Future Trends in Service-oriented Computing

8th Symposium of the
HPI Research School

June 20 - 21, 2013

Annual Symposium on
Future Trends in Service-Oriented Computing

Contents

Notes

Hasso Plattner Institute for IT-Systems Engineering

The Hasso Plattner Institute for IT-Systems Engineering (HPI) at the University of Potsdam is unique in Germany for two key reasons: It was the first university institute in Germany financed entirely by private funds, and second, it is a prime example of a successful public-private partnership. The Hasso Plattner Institute offers the Bachelor's and Master's degree in "IT-Systems Engineering" that emphasizes the ability to design, develop, and control large, complex, and distributed IT systems. A particular specialty of the HPI is the strong engineering orientation that intensively incorporates industrial projects in its curriculum.

10 Research Groups shape the profile of the HPI in IT-Systems Engineering. At the HPI, 450 undergraduate and graduate students are currently enrolled and about 190 research assistants and Ph.D. students are researching in their respective field. Since October 2005, the HPI runs the Research School on "Service-Oriented Systems Engineering", an international Ph.D. school with 56 students in four different countries: Potsdam in Germany, Cape Town in South Africa, Haifa in Israel, and Nanjing in China.

The Hasso Plattner Institute tightly cooperates with scientific partners, both nationally and internationally. Among the partners – apart from renowned European universities – are the Stanford University, the Massachusetts Institute of Technology (MIT) in the US, as well as Technical University of Beijing in China. Furthermore, the HPI cooperates with renowned major IT companies, such as EMC, Fujitsu, HP, IBM, Microsoft, SAP, Siemens, and T-Mobile.

Agenda

Symposium on Future Trends in Service-Oriented Computing

Thursday, June 20, 2013

Room: HS 1, HS Foyer (Lecture Building)

Friday, June 21, 2013

Room: HS 3 (Lecture Building)

9:00 – 10:00	**Keynotes**

10:00 – 10:15 Coffee Break

10:15 – 10:50 **Opening of the HP Converged Cloud @ HPI FutureSOC Lab**

www.hp.com/go/converged-cloud
www.hpi.uni-potsdam.de/future_soc_lab

10:50 – 11:30 **Session 4 – ICT4D**

11:30 – 11:45 Coffee Break

11:45 – 13:15 **Session 5 – Scalable Computing**

Notes

Introduction:
Hasso Plattner Institute

Bio

Christoph Meinel is full professor (C4) for computer sciences at HPI and University of Potsdam, holding a chair on „Internet Technologies and Systems". His research focuses on Future Internet Technologies, in particular Internet and Information Security, Web 3.0: Semantic, Social and Service Web, as well as innovative Internet Applications, especially in the domains of e-Learning and Telemedicine. Apart from teaching in the HPI Bachelor and Master courses on IT-Systems Engineering he also teaches at the HPI School of Design Thinking. He is a visiting professor at the College for Computer Science at Beijing University of Technology in China and is a senior research fellow at the Interdisciplinary Center for Security, Reliability and Trust (SnT) at the University of Luxembourg (formerly LIASIT – Luxembourg International Advanced Studies in Information Technology). Since 2008, he is program director of the HPI-Stanford Design Thinking Research Program together with Prof. Larry Leifer from Stanford University.

Prof. Dr. Christoph Meinel

Director of the Hasso Plattner Institute, Germany

Introduction:
Future SOC Symposium

Prof. Dr. Andreas Polze

Speaker of the HPI Research School

Bio
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. He is member of the GI and the IEEE. He has been CoChair of ISORC 2011 and 2012 (Intl. Symp. On Object-Oriented Real-Time Computing). Andreas Polze has (co-) authored more than 90 papers in scientific journals and conference proceedings. He has contributed to five books.

Together with Mark Russinovich and David Solomon, Andreas Polze is one of the co-authors of the Windows Curriculum Resource Kit (CRK), the top-download at the Microsoft faculty resource center. Andreas Polze has been funded through the Rotor-I and Rotor -II projects. He received a Phoenix Direct Funding award in 2007 for research on Phoenix for Real-time Robotics and Process Control. 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.

HANA as a Platform
for Innovations

The increase of main memory as well as the increased capacity for parallel processing in commodity servers are the foundation for the feasibility of In-Memory Data Management in enterprise computing. In his keynote, Hasso Plattner presents the underlying key concepts that enable the dramatic performance increase with In-Memory Data Management compared to traditional disk-based approaches. Furthermore, he demonstrates the potential of HANA as a platform for new innovations based on live demos that leverage HANA to implement new core database concepts and that implement new applications based on HANA within the domain of enterprise computing and beyond.

