



10th Annual Symposium on Future Trends in Service-Oriented Computing

Hasso Plattner Institute
Potsdam | June 17-19, 2015

Design IT. Create Knowledge.

Agenda

Wednesday, June 17, 2015 (Doctoral Symposium)

Room: [H.E-51](#) (Main Building)

10:00-10:30 **Keynote**

Prof. Dr. Tobias FRIEDRICH, Hasso Plattner Institute
[Models of Large Real-World Networks](#)

10:30-10:45 **Coffee Break**

10:45-12:30 **Doctoral Symposium**

GAO Heng, Ph.D. Student, Nanjing University
[Parallel Transformation to Programs on GPU Cluster](#)

Pedro LOPES, Ph.D. Student, Hasso Plattner Institute
[Proprioceptive Interaction: Our Own Muscles as Input & Output Devices Using Computer-controlled Electrical Muscle Stimulation](#)

Pacome AMBASSA, Ph.D. Student, University of Cape Town
[Security for Resilient Power Grids in Resource Constrained Environment](#)

Arian TREFFER, Ph.D. Student, Hasso Plattner Institute
[Omniscient Debugging in Database Applications](#)

Lighton PHIRI, Ph.D. Student, University of Cape Town
[Investigating the Impact of Organised Orchestration on Teaching](#)

Alexandra ION, Ph.D. Student, Hasso Plattner Institute
[Skin Drag Displays](#)

Yamiko MSOSA, Ph.D. Student, University of Cape Town
[Clinical Knowledge Framework for Low Resource Settings: A Case of Malawi](#)

Anton KROHMER, Ph.D. Student, Hasso Plattner Institute
[What is a Hyperbolic Random Graph?](#)

12:30-13:30 **Lunch**

13:30-15:00 **Poster & Ice Cream Session**

HPI Research School
[Ph.D. Students Share Their Ideas - Poster Session](#)

16:00 **Social Event**

Game Science Center Berlin

Thursday, June 18, 2015 (Symposium with Industry & Academia)

Room: HS 1, HS Foyer (Lecture Building)

13:00-13:15 Opening of the Symposium on Future Trends in Service-Oriented Computing

Prof. Dr. Christoph MEINEL, Hasso Plattner Institute, Director
Prof. Dr. Andreas POLZE, Hasso Plattner Institute, Speaker of the Research School

13:15-13:30 HPI Research School

Ph.D. Students Introduce Their Work - Elevator Pitch

13:30-14:15 Keynote

Chris SCHLÄGER, Managing Director, Amazon Development Center Germany
Building a Cloud

14:15-14:30 Coffee Break

14:30-15:30 Session 1

Dr. Wolfgang MAIER, Director Hardware Development at IBM R&D Böblingen

Collaborative Development in the Openness

Prof. Dr. Gregor ENGELS, University of Paderborn, Institut für Informatik
Domain-specific Languages for On-the-Fly Computing Markets

15:30-15:45 Coffee Break

15:45-16:45 Session 2

Dr. Eng Lim GOH, SVP & CTO, Silicon Graphics

Disruptive Trends in High Performance Computing

Dr. Maria KEET, University of Cape Town

Unification of Conceptual Data Modelling Languages

16:45-17:00 Coffee Break

17:00-18:30 Session 3

Matt FOLEY, Director, HP Helion Presales

Making the OpenStack Market: Why Corporate Stamina is Required

Prof. Dr. WANG Chongjun, Nanjing University

A General Framework for Big Data Analysis and Some Examples

Tim FELGENTREFF, Ph.D. Student, Hasso Plattner Institute

Integrating Declarative Constraints into Imperative Programming

19:00 Social Event

Dinner at Schloss Glienicke

Friday, June 19, 2015 (Symposium with Industry & Academia)

Room: **HS 1, HS Foyer** (Lecture Building)

09:00-09:45 **Keynote**

Prof. Dr. Alan BORNING, University of Washington & Communications Design Group, SAP Labs Palo Alto
Constraints for Interactive Systems: From Sketchpad and ThingLab to Babelsberg

09:45-10:00 **Coffee Break**

10:00-11:30 **Session 4**

Prof. Dr. Idit KEIDAR, Technion
Scalable Concurrent Data Structures

Fiona SSOZI, Ph.D. Student, University of Cape Town
Co-Designing Community-based ICT Interventions to Support Rural Water Management in Uganda: Experiences and Lessons

Ofir SHWARTZ, Ph.D. Student, Technion
Fast Encryption on (Shared) Block Eviction

11:30-11:45 **Coffee Break**

11:45-13:15 **Session 5**

PENG Yue, Ph.D. Student, Nanjing University
Analysis and Applications of Mass Data in Telecom

Sebastian HAHN, Ph.D. Student, Hasso Plattner Institute
Layout Stability in 2D Software Maps

Uri VERNER, Ph.D. Student, Technion
Accurate Summation of Floating-Point Numbers on GPUs

13:15 **Closing Remarks**

Hasso Plattner Institute for IT-Systems Engineering

The Hasso Plattner Institute for Software Systems Engineering in Potsdam is Germany's university excellence center for IT Systems Engineering. It is the only university institution in Germany offering bachelor and master programs in "IT Systems Engineering"—a practical and engineering-oriented course of studies in computer science, in which currently 480 students are enrolled. The HPI School of Design Thinking is Europe's first innovation school and is based on the Stanford model of the d.school. It offers 240 places for a supplementary study. There are a total of ten HPI professors and a further 50 guest professors, lecturers and contract teachers at the Institute. HPI carries out research noted for its standard of excellence in its ten computer science topic areas, as well as at the HPI Research School for PhD candidates, with its further research branches in Cape Town, Haifa and Nanjing. HPI teaching and research focuses on the foundation and application of large-scale, highly complex and interconnected IT systems. The development and exploration of user-driven innovations for all areas of life is an additional area of importance. HPI always earns the highest positions in the CHE university ranking. Since September 2012, the Institute has offered openHPI openhpi.de, an interactive Internet educational network that is open to everyone.



The Symposium on Future Trends in Service-Oriented Computing

The Symposium on Future Trends in Service-Oriented Computing 2015 is the annual symposium of the HPI Research School and is taking place for the tenth time. It outlines new trends in the area of Service-Oriented Computing and highlights recent work of select Research School members.

As the HPI Research School is an interdisciplinary undertaking of the HPI research groups, the Symposium on Future Trends in Service-Oriented Computing covers a wide range of topics concerning SOC, which include but are not limited to: cloud computing, {software, platform, infrastructure} as a service, service description, discovery and composition, service deployment, platform configuration and capacity planning, monitoring, service middleware, service-oriented architectures (SOAs), service management, information as a service, service development and maintenance, novel business models for SOAs, economical implications of web services and SOAs, service science, mobile and peer-to-peer services, data services, quality of service, exception handling, or service reliability and security.

Excellent speakers—both from industry and academia—leaders in their respective field of research, are invited to talk about their latest projects and resulting outcomes.



The HPI Research School

In October 2005, the HPI started its Research School on “Service-Oriented Systems Engineering”, a graduate school based on the model of the DFG (German Research Foundation) “Graduiertenkolleg”.

The Vision of the Research School

Design and implementation of service-oriented architectures impose numerous research questions from the fields of software engineering, system analysis and modeling, adaptability, and application integration. Service-Oriented Systems Engineering represents a symbiosis of best practices in object orientation, component-based development, distributed computing, and business process management. It provides integration of business and IT concerns. Service-Oriented Systems Engineering denotes a current research topic in the field of IT-Systems Engineering with high potential in academic research as well as in industrial application. Supported by an internationally renowned grant, PhD students at our college participate in joint activities such as lectures, seminars, winter schools and workshops.

