

At the PhD Forum we will have two keynote talks given by young and well-established experts. Johann Schlamp and Heiko Will will share their insights into specific technical topics, as well as experiences in professional research in academia and industry.

- Johann Schlamp (Founder and CEO, Leitwert)
  Keynote: Fun & Profit: Building an Internet-scale measurement infrastructure

- Heiko Will (CTO, Safety io)
  Keynote: Innovation and development of advanced solutions from a software perspective

  More information: `http://netsys2019.org/calls/phd-forum/`

12. DFN-Forum Kommunikationstechnologien
– Verteilte Systeme im Wissenschaftsbereich –

Dienstag, 14.05.2019 – Mittwoch, 15.05.2019 in Magdeburg

CALL FOR PAPERS

Der Verein zur Förderung eines Deutschen Forschungsnetzes e.V. (DFN-Verein) veranstaltet gemeinsam mit der Otto-von-Guericke-Universität Magdeburg am 14. und 15. Mai 2019 das 12. DFN-Forum Kommunikationstechnologien. Mitveranstalter sind die Zentren für Kommunikation und Informationsverarbeitung in Forschung und Lehre e.V. (ZKI) und die Gesellschaft für Informatik e.V.

Das 12. DFN-Forum Kommunikationstechnologien „Verteilte Systeme im Wissenschaftsbereich" ist eine Plattform zur Darstellung und Diskussion neuer Forschungs- und Entwicklungsergebnisse aus dem Bereich TK/IT. Das Forum dient dem Erfahrungsaustausch zwischen Wissenschaftlern und Praktikern aus Hochschulen, Großforschungseinrichtungen und Industrie.

Es wird um Beitragseinreichungen zu den nachfolgend aufgeführten Themenkreisen (TK) gebeten:

TK I: Neue Netztechnologien und Infrastruktur

Software Defined Networking

Network Functions Virtualization (NFV)

Internet of Things

Netze für High Performance Computing

Netzmanagement, -monitoring & Telemetry

TK II: ITC Management & Sicherheit

Service Management

Identity Management, AAI

IDS/IPS; NG-Firewalls, Tools

IT Security Awareness

Hochschullehre u. IT-Sicherheit

Datenschutz / EU Datenschutz-Grundverordnung

TK III: Infrastrukturen für eResearch

Grid and Cloud Computing

Sharing and Collaboration

Service Oriented Computing & Architectures

Virtuelle Forschungsumgebungen

Forschungsdatenmanagement

Big Data in eScience und dessen Netzaspekte

TK IV: IT-Zukunftsperspektiven

Wissenschaftsvernetzung in 10 Jahren

Künftige organisationsübergreifende IT-Infrastrukturen für Forschung und Lehre

HPC-Infrastrukturen in Europa

Cloud Services

Blockchain-Technologien

Beitragseinreichung:

Bitte reichen Sie Ihre Beiträge (PDF-Format, Länge max. 10 Seiten) bis **16.12.2018** ein unter:

https://www.dfn.de/dfn-forum2019

(Details zum Format der endgültigen Fassungen siehe diese Web-Adresse)

Die angenommenen Beiträge werden im Konferenzband veröffentlicht, der im Rahmen der GI-Edition Lecture Notes in Informatics erscheinen wird.

Für den besten Nachwuchs-wissenschaftlerInnen-Beitrag (Hauptautor (in)/Vortragende(r) bei Einreichung nicht promoviert) wird durch den DFN-Verein in Kooperation mit einem Sponsor der X-WiNner-Award (dotiert mit 1000 €) vergeben.

Wichtige Termine:

Einreichung der Beiträge:
16. Dezember 2018

Autorenbenachrichtigung:
24. Februar 2019

Abgabe der endgültigen Fassung:
24. März 2019

Programmkomitee:

Rainer Bockholt, Universität Bonn
Alexander Clemm, Futurewei
Gabriele Dobler, Landesamt für die Sicherheit in der Informationstechnik, Nürnberg
Gabi Dreo (Co-Chair), Universität der Bundeswehr München
Thomas Eickermann, FZ Jülich
Alfred Geiger, T-Systems SfR
Andreas Hanemann, FH Lübeck
Ulrich Lang, Universität zu Köln
Michael Menth, Universität Tübingen

Paul Müller, TU Kaiserslautern
Bernhard Neumair (Co-Chair), KIT
Christa Radloff, Universität Rostock
Helmut Reiser (Co-Chair), LRZ München
Sebastian Rieger, Hochschule Fulda
Uwe Schwiegelshohn, TU Dortmund
Marcel Waldvogel, Universität Konstanz
Stefan Wesner, Universität Ulm
Rene Wies, BMW Group
Martin Wimmer, DZNE, Bonn
Gregor Zimmermann, Universität Magdeburg

3.12.3   Call for Proposals to organize the International Conference on Embedded Wireless Systems and Networks (EWSN) 2020

www.ewsn.org

The International Conference on Embedded Wireless Systems and Networks (EWSN) is a leading international conference devoted to exchange of research results in the field of wirelessly networked embedded systems. The conference structure has been revised in 2016, the scope has been broadened while there is a featured topic each year that puts a focus on a hot topic without excluding other topics in the scope of the conference. The featured topic is supported by special events such as the very successful dependability competition in 2016, 2017, and 2018. Several workshops are held in conjunction with the conference. EWSN is held in cooperation with ACM SIGBED and ACM SIGMOBILE, proceedings are published in the ACM Digital Library following an open access model.

The EWSN Steering Committee is seeking proposals for the organization of EWSN 2020 with focus on Europe, but we are also open to locations worldwide that are easily reachable from Europe. Such proposals should contain:

- Description of the proposed venue (pictures help)

- Reachability of the venue from Europe and the World

- Options for accommodation in the vicinity of the venue, including approximate room rates

- Options for social events

- Names and short biographies of the proposed general chair and program chairs

- Outline of the conference budget including estimated registration fees

- Research and industry activities related to EWSN in the region of the venue

- Suggestions for a featured topic along with special events supporting this topic

Proposals should be sent by email as a single PDF file containing at most 6 pages to Kay Römer ¡roemer@tugraz.at¿. The steering committee will review all proposals and may contact the proposers to obtain additional information. The submission deadline for proposals to host EWSN 2020 is January 13, 2019. Notifications will be sent well before EWSN 2019 takes place (February 25-27, 2019 in Beijing, China) where the proposer is expected to introduce next year's venue to the audience.

Since 2004, EWSN has been annually held in February at European destinations such as Berlin (Germany), Istanbul (Turkey), Zurich (Switzerland), Delft (Netherlands), Bologna (Italy), Cork (Ireland), Coimbra (Portugal), Graz (Austria), or Madrid (Spain). In 2019, EWSN is held for the first time outside of Europe, at Tsinghua University in Beijing, China. It is a 3-day event with workshops on the first day, followed by a two-day single-track technical program.

