CONTENTS OF THIS ISSUE
2 SPEC Research Group Officers
2 SPEC Research Working Groups
3 Foreword from Chairs and Editor
3 SPEC Research Group Mission Statement
3 SPEC Announcements
5 Report: Cloud Working Group
6 Report: IDS Benchmarking Working Group
6 Report: Big Data Working Group
7 Report: DevOps Performance Working Group
8 Three Distinctions of Alexandru Iosup
9 Winner of the SPEC Distinguished Dissertation Award 2015
10 Welcome to ICPE 2016 in Delft
10 ICPE 2017 Preliminary Announcement
10 LIMBO: a New Peer-reviewed Tool in SPEC Repository
11 Graphalytics: Benchmarking Platforms for Large-Scale Graph Processing
12 SPEC Symposium’16 – Energy Efficiency
13 InspectIT: Open Source APM Solution
14 diagnoseIT: A new APM Research Project
15 SPECtacular Awards 2015 and 2016

ICPE 2017 WILL BE HELD IN L’AQUILA, ITALY

Vittorio Cortellessa and Walter Binder, the General Chairs of the next ACM/SPEC International Conference on Performance Engineering (ICPE 2017), invite interesting high-quality submissions. The conference will take place in March 2017 in L’Aquila, Italy.

Read more on page 10

FOUR SPEC RESEARCH WORKING GROUPS REPORT ON THEIR PROGRESS

The SPEC Research Working Groups report on the progress, articles, benchmarks, and technical reports published in the year 2015. The Working Groups are always open for new members, feel invited to join us!

Read more on pages 5-7

YUFEI REN WINS THE SPEC DISTINGUISHED DISSERTATION AWARD

Among multiple high-quality dissertations that have been submitted to compete in the SPEC Distinguished Dissertation Award, the committee awarded Yufei Ren for his work on contemporary operating system virtualization techniques. Additionally, Cong Xu was distinguished with honorable mention.

Read more on page 9

NEW TOOLS IN THE SPEC REPOSITORY OF PEER-REVIEWED TOOLS

LIMBO and DynamicSpotter were accepted for the SPEC peer-reviewed tools repository. More tools are currently under review and further submissions are invited.

Read more on pages 3 and 10

CONTACT

Standard Performance Evaluation Corporation (SPEC)
7001 Heritage Village Plaza, Suite 225
Gainesville, VA 20155, USA

SPEC Research Group
Chair: Samuel Kounev (rgchair@spec.org)
Web: http://research.spec.org
SPEC RESEARCH GROUP OFFICERS

Chair:  
Samuel Kounov, University of Würzburg, Germany, rgchair@spec.org

Vice-chair:  
André van Hoorn, University of Stuttgart, Germany

Secretary:  
Klaus-Dieter Lange, HPE, USA

Release Manager:  
Qais Noorshams, IBM, Germany

Steering Committee:  
Samuel Kounov, University of Würzburg, Germany  
Qais Noorshams, IBM, Germany  
Tilmann Rabl, Bankmark UG, Germany  
Petr Tůma, Charles University of Prague, Czech Republic  
J. Nelson Amaral, University of Alberta, Canada  
André van Hoorn, University of Stuttgart, Germany  
Alexandru Iosup, TU Delft, The Netherlands  
Lizy John, University of Texas at Austin, USA  
Klaus-Dieter Lange, HPE, USA  
Meikel Poess, Oracle Corporation, USA