Prof. Dr. Hasso Plattner

Chairman and Co-Founder SAP AG, Germany

Bio

Prof. Dr. h.c. Hasso Plattner is a co-founder of SAP AG, where he served as the CEO until 2003 and has since been chairman of the supervisory board. SAP AG is today the leading provider of enterprise software solutions. In his role as chief software advisor, he concentrates on defining the mid- and long- term technology strategy and direction of SAP.

Hasso Plattner received his diploma in communications engineering from the University of Karlsruhe. In recent years, he has been focusing on teaching and research in the field of business computing and software engineering at large. In 1998, he founded the Hasso-Plattner-Institute (HPI) in Potsdam, Germany. At the HPI, approximately 460 students are currently pursuing their Bachelors' and Masters' degrees in IT-Systems Engineering with the help of roughly 50 professors and lecturers. The HPI currently has about 100 PhD candidates.

Hasso Plattner leads one of the research groups at HPI which focuses mainly on In-Memory Data Management for Enterprise Applications and Human-Centered Software Design and Engineering.

Rafael Kolleß

SAP HANA Core Berlin, Germany

Build Infrastructure and Development Process @ SAP HANA

Since 200x, SAP provides an internal service for developers to support them with a central build infrastructure. This build infrastructure provides several tools and the build environment within a "clouded" infrastructure optimizing the platform-independent development. Formally created to support the development of MaxDB, liveCache and liveCache applications, this build infrastructure is used today to provide the optimal build process for the SAP HANA Database. Its adaptable and scalable strategy and architecture provides a fast build solution with comprehensive statistical and control mechanisms.

The SAP Build and Infrastructure team will illustrate the infrastructure solutions in SAP HANA Database development and explain how developers are supported in the associated processes. Tools like Vmake and MakeQueue will be demonstrated, which form the central building framework for all SAP HANA developers. Likewise, the requirements for the server, storage and network architecture will be explained as well as the challenges to facilitate the fast and scalable processing of jobs pushed by developers into the build infrastructure.

Bio
Rafael Kolleß worked as a technical consultant for the SAP Deutschland AG & Co KG from the year 2000 with the focus on virtualized SAP landscapes and performance optimization projects. He created architecture designs and operating system optimization plans for high performance system landscapes. Rafael Kolleß published best practice and architecture documents with partners of SAP for operating system and Cloud virtualization performance optimization. 2013 he joined the SAP HANA Build infrastructure Team for technical and architectural development.

Windows Server 2012
and the Microsoft Cloud OS

At the industry level, there is a fundamental shift toward cloud computing, which has implications on how applications are built, how applications are delivered as services to customers, and, finally, how those services are operated and maintained in a consistent and reliable way.

The Microsoft Cloud OS is a stack of technologies, including Windows Server to manage compute, storage and network resources in the data center, Windows Azure to deliver services, and SQL Server to handle big data problems. The goal of the Cloud OS is to provide one consistent platform and API to deliver all those various aspects to the need of modern applications.

In this talk we will give an overview about how Windows Server 2012 contributes to the vision of the Cloud OS, and how it enables modern IT to deliver services on-premise, in the cloud, or in hybrid environments.

Delivering a reliable Cloud OS also means to substantially commit to the security of customers and the protection against potential threats. As an example, we will summarize, from a developer's perspective, the impact of and response to the so called Flame virus on the Windows update infrastructure in summer 2012.

Bio
Alexander Schmidt works with the Cloud OS Infrastructure team at Microsoft, where he is the lead developer for Windows Server Update Services, the core of Microsoft's software distribution technology in the enterprise space. Before joining Microsoft, he worked with the Operating Systems and Middleware group at the Hasso Plattner Institute, where he received his Ph.D. in 2011. He holds a graduate degree in Computer Science from Chemnitz University of Technology. Alexander is an alumnus of the HPI Research School on Service-oriented Systems Engineering.

Dr. Alexander Schmidt

Windows Server Team

Microsoft Corporation, Redmond, USA

Werner Haas

*Intel Labs,
Braunschweig,
Germany*

Persistent Memory – Breakthrough or One Bridge Too Far?