The Members of the Research School

The professors of the HPI with their research groups are supporting pillars for our PhD school. With its interdisciplinary structure, the research college on Service-Oriented Systems Engineering interconnects the HPI research groups and fosters close and fruitful collaborations.

In context of the Research School, the different groups at HPI work on the following topics:

Human Computer Interaction and Computer Vision as Service (Prof. Dr. Patrick Baudisch), Service-Oriented Geovisualization Systems (Prof. Dr. Jürgen Döllner), Algorithm Engineering for Service-Oriented Systems (Prof. Dr. Tobias Friedrich), Modeling and Verification of Self-Adaptive Service-Oriented Systems (Prof. Dr. Holger Giese), Tools and Methods for Software Engineering in Service-Oriented Systems (Prof. Dr. Robert Hirschfeld), Security Engineering of Service-Based IT-Systems (Prof. Dr. Christoph Meinel), Service-Oriented Information Systems (Prof. Dr. Felix Naumann), Evolutionary Transition of Enterprise Applications to Service-Oriented (Prof. Dr. h.c. Hasso Plattner), Operating System Abstractions for Service-Oriented Computing (Prof. Dr. Andreas Polze); and Services Specification, Composition, and Enactment (Prof. Dr. Mathias Weske).

On the website of the Research School, please find latest information about the Ph.D. students, their research interests, joint projects, and events:

http://www.hpi.de/research_school

The Doctoral Symposium

Over the years the HPI Research School has been expanded to a state in which we are excited to—in addition to our members from **Hasso Plattner Institute Potsdam**, Germany—welcome colleagues from **University of Cape Town (UCT)**, South Africa; the **Technion**, Israel; and **Nanjing University**, China. In order to foster collaboration and information exchange, we organized a Doctoral Symposium, so that PhD students from HPI, UCT, Technion, and NJU will get to know each other both on the social and the academic levels.

The event includes a mix of a social event, poster session, and demo presentations. The poster session that dives into the research topics of the attending PhD students, will follow a more informal pattern: eating ice cream while exploring other people posters and explaining yours!



Social Event: Game Science Center Berlin

Game Science Center Berlin: the world's first exhibition house dedicated to interactive technologies and projects is located in the central district of Berlin Mitte, around the corner from Checkpoint Charlie. In the 300 m² space you will experience the exhibits through interaction and not as a passive observer.

Interactive technology develops at a rapid pace. Big companies bring new devices and products to market quicker than ever before. But where do they get their ideas? Often, these new product do not come from the internal research departments of the Big Players, but from small and independent teams of inventors and developers.

Various installations show which new ways of controlling are currently in development and will in the future be available at home, through playing with interactive content and games. Other installations are unique pieces that can only be played in a bigger space. Besides new technological developments, Game Science Center works together with independent developers to show you innovative ways of using existing technology.

<http://www.gamesciencecenter.de/>

Speakers



Prof. Dr. Christoph MEINEL

Director of the
Hasso Plattner Institute

Opening of the Symposium on Future Trends in Service-Oriented Computing

Christoph Meinel is CEO and Scientific Director of the Hasso Plattner Institute at the University of Potsdam and holds the chair of "Internet Technologies and Systems." He teaches Bachelor and Master courses in "IT-Systems Engineering," oversees numerous PhD projects and is a teacher at the "HPI School of Design Thinking." His research expertise focuses on the areas of Security Engineering, Knowledge Engineering and Web 3.0–Semantic, Social and Service Web. He is also scientifically active in the field of innovation research and the innovative method of Design Thinking. Christoph Meinel is the author or co-author of 14 books and anthologies, as well as editor of various conference proceedings. More than 450 of his papers have been published in scientific journals and at international conferences. He is a member of the National Academy of Science and Engineering (acatech), visiting professor at Beijing University of Technology and serves on many scientific committees and supervisory boards.



Prof. Dr. Andreas POLZE

Speaker of the
HPI Research School

Prof. Dr. Andreas Polze is the Operating Systems and Middleware Professor at the Hasso Plattner Institute for Software Engineering at University Potsdam, Germany. He is also the speaker of the Ph.D. school on "Service-Oriented Systems Engineering" at HPI and member of the steering committee of HPI's Future SOC Lab. Andreas received a doctoral degree from Freie University Berlin, Germany, in 1994 and a habilitation degree from Humboldt University Berlin in 2001, both in Computer Science. At HPI, his research focuses on architectures of operating systems, on component-based middleware, as well as on predictable distributed and cloud computing. Andreas Polze was visiting scientist with the Dynamic Systems Unit at Software Engineering Institute, at Carnegie Mellon University, Pittsburgh, USA, where he worked on real-time computing on standard middleware (CORBA) and with the Real-Time Systems Laboratory at University of Illinois, Urbana-Champaign. Current research interests include Predictable Service Computing, Adaptive System Configuration, and End-to-End Service Availability for standard middleware platforms. Together with Charité, GETEMED, and Deutsche Telekom, he has run the Fontane telemedicine project. Joint research with SAP has investigated porting HANA to new processor architectures.

Models of Large Real-World Networks

The node degrees of large real-world networks often follow a power-law distribution. Such networks are typically called scale-free networks and occur in literally hundreds of domains like social networks, internet topologies, the web graph, power grids, and many others. The talk will introduce the basics of network science, present a number of models of scale-free networks and will hint how to analyze some of their properties.



Prof. Dr. Tobias FRIEDRICH

Hasso Plattner Institute,
Algorithm Engineering Chair

Professor Friedrich just established his chair at the Hasso Plattner Institute. His algorithm engineering research group started in April 2015. Before he came to Potsdam, he was heading the chair for theoretical computer science at University of Jena, Germany and was a senior researcher at the Max Planck Institute for Computer Science. He has received his M.Sc degree in computer science from University of Sheffield, United Kingdom, his M.Sc. degree in mathematics from University of Jena, Germany, and his Ph.D. in computer science from Saarland University, Germany. His research considers the foundations of computer science in the areas algorithms and complexity. A special focus of his work are random structures and methods.



Gao Heng

Ph.D. Student,
Nanjing University

Parallel Transformation to Programs on GPU Cluster

The computation ability of graphics processing unit (GPU) has been under remarkable development in recent years. As a highly parallel programmable processor, it costs more time to design a proper program for its different architecture from CPU. Many efforts have been made to simplify the programmability, but it's still not as usual as we do with CPU, and when it comes with the Cluster, things become even trickier. By taking advantage of Polyhedral and Polytope models, we would like to introduce a way to ease the hardness: transform the traditional serial code into parallel one that can be run on GPU Cluster.

Gao Heng is a Ph.D. student of Dept. of Computer Science and Technology, Nanjing University. His research interests include GPU computing, 3D-modeling, seismic data processing and so on.

Proprioceptive Interaction: Our Own Muscles as Input & Output Devices Using Computer Controlled Electrical Muscle Stimulation

We propose a new interaction modality. It is based on the user's proprioceptive sense, i.e., rather than seeing, hearing, or feeling an outside stimulus, users feel the pose of their own body. We call this proprioceptive interaction. In this talk we will demonstrate several examples of how this enables wearable, immersive and physical interactions.