In addition to that, special events (e.g., dependability competition) have been held before the conference. An important element of the conference is a combined demonstration and poster session with 30-50 exhibits. The conference was typically held on a university campus. In the last years it typically had about 150 attendees.

EWSN Steering Committee:

Koen Langendoen, TU Delft, The Netherlands

Kay Römer, TU Graz, Austria

Thiemo Voigt, Uppsala University and SICS, Sweden

Andreas Willig, University of Christchurch, New Zealand

Adam Wolisz, TU Berlin, Germany

Abgeschlossene Promotionen

4.1   Bastian Bloessl, (Falko Dressler, Universität Paderborn)

Title: A Physical Layer Experimentation Framework for Automotive WLAN

Abstract: Future cars will be equipped with communication modules that allow them to exchange information directly with each other and potentially infrastructure nodes, forming a Vehicular Ad Hoc Network (VANET). Through communication, cars will be able to coordinate and drive cooperatively, which will make transportation safer, more efficient, and more comfortable than ever before. One of the considered technologies for vehicular networks is IEEE 802.11p, a slightly modified version of consumer Wireless LAN (WLAN) that was adapted to better fit the characteristics of vehicular environments. While the decision to rely on readily available technology might ease market introduction, it also raises the question whether a physical layer that was designed for relatively static indoor environments can provide reasonable performance in highly dynamic VANETs. Using Software Defined Radios (SDRs), i.e., fully programmable radios, we are able to address this question, as they allow us to closely examine and modify the physical waveform. We made SDR accessible for research on VANETs by imple- menting the first IEEE 802.11p transceiver for GNU Radio, a popular real-time signal processing framework for use in SDRs. Performing all signal processing on a PC, our transceiver is well-suited for rapid prototyping and can be used for simulations as well as real-world experiments, offering a seamless switch from theory to practice. In the first part of the thesis, we detail the design of our IEEE 802.11p transceiver, study its computational complexity, and present results from thorough validations through simulations and interoperability tests. We furthermore show that it is possible to support time-critical functionalities like channel access and automatic gain control without giving up the advantages of a PC implementation. In the second part, we use our transceiver to address selected research questions in VANETs. Here, we conduct field tests to compare the performance of different devices and algorithms in realistic environments and study the impact of noise and intra-technology interference on IEEE 802.11p. Finally, we show a use-case for our transceiver that goes beyond signal processing: With full access to all information down to the physical layer, we develop a novel, robust attack on the location privacy of vehicles and study its impact through network simulations.

4.2 Florian Klingler, (Falko Dressler, Universität Paderborn)

Title: Efficient Wireless Communication in Vehicular Networks

Abstract: Wireless communication among vehicles has been shown to be beneficial for a variety of use cases in the automotive domain ranging from pure safety to traffic efficiency and to entertainment applications. To accomplish communication, different protocol stacks have been standardized around the world, e.g., ETSI ITS-G5 in Europe and IEEE 1609 WAVE in the U.S., both building upon IEEE 802.11p WLAN, yet for many applications, efficiency is still a problem. We thus begin this PhD thesis with an analytical investigation of the capacity bounds of IEEE 802.11p. As a first contribution towards efficient wireless communication, we study the performance of IEEE 802.11p based unicast communication, which is, e.g., used by the ETSI ITS-G5 GeoNetworking specification. Our investigations reveal that unicast communication employing retransmissions at the MAC layer is not only not beneficial in vehicular communications, but maybe harmful in typical scenarios, as it leads to higher communication delays. Based on our findings and current limitations of ETSI ITS-G5, we present as a second contribution a purely broadcast based networking architecture, which categorizes communication demands of applications into four distinct classes. A central building block of our network layer is the support of 2-hop neighbor information using space efficient Bloom filters to provide nodes a better overview of their vicinity. In our third contribution, we take a detailed look on how to properly maintain this neighbor information and propose Bloom Hopping, a 2-hop message dissemination protocol, which operates independently from the road topology. Simulation results show that it can outperform traditional 2-hop approaches (not using Bloom filters) in terms of requiring less channel resources and providing better application performance. As a fourth contribution, we focus on the scalability of vehicular communication by taking advantage of multi-channel operation similar to what has been proposed in IEEE 1609.4 WAVE. In particular, we design a set of scheduling algorithms that answer the question when to send which information on which channel. Results reveal that our system has lower channel resource requirements and provides better application layer performance in comparison to single-channel protocols. As a summary, we believe the work presented in this PhD thesis brings vehicular communication forward in research and one step closer to the road.

4.3 Andreas Blenk (Wolfgang Kellerer, Technische Universität München)

Title: Towards Virtualization of Software-Defined Networks: Analysis, Modeling and Optimization

Am 9. Nov. 2018, wurde Herr Dr.-Ing. Andreas Blenk mit dem "Kurt Fischer-Promotionspreis" der Fakultät für Elektrotechnik und Informationstechnik der Technischen Universität München für seine Dissertation ausgezeichnet.

Abstract:

Heutige Kommunikationsnetze können die stark variierenden und sich schnell ändernden Anforderungen durch immer unterschiedlichere Applikationen und Dienste nicht mehr effizient bewältigen. Netzprotokolle und Algorithmen wurden ursprünglich nicht dafür entwickelt, unterschiedliche Applikationen und Dienste differenziell zu behandeln und sich schnell an wechselnde Dienstanforderungen anzupassen. Neue Netzkonzepte wie Network Virtualization (NV) und Software-Defined Networking (SDN) bieten das Potential, die bestehenden Probleme, wie das Fehlen an Flexibilität und schneller Anpassbarkeit, zu lösen. Die Einführung beider Konzepte führt jedoch zu neuen Herausforderungen, die bewältigt werden müssen. Unter anderem müssen Virtualisierungsschichten für Netze geschaffen werden, welche eine geringe Latenz bzgl. der Steuerung der Netzressourcen erreichen. Außerdem haben Nutzer virtueller Netze durch die Einführung beider Konzepte hohe Anforderungen an die Betreiber der Kommunikationsnetze. Sie erwarten eine schnelle, nahezu augenblickliche Bereitstellung ihrer angeforderten virtuellen Netzressourcen.

Diese Dissertation präsentiert Messmethoden sowie den Entwurf einer flexibel anpassbaren Virtualisierungsschicht für die Virtualisierung Software-basierter Netze. Weiter führt diese Arbeit mathematische Modelle ein, welche es erlauben, die Planung der zentralen Steuerung der Virtualisierungsschicht zu optimieren und zu analysieren. Mit Hinblick auf die schnelle Bereitstellung von Netzressourcen beschäftigt sich diese Arbeit mit Optimierungsansätzen, welche Methoden aus dem Bereich des Maschinellen Lernens einsetzen.