The vast majority of computer systems in use today still follow the design laid out in John von Neumann's seminal "First Draft of a Report on the EDVAC" from 1945. His system already distinguished between (volatile) memory and an "outside recording medium", nowadays called storage. Semiconductor research was not only driven by Moore's Law, that is the quest for ever decreasing transistor sizes, but also led to new components, such as Flash memories that challenge traditional hard disks as storage medium. Emerging non-volatile memory technologies have the potential of going even one step further and challenging the role of DRAM as bulk memory. They key question to answer, however, is whether an evolution of block-oriented storage interfaces is sufficient to reap the benefits or whether memory persistency should be exposed directly to software.

In this talk we will briefly look at the physical properties of the upcoming non-volatile memories and the baseline set by next generation storage technology. Then we will shed some light on one of Intel Labs' current research vectors and the pitfalls associated with the integration of non-volatile devices into the cache-memory hierarchy from a computer architecture perspective. Beyond an overview over the status quo and open questions we want to present a call to action to think about future computing experiences that could be enabled by hardware innovation.

Bio
Since 2006, Werner Haas is working on digital design and system architecture at Intel Labs Braunschweig in the area of memory architecture research. Current focus is the implications of emerging non-volatile memories on computer systems and how to expose new capabilities to the programmer. Before transitioning to Intel Labs he worked two years in Intel's optical networking division on post-silicon validation of its framer products. He was a scientific assistant at the Institute for Computer Aided Design of the University of Erlangen-Nuremberg from 1997-2003, closely collaborating with Lucent/Bell Labs on the design and verification of integrated circuits for optical networking with research focus on the formal specification of event-driven systems. He received the Dipl.-Ing. degree in electrical engineering from the University of Erlangen-Nuremberg in 1997.

Dynamic Coalitions

Dynamic Coalitions essentially represent a coordination principle, where hierarchically nested sets are equipped with a notion of dynamic membership. Their proper expressive power, however, arises from extensions by further dimensions with, for example, data and corresponding access policies. The talk provides an overview of our current and planned work in this area.

Bio

Uwe Nestmann received his doctoral degree in Theoretical Computer Science in 1996 from the Universität Erlangen-Nürnberg. He spent almost ten years abroad in institutes and universities in France (INRIA, postdoc), Denmark (BRICS, postdoc) and Switzerland (EPFL, assistant professor). In 2005, he became professor at TU Berlin to build up a research group on Models and Theory of Distributed Systems. Each of these periods was marked by the focus of his theoretical foundations research in selected application areas: distributed implementation of programming languages, fault-tolerant distributed algorithms, distributed object-oriented programming, security protocols, trust models, business processes, healthcare processes, online social networks, etc.

Uwe Nestmann is "recommended member" of IFIP's Technical Committee TC1 on "Foundations of Computer Science", founding member of the IFIP WG 1.8 on "Concurrency Theory", and member of the IFIP WG 2.2 "Formal Description of Programming Concepts". He is also head of the recently founded GI-Fachgruppe on "Concurrency Theory".

Prof. Dr. Uwe Nestmann

Models and Theories of Distributed Systems

Technical University Berlin, Germany

Genomic Data Analysis Inside SAP HANA

The revolution of affordable DNA sequencing is on the rise and brings substantial challenges to the IT world. Terabytes of data need to be processed and analyzed in a fast and reliable way every day. With SAP HANA's powerful in-memory technology we can already tackle many of these problems today. To fill the remaining gaps, industrial quality genomics algorithms are being implemented directly inside the core of SAP HANA. Besides substantial performance improvements this provides a higher maintainability and usability which can pioneer the use of DNA sequencing in everyday clinical work.

Emanuel Ziegler

SAP TIP, Germany

Bio

Emanuel Ziegler studied Mathematics at the University of Kaiserslautern from 1999 to 2003 and Physics at the Universities of Kaiserslautern and Heidelberg from 1999 to 2005. Afterwards he worked at the Institute of Theoretical Astrophysics in Heidelberg on massively parallel magneto-hydrodynamical simulations. In 2010 he joined SAP to support the SAP HANA core development team where he currently focuses on the integration of bioinformatics algorithms into SAP HANA.

Devices and Services in Health Care

GETEMED, located in Teltow, Brandenburg, Germany, has been developing, manufacturing and selling medical devices in the fields of cardiological diagnostics and vital signs monitoring for over 25 years. In the early years, GETEMED focused mainly on the home monitoring of newborns. Since then, GETEMED has progressed to being a recognised specialist in the ambulatory monitoring of risk patients from all age groups. Furthermore, merging the know-how from both specialised fields has enabled GETEMED to offer customised solutions and innovative treatments for telemedical applications.

The talk will explain the role of devices and services in health care by means of two examples:

1. The aim of the first example is to provide a workflow/procedure for fast acquisition and analysis of ECG data when a medication is being administered by non-cardiologists for situations that could require immediate intervention.