To instantiate this, we have implemented several wearable devices called Pose-IO that offers input and output based on proprioception. Users communicate with Pose-IO through the pose of their wrists. Users enter information by performing an input gesture by flexing their wrist, which the device senses using a 3-axis accelerometer. Users receive output from Pose-IO by finding their wrist posed in an output gesture, which Pose-IO actuates using electrical muscle stimulation.

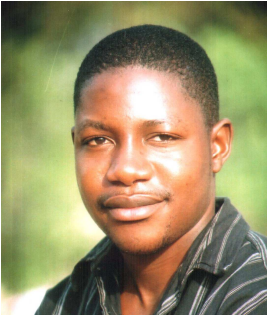
This modality allows users to interact with computers without visual or auditory senses, but through the proprioceptive sense alone. We developed several applications that demonstrate proprioceptive interaction, such as eyes-free gaming, video-scrubbing, force-feedback and even support while interacting with everyday objects.



Pedro LOPES

Ph.D. Student,
Hasso Plattner Institute

Pedro is a PhD student of Prof. Patrick Baudisch's Human Computer Interaction lab in Hasso Plattner Institut, Berlin. Pedro creates wearable interfaces that read & write directly to the user's body through our muscles [proprioceptive interaction]. Pedro augments humans & their realities by using electrical muscle stimulation to actuate human muscles as interfaces to new virtual worlds. His works have been published at ACM CHI and UIST. Enjoys writing about tech and is the digital content editor of the ACM XRDS.



Pacome AMBASSA

Ph.D. Student,
University of Cape Town

Security for Resilient Power Grids in Resource Constrained Environment

Reliable access to electricity is a prerequisite for economic and social development. Households utilize electricity for purposes that include cooking, lighting, heating and studying. Moreover, essential organizations such as hospitals and schools require electricity for enhanced healthcare and education. In regions where access to the national power grid is negatively impacted by load shedding, micro-grid architectures that are based on distributed power generation offer a solution that can make an important contribution to equitable access to power. However, the challenge when using micro-grid architectures based on renewable energy sources in low income communities is that the power network has limited capacity and is constrained in terms computation power as well as network connectivity. Therefore, we propose re-modeling the micro-grid architecture to incorporate low cost information and communication technology devices and wireless communication network to handle monitoring, control and state estimation. Monitoring and control lead to collection and analysis of a tremendous amount of personal and sensitive data, and so, must be collected in ways that protect the privacy of users. instance energy usage data can provide inferential information on the number of people in a home and even the movement of these persons. Given the unreliability of the metering equipment, a further consideration is to prevent fraud and energy theft in order to guarantee trustworthiness and grid stability.

Pacome L. Ambassa is currently pursuing studies towards a PhD degree in the Department of Computer Science at the University of Cape Town. He is working under the supervision of Dr. Anne V.D.M Kayem and Prof. Dr. Christoph Meinel. His research is in the general area of information security and cryptography. He is particularly interested in privacy for smart micro-grids in resource constrained environments. Pacome comes from Yaoundé, the lively capital of Cameroon. He obtained an MSc in Computer Engineering and a BSc in Computer Science in 2012 and 2009 respectively. Both degrees from the Department of Mathematics and Computer Science at the University of Ngaoundere.

Omniscient Debugging in Database Applications



Arian TREFFER

Ph.D. Student,
Hasso Plattner Institute

A regular debugger allows the developer to pause the execution of a program, to inspect its state, and to resume and pause it again at a later point in time. In contrast, an omniscient debugger is a debugger that knows the program's state from any point in time, allows the developer to jump to any point in the program's execution, and is able to answer queries about future or past program states. Most research in the area of omniscient debugging has been done in the context of imperative and object-oriented languages.

The talk will begin with an introduction to omniscient debugging and how it changes the approach to finding bugs and then present ongoing work on an omniscient debugger for SQLScript while discussing differences in debugging object-oriented and declarative code.

Arian Treffer is a PhD student at the Research School of the Hasso Plattner Institute, Potsdam, and is working in the research group of Prof. Plattner. He received his Master's degree at the HPI in 2012. His research interests are debugging and program comprehension, in particular with the help of powerful databases.



Lighton PHIRI

Ph.D. Student,
University of Cape Town

Investigating the Impact of Organised Orchestration on Teaching

Even though there are a number of factors that are known to influence educational quality, supporting teachers is considered one of the most effective ways of making classrooms effective learning environments, subsequently improving the quality of learning. However, the multi-faceted nature of classroom orchestration—the teacher-centric real-time management of classroom activities—, its complexity, and general classroom constraints, present grand challenges on the effective management of the modern-day classroom environment. We argue that streamlined technology-driven orchestration could be attained through the use of a classroom orchestration workbench, potentially making educators more effective. We present an early version of a prototype orchestration platform, and initial supporting evidence demonstrating the feasibility of organised orchestration and its use in a real-world setting.

Lighton Phiri is a PhD student in the HPI Research School, in the Department of Computer Science at the University of Cape Town. His current research focus is in the Technology Enhanced Learning (TEL) research area. He is exploring technology-driven classroom orchestration in order to understand the impact of organised orchestration on educators' teaching effectiveness within formal learning environments. He received a BSc degree from the University of Zambia in 2007 and an MSc degree from the University of Cape Town in 2013, both in Computer Science.

Skin Drag Displays



Alexandra Ion

Ph.D. Student,
Hasso Plattner Institute

Wearable devices, such as smart watches, provide an instant notification service as they connect to online services and social networks and inform the user about current events. Tactile devices that are in continuous physical contact with the wearer's skin allow sending simple messages to the user without the need to visually examine the device. Devices based on a single vibrotactile actuator for example, allow pulsing "Morse-like" messages.

We propose a new type of tactile displays that drag a physical tactor across the skin in 2D. We call this skin drag. We demonstrate how this allows us to communicate geometric shapes or alphabetical characters to users. The main benefit of our approach is that it simultaneously produces two types of stimuli, i.e., (1) it moves a tactile stimulus across a larger skin area and (2) it stretches the user's skin. Skin drag thereby combines the essential stimuli produced by vibrotactile arrays, which allows drawing simple shapes by fading from one vibration motor to the next, and skin stretch, which pushes and stretches the user's skin with a physical contactor to communicate directional cues.

In our study, skin drag allowed participants to recognize tactile shapes significantly better than a vibrotactile array of comparable size. We present two arm-worn prototype devices that implement our concept.

Alexandra is a PhD student at the human computer interaction lab at the Hasso Plattner Institute (Potsdam, Germany) of Patrick Baudisch. She is interested in haptics and mechanical properties in fabrication.



Yamiko Msosa

Ph.D. Student,
University of Cape Town

Clinical Knowledge Framework for Low Resource Settings: A Case of Malawi

Computerised clinical practice guidelines are a key component of effective clinical decision support systems (CDSSs), especially in low-resource regions such as Malawi. To address shortages in staffing and budgets for training, the practice of “task-shifting”, the clinical practice guidelines (CPGs) enable health workers with limited training to provide a standardised level of care. However, CPGs are traditionally paper-based, with only a few CPGs having been computerised for Malawi’s national electronic health record system. This work investigates the CPG computerisation challenges and evaluates appropriate strategies for supporting new and revised CPGs for Malawi’s CDSS.