NV zielt darauf ab, virtuelle Netze mit hoher und garantierter Dienstgüte bereitzustellen. Dies benötigt allerdings eine gut konzipierte Virtualisierungsschicht. Die Herausforderung liegt darin, dass sogenannte Netzhypervisoren, welche die Virtualisierungsschicht realisieren, selbst zu Überlagerungen der Netz- und Rechenressourcen und damit zu Garantieverletzungen virtueller Netze führen können. Diese Dissertation trägt mit der Entwicklung eines Messwerkzeuges dazu bei, die Steuerung von Virtualisierungsschichten zu untersuchen. Messungen zeigen dabei die Quellen für Ressourcenüberlagerungen innerhalb von Netzhypervisoren auf. Basierend auf diesen Beobachtungen wird ein Konzept einer Virtualisierungsschicht mit hoher Garantiegüte sowie Anpassungsfähigkeit vorgestellt. Messanalysen des Konzepts zeigen, dass durch gezielte Isolation virtueller Netze deren Garantien eingehalten werden können. Gleichzeitig geben die Messungen Aufschluss darüber, welchen Einfluss Anpassungen der Virtualisierungsschicht zur Laufzeit auf die zentrale Steuerung haben können.

Die Verwendung von Netzhypervisoren birgt weitere Herausforderungen. Unter anderem muss die Frage beantwortet werden, wie viele Netzhypervisoren notwendig sind und an welchen Orten diese für eine optimale Latenz der Steuerungsschicht platziert werden müssen. Ähnlich

wie die Steuerungseinheiten von SDN Netzen werden Netzhypervisoren vorwiegend in Software implementiert. Dadurch können sie die Flexibilität nutzen, welche durch Softwareimplementierung ermöglicht wird: Netzhypervisoren können überall im Netz auf Servern ausgeführt werden. Das zugrundeliegende Platzierungsproblem von Netzhypervisoren ist jedoch wie das Platzierungsproblem von Steuerungseinheiten in SDN Netzen algorithmisch schwer. Diese Arbeit stellt Optimierungsmodelle für die Platzierung von Netzhypervisoren vor. Die Lösungen der Optimierungsmodelle geben Antworten dar- auf, wie viele Hypervisoren wo genutzt werden müssen. Weiter werden die Modelle für statischen und dynamischen Netzverkehr untersucht. Besonders für Netze mit einem hohen Bedarf an dynamischer Anpassung wird erwartet, dass NV und SDN neue Möglichkeiten für eine bessere Nutzung der Netzressourcen bieten.

Die Verwendung von NV und SDN erhöht auch die Anforderungen an die Bereitstellung virtueller Netze: virtuelle Netze können jederzeit angefordert werden. Dazu benötigen Netzbetreiber jedoch effiziente und insbesondere schnelle Algorithmen, welche die angeforderten virtuellen Ressourcen im physikalischen Netz reservieren. Die Betreiber virtueller Netze profitieren generell von einer schnellen Bereitstellung – dementsprechend bieten schnelle Algorithmen Geschäftsvorteile für die Betreiber der physikalischen Infrastruktur. Diese Dissertation untersucht das Potential von Maschinellem Lernen, um schnellere und effizientere Reservierungen physikalischer Ressourcen für virtuelle Netze zu ermöglichen. Es werden Methoden vorgestellt, die mithilfe neuronaler Berechnung Optimierungsprobleme schneller lösen: durch die neuen Methoden kann der Suchraum von Optimierungsproblemen effizient eingeschränkt werden. Außerdem wird ein System vorgestellt, das die Lösungsdaten von Optimierungsproblemen nutzt, um die Effizienz von Algorithmen im Hinblick auf zukünftige Probleminstanzen zu steigern.

4.4   Raed Al-Aaridhi (Kalman Graffi, HHU Düsseldorf)

Title: Secure Distributed Data Structures in Peer-to-Peer Networks

Abstract: Nowadays, the Internet is very important in human daily life and has the potential to change the society via a large scale of applications which play a great role to develop a wide range of fields such as in industry and to enable basic communication between wide ranges of the people. The majority of these applications are provided technically from single entities such as a server or group of servers as a centralized point of service. They inherently carry the risk of misuse of private information, sensitive data leakage, snooping and spying on the users due to the central access of the supplier. Peer-to-peer (P2P) networks emerged in the Internet in order to provide new network functionality to interested peers, such as direct user-to-user communication, without the need of central providers. Due to the features and advantages of the decentralized approach of P2P networks such as robustness, scalability and no single point of failure, various large-scale application domains with diverse functionality requirements may be addressed.

The users in P2P networks provide each other data and in order to build more advanced appli- cations such as social networks or distributed computing graphs, more advanced data structures such as sets, lists and trees should be supported by a P2P storage overlay with convenient ac- cess to these entries. In this thesis, we focus on the improvement of storage approaches in P2P networks and therefore introduce a new concept for distributed data structures by designing a new storage layer for P2P networks which allow the storage of complex data structure, as well as guarantee that the data will still be available using a special replication mechanism. To achieve that, our approach is based on three main parts.

In the first part, we focus on storage data and this entails a suitable storage service layer in P2P networks. Therefore, we design and evaluate a new layer named Distributed Data Structure (DDS). This layer persists data on a distributed hash tables (DHT), among multiple users, providing advance data structures like lists, sets, trees or single objects. The main idea behind the implementation is that a set, list or tree is stored in the DHT as data items containing ID information, pointers, and payload. DDS distributes the storage of the data over various nodes. A DDS supports to store DDS, retrieve DDS, modify DDS, adding and deleting entries in a DDS. In the evaluation of this DDS concept, all elements of each DDS are successfully stored and retrieved. Further, the evaluation shows that the approach comes with low overhead and delay.

In the second part of the thesis, we deal with the challenges of adding services for this DDS storage layer, such as search mechanisms of metadata as well as computational elements to DDS. These services are essential for our DDS approach in order to add new functionality that is required by complex P2P applications. In detail, we propose an extension for the DDS called the Computational Data Element, which interprets and computes the DDS payload and thus supports distributed function resolution. Furthermore, we introduce efficient algorithms that support metadata searches for the DDS in structured P2P networks.

In the third part of the thesis, we deal with the security issues for our DDS approach. Therefore, we propose a secure model for DDS, which guarantees security and access control

of the data storage in the DDS in the P2P network using security mechanisms. The proposed security mechanism works completely without any trust between nodes in the networks.

In conclusion, we propose a secure distributed data structure scheme, a new methodology to store advanced data structures such as sets, lists, and trees in P2P overlay networks. We show that sophisticated P2P applications such as online social networks can be built on top of the DDS scheme as well as that new functionalities can be added to our storage scheme on the top of DDS layer. In the evaluation, we show that the approach provides the desired functionality, distributed the load and comes with low overhead and delay. We further show that our approach is secure through its integrated security mechanisms which are proposed to guarantee that the DDS is secure. We believe that our secure DDS approach will benefit the creation of further P2P-based applications.