Publicity Officer:  
Christoph Heger, NovaTec Consulting GmbH, Germany

Newsletter Editor:  
Piotr Rygielski, University of Würzburg, Germany

SPEC RESEARCH WORKING GROUPS

Cloud Working Group

Chair:  
Alexandru Iosup, TU Delft, The Netherlands

Secretary:  
Aleksandar Milenkoski, University of Würzburg, Germany

Release Manager:  
Nikolai Herbst, University of Würzburg, Germany

IDS Benchmarking Working Group

Chair:  
Marco Vieira, University of Coimbra, Portugal

Vice-Chair:  
Alberto Avritzer, Siemens Corporate Research, USA

Secretary:  
Aleksandar Milenkoski, University of Würzburg, Germany

Release Manager:  
Aleksandar Milenkoski, University of Würzburg, Germany

Big Data Working Group

Chair:  
Tilmann Rabl, Bankmark UG, Germany

Vice-Chair:  
Todor Ivanov, Goethe University Frankfurt, Germany

Secretary:  
Meikel Poess, Oracle Corporation, USA

Release Manager:  
John Poelman, IBM, USA

DevOps Performance Working Group

Chair:  
André van Hoorn, University of Stuttgart, Germany

Vice-Chair:  
Felix Willnecker, fortiss GmbH, Germany

Secretary:  
Robert Heinrich, KIT, Germany

Release Manager:  
Alexander Wert, NovaTec Consulting GmbH, Germany

http://research.spec.org/working-groups/cloud-working-group.html

http://research.spec.org/working-groups/ids-benchmarking-working-group.html

http://research.spec.org/working-groups/big-data-working-group.html

http://research.spec.org/working-groups/devops-performance-working-group.html
WELCOME TO THE SPEC RESEARCH GROUP NEWSLETTER

We are delighted to present to you the next issue of the SPEC Research Group Newsletter. This regular publication provides information on latest developments, news, and announcements relevant to the benchmarking and quantitative system evaluation communities. Our newsletter is part of our mission to foster the exchange of knowledge and experiences between industry and academia in the field of quantitative system evaluation and analysis.

The past year has been very intense and exciting for the SPEC RG. To the major activities and milestones reached, we include: the organization of ICPE 2016, accepting two new tools for the SPEC repository of peer-reviewed tools, successful year for the four working groups, releasing two technical reports: (“New Cloud Metrics”, and “Performance-oriented DevOps: Research Agenda”), selecting the winner of the SPEC Distinguished Dissertation Award, and many more.

We have been actively working on preparation, planning and organization of the ICPE 2016. We hope that the vivid exchange of ideas during the upcoming ICPE 2016 will be a great motivation for the next year of scientific and engineering work.

We hope that you will enjoy reading the newsletter. We welcome and encourage your contributions for articles and suggestions for future coverage.

Samuel Kounev (University of Würzburg), André van Hoorn (University of Stuttgart), Piotr Rygielski (University of Würzburg)

SPEC RESEARCH GROUP MISSION STATEMENT

The SPEC Research Group (RG) is one of the four groups of the Standard Performance Evaluation Corporation (SPEC). Its mission is to promote innovative research in the area of quantitative system evaluation and analysis by serving as a platform for collaborative research efforts fostering the interaction between industry and academia in the field.

The scope of the group includes computer benchmarking, performance evaluation, and experimental system analysis considering both classical performance metrics such as response time, throughput, scalability and efficiency, as well as other non-functional system properties included under the term dependability, e.g., availability, reliability, and security. The conducted research efforts span the design of metrics for system evaluation as well as the development of methodologies, techniques and tools for measurement, load testing, profiling, workload characterization, dependability and efficiency evaluation of computing systems.

Samuel Kounev (University of Würzburg)

SPEC ANNOUNCEMENTS

Zenodo repository for persisting ICPE 2016 submissions artifacts

January 20, 2016

Pursuing its mission to serve as a platform for collaborative research efforts, the SPEC Research Group (RG) has opened a new community on the Zenodo open digital repository. The purpose of the community is to archive and share research artifacts associated with RG activities, in particular the ACM/SPEC International Conference on Performance Engineering (ICPE). By providing a stable location for artifacts required to reproduce and reuse the research results, RG aims to broaden the practical impact of ICPE contributions and nurture an environment where detailed disclosure of research results is an accepted practice. At the time of writing, over a third of the authors presenting at ICPE 2016 has already uploaded the associated artifacts to the repository. More uploads are being prepared. The repository is available online under the provided link.

http://zenodo.org/collection/user-spec-rg

Petr Tůma (Charles University of Prague)

The SERT 1.1.1

January 18, 2016

The first quarter of 2016 sees the release of version 1.1.1 of the Server Efficiency Rating Tool (SERT) for the US EPA ENERGY STAR for Computer Servers program. This update adds support for the IBM Power8 processor family in little endian mode, validated with Ubuntu 14.04.03 and IBM J9 8.0 SR1.