Yamiko is a PhD student with the ICT4D research lab within the Department of Computer Science at the University of Cape Town. He is a software developer who has worked in various technical and leadership roles for the past 15 years. He obtained an MSc in Computer Science from the University of Essex after attaining a BSc Honours in Computing from the University of Greenwich in the UK. His passion lies in applying his computing skills to improve healthcare delivery and preserve Indigenous Knowledge (IK) in limited resource settings. He is currently investigating how to represent clinical knowledge for guideline-driven clinical decision support systems in low resource settings.

What is a Hyperbolic Random Graph?

Large real-world networks are typically scale-free. Recent research has shown that such graphs are described best in a geometric space. More precisely, the internet can be mapped to a hyperbolic space such that geometric greedy routing performs close to optimal. This observation pushed the interest in hyperbolic networks as a natural model for scale-free networks. Hyperbolic random graphs follow a power-law degree distribution with controllable exponent β and show high clustering.



Anton KROHMER

Ph.D. Student,
Hasso Plattner Institute

Anton is a 3rd-year PhD student at the chair for algorithm engineering under Prof. Tobias Friedrich. He completed his Master's degree in computer science at Saarland University and studied for his PhD at the Friedrich-Schiller-University Jena before coming to HPI in April 2015.

Speakers

Ph.D. Students Introduce Their Work: Elevator Pitch

HPI Research School "Service-Oriented Systems Engineering"

Hasso Plattner Institute,
Postdam

Aragats AMIRKHANYAN: Geo-Spatial Analytics of Data to Improve Security Situation Awareness

Ekaterina BAZHENOVA: Deriving Decision Models from Process Models by Enhanced Decision Mining

Thomas BRAND: Runtime Data-Driven Software Evolution in Enterprise Software Ecosystems

Sören DISCHER: Scalable Visualization of Massive 3D Point Clouds

Dietmar FUNCK: Requirements for Analysis of Multi-Temporal 3D Point Clouds

Sona GHAREMAI: Utility-Driven Modularized MAPE-K Loop Architectures for Self-Adaptive Systems

Lena HERSCHEID: Software Dependability Evaluation

Robert KOVACS: Level-Ups: Motorized Stilts that Simulate Stair Steps in Virtual Reality

Martin KREJCA: Understanding Swarm Algorithms

Sankalita MANDAL: From Choreography Diagrams to RESTful Interactions

Toni MATTIS: Optimizing Dynamic Languages for Data-Intensive Workloads

Ralf ROTHENBERGER: Better Algorithms on Complex Networks

Thijs ROUMEN: Ready-Fire-Aim; Interactive Fabrication for Users Who Do Not Plan

Ahmad SAMIEI: Incremental Record Deduplication

WANG Cheng: Deep Semantic Mapping for Cross-Modal Retrieval

The HPI Research School "Service-Oriented Systems Engineering" focuses on the design and implementation of service-based architectures that target various research problems from software engineering, system modeling and analysis, as well as the adaptability and integration of applications. It represents a synthesis of best practices in object orientation, component-based development, distributed computing, and business process management. The topics of the HPI Research School thus have a unique potential not only in terms of academic research but also in industrial application.

Building a Cloud

IT people know how to setup a server and connect it to the Internet. For them it's simple to build web services and they enjoy upgrading their site with each new version of the components they use. If you ask the same IT people what they don't like about running their technology, chances are they will tell you all of the "heavy lifting" of racking and stacking servers and maintaining their datacenters. Many spend more time just keeping the lights on and little time on improving their applications for their customers. The vast majority of companies want to focus on their business skills rather than becoming datacenter experts. Can a service provider deliver them a solution that provides them with the IT infrastructure and services they need without them needing to become experts in every aspect of running a data center?

At Amazon Web Services we strive to do just that. This presentation will explain how AWS has built a scalable infrastructure and a set of services that other businesses can build on. It will cover the fundamental building blocks and the rich ecosystem that was created on top of AWS and will provide some insight into key components like operating systems and hypervisors as well as share some of the learnings we took away from building and providing AWS to our customers.



Chris SCHLÄGER

Managing Director,
Amazon Development
Center Germany

Chris Schläger is Managing Director of the Amazon Development Center Germany GmbH and also Director of Kernel and Operating Systems at Amazon. He and his teams are responsible for the operating systems that power Amazon's servers and EC2 instance types. Prior to Amazon he ran the AMD Operating System Research Center (OSRC) and was responsible for supporting AMD CPUs in the Linux Kernel, KVM and Xen. Prior to AMD, he was VP of Linux Distributions at Novell and SUSE.



Dr. Wolfgang MAIER

Director Hardware
Development at IBM R&D
Böblingen

Collaborative Development in the Openness

Openness is a concept that is characterized by an emphasis on transparency and free unrestricted access to knowledge and information as well as collaborative or cooperative management and decision making. As modern IT Infrastructure has changed significantly in recent years comprehensive adaptations in future server-designs are essential to be better positioned for upcoming challenges. These include new technology partnerships in the context of openness across all system components. OpenPower, which is an open technical community based on the IBM POWER architecture enables collaborative development and offers opportunities for product differentiation and industry growth. The presentation will give an overview of the current trends in the server industry, highlight new collaborative approaches and introduce an outlook to next generation technologies.

Wolfgang Maier's career with IBM started as design engineer for Mainframe Firmware in 1996. Three years later he accepted the role of department manager for System z IO Firmware and started to focus on the employment of industry standard IO technologies in IBM high end servers. During his international assignment in Austin (Texas) he directed the first implementation of the Infiniband technology for the IBM POWER line. After his return to Germany he extended the use of industry standards within the mainframe and headed the development of central IO hardware as well as mainframe and POWER CMOS processors. His current responsibilities also span the system packaging and system control area with special focus on workload optimization and power efficiency. He is leading the European business development of the OpenPower foundation which was founded by IBM and several other technology partners in 2013.

Wolfgang Maier obtained his PhD in Laserphysics from the University of Tuebingen in 1996. He enjoys to spend his spare time with his family, loves skiing and motorbikes

Domain-specific Languages for On-the-Fly Computing Markets



Prof. Dr. Gregor ENGELS

University of Paderborn,
Institut für Informatik

The Collaborative Research Centre “On-The-Fly Computing” (DFG SFB 901) works on foundations and principles for the vision of the Future Internet. It proposes the paradigm of On-The-Fly Computing, which tackles emerging worldwide service markets. In these markets, service providers trade software, platform, and infrastructure as a service. Service requesters state requirements on services. To satisfy these requirements, the new role of brokers, who are (human) actors building service compositions on the fly, is introduced. Brokers have to specify service compositions formally and comprehensively using a domain-specific language (DSL), and to use service matching for the discovery of the constituent services available in the market. The broker’s choice of the DSL and matching approaches influences her success of building compositions as distinctive properties of different service markets play a significant role.

In the talk, we describe concepts and first results of our work in this Collaborative Research Centre. In particular, we explain a new approach of engineering situation-specific DSLs by customizing a comprehensive, modular DSL.

Gregor Engels received his PhD in Computer Science in 1986 from the University of Osnabrück, Germany. Between 1991 and 1997 he held the position of Chair of Software Engineering and Information Systems at the University of Leiden, The Netherlands. Since 1997, he is Professor of Informatics at the University of Paderborn, Germany.

Currently, he is also director of two technology transfer labs at the University of Paderborn, the C-LAB, a joint venture together with ATOS, and the s-lab - Software Quality Lab, where overall more than 50 PhD students do joint research with industrial partners.

His research interests are in the area of model-driven software development, software architecture, and software quality assurance.

He has published more than 200 papers in scientific journals, as book contributions or articles at international conferences and workshops.