2. Tele-monitoring of patients suffering from congestive heart disease

Bio
Robert Downes, born 1963 in Dublin, Ireland, began his career with GETEMED in 1987 as a hardware developer after completing his electrical engineering studies in Dublin. In 1996 he took over the responsibility for the product development department and joined the Board of the Directors in April 2010.

Robert Downes

CEO, GETEMED Medizin- und Informationstechnik, Germany

Dr. Georg Greten

CEO, IVZ, Germany

Digital Broadcast Archives and Retro-Digitization

The product of radio and television broadcast are digital files. This content is a mirror of our time and has to be archived for reuse or for academic research.

In order to archive 1 second of digital video content we need approximately 15 Megabyte. 1 day needs 1 Terabyte! Nothing will be deleted!

Retro-Digitization of existing archives has to be done also. Within the next 10 years most of the German broadcast companies will digitalize the last 60 Years.

IVZ will handle the digital content of at least DW, DRADIO, MDR, NDR, rbb, WDR, and HSB. We have to (1) invent new solutions to protect this content, (2) handle with really 'Big Data', and (3) find and deliver files within a few minutes in a format that is actually needed. IT is a big and fantastic IT-Job.

Bio

In his dissertation Dr. Georg Greten did basic research on materials for holographic data storage. During this time he also worked for several months at the Hugh Research Labs (California). Before joining the IVZ as CEO in 2001 he worked as CIO at Volkswagen Bordnetze.

During his time as CEO IVZ became the IT-hosting partner for almost all German public broadcasters. In continuation of his thesis data storage of digital video and digital audio is still one of his projects.

Dr. Georg Greten lives with his family since 1997 in Berlin

Moving BPM to the Cloud - The Case of Signavio and Effektif

Cloud computing has transformed the way how software is developed and delivered by vendors, implemented by system integrators and consumed by corporations. More and more applications that were previously only provided as on-premise installations are now offered as cloud services. Even integration- and customization-intensive applications are moving to the cloud these days. This presentation focuses on the past and future challenges of two Business Process Management (BPM) companies: Signavio, a cloud-based business process analysis platform, and Effektif, a cloud-based process automation platform.

Dr. Gero Decker

CEO, Signavio, Germany

Bio

Dr. Gero Decker is co-founder and co-CEO of Signavio, a Berlin- and Silicon Valley-based software vendor. The company was the first to launch a cloud-based tool for business process modeling. With its 400 customers around the world, Signavio is leading that nascent market head-to-head with IBM. Before founding Signavio, Gero has completed his PhD at Hasso-Plattner-Institute in 2009. Gero is also one of the initiators of the Berlin BPM initiative, a frequent speaker on B2B startups and a mentor at the Berlin Startup Academy.

Heterogeneous Software Pipelining for Memory-bound Kernels

Fahad Khalid

HPI Research School, Germany

Many scientific applications comprise of compute-bound computational kernels, i.e., the performance bottleneck lies in the complexity of arithmetic operations. Properly tuned compute-bound kernels can effectively leverage the massively parallel architecture of accelerators like GPUs.

The performance bottleneck for memory-bound kernels, however, is dictated by the frequency of memory access operations. Such kernels are not favored by accelerator architectures. This raises the following questions: "Is it possible to effectively utilize accelerators for memory-bound algorithms? Or must such algorithms be executed on CPU-only systems?"

As a first step, a method termed Heterogeneous Software Pipelining has been developed. In this method, a highly memory-bound kernel is split into a compute-bound and a memory-bound part. These two kernels are then executed in a pipeline spanning both the CPU and GPU; each kernel leveraging the suitable processor. The approach has been validated against a simulation kernel from the domain of Systems Biology.

Bio
Fahad Khalid joined the HPI Research School on Service Oriented Systems Engineering as a PhD student in May 2011. He is a member of the Operating Systems and Middleware Group. His research is in the area of Heterogeneous Parallel Computing. Fahad collaborates with the Max Planck Institute of Molecular Plant Physiology, to apply his research results to the simulation and analysis of Metabolic Networks.

Prior to joining the HPI, Fahad has worked as Software Developer and System Architect for large-scale telecommunications software systems; specifically in the areas of Real-time Charging and Provisioning & Service Activation. Fahad studied Computer Science in Pakistan, and Artificial Intelligence in Sweden He was also part of a team that developed research prototypes for the Stanford Linear Accelerator Center (SLAC) and the Center for European Nuclear Research (CERN).