4.5   Andreas Disterhöft (Kalman Graffi, HHU Düsseldorf)

Title: OverlayMeter: Robust System-wide Monitoring and Capacity-based Search in Peer-to-Peer Networks

Abstract: Im letzten Jahrzehnt fanden viele Forschungsaktivitäten im Bereich von Peer-to-Peer-Systemen statt. Applikationen, die das Peer-to-Peer-Paradigma anwenden, sind gegenwärtig und deren Verkehrsaufkommen macht, abhängig von der Region, einen signifikanten Anteil am Gesamtverkehrsaufkommen im Internet aus. Das definierte Ziel der Systeme ist die Schaffung einer gewissen Servicequalität, was in dezentralen Systemen eine Herausforderung darstellt. Diese beruht auf der Tatsache, dass Teilnehmer aufgrund ihrer vorliegenden Informationen Entscheidungen treffen müssen. Um optimale Entscheidungen treffen zu können, ist eine solide und umfangreiche Datenbasis unabdingbar. Die Literatur hält hierfür Monitoring-verfahren bereit, worauf in dieser Arbeit aufgebaut wird. Unter Monitoring wird die Daten-erfassung und Verteilung von System- und Teilnehmer-spezifischen Daten verstanden. Diese Dissertation beschäftigt sich mit offenen Forschungsfragen zur Verbesserung und Erweiterung von Monitoringverfahren. Ferner werden Fragestellungen zur Vereinfachung von Abläufen zur Inbetriebnahme solcher Peer-to- Peer-Systeme angegangen.

Im ersten Teil beschäftigen wir uns mit Monitoringverfahren im System-spezifischen Kontext. Hier setzen wir auf Baum-basierte Verfahren, denen wir das größte Potenzial zusprechen, und gehen vorhandene Probleme in deren Robustheit an. Modernste Baum-basierte Verfahren in der Literatur werden als hoch präzise aber nicht robust eingestuft, welche der Dynamik der Teilnehmer geschuldet ist. Als Folge werden Kommunikationspfade entlang des Baumes gestört, unterbrochen und im schlimmsten Fall müssen diese rekonstruiert werden. Dies führt zu Datenverlust, was sich negativ auf die Präzision auswirkt. Unsere Antworten auf offene Forschungsfragen umfassen die Einführung von Redundanz in einer smarten Verteilungsfunktion und die Vorstellung zusätzlicher Mechanismen, die für eine verbesserte Wahrnehmung der Monitoringstruktur sorgen. Zwei Verfahren werden im Rahmen dieser Dissertation vorgestellt. Diese erhöhen die Robustheit signifikant, halten die Präzision auf einem gleichbleibend hohem Niveau und weisen ein gutes Kosten-Nutzen-Verhältnis auf.

Neben der Verbesserung von vorhandenen Monitoringsystemen, behandeln wir Phänomene, die zu einer Beeinträchtigung des Monitoringergebnisses führen. Der Einfluss von bösartigen Teilnehmern in Monitoringverfahren wird in der Literatur nicht hinreichend analysiert und vorhandene Lösungen zum allgemeinen Umgang solcher Teilnehmer sind komplex und könnten weitere Angriffsvektoren schaffen. Wir analysieren den Einfluss von bösartigen Teilnehmern, die Ergebnisse manipulieren oder sich nicht an die Protokollspezifikationen halten, betonen die gravierenden Schwachstellen und stellen Mechanismen zur Abschwächung vor. Wir zeigen in einer umfangreichen Evaluation, dass Manipulationsangriffe anhand einer Ausreißererkennung auf eine konvexe Hülle beschränkt und Angriffe auf die Monitoringstruktur durch die Verifizierung der Herkunft gemindert werden können. Insgesamt agiert die Erweiterung passiv und ist somit vielseitig einsetzbar. Zum anderen verfolgen wir ein bisher nicht diskutiertes Feld im Monitoring; der unvollständige Teilnahme von Benutzern in Monitoringverfahren. Wir ermitteln den Einfluss, den das Verhalten auf die Präzision des Monitorings hat, und stellen eine Lösung für

das Problem vor. Wir fokussieren uns auf die Einsammlung des globalen Zustands des Systems und sind somit an den Monitoringinformationen aller Benutzer interessiert. Als Lösung stellen wir ein generisches Verfahren vor, welches in Form einer Middleware agiert, um vorhandene Monitoringverfahren wiederverwenden zu können. Hierbei setzen wir auf eine Organisation der aktiven Teilnehmer, um per Probingmechanismen die passiven Teilnehmer zu vermessen und diese Informationen in das Monitoring einzuspeisen. Die Evaluation zeigt eine hohe Präzision, die unter anderen von der Präzision der Probingverfahren abhängt. Neben der Erhebung von System-spezifischen Daten gehen wir die Teilnehmer-spezifische Datenerhebung und die Suche nach Knotenkapazitäten an. Das Ziel ist die Schaffung einer effizienten Indizierungsstruktur, welche die vielfältigen und hoch dynamischen Kapazitäten der Teilnehmer effizient und verteilt speichert, und einer präzisen Suche nach Teilnehmern, die spezifische Anforderungen erfüllt. Unsere Motivation für solche Systeme zielt auf die Delegierung von Aufgaben und der Realisierung von verteilten Berechnungen im dezentralen Kontext ab. In der Literatur werden Verfahren vorgestellt, die nicht alle Knotenkapazitäten berücksichtigen, nicht mit der Anzahl an Kapazitäten skalieren oder nicht auf hoch dynamische Daten abzielen. Wir stellen zwei Lösungen vor, die hochdynamische Knotenkapazitäten effizient halten und die Last fair auf alle Teilnehmer verteilen. Während unsere erste Lösung global die Anzahl an Kapazitäten statisch setzt, verwendet unsere zweite Lösung einen dynamischen Ansatz. Die vorgestellten Suchprozesse arbeiten schnell und präzise, womit diese den gestellten Anforderungen genügen.