Dr. Eng Lim Goh

SVP & CTO, Silicon Graphics

Disruptive Trends in High Performance Computing

In the next few years the high performance computing industry is expected to go through major changes that will significantly affect applications. This is attributed to a combination of technologies that are maturing across the entire system hierarchy, i.e. from the processor, memory, IO, storage to the network. Additionally there are user and societal factors. From the former, the expectation for AI-driven autonomous systems management, resiliency, data exploitation and the Cloud. From the latter, the progressive public expectation around energy efficiency and changes in funding as major economies of the world recover.

Dr. Eng Lim Goh joined SGI in 1989, becoming a chief engineer in 1998 and then chief technology officer in 2000. He oversees technical computing programs with the goal to develop the next generation computer architecture for the new many-core era. His current research interest is in the progression from data intensive computing to analytics, machine learning, artificial intelligence and autonomous systems.

Unification of Conceptual Data Modelling Languages



Dr. Maria Keet

Depa of Computer Science,
University of Cape Town

Software interoperability and application integration can be realised through using their respective conceptual data models, which may be represented in different conceptual data modelling languages. While such modelling languages seem similar, they are known to be distinct. However, there is no unifying framework that considers all language features of the static structural components and constraints such that it allows for inter-model assertions and validations thereof for complex system development. We present an overview of steps taken to solve this problem, being i) a unified, ontology-driven, metamodel of the static, structural, components and constraints from EER, UML Class Diagrams, and ORM/2 and its formalisation, ii) a metamodel-driven approach to conceptual model interoperability using rules, and iii) specification of conceptual model profiles based on the language's features' usage.

This work is based upon research supported by the Department of Science and Technology of South Africa and the Argentinian Ministry of Science and Technology. More detail and some papers are available from its project page at <http://www.meteck.org/SAAR.html>

Dr. C. Maria Keet is a Senior Lecturer with the Department of Computer Science, University of Cape Town. She focuses on logic-based knowledge representation, ontology and Ontology, and conceptual data modelling. Before her employment at UCT, Maria was Senior lecturer at the School of Computer Science, University of KwaZulu-Natal, South Africa, and before that, a non-tenured Assistant Professor at the KRDB Research Centre, Free University of Bozen-Bolzano, Italy. She obtained a PhD in Computer Science at the KRDB Research Centre in 2008, following a BSc(honours) 1st class in IT & Computing from the Open University UK in 2004, and 3.5 years work experience as systems engineer in the IT industry. In addition to computer science, she obtained an MSc in Food Science (Microbiology) from Wageningen University and Research Centre, the Netherlands, in 1998, and an MA 1st class in Peace & Development Studies from the University of Limerick, Ireland, in 2003.



Matt FOLEY

Director, HP Helion Presales

Making the OpenStack Market: Why Corporate Stamina is Required

As the saying goes, “you can spot a pioneer because he is the one with the arrows in his back”. It is a risky proposition to hop on a new bandwagon and drive a new technology movement across the industry, and in this discussion of the practical workings of new technology introduction, Matt Foley from HP will describe the wide variety of activities that an industry vendor must go through in order to successfully introduce a new idea and create a new market to use it. The discussion will range from some of the specific, detailed technical enablement undertaken to expand the OpenStack market, to the advanced go-to-market activities being developed in this age of intersection between technical possibilities and political realities.

Matt Foley currently leads the Cloud Presales team for HP’s Enterprise Group in the EMEA region. Prior to this, Matt led the ESSN OEM sales team in EMEA. In the past, Matt led the Telecom Infrastructure team in HP BladeSystem, in addition, he also led the Blade SWAT team, which provided direct R&D expertise to customer engagements. Previously he held operations and business planning positions in the digital signal processing (DSP) business at Texas Instruments. Matt holds a Bachelor of Science in Electrical Engineering from the University of Notre Dame, a Bachelor of Arts (History) from the University of Notre Dame, and an MBA from the University of Houston.

A General Framework for Big Data Analysis and Some Examples

Discovering knowledge from data is the constant theme in the process of human civilization for the knowledge or insight discovered from data may lead us to a better life and work. With the development of technology and the progress of society, the data became to be more complex, huge and big and the system needing became to be more personalized and flat. How to deal with these challenges is an urgent problem. This talk will briefly introduce some research work of ours in data analysis and knowledge discovery and a general framework and some application cases will be given.



Prof. Dr. **WANG Chongjun**

Nanjing University

Dr. Wang Chongjun is a full-time professor in the Department of Computer Science and Technology, Nanjing University. Prof. Chongjun Wang is also one of the 7 professors in the HPI Research School at Nanjing University. His research interest includes Agent and multi-agent system, complex network analysis, big data analysis and intelligent system. He has published more than 50 papers in these 5 years and over 10 research results have been industrialized.



Tim FELGENTREFF

Ph.D. Student,
Hasso Plattner Institute

Integrating Declarative Constraints into Imperative Programming

Constraints provide a useful technique for ensuring that desired properties hold in an application. As a result, they have been used in a wide range of applications, including graphical layout, simulation, scheduling, and problem-solving. We have designed and implemented Babelsberg, an object-constraint programming language that cleanly integrates constraints with a host object-oriented language in a way that respects encapsulation and standard object-oriented programming techniques. Our design and implementation also incorporate incremental re-solving to better support user interaction, as well as a cooperating solvers architecture that allows multiple solvers to work together to solve more difficult problems.

Tim Felgentreff is a PhD student at the Software Architecture Group at the Hasso-Plattner-Institute (HPI), University of Potsdam, and a member the HPI Research School for Service-Oriented Systems Engineering since 2013. His research interests are around programming language constructs and virtual machines. Contact him at tim.felgentreff@hpi.uni-potsdam.de. See also <http://www.hpi.uni-potsdam.de/hirschfeld/people/felgentreff>

Constraints for Interactive Systems: From Sketchpad and ThingLab to Babelsberg

A constraint is a declarative description of a relation that we want to have hold, for example, that a set of icons be equally spaced and positioned at the bottom of a window, or that a resistor in an electrical circuit simulation obey Ohm's Law. Constraints have a long history in interactive systems. A key early system was Ivan Sutherland's Sketchpad from 1963; a less notable but still early system was my own ThingLab from 1979. In this talk I'll describe a little of that history, including a demo of a revived version of ThingLab, using the original code from 1979 running in a web browser using a Smalltalk-78 interpreter written in Lively Javascript. I'll then describe some constraint satisfaction algorithms targeted at interactive systems, including Cassowary, which is used in Apple's Auto-Layout system for the Macintosh and iOS. Finally, I'll discuss recent work on Babelsberg, a family of object constraint programming languages by Tim Felgentreff and others from the Software Architecture Group at HPI, and ideas for future research in the area.



Prof. Dr. Alan BORNING

University of Washington
& Communications Design
Group, SAP Labs Palo Alto

Alan Borning is a professor of Computer Science & Engineering at the University of Washington. His research interests are in human-computer interaction, and in object-oriented and constraint programming languages. Current projects include tools for making public transit more usable, systems to support civic engagement and participation, and constraint-based programming languages and systems. He received a BA from Reed College in 1971, and a PhD in computer science from Stanford University in 1979. Awards include a Fulbright Senior Scholar Award for lecturing and research in Australia, and being named a Fellow of the Association for Computing Machinery in 2001. He has been a regular visitor to HPI, including visits to both the Human Computer Interaction and Software Architecture groups.