Semantic Multimedia Analysis and Search

Video and multimedia data have become the predominant information on the World Wide Web. To cope with the ever growing amount of multimedia data on the web search engines have to open up the media content for search and retrieval. Automated multimedia analysis technologies such as, e.g. automated speech recognition, video OCR, or visual concept detection help to open up large scale multimedia repositories although the achieved analysis results often are error prone and unreliable. Semantic analysis considers the multiple (mostly text-based) metadata streams ranging from unreliable automated analysis up to authoritative metadata provided by experts, and constructs a semantic context to enable understanding of the media content. Thus, semantic analysis enables the improvement of metadata reliability by evaluating the plausibility of the content-based logical assumptions. In addition, semantically annotated multimedia data enables semantic and exploratory search to open up new ways of accessing multimedia repositories.

Bio

Harald Sack is Senior Researcher at the Hasso Plattner-Institute for IT-Systems Engineering (HPI) at the University of Potsdam. After graduating in computer science at the University of the Federal Forces Munich Campus in 1990, he worked as systems/network engineer and project manager in the signal intelligence corps of the German federal forces. In 1997 he became associated member of the graduate program 'mathematical optimization' at the University of Trier and graduated with a PhD thesis on formal verification in 2002. From 2002–2008 he did research and teaching as a postdoc at the Friedrich-Schiller-University in Jena and since 2007 he has a visiting position at the HPI, where he now is head of the research group 'Semantic Technologies and Multimedia Retrieval'. His areas of research include semantic web technologies, multimedia analysis and retrieval, knowledge representations, machine learning and semantic enabled retrieval. Since 2008 he also serves as general secretary of the German IPv6 council.

Dr. Harald Sack

*Senior Researcher,
Hasso Plattner
Institute, Germany*

Data Profiling Revisited

Prof. Dr. Felix Naumann

Information Systems

HPI Research School, Germany

Data profiling comprises a broad range of methods to efficiently analyze a given data set. In a typical scenario, which mirrors the capabilities of commercial data profiling tools, tables of a relational database are scanned to derive metadata, such as data types and value patterns, completeness and uniqueness of columns, keys and foreign keys, and occasionally functional dependencies and association rules. Individual research projects have proposed several additional profiling tasks, such as the discovery of inclusion dependencies or conditional functional dependencies.

Data profiling deserves a fresh look for two reasons: First, the area itself is neither established nor defined in any principled way, despite significant research activity on individual parts in the past. Second, more and more data beyond the traditional relational databases are being created and beg to be profiled. The talk proposes new research directions and challenges, including interactive and incremental profiling and profiling heterogeneous and non-relational data.

Bio

Felix Naumann studied mathematics, economy, and computer sciences at the University of Technology in Berlin. After receiving his diploma (MA) in 1997 he joined the graduate school "Distributed Information Systems" at Humboldt University of Berlin. He completed his PhD thesis on "Quality-driven Query Answering" in 2000. In 2001 and 2002 he worked at the IBM Almaden Research Center on topics around data integration. From 2003 - 2006 he was assistant professor for information integration at the Humboldt-University of Berlin. Since then he holds the chair for information systems at the Hasso Plattner Institute at the University of Potsdam in Germany.

Non-Volatile Memory Enhancement: A Cross-Layer Approach

Amit Berman

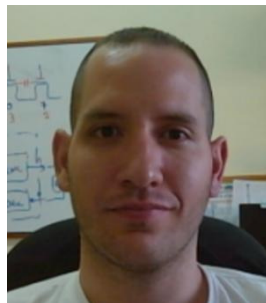*HPI Research School
at Technion, Israel*

The invention of semiconductor technology has marked a new era in memory devices: SRAM, DRAM, Flash and more. The ever-increasing rate of data production and consumption stimulates the development of high-performance memory devices. At times, high-density scaling drives new applications and ways of operation. However, device advancement presents trade-offs and ever growing challenges.

High-performance memory (SRAM, DRAM) suffers from relatively low density, higher power consumption and, most important, data volatility. Similarly, high-density, non-volatile memory (Flash) exhibits relatively low performance. As device technology shrinks, massive inter-cell interference is limiting the achievable density, high variations among memory cells result in degraded read/write performance, and endurance is limited due to cell degradation. Over the past decade, the various challenges have been the subject of much research, mostly focused on technology- and circuit-level innovation. Other challenges (e.g. restricted overwrite due to one-way charge level changes) were addressed by coding techniques.