It also includes a new revision of PTDaemon, v1.8.0. This adds support for the Yokogawa WT310E & 333E and the Hioki PW 3335, 3336 & 3337 power analyzers. All work in single channel AC mode, and also in multi-channel mode for those models that support more than one input channel.

As with every SERT update, the user guide has been thoroughly revised, based on user feedback and support questions received since the last release. This update is available in both English and Mandarin.

Mike Tricker (SPECpower Committee Secretary)
Article accepted for publication in the prestigious journal “ACM Computing Surveys”  
July 28, 2015

A paper produced by the SPEC RG IDS Benchmarking Working Group has been accepted for publication in ACM Computing Surveys (CSUR). The paper surveys the state-of-the-art in the area of evaluation of intrusion detection systems.

CSUR publishes survey articles and tutorials related to computer science and computing. According to the ISI Journal Citation Reports, CSUR has among the highest impact factors of all computer science journals.


www.research.spec.org

The 13th IEEE International Conference on Autonomic Computing (ICAC 2016)  
September 29, 2015

The 13th IEEE International Conference on Autonomic Computing (ICAC 2016) will be held in Würzburg, Germany on July 19-22, 2016.

ICAC is the leading conference on autonomic computing, its foundations, principles, engineering, technologies, and applications. Nowadays, complex systems of all types, like large-scale data centers, cloud computing infrastructures, cyber-physical systems, the internet of things, self-organizing systems, organic computing systems, cognitive computing systems, or self-aware computing systems, are increasingly complex, involving many active, interconnected components requiring careful coordination. Being impossible for a human to manage such systems, the autonomic computing paradigm with its support for self-management capabilities becomes increasingly indispensable for the components of our IT world.

http://icac2016.uni-wuerzburg.de/  
www.research.spec.org

SPEC SFS2014 benchmark received an update  
November 19, 2015

This update fixes a possible sensitivity to systems that have inline compression enabled and incorporates all errata fixes since the initial release. Going forward, all result submissions must be made using the SP1 version of the benchmark. Existing licensees of V1.0 are entitled to a free upgrade to SP1.

https://spec.org/sfs2014/  
www.spec.org

DynamicSpotter was accepted for SPEC Tools Repository  
January 21, 2016

A new tool was accepted for SPEC RG’s repository of peer-reviewed tools for quantitative system evaluation and analysis: DynamicSpotter. DynamicSpotter is a framework for measurement-based, automatic detection of software performance problems in Java-based enterprise software systems. DynamicSpotter combines the concepts of software performance anti-patterns with systematic experimentation.

More tools are currently under review and further submissions are encouraged.

http://research.spec.org/tools/  
www.research.spec.org

SPECjbb2015 released  
November 18, 2015

SPEC announces the release of SPECjbb2015, an enhanced Java server benchmark that now supports virtualized hosts, adds stricter performance validation, and specifies faster response times for a more accurate assessment of total capacity in a variety of real-world deployments.

https://spec.org/jbb2015/  
www.spec.org

Book: Server Efficiency—Metrics for Computer Servers and Storage  
June 19, 2015

Klaus-Dieter Lange, SPEC board member and SPECPower chair, together with Karl Huppler, a long-time supporting contributor to SPEC, are the authors of the recently released “Server Efficiency—Metrics for Computer Servers and Storage”, the 12th book in the ASHRAE Datacom Series. Huppler calls the book “a valuable guide for choosing energy-efficiency measures for computer servers and associated storage.” It can be purchased on the ASHRAE website.

http://www.techstreet.com/ashrae/products/1894771  
www.spec.org
REPORT: CLOUD WORKING GROUP
January 18, 2016

The SPEC RG Cloud Group has continued, over the course of 2015, to pursue its long-term mission of taking a broad approach, relevant for both academia and industry, to cloud benchmarking, quantitative evaluation, and experimental analysis. Our group focuses on novel cloud properties such as elasticity, performance isolation, dependability, and other non-functional system properties, in addition to classical performance-related metrics such as response time, throughput, scalability, and efficiency. Among the keywords most discussed in the group, over 2015, are cloud metrics, elasticity, auto-scaling, service definition and configuration, and data as a service.