Im letzten Teil dieser Arbeit richten wir den Fokus auf ein Hemmnis bei der Verwendung von Peer-to-Peer-Software: der Installation und Einrichtung der benötigten Drittanbietersoftware. Wir schlagen die Verwendung von der allseits bekannten Web-Umgebung vor. Benutzer öffnen ihren Browser und nehmen den gewünschten Service in Anspruch, indem die jeweilige Ressource aus dem Web aufgerufen wird. Der neue WebRTC-Standard birgt die Möglichkeit direkte Verbindungen zwischen Browser-Instanzen aufzubauen und bietet somit die Möglichkeit der Verwendung von Peer-to-Peer-Techniken im Kontext des Webs. Wir erschaffen eine Chattingplattform, welche auf ein Peer-to-Peer-Overlay aufbaut, evaluieren die Performance und geben einen Überblick über mögliche Problematiken dieser neuen Möglichkeit. In einer weiteren Arbeit stellen wir eine effiziente Verteilungsstrategie von Daten vor, welche die Verteilungszeit mit einer oberen Schranke abschätzt. Dieses Verfahren wird in einem Start-up verwendet, um mit Hilfe des neuen Standards und Peer-to-Peer-Techniken Bandbreiteneinsparungen in Live-Streaming Szenarien zu realisieren. Wir fassen die vorgestellten Verfahren zu dem sogenannten Overlay-Meter zusammen, welche eine Basis für die umfangreiche Erhebung von Daten schafft. Diese Basis umfasst eine präzise und kosteneffiziente System- sowie Teilnehmer-spezifische Datenerhebung und die Suche nach Teilnehmerkapazitäten. Die Verfahren des OverlayMeters können schließlich in diversen Peer- to-Peer-Systemen eingesetzt werden, um dieses zuverlässig und präzise zu vermessen.

4.6 Martin Henze (Klaus Wehrle, RWTH Aachen)

Title: Accounting for Privacy in the Cloud Computing Landscape

Abstract: While offering many benefits, cloud computing also introduces serious privacy challenges as evidenced by recent security breaches and privacy incidents. In this dissertation, we argue that overcoming these privacy challenges requires cooperation between the various actors in the cloud computing landscape, i.e., users, service providers, and infrastructure providers. All these different actors have clear incentives to care for privacy and, with the contributions presented in this dissertation, we provide technical approaches that enable each of them to account for privacy.

As our first contribution to support users in exercising their privacy, we raise awareness for their exposure to cloud services in the context of email services as well as smartphone apps and enable them to anonymously compare their cloud usage to their peers. With privacy requirements-aware cloud infrastructure as our second contribution, we realize user-specified per-data item privacy policies and enable infrastructure providers to adhere to them. We furthermore support service providers in building privacy-preserving cloud services for the Internet of Things in the context of our third contribution by enabling the transparent processing of protected data and by introducing a distributed architecture to secure the control over devices and networks. Finally, with our fourth contribution, we propose a decentralized cloud infrastructure that enables users who strongly distrust cloud providers to completely shift certain services away from the cloud by cooperating with other users.

4.7   Alexander Frömmgen (Ralf Steinmetz, TU Darmstadt)

Title: Programming Models and Extensive Evaluation Support for MPTCP Scheduling, Adaptation Decisions, and DASH Video Streaming

Abstract: In this dissertation, we identify that the analysis, implementation, and evaluation of communication systems is hindered by two obstacles: i) missing abstractions and the resulting implementation complexity and ii) the required extensive evaluations for today's large configuration spaces and heterogeneous network environments. A prominent example is Multipath TCP – today's de facto multipathing transport protocol. Multipath TCP packet scheduler innovations are hindered by the implementation complexity of the Linux kernel network stack and the required analysis for a variety of applications and network conditions.

To tackle the first obstacle, we are the first to propose a programming model as abstraction for the design and development of Multipath TCP schedulers. We introduce the ProgMP programming model, which provides a powerful specification language and a high-level application API to specify executable Multipath TCP schedulers. We show the strength of ProgMP by implementing more than eight novel general purpose, preference-, and application- aware schedulers tackling diverse objectives. As part of these schedulers, we propose the first redundant Multipath TCP scheduler and show that this scheduler significantly reduces latency for applications with tight latency requirements but only moderate throughput needs. We use ProgMP for a detailed analysis of design decisions for the incorporation of redundancy to balance latency and throughput. We further propose schedulers that retain finegrained throughput or latency objectives, or improve the interaction with upper layer protocols such as HTTP/2, while preserving path preferences. Our detailed emulation-based and real world measurements show that ProgMP enables timely scheduling decisions and a wide range of executable, novel Multipath TCP schedulers. Beside ProgMP, which is our main contribution to overcome the first obstacle of missing abstractions, we further introduce programming models as abstraction for the adaptation decisions of adaptive communication systems. Here, we propose to specify the adaptation decision with event condition action rules and learn rules for a given utility function with genetic programming in extensive network experiments. Finally, we propose a programming model for the specification of topology adaptations in communication systems based on topology graph patterns.

To overcome the second identified obstacle and foster extensive evaluations, we present the MACI framework for the management, scalable execution, and interactive analysis of extensive network experiments. In essence, MACI is a combination and integration of established tools to foster rigorous, seamless evaluations throughout the research process. We discuss our MACI experiences during i) the development and evaluation of our proposed ProgMP schedulers, ii) the analysis of a distributed topology graph pattern matching protocol, and iii) a systematic comparison of DASH video streaming implementations. Our experiences confirm that MACI provides support for the recurring tasks in the evaluation of diverse communication systems and significantly increases research efficiency. The experiments with MACI, i. e., the ProgMP, the topology graph pattern matching, and the DASH experiments, go beyond an evaluation of MACI and significantly contribute to the understanding of these domains.

Overall, this dissertation contributes i) three programming models for the domains of Multipath TCP, adaptive communication systems, and topology adaptations in communication systems, ii) more than eight novel, deployable general purpose, preference-, and application-aware Multipath TCP schedulers, and iii) a reusable framework for the seamless execution and analysis of extensive network experiments.

4.8   Christian Koch (Ralf Steinmetz, TU Darmstadt)

Title: Efficient Proactive Content Distribution and Placement of Video-on-Demand Content

    Abstract: Video delivery over the Internet is the dominant source of network load all over the world. Especially Video-on-Demand (VoD) streaming services such as YouTube, Netflix, and Amazon Video have propelled the proliferation of VoD in many peoples' everyday life. VoD allows watching video from a large quantity of content at any time and on a multitude of devices, including smart TVs, laptops, and smartphones. Studies show that many people under the age of 32 grew up with VoD services and have never subscribed to a traditional cable TV service. This shift in video consumption behavior is continuing with an ever-growing number of users. To satisfy this large demand, VoD service providers usually rely on Content Delivery Networks (CDNs), which make VoD streaming scalable by operating a geographically distributed network of several hundreds of thousands of servers. Thereby, they deliver content from locations close to the users, which keeps traffic local and enables a fast playback start. CDNs experience heavy utilization during the day and are usually reactive to the user demand, which is not optimal as it leads to expensive over-provisioning, to cope with traffic peaks, and overreacting content eviction that decreases the CDN's performance. However, to sustain future VoD streaming projections with hundreds of millions of users, new approaches are required to increase the content delivery efficiency. To this end, this thesis identifies three key research areas that have the potential to address the future demand for VoD content. Our first contribution is the design of vFetch, a privacy-preserving prefetching mechanism for mobile devices. It focuses explicitly on Over-the-Top (OTT) VoD providers such as YouTube. vFetch learns the user interest towards different content channels and uses these insights to prefetch content on a user terminal. To do so, it continually monitors the user behavior and the device's mobile connectivity pattern, to allow for resource-efficient download scheduling. Thereby, vFetch illustrates how personalized prefetching can reduce the mobile data volume and alleviate mobile networks by offloading peak-hour traffic.