In our research, we explore cross-layer methods for enhancing memory characteristics (density, read/write performance, power and reliability). Specifically, inter-cell interference is mitigated by using constrained coding to prevent the data patterns that cause interference beyond a predefined limit; read performance is improved by way of a speculative early sensing mechanism, whereby cell read time is dynamically minimized through premature sensing along with guaranteed error detection; multi-level cell write speed is improved by minimal maximum-level programming, whereby cells are being written gradually, different same-size pages are stored in different numbers of cells, and bit fractions of any given page are stored in a cell; and the number of possible rewrites between block erasures is increased via page management that permits writing to retired pages when proper data is available. Our schemes are presented and evaluated mostly in the context of NAND Flash, with several extensions to DRAM and SRAM, but some are also applicable to emerging memory technologies such as PCM.

Bio

Amit Berman is a Ph.D candidate at the Electrical Engineering Department, Technion - Israel Institute of Technology, and a member of the HPI research school at the Technion. He received the B.Sc and M.Sc in Electrical Engineering at 2006 and 2010 respectively. He is a recipient of several awards, including Hershel Rich Technion Innovation award, HPI fellowship, Mitchell grant and Intel research award. He held engineering and management positions at Intel and Saifun (a start-up acquired by Spansion) during 2003-2009. He authored several international publications in the fields of information theory, memory systems and computer architecture and holds several pending US patents.

Trends and Current Research Results in ICT4D - The Whys and the Wherefores

Dr. Anne Kayem

University of Cape Town, South Africa

The paradigm of information and computing technologies for the developing world (ICT4D) holds the promise of enabling cost effective technological solutions to the computing problems that emerge in this context. In the developing world, the computing needs that arise are not served simply by providing access to first world technological solutions. A key reason for this is that the algorithms and methodologies underlying these technologies presume quasi-infinite resource availability and do not take into account the social context of the users. Therefore in addressing ICT4D problems, we note that a rather radical stance is needed to overcome the inclination to focus on the technological issues and ignore social involvement.

In order to avoid the technical bias typically associated with standard software engineering practices, we are interested therefore, in building socially aware software systems that operate optimally in constrained resource settings. Our socially aware software engineering approach is based on a combination of user-centred methods from the field of human computer interaction, participatory design methods, and action research cycles. We tackle problems that stem from a variety of standard computing research fields that include: Mobile Computing, Human Computer Interaction, Security, Education, Digital Libraries, Sensor Networks, and Speech Recognition. Our results demonstrate that in comparison to standard technological approaches, the socially aware design philosophy yields constructive and effective solutions to ICT4D problems.

Bio

Anne V.D.M. Kayem is a Senior Lecturer at the Department of Computer Science and is Head of the Hasso-Plattner Institute at the University of Cape Town, South Africa. Prior to this she was a post-doctoral researcher at the German Research Centre for Artificial Intelligence (DFKI Bremen, Germany). She holds a BSc and MSc degree in Computer Science from the University of Yaoundé I, Cameroon, and a PhD degree in Computer Science from Queen's University (Kingston, Canada). In her PhD dissertation she studied cryptographic key management problems in shared data environments.

Her current research interests lie in the area of information security with a focus on addressing access control, unconventional/autonomous systems, information flow control, and privacy problems in resource constrained environments. She co-authored a monograph on adaptive cryptographic access control and is actively involved in the security community as a program committee member and a reviewer.

Approximate Counting

Approximate counting schemes, also known as sketching, offer space efficient data structures for counting the number of assurances for a very large number of items. These schemes trade-off the accuracy of the counters in order to gain significant storage space reductions. In this talk I will introduce this area and show how approximate counting can be used to boost distributed caching performance and P2P routing protocols. I will also present our analysis of the space vs. accuracy tradeoff of approximate counting as well as resulting space optimizations.

Bio

Roy Friedman is an associate professor in the department of Computer Science at the Technion. His research interests include Distributed Systems with emphasis on Mobile Computing, Middleware for Mobile Ad-Hoc Networks, Fault-Tolerance and High Availability, and Peer-to-Peer computing. He has published over 90 technical papers on these topics and he holds two patents. Formerly, Roy Friedman was an academic specialist at INRIA (France) and a researcher at Cornell University (USA). He is a founder of PolyServe Inc. (acquired by HP) and holds a Ph.D. and a B.Sc. from the Technion.