Prof. Dr. Idit KEIDAR

Dept. of Electrical
Engineering,
Technion

Scalable Concurrent Data Structures

The advent of the multi-core revolution has made increased concurrency a major emphasis in software development. In this talk, I will focus on scaling the concurrency of data structures.

To make the case that parallelizing data structures matters, I will illustrate its importance for system performance: I will present our cLSM algorithm for scalable concurrency in log-structured key-value stores. cLSM exploits multiprocessor-friendly data structures and non-blocking synchronization to support a rich data store API, including snapshot scans and general non-blocking read-modify-write operations. A LevelDB-based implementation of cLSM improves throughput by $1.5\times$ to $2.5\times$ compared to the best-in-class competitor, on production, as well as synthetic, workloads.

I will proceed to address the challenge of ensuring correctness of high-performance concurrent data structures, which we tackle in two complementary ways. First, we present a new framework for reasoning about correctness of data structures under reads-write concurrency, which significantly simplifies proofs. Second, we provide a fully automatic approach for parallelizing sequential data structures in a way that is both safe and scalable.

Based on joint works with Maya Arbel, Edward Bortnikov, Gregory Chockler, Guy Golan-Gueta, Eshcar Hillel, and Kfir Lev-Ari.

Idit Keidar is a Professor and the Associate Dean for Graduate Studies at the Department of Electrical Engineering at the Technion. She also heads the Networked Software Systems Laboratory (NSSL). She received her BSc (summa cum laude), MSc (summa cum laude) and PhD at the Hebrew University of Jerusalem in 1992, 1994, and 1998 resp. Prof. Keidar is a world renown expert in distributed computing and concurrency, having published over 100 papers in competitive peer-reviewed journals and conferences, which were cited more than 4300 times. She has supervised over 30 graduate students and 3 postdocs.

Co-Designing Community-based ICT Interventions to Support Rural Water Management in Uganda: Experiences and Lessons



Fiona Ssozi

Ph.D. Student,
University of Cape Town

The proliferation of affordable Information and Communication Technologies (ICTs) principally in the form of mobile phones has provided a platform for more affordable and sustainable information dissemination and communication to improve service delivery in underserved and remote areas like rural communities. However, creating relevant ICT applications for rural communities is quite challenging due to a number of limiting factors such as lack of reliable communication infrastructure, remoteness, low literacy, political interference, culture of technology use and language barriers. Traditional system development methodologies assume that end users can articulate their needs clearly, are similarly educated and are therefore only involved in the later stages of the development process. Designing technology that is locally relevant for rural communities requires the active participation of the people that have an understanding of the context. User centered design approaches like Co-Design allow for active engagement by not only giving rural technology users a voice in the development process, but a better understanding of the users' knowledge and environmental aspects in their context that can easily affect the use and adoption of the developed intervention for the implementer. In this talk, I will present the Co-Design experiences from a Community mobile based intervention collaboratively designed with 3 rural communities in Uganda, initial results and key lessons so far.

Fiona holds an MSc. (Information Systems) degree from London South Bank University (UK) and a BSc. in Computer Science from Makerere University (Uganda). Her PhD research focuses on co-designing appropriate ICT tools to support rural communities in the management of their water supplies under the Community based (water) management model. This research seeks to not only empower communities to participate in the design and development of ICT tools that meet their needs but also to show how technology design approaches can contribute to sustainability of community-based ICT interventions. This research is being conducted under the supervision of Prof. Edwin Blake and Assoc. Prof. Ulrike Rivett.



Ofir SHWARTZ

Ph.D. Student,
Technion

Fast Encryption on (Shared) Block Eviction

Encryption is one of the main building blocks used in many security systems. Although encryption is an important tool for providing secrecy, using encryption raises performance issues, as the encryption (and decryption) process has an inherent latency.

Modern secure processors use encryption and decryption in order to keep the confidentiality of the data, therefore a significant effort was done in order to decrease the latency of the decryption process. Many claim that the latency of the encryption is of a lesser problem, as data is only encrypted when it is not needed soon. However, data-sharing applications often require data encryption to be processed by another entity, before it can be decrypted by the requestor; this problem heavily scales when many cores or computers are working together.

In this work we present a method in order to dramatically reduce the overhead of the encryption. Not only does it reduce the latency of the encryption, but also it reduces the amount of hardware required for data eviction. While being encryption algorithm agnostic, we supply the same level of security as the encryption algorithm supplies

Ofir Shwartz is currently a PhD student at the Technion Israel Institute of Technology, where he also acquired his Master degree and BSc degree. Shwartz was a member of the design and architecture team at EZchip Technologies developing performance critical systems, and before worked at companies such as Intel Corporation and Zoran Microelectronics. His main interests are computer architecture, performance oriented systems, and system security.

Analysis and Applications of Mass Data in Telecom

With the age of big data is coming, the traditional marketing methods in telecom fail to meet the requirements of new situation. This report mainly focuses on the analysis and applications of big data in telecom. We process a series of algorithms to analyze the big data of telecom to construct useful data models. Then based on the data models we implement a platform to integrate different applications, just like precision marketing, content recommendation and so on.



PENG Yue

Ph.D. Student,
Nanjing University

Peng Yue is a Ph.D. student of Dept. of Computer Science and Technology, Nanjing University. His research interests include machine learning, data mining, social network analysis and so on. In the past 3 years, 3 research results have been industrialized.



Sebastian HAHN

Ph.D. Student,
Hasso Plattner Institute

Layout Stability in 2D Software Maps

The visualization of hierarchical datasets is a well investigated research field with a high range of use cases and data sets, e.g. the visualization of software system's package structure at a single state of the development process in so called "software maps" to get an overview of the system. One goal of such "software maps" is to support a user to create a mental map of the software system that allows the fast recognition of specific points of interests. Since software systems are evolving over time the layout algorithms that create those depictions need to fulfil a special requirement: Similar datasets should lead to similar depictions. This ability of an algorithm to do so is called layout stability. This talk gives an overview about the comparative evaluation of layout algorithms with respect to their stability with a special focus on software maps.

Sebastian Hahn graduated in Media Informatics at the University of Munich in 2011. He joined the HPI Research School in December, 2011 and is a member of the Computer Graphics Systems Group supervised by Prof. Döllner. His primary research topics are located in the field of Visual Software Analytics with a special focus on the stability of layout algorithms for 2.5D software maps.

Accurate Summation of Floating-Point Numbers on GPUs



Uri VERNER

Ph.D. Student,
Technion

Two problems with parallel summation of floating-point numbers on GPUs are loss of precision and non-reproducible results. The precision loss is due to round-off error propagation, and the lack of bit-accurate consistency across platforms and setups can be attributed to the non-associative nature of floating-point addition.

To address these problems, we implemented a new method for efficient bit-accurate parallel summation of double-precision numbers on GPUs. This method provides the summation result with full precision, i.e., without round-off error. Thus, it provides the same result on all architectures and execution setups. We see two main uses for this method: (1) algorithms that benefit from extended precision, such as iterative linear solvers (QUDA, AMG), and (2) where reproducible results are required, such as in cross-platform libraries, for tuning of execution parameters with result validation, etc.

Uri Verner is a PhD student at the Department of Computer Science in the Technion, where he is advised by Professors Assaf Schuster and Avi Mendelson. His research interests include theoretical and practical aspects of real-time processing of streaming data in GPU-based systems. Uri completed his BSc studies in the Department of Computer Science in the Technion, and continued towards a PhD in the direct track in the same institution. Uri interned at NVIDIA during Summer 2014, where he initiated the work presented in this talk.