The scope of the group is ‘to develop new methodological elements for gaining deeper understanding not only of cloud performance, but also of cloud operation and behavior, through diverse quantitative evaluation tools, including benchmarks, metrics, and workload generators’. In 2015, through bi-weekly online meetings facilitated by WebEx and SPEC, we have advanced work on 4 main topics and a number of other sub-topics:

(1) Cloud Usage Patterns (CUPs): The goal of this activity is to define a formalism for expressing cloud usage patterns and scenarios. The joint authors, who represent seven organizations, propose [1] a simple yet expressive textual and visual formalism, which can be used by both general users and cloud experts. A key feature of the textual formalism is its conciseness; this goes in contrast to other formalisms that also focus on the executability of the specification. By expressing over ten patterns commonly seen in academic and industrial practice, the authors show that CUP is practical. An extended article, with new core concepts, was created during 2015 and is currently under submission.

(2) Cloud Metrics Survey and Design: This ongoing activity focuses on surveying existing cloud metrics and on the design of key missing metrics that allow the quantitative assessment and characterization of typical cloud usage scenarios. Among the key new metrics, the joint authors focus on various forms of elasticity [2] and risk-quantifying metrics [3]. A continuation of this work, and an extended set of metrics, have been developed by the group over 2015 and are being prepared for publication.

(3) BUNGEE: This ongoing activity focuses on the development and validation of a Java-based framework focusing on cloud elasticity, especially for IaaS cloud platforms and auto-scaling environments. The tool provides load and stress-testing functionality, and automates the analysis of the quality of the elastic behavior of the system under test through several elasticity metrics. Currently, BUNGEE supports CloudStack and Amazon AWS based deployments. The group is currently extending BUNGEE to support more cloud environments and metrics.

(4) Benchmarking Auto-Scaling Techniques: This ongoing activity, which various members of the RG Cloud Group are just starting, is aiming to conduct a quantitative analysis and comparison of auto-scaling techniques in virtualized environments.

Current participants in the RG Cloud Group include the Delft University of Technology (Delft), the IBM T.J. Watson Research Center (USA), Lund University (Sweden), MITRE (USA), Oracle (USA), Salesforce.com (USA), SAP (Germany), Tata TCS (India), Umeå University (Sweden), and the University of Würzburg (Germany). Several of the members play leading roles in their institutions, and others have won important distinctions over the course of 2015. For example, Dr. Samuel Kounev currently leads the Descartes Software Engineering Group of the University of Würzburg, and Dr. Alexandru Iosup has won the Netherlands Teacher of the Year 2015 award and has been selected to join the Young Academy of the Royal Netherlands Academy of Arts and Sciences. Besides the frequent participants, we have welcomed various invited speakers and guest participants. For 2016, we are actively seeking new participants and activities.

In 2015, the RG Cloud Group has been represented by its members at many international academic and industrial venues, and has helped organize various international events, such as HeteroPar and the flagship conference of SPEC, the ACM/SPEC International Conference on Performance Engineering (ICPE). Internally within SPEC, our group has contributed to the review and subsequent publication of several benchmarking tools. Concluding, 2015 was a full and successful year for the RG Cloud Group. We are looking forward to an even more successful 2016!

Acknowledgments: part of this work has been submitted by the group as a poster to the ICPE2016 conference, to inform our community about the opportunity of collaborating with the RG Cloud Group.


http://research.spec.org/working-groups/rg-cloud-working-group.html

Alexandru Iosup (TU Delft)
The SPEC RG IDS Benchmarking Working Group successfully concluded its agenda for 2015 and faces 2016 with a renewed commitment. In 2015, the Working Group further established its research agenda having several works published.

The SPEC RG IDS Benchmarking Working Group published a paper focusing on evaluation of IDSes in virtualized environments at RAID 2015 (the 18th International Symposium on Research in Attacks, Intrusions and Defenses) [1]. This symposium brings together leading researchers and practitioners from academia, government, and industry to discuss novel security problems, solutions and technologies related to intrusion detection, attacks and defenses. The paper presents hlnjector, a tool for generating IDS evaluation workloads by injecting such attacks during regular operation of a virtualized environment. It demonstrates the application of the tool and shows its practical usefulness by evaluating a representative IDS designed to operate in virtualized environments. The virtualized environment of the industry-standard benchmark SPECvirt_sc2013 is used as a testbed, whose drivers generate workloads representative of workloads seen in production environments. This work enables for the first time the injection of attacks in virtualized environments for the purpose of generating representative IDS evaluation workloads.