Prof. Dr. Roy Friedman

HPI Research School at Technion, Israel

Metastability and Synchronization in Modern VLSI Technologies
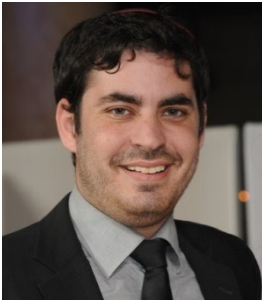
Salomon Beer

HPI Research School at Technion, Israel

Metastability events are common in digital circuits, and synchronizers are a necessity to protect from their fatal effects. Originally, synchronizers were required when reading an asynchronous input (that is, an input not synchronized with the clock so that it might change exactly when sampled). Now, with multiple clock domains on the same chip, synchronizers are required when on-chip data crosses the clock domain boundaries. Any flip-flop can easily be made metastable. Toggle its data input simultaneously with the sampling edge of the clock, and you get metastability.

One common way to demonstrate metastability is to supply two clocks that differ very slightly in frequency to the data and clock inputs. During every cycle, the relative time of the two signals changes a bit, and eventually they switch sufficiently close to each other, leading to metastability. This coincidence happens repeatedly, enabling demonstration of metastability with normal instruments. Understanding metastability and the correct design of synchronizers to prevent it is sometimes an art. Stories of malfunction and bad synchronizers are legion. Synchronizers cannot always be synthesized, they are hard to verify, and often what has been good in the past may be bad in the future. Papers, patents, and application notes giving wrong instructions are too numerous, as well as library elements and IP cores from reputable sources that might be "unsafe at any speed.'

This presentation will give a glimpse into the theory and practice of metastability and synchronizers. We will present the latest results of our research and provide a wide overview and introduction to the field.

Bio

Shlomi Beer is a Ph.D candidate at the Electrical and Computer Engineering Department, Technion - Israel Institute of Technology. He received the B.Sc and M.Sc in Electrical Engineering and the B.Sc in Physics from the Technion, all Summa Cum Laude. He is a recipient of several awards, including Chais foundation fellowship, Benin Scholarship and a special honor medal from the Israeli Parliament (Knesset). He is also an HPI fellow. He is alumnus of the Technion Excellence Program and a memeber of the IEEE. He won the gold medal in the Uruguayan Physics Olympiad in 1999, and a Silver medal in the International Physics Olympiad in 2000. He held engineering positions at Freescale Semiconductor (Previously Motorola Semiconductor) during 2005-2011, and authored several international publications and patents in the field of computer architecture, VLSI systems and computer vision algorithms.

A Streamlined Mobile User-Interface for Improved Access to LMS Services

Universities in developing countries face greater challenges in implementing learning management systems (LMSs) due to resource-poor settings, characterized by: low levels of ICT infrastructure; electricity outages; few computers; and limited and expensive Internet bandwidth, among other constraints.

It is anticipated that, if mobile phones are carefully integrated into the ecologies of LMSs, the impact of some of the above challenges in implementing LMSs would be reduced.

This paper presents a user-centered design process of mobile LMS interfaces for accessing selected LMS services on mobile phones, and a user experience evaluation for a mobile LMS application implementation.

From the design and implementation processes of the mLMS (mobile LMS), and the user experience evaluation of a working mLMS prototype, we conclude that: the ideas presented in the mLMS are technically feasible; the application is useful to the students and the students are encouraged to use their mobile phones to access LMS services more often, thereby reducing the over-reliance and pressure on the constrained institutional ICT resources.

Bio
Grace Ssekakubos research interests are broadly in ICT4D, particularly e-learning and e-government. For his PhD research, he is exploring strategies through which earners/institutions in developing countries can use mobile phones to effectively exploit the potential of leaning management systems in the support of blended learning. In the two years already spent on this research, I and my supervisors have generated and published important findings about LMS use in developing country universities.

Ssekakubo won the award for best research paper – on understanding the expectations of learners in developing countries – at the International Association for Development of the Information Society (IADIS) e-Learning Conference in Lisbon, 2012.