    Our second contribution focuses on proactive in-network caching. To this end, we present the design of the ProCache mechanism that divides the available cache storage concerning separate content categories. Thus, the available storage is allocated to these divisions based on their contribution to the overall cache efficiency. We propose a general work-flow that emphasizes multiple categories of a mixed content workload in addition to a work-flow tailored for music video content, the dominant traffic source on YouTube. Thereby, ProCache shows how content-awareness can contribute to efficient in-network caching.

    Our third contribution targets the application of multicast for VoD scenarios. Many users request popular VoD content with only small differences in their playback start time which offers a potential for multicast. Therefore, we present the design of the VoDCast mechanism that leverages this potential to multicast parts of popular VoD content. Thereby, VoDCast illustrates how Internet Service Providers (ISPs) can collaborate with CDNs to coordinate on content that should be delivered by ISPinternal multicast.

4.9   The An Binh Nguyen (Ralf Steinmetz, TU Darmstadt)

Title: Quality-Aware Tasking in Mobile Opportunistic Networks

Abstract: Advances in wireless technology have facilitated direct communication among mobile devices in recent years, enabling opportunistic networks. Opportunistic networking among mobile devices is often utilized to offload and save cellular network traffic and to maintain communication in case of impaired communication infrastructure, such as in emergency situations. With a plethora of built-in capabilities, such as built-in sensors and the ability to perform even intensive operations, mobile devices in such networks can be used to provide distributed applications for other devices upon opportunistic contact. However, ensuring quality requirements for such type of distributed applications is still challenging due to uncontrolled mobility and resource constraints of devices. Addressing this problem, in this thesis, we propose a tasking methodology, which allows for assigning tasks to capable mobile devices, considering quality requirements. To this end, we tackle two fundamental types of tasks required in a distributed application, i.e., information retrieval and distributed processing. Our first contribution is a decentralized tasking concept to obtain crowd collected data through built-in sensors of participating mobile devices. Based on the Named Data Networking paradigm, we propose a naming scheme to specify the quality requirements for crowd sensing tasks.With the proposed naming scheme, we design an adaptive self-organizing approach, in which the sensing tasks will be forwarded to the right devices, satisfying specified quality requirements for requested information. In our second contribution, we develop a tasking model for distributed processing in opportunistic networks. We design a task-oriented message template, which enhances the definition of a complex processing task, which requires multiple processing stages to accomplish a predefined goal. Our tasking concept enables distributed coordination and an autonomous decision of participating device to counter uncertainty caused by the mobility of devices in the network. Based on this proposed model,we develop computation handover strategies among mobile devices for achieving quality requirements of the distributed processing.

Finally, as the third contribution and to enhance information retrieval, we integrate our proposed tasking concept for distributed processing into information retrieval. Thereby, the crowd-collected data can be processed by the devices during the forwarding process in the network. As a result, relevant information can be extracted from the crowd-collected data directly within the network without being offloaded to any remote computation entity. We show that the obtained information can be disseminated to the right information consumers, without over-utilizing the resource of participating devices in the network.

Overall, we demonstrate that our contributions comprise a tasking methodology for leveraging resources of participating devices to ensure quality requirement of applications built upon an opportunistic network.

4.10 Leonhard Nobach (Ralf Steinmetz, TU Darmstadt)

Title: Seamless Flexibility in High-Performance Network Functions Virtualization

Abstract: Communication network carriers are challenged to continuously deliver higher performance, more adaptable network services to even lower costs. Network Functions Virtualization (NFV) is an architectural concept aiming to decrease costs and increase flexibility of a network infrastructure. In an NFV architecture, network functions, which are traditionally executed on specialized appliance hardware, are executed on standard, inexpensive, and general-purpose servers. Furthermore, NFV applies cloud computing principles to the network functions implemented for standard hardware, enabling elasticity, flexibility and a fast time-to-market. For a sufficient flexibility, it is often desired that network function instances can be quickly moved between physical locations while they are in operation, which requires seamless state migration. Existing state migration mechanisms have been primarily designed for and tested in intra-datacenter situations. However, new concepts like carrier edge clouds and fog computing might require a state migration method for network function instances over long-distance links. The latters likely do not provide the throughput and latency available in a datacenter. We have identified that current methods can only migrate seamless in long-distance situations, if either the network function or the long-distance link is subject to low utilization. Furthermore, there are currently elasticity limits when using hardware acceleration for NFV environments. Due to the fixed set of commodity CPU and hardware acceleration resources on a computing node, either of the aforementioned resource types might become underutilized. Furthermore, the extraordinarily high performance of widely-available, inexpensive chipsets found in network switches could highly increase resource efficiency of network functions. However, the use cases of these chipsets are commonly limited in functionality, and it is unclear if a carrier-grade network function can be implemented by using them.

In this thesis, we propose a seamless migration mechanism for virtualized network functions, which reduces the state migration traffic compared to the state of the art by omitting redundant information. Our evaluation shows that if compared to the state of the art, the reduction of the migration traffic allows an almost three-fold increase of the network function instance's or the link's utilization during migration, while completing the migration in only one third of the time. We propose an architecture which meets elasticity demands of network function implementations requiring heterogeneous processing resources like FPGAs, commodity CPUs, or in-network processing. We furthermore propose a method to quantify the benefits of elastic FPGA provisioning. Finally we investigate the functionality of a widely-used switching chipset in the context of carrier network functions, and conclude that all essential features of a Broadband Remote Access Server (BRAS) can be implemented using it. Overall, we show that we can improve flexibility through enabling NFV state migration over long-distance links, as well as resource efficiency via increased hardware acceleration utilization.