In addition, a paper produced by the SPEC RG IDS Benchmarking Working Group was published by ACM Computing Surveys (CSUR) [2]. The paper surveys the state-of-the-art in the area of evaluation of intrusion detection systems. CSUR publishes survey articles and tutorials related to computer science and computing. According to the ISI Journal Citation Reports, CSUR has among the highest impact factors of all computer science journals.


Employing traditional ways of specifying standardized benchmarks with predefined workloads is not trivial for big data systems, because of the combinations of large volumes of data, heterogeneous data formats, and the rapidly improving performance of both hardware and big data systems, it is hard to generalize architectural aspects that best suit all application requirements, making the investigation and standardization of such systems very difficult.

As big data systems are evolving, there is an inherent need to evaluate and quantify their performance with the ultimate goal of comparing these systems. Comparisons are desirable in different dimensions, such as software stack, hardware, use case, and tuning parameters. That is, one might want to compare a particular software stack on different hardware systems, a particular hardware setting on different software stacks, or one software stack on a particular hardware with different tunings.

With the rapid increase in big data solutions, both academia and industry alike are developing new benchmarks at a rapid pace. Driven by the "velocity of change" many performance benchmark developers "cut corners" by customizing their benchmarks too closely to the architectural characteristic of the system they want to benchmark, instead of abstracting its core performance attributes. These benchmarks become "island solutions" that only fit the systems they targeted in the first place. This approach works well if the goal is to compare the performance of a particular software stack on a particular hardware setting. However, this does not work well to compare the performance of different software stacks on the same hardware platforms or vice versa.

Employing traditional ways of specifying standardized benchmarks with predefined workloads is not trivial for big data systems, because of the combinations of large volumes of data, heterogeneous data formats, and velocity of changes in the processing technology used in big data solutions. As a consequence, many companies and research institutions are developing their own "island solutions" that only fit systems they target. It is a challenge for both industry and academia to keep track of the large number of emerging benchmarks.

Therefore, in 2015, the Big Data Working Group focused on surveying current big data benchmarking efforts and published a paper on this topic at the Transaction Processing Performance Council's Technical Conference (TPC TC) [1]. Furthermore, the group co-organized the 6th Workshop on Big Data
Benchmarking [2] in Toronto and held its first face to face meeting there. As an outreach activity, a poster and lightning talk was presented at the 8th Extremely Large Database Conference [3].

The group holds weekly meetings, with internal calls and open, public calls alternating. For the open calls, presentations on big data benchmarking, big data systems, performance tuning, and related research are invited. These calls are well attended and received. Topics in 2015 were BigBench, IoTAbench, big data in Finance, SparkBench, Oracle Big Data SQL, Graphalytics, HiBench, Benchmarking Facets, and benchmarking on modern clusters. All presentations can be found on the working group’s website [4]. In the internal calls, the group furthers the research on big data benchmarking. In 2016, besides extending the ongoing research activities, the group plans to co-organize the 8th Workshop on Big Data Benchmarking, which will be held in Barcelona, Spain hosted by the Barcelona Supercomputing Center.

The DevOps Performance Working Group fosters and facilitates research in combining APM and SPE activities, e.g., by experience sharing, agreement on definitions, specification of metrics, and dissemination of novel methods, techniques, and tools for quantitative evaluation. The group focuses on the challenges and opportunities of performance evaluations in DevOps environments. We aim to identify cross-community collaboration, and to set the path for long-lasting collaborations towards performance-aware DevOps.

As the major joint activity in 2015, the DevOps Working Group created and published the technical report SPEC-RG-2015-01 “Performance-oriented DevOps: A Research Agenda” [2]. The report surveys performance evaluation methods, techniques, and best-practices for all lifecycle phases of enterprise software applications and identifies research challenges for the upcoming DevOps era. This report acts as a research agenda for the next years in this narrow domain related to different communities including performance and software engineering, cloud computing, and big data.