Grace Ssekakubo

HPI Research School at University of Cape Town, South Africa
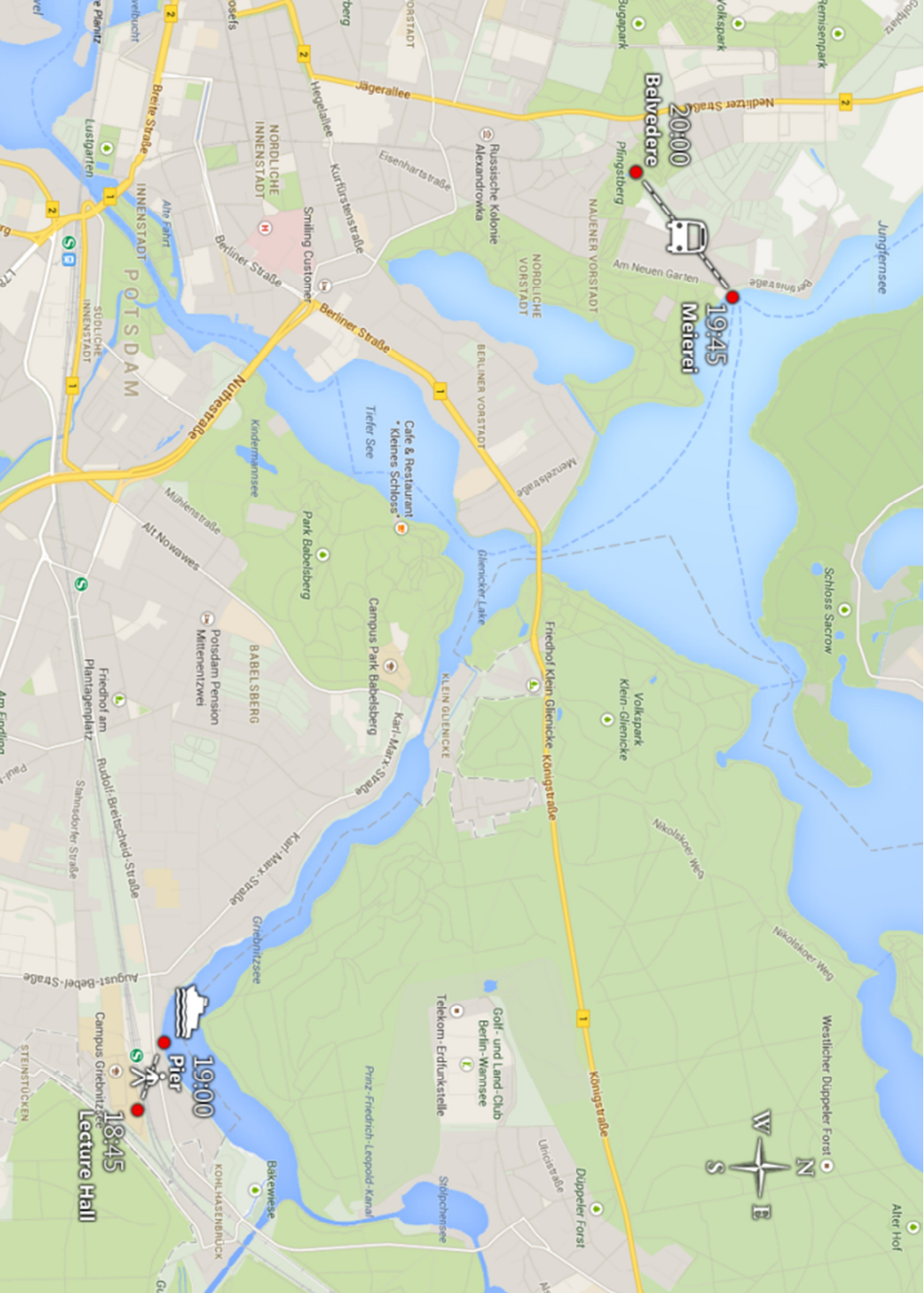
Social Event – Dinner at Belvedere

The boat tour starts at 19:00 at the pier near hotel "Avendi" at lake "Griebnitzsee". We will enjoy a beautiful landscape full of greenery, mansions, and historical landmarks. After arriving at the "Meierei" (kind of a dairy farm) at about 19:45, we will switch vehicles and go by bus until we reach the palace "Belvedere" on top of the hill "Pfingstberg". There, we will close the day having dinner under the starry sky with a great view on Potsdam and Berlin.

Don't forget to bring your camera! ;-)

(left) Important meeting spots, Google Maps

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 group 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 college, 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

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. Christof Meinel

Service-Oriented Information Integration
> Prof. Dr. Felix Naumann

Evolutionary Transition of Enterprise Applications to Service-Orientation
> Prof. Dr. h.c. Hasso Plattner

Operating System Abstractions for Service-Oriented Computing
> Prof. Dr. Andreas Polze

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.uni-potsdam.de/research_school

International Branches

International cooperations enable the HPI to extend its research scope and to provide its 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, China
In November 2011 the "HPI Research School at Nanjing University" was opened.

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.

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 "Service-oriented Systems Engineering"

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; 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; 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 certifi cates/transcripts, brief research proposal, work samples/copies of relevant scientifi c 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.uni-potsdam.de

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

http://www.hpi.uni-potsdam.de/research_school

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