4.11   Denny Stohr (Ralf Steinmetz, TU Darmstadt)

Title: User-centric Video in the Future Internet: QoE in Participatory Video Generation and Distribution

Abstract: Today, more than 73 percent of all transmitted data on the Internet is video traffic, making it the central network application which is used by billions of users globally; with new service offerings, improving content quality and, an increasing number of customers, also, new challenges arise in this domain. For example, streamed video is viewed and shared more than ever on mobile devices, bandwidth requirements rise to support standards with superior qualities like 4K and HDR, and worldwide service offerings come with diverse network environments to handle. Driven by these challenges, this dissertation presents research with the central goal to measurably improve users' Quality of Experience in current and future video applications on the Internet. We present findings in integral parts of video streaming applications, comprising adaptive live mobile broadcasting and video on demand use cases within three integrative research areas. In our first contribution, we initially present results of a measurement study on live mobile video broadcasting services that show the video upload quality to be particularly impaired when mobile connections are used. For the automatic composition of live video, the quality of such mobile broadcasts are a prerequisite for achieving a high user satisfaction by switching between the best available content from multiple sources. However, the current approach to upload all available live user-generated video streams for mobile video composition leads to a high overhead on mobile devices. Our work presents a new method based on device context measurements that allows to drastically improve efficiency in such automatic video composition systems by identifying the relevant quality indicators on the device based on derived sensor and network measurements. We achieve an improvedQuality of Experience with our proposed context-based streamselection method as verified in a field test and a crowd-sourced user study. Next, in the context of the distribution of video on demand content using Dynamic Adaptive Streaming over HTTP (DASH), we show that strong potential lies in investigating the cross-layer configuration space of video streaming systems, given the wide range of interdependent system aspects, environments, and service requirements as opposed to state-of-the-art research that focuses on single system aspects such as adaptation algorithms. By generating a broad set of experiments, i. e., covering a wide spectrum of cross-layer DASH video streaming system configuration parameters, we identify such performance aspects related to, e. g., the TCP congestion control, adaptation algorithms, and DASH players within heterogeneous network environments. We show that a subset of concrete configurations can improve DASH user experience in video on demand applications, and further motivate transitions of such DASH mechanisms based on learned sweet spot configurations.

Last, we envision that in the long term, more fundamental changes to the underlying network infrastructure of the Internet need to be considered for addressing the demands of developing video streaming systems by investigation of adaptive video distribution in Named Data Networks (NDNs). First, we show that the naïve application of established concepts in DASH adaptation algorithms, that use buffer or segment throughput measurements as input, lead to unfavorable results given substantial differences in the network behavior of NDN. Our proposed concept

for adaptation algorithms in NDNs is based on an improved network throughput measurement method and is shown to reduce stalling and increase streaming bitrates as compared to approaches used in current DASH adaptation algorithms. Overall, this dissertation provides the following contributions: i) first, a detailed emulation-based analysis and comparison of today's DASH system implementations and algorithms, ii) novel concepts to enable efficient live mobile video composition, iii) and last, significant improvements in the performance for adaptive video streaming systems with the emerging NDN paradigm.

4.12   Michael Stein (Max Mühlhäuser, TU Darmstadt)

Title: Local Algorithms for Distributed Topology Adaptation

Abstract:

In communication networks, the connectivity between nodes is conceptualized as network topologies. Topologies constitute a crucial aspect of network design, maintenance, and optimization. Topology adaptations modify topologies at runtime to optimize the network w.r.t. given goals, e.g., energy conservation or load balancing. Topology adaptations shall be scalable and efficient; a concern that is commonly pursued by designing distributed algorithms (without centralized control) that are 'local' in the sense that each node acts based on limited knowledge about the network. Although locality is a major concern even beyond the field of topology adaptation, the distinguishing characteristics and graduations of local algorithms have been explored insufficiently in practice. The consensus among designers of distributed algorithms mainly restricts to the statement that local algorithms have a bounded view of the topology. This dissertation contributes to the systematic understanding of locality in the field of topology adaptation. Among other things, the dissertation presents a classification of locality, novel local algorithms for topology adaptation, and a systematic approach for locality control of existing topology adaptations.

4.13 Malte Zuch (Arne Koschel, HS Hannover & Andreas Rausch, TU Clausthal)

Title: Elektromobilität und das Problem der Ladesäulenwahl

Abstract: Elektromobilität und das Problem des Aufladens kennzeichnen sich aktuell noch durch das Auffinden unbelegter Ladesäulen und lange Ladezeiten für den Endkunden. Geringe Fahrreichweiten der ersten Generationen von Elektrofahrzeugen und die begrenzte Verfügbarkeit öffentlicher Schnellladesäulen untermauern die öffentliche Wahrnehmung der Elektromobilität häufig mit dem Begriff der Reichweitenangst. Der Fahrzeugnutzer ist es gewohnt, unkompliziert in einem gut ausgebauten Tankstellennetz jederzeit bis zu eintausend Kilometer Reichweite in wenigen Minuten Tankzeit für bestehende Fahrzeuge mit Verbrennungsmotoren zu erwerben. Diese Einfachheit bietet Elektromobilität aktuell nicht. Es existieren unterschiedliche Steckersysteme, uneinheitliche Preismodelle der Ladesäulenbetreiber, Anmeldepflichten der Kunden bei den Ladesäulenbetreibern, unterschiedliche Ladeleistungen und umständliche Abrechnungssysteme. Das alternative Aufladen am Hausstromanschluss erfordert mehrere Stunden Ladezeit und verlangt von Fahrern einen eingeschränkten Mobilitätsradius in der Nähe des Hausstromanschlusses. Doch selbst wenn all diese Teilprobleme gelöst werden, verbleibt die technologiecharakteristische Problematik der langen Ladezeiten. Denn selbst an Schnellladesäulen treten Ladezeiten von 25 min auf und übersteigen damit die regulären Tankzeiten von etwa 2,5 min um das Zehnfache. Und diese langen Ladezeiten treten entsprechend häufig auf, denn die geringe Fahrreichweite aktueller Elektrofahrzeuge führt dazu, dass Elektrofahrzeuge häufiger Ladesäulen aufsuchen müssen, als gängige Fahrzeuge mit Verbrennungsmotoren Tankstellen aufsuchen. Das häufige Aufsuchen von Ladesäulen innerhalb der noch unzureichend ausgebauten Ladeinfrastruktur und die bei der Ankunft erforderlichen langen Ladezeiten können Blockierungen und Wartezeiten zwischen den Fahrern von Elektrofahrzeugen bei der Ankunft an den Ladesäulen provozieren. Dabei stellt sich schon heute und zukünftig noch viel mehr folgende Frage: ¿¿ Wie können Fahrer von Elektrofahrzeugen individuell durch Berücksichtigung ihrer persönlichen Präferenzen bei ihrer Ladesäulenwahl durch Optimierung auf der Basis der von ihnen bereitgestellten Fahrzeugpositionsdaten und Akkustanddaten von einem kollaborativen Ladesäulenmanagementsystem unterstützt werden, sodass es zu weniger gegenseitigen Blockierungen an Ladesäulen kommt und damit die öffentliche Ladesituation verbessert werden kann, und wie stören Fahrer diese Optimierung, die keine Daten bereitstellen möchten oder können? ¡¡ Diese Fragestellung wird im Rahmen der vorliegenden Arbeit beantwortet.