In February 2015, the group met for its first face-to-face meeting, co-located with the RELATE Winter School at the University of Würzburg, Germany. The agenda of the one-day meeting comprised detailed discussions on the technical report, two invited talks, and discussions on future working group activities. 13 group members participated in the meeting.

Together with two EU projects, the working group initiated the International Workshop on Performance-Aware DevOps (QUDOS). QUDOS 2015 [3], technically cosponsored by the SPEC RG, was co-located with the renowned 10th Joint Meeting of the European Software Engineering Conference and the ACM SIGSOFT Symposium on the Foundations of Software Engineering (ESEC/FSE) in Bergamo, Italy in September 2015. The initial workshop comprised 10 talks, 8 scientific papers, and around 25 registered participants. Due to the great interest in this new workshop a second edition of QUDOS is planned for fall 2016.

Several sub-projects among subsets of the members have been conducted. A comparison and integration of resource demand estimation (LibReDE) and measurement (PMWT) techniques resulted in a publication at the 12th European Workshop on Performance Engineering (EPEW). Papers and tools on the WESSBAS approach for specifying, extracting, and generating session-based workloads have been published. A collaborative research project diagnoseIT on “Expert-Guided Automatic Diagnosis of Performance

REPORT: DEVOPS PERFORMANCE WORKING GROUP

December 21, 2015

The DevOps Performance Working Group [1] is concerned with combining application performance management (APM) and software performance engineering (SPE) activities for business-critical software systems. The need for a better SPE/APM integration is driven by an increased interrelation of development and operation teams in corporate environments, including new software development and organization paradigms known as DevOps. The DevOps movement aims on merging the classical development and operations silos to end-to-end responsible teams. This paradigm change requires increased collaboration and a high degree of automation in the development and deployment processes. The community has failed to systematically integrate performance management practices into the DevOps world, even though modern software development paradigms provide great opportunities to do that. Only holistic performance management, integrating Dev and Ops throughout the whole life-cycle, leads to high-quality software.


Tillmann Rabl (bankmark UG)
Problems in Enterprise Applications” has been started (read more on page 14).

A current major joint activity is the development of a reference architecture and a process model for performance-aware DevOps. The technical report and a survey on the industrial DevOps performance practices, concurrently conducted by the working group, will serve to identify the core design rationale. The survey aims on detecting current DevOps practices in context of performance evaluation to align the reference architecture and process to industry practice. The outcome of this project will help companies to transform from classical development and operations silos to a performance-aware DevOps process model.

In September 2016, the group will co-organize a GIDagstuhl seminar entitled “Software Performance Engineering in the DevOps World” [4]. The main goal of the GIDagstuhl Seminar is to bring together young researchers in the areas of software engineering, performance engineering, cloud computing, and big data to present their current research projects, to exchange experience and expertise, to discuss research challenges, and to develop ideas for future collaborations.

The group meets on a biweekly basis to discuss current activities and new project ideas, including invited presentations. In 2015, 22 meetings were held, including talks about performance problem detection, performance regression testing, and joint projects of the group. For more information about the DevOps Performance Working Group, (including mission, activities, meetings, presentations, projects) visit our web page [1]. If you are interested in following the discussions or contributing actively, please get in touch with the working group chairs.


André van Hoorn (University of Stuttgart), Felix Willnecker (fortiss GmbH)
science platform of leading young researchers. Every year, the Young Academy selects ten talented new researchers to add to its ranks. Members are elected for five years.

Dr. Iosup has been recognized for being an international pioneer in the field of distributed systems. His research was considered essential to emerging fields such as cloud computing, to popular internet applications such as e-Science and online gaming, and to the future of large-scale and/or gamification-based teaching. Iosup is an advocate of open access and devotes a great deal of his time to supervising talented young researchers. He is involved in master classes on technology, in particular in his field of research, for Dutch engineers and students.

In December 2015, Dr. Alexandru Iosup has been announced as the winner of the Netherlands Award for ICT Research 2016. The prestigious Netherlands Award for ICT Research is presented annually by the Royal Dutch Organization of Sciences (Koninklijke Hollandsche Maatschappij der Wetenschappen, KHMW, founded 1752) to a scientific researcher, not older than 40 years old, who has conducted innovative research or is responsible for a scientific breakthrough in the field of ICT. The prize is an initiative of the Royal Netherlands Academy of Arts and Sciences via ICT Research Platform Nederland (IPN), in collaboration with the Netherlands Organisation for Scientific Research (NWO). On 23 March 2016, Dr. Iosup will receive his award at a special ceremony during the ICT. OPEN 2016 event.