Social Event

Dinner at Schloss Glienicke



<http://www.spsg.de/schloesser-gaerten/objekt/schloss-glienicke>

Schloss Glienicke (Glienicke Palace) is located on the peninsula of Berlin-Wannsee, near the Glienicke Bridge, on the B1 across from the Glienicke Hunting Lodge. It was designed by Karl Friedrich Schinkel for Prince Carl of Prussia in 1826. The building, originally merely a cottage, was turned into a summer palace in the late classical style. Particularly striking are two golden lion statues in front of the frontage, which were also designed by Schinkel. The lions are versions of the Medici lions from the Villa Medici. In the palace are "antique objets d'art", which the Prince brought back from his trips. The palace's park is now called the Volkspark Glienicke. The palace and park are UNESCO World Heritage sites as part of the Palaces and Parks of Potsdam and Berlin since 1990.

Schedule for Thursday (June 18) evening

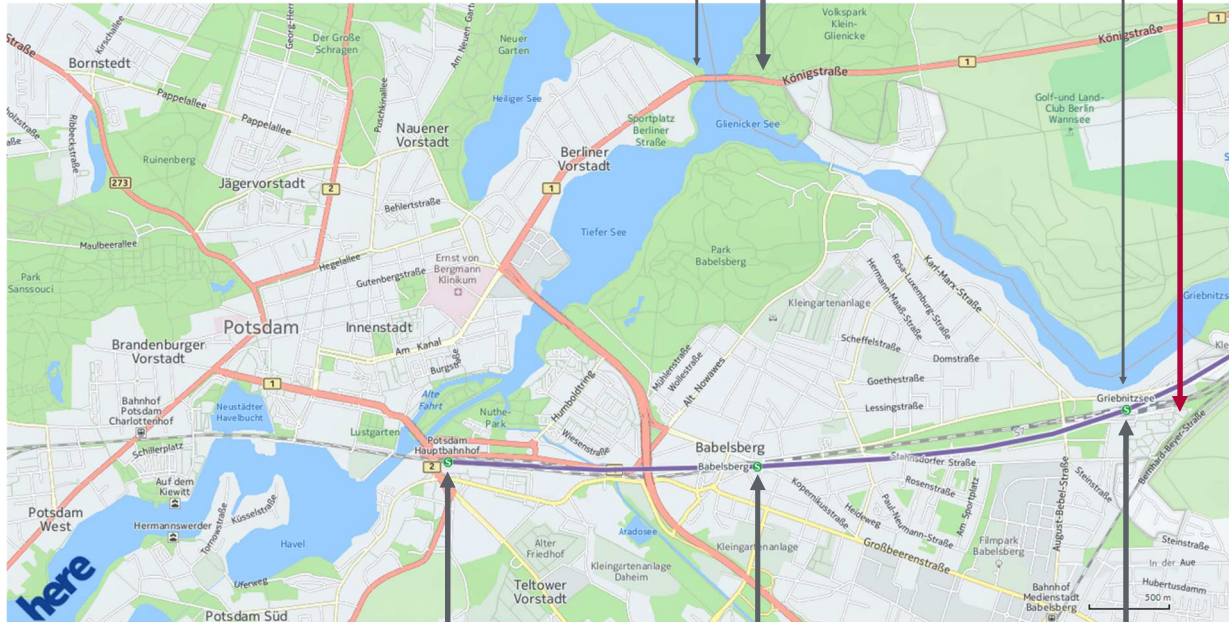
Starting with a boat tour at 19:00, we will have dinner at 20.30 in *Glienicke Palace (Remise)*. There will be shuttle busses back to *Hasso Plattner Institute/Griebnitzsee* available departing approx 22.45.



- 19:00 - Boat departure at Griebnitzsee landing (near hotel *Avendi* at lake *Griebnitzsee*)
- 20:15 - Arrival at *Anlegestelle Glienicker Brücke (Glienicke Bridge landing)*
- 20:30 - Welcome reception at *Remise Schloss Glienicke (Glienicke Palace Carriage House)*
- 22:45 - Bus shuttle departure to *Hasso Plattner Institute/Griebnitzsee* (via *Potsdam Central Station*)


Schloss Gliencke (Social Event)

Glienicke Bridge landing

Griebnitzsee landing



  Potsdam Hauptbahnhof (Central Station)

 Babelsberg

 Griebnitzsee

<https://www.here.com/?map=52.39625,13.08678,14>

International Branches

International cooperations enable the HPI to extend its research scope and to provide international partners with an opportunity for close exchange and with access to the HPI's international research contacts. Junior researchers work at their home universities, but receive their scholarships from the HPI in Germany. While being mentored jointly by their home university professors, they will be integrated into the Potsdam HPI Research School's research activities and participate in joint conferences and symposia.

Nanjing University, Nanjing, China

In November 2011 the "HPI Research School at Nanjing University" was opened.

Technion, Israel Institute of Technology, Haifa, Israel

Since April 2010 there is a HPI Research School at Haifa in cooperation with Technion—Israel Institute of Technology too. The Ph.D. students are working at the "HPI Research School at Technion, Haifa" within the HPI Research School team.

University of Cape Town, Cape Town, South Africa

In April 2009, the HPI Research School launched a "branch" in South Africa. The "HPI Research School at University of Cape Town" is mainly researching information and communication technologies that are relevant for developing and emerging countries.



Expansion of the Research School

Annually, the Institute's Research School seeks talented junior researchers and accordingly offers

8 Ph.D. Scholarships and 2 Postdoc Scholarships

The HPI Research School focuses on the foundation and application of large-scale, highly complex and interconnected IT systems. With its interdisciplinary and international structure, the Research School interconnects the HPI research groups as well as its international branches at Cape Town University, Technion - Israel Institute of Technology and Nanjing University. The HPI Future SOC Lab, a state-of-the-art computer center, enriches the academic work at the HPI Research School.

The HPI professors and their research groups ensure high quality research and will supervise Ph.D. students in the following topic areas: Human Computer Interaction, Prof. Dr. Patrick Baudisch; Computer Graphics Systems, Prof. Dr. Jürgen Döllner; Algorithm Engineering, Prof. Dr. Tobias Friedrich; System Engineering and Modeling, Prof. Dr. Holger Giese; Software Architecture, Prof. Dr. Robert Hirschfeld; Internet Technologies and Systems, Prof. Dr. Christoph Meinel; Information Systems, Prof. Dr. Felix Naumann; Enterprise Platform and Integration Concepts, Prof. Dr. h.c. Hasso Plattner; Operating Systems and Middleware, Prof. Dr. Andreas Polze; and Business Process Technology, Prof. Dr. Mathias Weske.