4.14   Mohamed Hail (Stefan Fischer, Universität Lübeck)

Title: Named Data Networking for the Internet of Things

Abstract: Internet of Things (IoT) systems have become the central part of future internet research. In the IoT, heterogeneous devices are connected to sense the environment or to observe individual tasks. Many research fields use the seamless IoT infrastructure to interact with the integrated devices and diverse services. Furthermore, IoT is a promising technology to increase the comfort and quality of life and opens new ways of interaction between people and things. In IoT systems:

1. Devices communicate with each other through the Internet.
2. Devices are equipped with sensors that sense the environment.
3. Data collected from sensors are reachable from any place in the world.
4. Devices can communicate and learn from each other.

Besides that, the main goal of IoT is to connect things and people together so that people can deliver desired information in the form of digital entity anytime and anywhere. IoT deals with the need of human wishes in different fields. In the last year, many research fields like health-care and home automation consider IoT as an essential research area. Real life applications in healthcare sectors, home automation, industry, smart cities, monitoring scenarios, etc. benefit from the low-cost wireless technology in IoT on one hand. On the contrary, IoT system has many challenging features: many devices are resource- constrained with energy and memory, are highly heterogeneous and their applications continuously transmit transient information. Furthermore, Requesting, delivering and updating the information in IoT are challenging because of the resource limitation. The Information-Centric Networking (ICN) is considered as potential communication paradigm for the future Internet, which replaces the host-to-host communication paradigm with the information-centric paradigm. Since ICN matches the pattern of information-oriented applications and provides an efficient and intelligent communication paradigm, it is considered as a good solution for the IoT system. Therefore, this dissertation considers the concept of Information-Centric Networking (ICN) as a good solution for the future IoT communication.

4.15 João do Monte Gomes Duarte (Torsten Braun, Universität Bern)

Title: Mobility Support in Vehicular Named-Data Networking

Abstract: Vehicular Named-Data Networking (VNDN) refers to the use of the Named-Data Networking (NDN) communication model over Vehicular Ad-hoc Networks (VANETs). VANETs enable communication among vehicles and between vehicles and other types of nodes, including road-side units, sensors, mobile phones and other Internet of Things (IoT) devices. In this way, VANETs hold the potential to support the deployment of secure and efficient transportation systems, consequently improving drivers and passengers on-road experience. NDN focus on named content and relies on in-network and decentralized caching to provide content redundancy within networks, which is useful for decreasing network resource utilization and improve response time and content availability. In this way, NDN improves VANET application performance when compared to other communication techniques such as IP, which focus on hosts instead of content. This Ph.D. thesis proposes efficient solutions to address the negative effects of communication conditions induced by high vehicle mobility and wireless communications on VNDN application performance. Among the contributions, this thesis first proposes a geographic routing protocol to route VNDN messages between content sources and requesters. This geographic routing protocol is receiver-based, becon-less and, multi-hop. It applies the idea of contention-based forwarding where only the nodes located in positions that provide more progress towards the destination of a message are selected to forward the message. Besides, the proposed geographic routing protocol also addresses the effects of well-known VANET problems such as broadcast storms, message redundancy and transmission resynchronization. Then, this thesis investigates the effects of content receiver/requester mobility in VNDN, and identifies the problem of Reverse Path Partitioning (RPP). RPP can be defined as disruptions on the communication link between two consecutive Data message forwarders, preventing them from routing a Data message towards the content requester and can happen even in connected VNDN scenarios. RPP can be caused by different factors such as variable inter-vehicle distances and speeds, variable vehicle transmission power and signal attenuations due to temporary conditions of the shared wireless communication medium. To address RPP this thesis introduces Auxiliary Forwarding Set (AFS). AFS determines the RPP probability and when required chooses and extra set of eligible vehicles as candidates to forward message towards their destinations, as opposite to standard NDN where only the nodes that forwarded an Interest message forward the corresponding Data message. This thesis also investigates the problem of content source mobility and network partitions in VNDN. The content source mobility problem refers to the case where a content source vehicle moves to a different location after advertising a content object. In such a case, the content source misses the Interest messages sent towards its old location and can not provide the requested content. To address this problem, this thesis applies the concept of Floating Content (FC). In FC whenever a content source vehicle leaves the location where a content object was advertised, it replicates the content object to the remaining vehicles currently in that location. Therefore, the content object can still be provided by other vehicles from the same region where it was advertised after the original producer has moved

to a different locations or has disconnected from the network. The network partitions problem refers to the case where the propagation of a message is interrupted because the vehicle sending or forwarding it is not able to communicate with any other vehicle closer to the destination. To address this problem this thesis proposes two different solutions. For the cases where infrastructure support is available, content retrieval can be delegated to existing road-side units (RSUs) while for the cases of no infrastructure support this thesis apply the concept of store-carry-forward (SCF). In SCF whenever network partitions occur vehicles buffer messages and deliver them as soon as communication links are re-established. As the last contribution, this thesis integrates all the solutions described above in a framework and proposes a mechanism for advertising newly produced content objects. This framework is able to support VNDN communications in both highway and urban scenarios with variable vehicle densities. The evaluation results show that the solutions proposed in this thesis are efficient and scalable providing high VNDN application performance even in complex and highly mobile traffic scenarios.

KuVS Newsletter

Ankündigungen und Termine

- IEEE/IFIP WONS 2019: 15th Wireless On-demand Network systems and Services Conference, 22-24 January 2019, Wengen, Switzerland: `http://2019.wons-conference.org/`

- MAKI Scientific Workshop 2019 zum Thema "Self-organizing Systems" am Freitag 8. März 2019 in Darmstadt: `https://www.maki.tu-darmstadt.de/vortraege_events/maki_scientific_workshop/2019/agenda_2019.de.jsp`

- International Conference on Networked Systems 2019: 18. bis 21. März in München: `http://www.netsys2019.org/`

KuVS Newsletter

Nächster Newsletter

Nächster Newsletter : Juni 2018

Einreichungsfrist für Beiträge : 1. Mai 2018

Wir bitten dabei um Einreichungen zu den folgenden Themengebieten:

- Fachgruppe KuVS
  - Geschäftsberichte der GI – KuVS – Fachgruppe
  - · · ·
- Neues aus den Arbeitsgruppen
  - Abgeschlossene Promotionen
  - Preise
  - Personenbewegungen
  - Stellenmarkt
  - · · ·
- Neue Projekte
  - Initiativen
  - Großprojekte
  - · · ·
- Calls und Berichte zu Veranstaltungen
  - Konferenzberichte (Konferenzen, Fachgespräche, Dagstuhl, ...)
  - Call for Papers and Participation
    ("Eigene" Konferenzen, Fachgespräche, Summer Schools, ...)
  - · · ·
- Ankündigungen und Termine

Einreichungen können per E-Mail an die Editoren gesendet werden:

mailto:graffi@hhu.de   mailto:oliver@comsys.rwth-aachen.de