Dr. Iosup plans to use the €50,000 prize money to strengthen his research group in order to launch new research into graph-processing systems, starting with benchmarking and as a collaboration between the SPEC RG Cloud Group and the Big Data Working Group. The jury praised Dr. Iosup for his academic achievements, his active collaboration with companies, and his efforts to bring ICT research to the attention of a wide audience.

The SPEC Research Group wishes to commend Alexandru for these distinctions.


Members of SPEC RG Cloud Working Group

---

**YUFEI REN FROM STONY BROOK UNIVERSITY, NEW YORK WINS THE 2015 SPEC DISTINGUISHED DISSERTATION AWARD**

**January 12, 2016**

The SPEC Distinguished Dissertation Award is an annual award that aims to recognize outstanding doctoral dissertations within the scope of the SPEC Research Group in terms of scientific originality, scientific significance, practical relevance, impact, and presentation. This year, the award committee considered 15 excellent dissertation submissions from universities around the world: Pennsylvania State University, Virginia Tech, Karlsruhe Institute of Technology, Australian National University, University College Dublin, University of Lisbon, Colorado State University, University of Malaya.

The winning dissertation from Yufei Ren of New York’s Stony Brook University, nominated by Professor Dantong Yu, is about scalable end-to-end data I/O over enterprise and datacenter networks. The committee particularly appreciates the insights presented in this dissertation for improving data-intensive applications in data centers from a holistic perspective. The practically oriented work across multiple layers of the networked storage stack coupled with the solid experiments drew praise from the committee members. The award is to be handed over at the ICPE 2016 Conference in the Netherlands in March 2016.

In addition to selecting the winner, the committee decided to recognize one dissertation with honorable mention. This is the dissertation of Cong Xu, nominated by Professor Yuan Xie of the Pennsylvania State University, for contributions to modeling, circuit design and microarchitecture of emerging resistive memory.

The award selection committee for 2015 chaired by Prof. Lizy Kurian John of the University of Texas at Austin, consisted of the following members:

- Mauricio Breternitz, AMD, USA
- Yao-Min Chen, Oracle, USA
- Ramesh Radhakrishnan, Dell, USA
- Seetharami Seelam, IBM, USA
- Petr Tuma, Charles University, Czech Republic
- Zhibin Yu, China Shenzhen Institute of Advanced Technology, CAS, China
- Lizy Kurian John (University of Texas at Austin)

The SPEC Distinguished Dissertation Award was established in 2011 to recognize outstanding dissertations within the scope of the SPEC Research Group in terms of scientific originality, scientific significance, practical relevance, impact, and quality of the presentation.

Lizy Kurian John (University of Texas at Austin)
LIMBO: A TOOL FOR MODELLING, EXTRACTING AND GENERATING TIME-VARYING LOAD INTENSITY PROFILES

January 14, 2016

LIMBO is an Eclipse-based tool for the creation of load profiles with variable intensity over time both from scratch and from existing data [1]. Primarily, LIMBO’s intended use is the description of load arrival behaviors in open workloads. Specifically, LIMBO can be employed for the creation of custom request or user arrival time-stamps or for the re-parameterization of existing traces.

LIMBO bases on the Descartes Load Intensity Model (DLIM) for the formalized description of its load intensity profiles. The DLIM formalism can be understood as a structure for piece-wise defined and combined mathematical functions that capture specific elements of a time-series like seasonal patterns, trends, bursts and noise.
LIMBO is capable of generating request or user arrival time stamps from DLIM instances.

In a next step, these generated time-stamps can be used for both open workload-based benchmarking or simulations. For example, TimestampTimer plug-in for JMeter already allows the precisely timed sending of requests to a system-under-test.

LIMBO offers a range of features for easy load intensity modeling and analysis, including, but not limited to, a visual decomposition of load intensity time-series into seasonal and trend parts, a simplified load intensity model as part of a model creation wizard, and an automated model instance extractor.