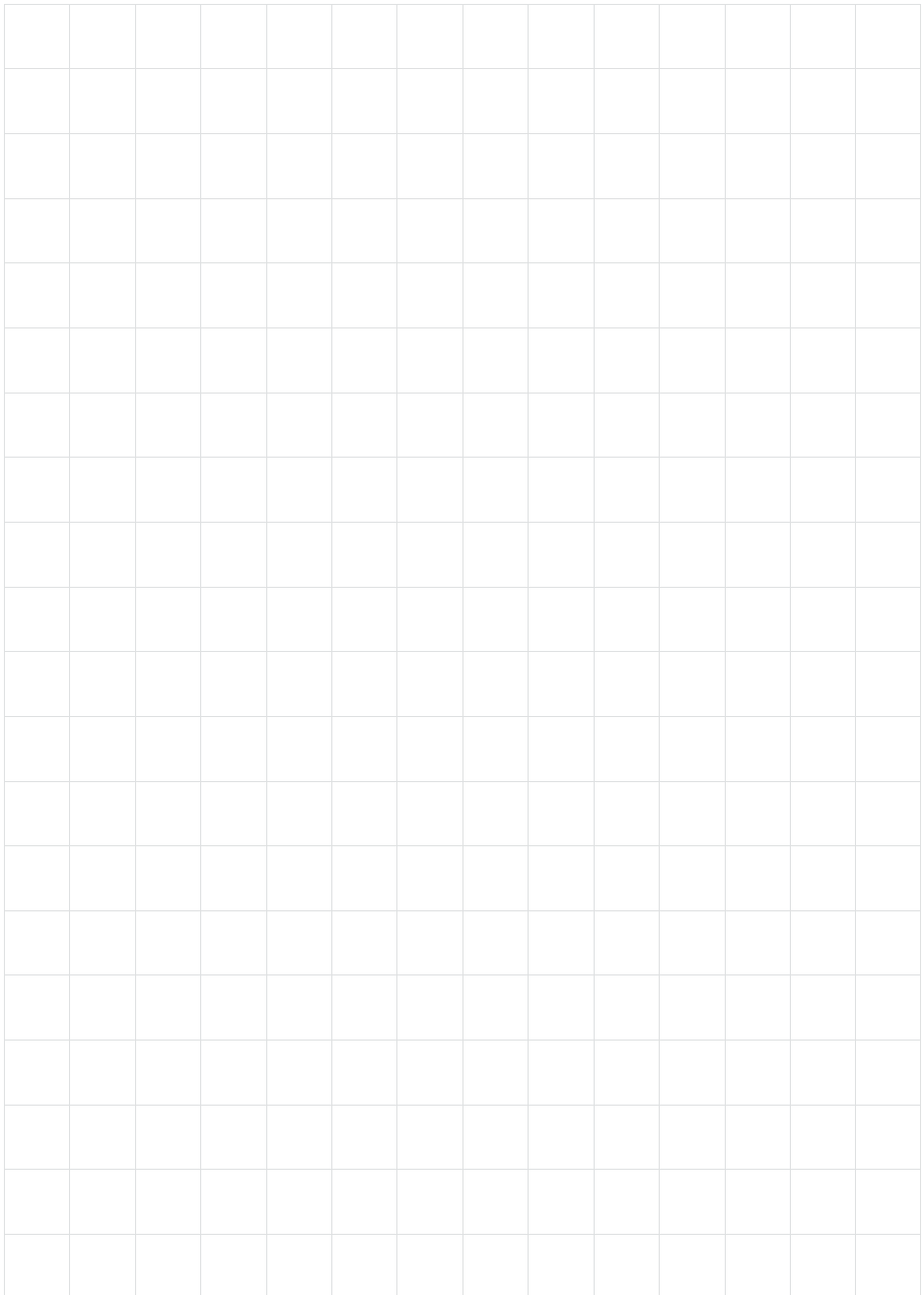
If you have prior experience in any of these areas, you are invited to submit a full application with the following documents: curriculum vitae and copies of certificates/transcripts, brief research proposal, work samples/copies of relevant scientific work (e.g. master's thesis), and a letter of recommendation.

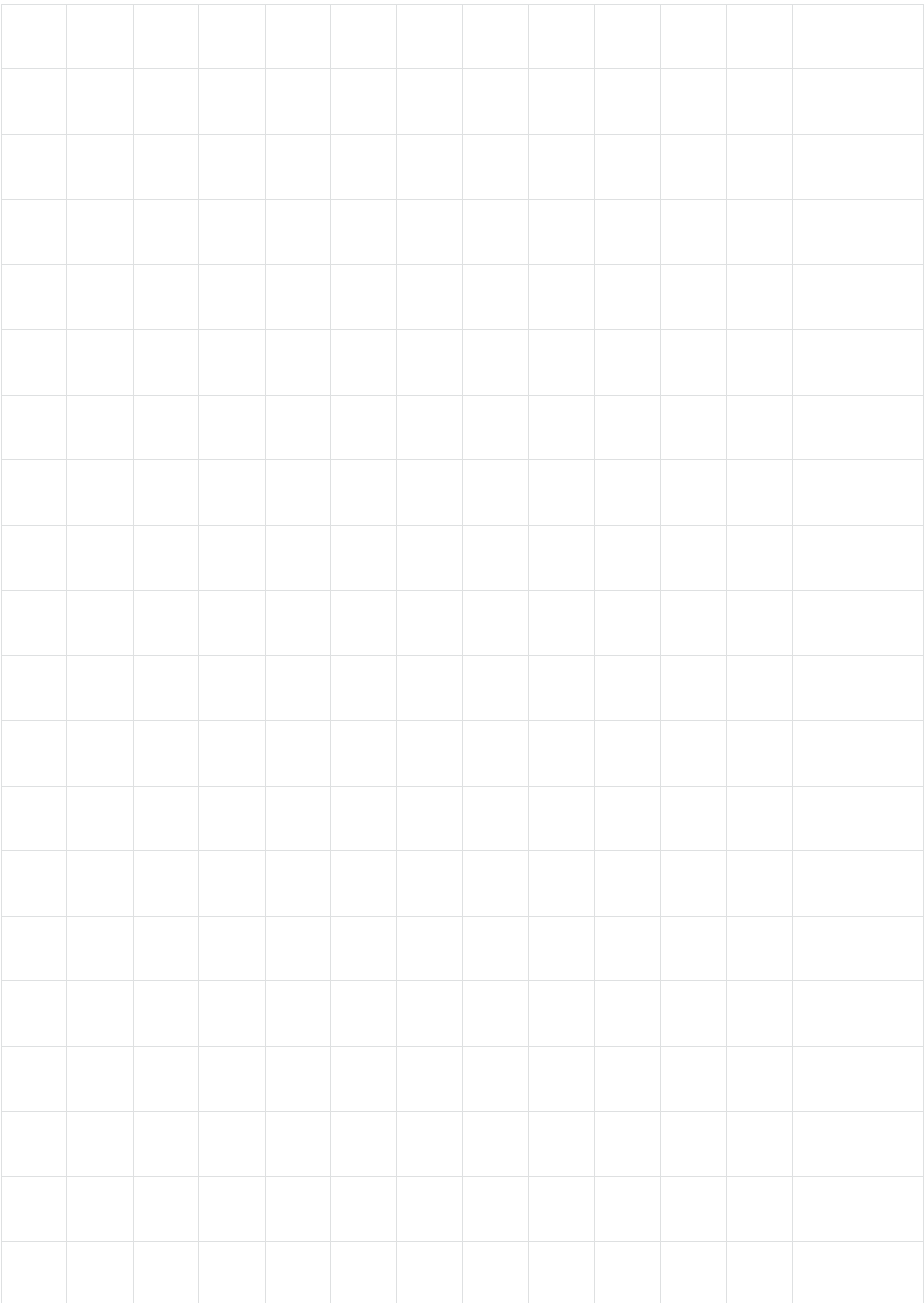
Applications must be submitted by August 15th of the respective year. Positions are usually available at the beginning of October. Please send your applications to:

research-school-application@hpi.de

For more information on HPI and its HPI Research School see:

http://www.hpi.de/research_school





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Photo: HPI/Kay Herschelmann