LIMBO’s development has been started in late 2013 at the Karlsruhe Institute of Technology and is now maintained at the University of Würzburg.

Since LIMBO was accepted for the SPEC RG’s tool repository in 2014, it has been adopted in research projects like EU FP7 projects Cactos and CloudScale. In addition, LIMBO has become a foundation for a Cloud Elasticity Benchmarking Framework named BUNGEE [2].


http://descartes.tools/limbo
The inaugural SPEC’s Symposium ’16–Energy Efficiency was held in Fremont, California in January 2016. We were delighted to have brought together representatives from the U.S. Environmental Protection Agency, The Green Grid, ISO, ITIC, academic researchers, and SPEC benchmark developers in order to share ideas, discuss challenges, and present results of both work-in-progress and state-of-the-art research on server efficiency. It was with great honor to welcome the keynote speaker Jeremy Arnold (IBM) and listening to his speech “What is a Good Benchmark?”. He discussed what makes a good benchmark, and how benchmarks should be selected and used based on the performance measurement goals of the user.

Sanjay Sharma (Intel) described the history and evolution of SPECpower_ssj2008, the industry’s first server energy efficiency benchmark.

An overview of all SPEC’s Energy Metrics were presented by David Schmidt (Hewlett Packard Enterprise).

Hansfried Block (Fujitsu) summarized the features of the Server Efficiency Rating Tool (SERT), together with the history of its evolution and the current use with the EPA ENERGY STAR program today.

John Clinger (ICF International/EPA) provided insight into the possible future evolution of the U.S. EPA’s ENERGY STAR for Computer Servers program. He also provided ideas for how the use of the SERT might evolve, including the addition of metrics.

Jóakim von Kistoswki described in his session, Research and SPEC Chauffeur, how he and his research colleagues at the University of Würzburg are using the Chauffeur WDK (derived from the SERT program) to rapidly develop new tools for measuring energy efficiency.

Xiaomeng Lu shared her insight, connections between industry and policymakers, into the challenges western organizations face when interacting with Asia Pacific governments and policy-makers on energy efficiency and benchmarking.

Henry Wong (Intel, ISO & TGG) described in his presentation ISO and Global Government Programs, how ISO can help to minimize the political aspects of
benchmark and tool sharing across world markets. He aligned the discussion with Xiaomeng’s description of the Asia Pacific challenges.

The panel “Panel Discussion: The Future of Energy Efficiency of Server” with John Clinger, Henry Wong, Xiaomeng Lu, and Klaus-Dieter Lange discussed the premise: “The dawn of performance engineering is over”. The discussion covered the tools and programs together with their ideas for future international collaboration.

Klaus and Xiaomeng delivered a SERT Demonstration on how the SERT is used to measure the energy efficiency of a server, using a server, a laptop, a power analyzer, and a temperature sensor.

The second presentation of the SPEC Symposium’16 takes place in Delft in the Netherlands. This event is co-located with the International Conference on Performance Engineering (ICPE) 2016, at the TU Delft in the University Aula. This symposium includes content derived from that presented in Fremont in January, along with EU-centric sessions and a panel discussion.

It is hoped that industry and academic representatives who were unable to attend the US event will be present. Representatives of several Asian Government bodies and standards organizations have been invited. They are presenting content specific to their national objectives for international cooperation on energy efficiency standards and testing.

Mike Tricker (SPECpower Committee Secretary)

inspectIT
THE OPEN SOURCE APM SOLUTION

January 5, 2016

Today’s businesses have understood what impact the performance and scalability of their software applications has on revenue and total cost of ownership. These businesses use application performance management solutions to maintain the satisfying level of service quality, to detect problems early and to diagnose problems quickly to insure a stable revenue stream and reasonable total cost of ownership. Some businesses remain with an unsatisfied need to manage the performance of their applications. Because many businesses do not want to take the risk of a vendor lock-in that may dissolve or discontinue the product or cannot cope with the acquisition and annual maintenance costs. The public sector on the other hand may not be able to make a benefit of using the product due to budget restrictions or if the source code cannot be examined for safety or security reasons. Research groups are also often not able to make use of the commercial solutions because of the high acquisition costs. In light of these observations, the matured tool inspectIT was made public to provide an open-source application performance management solution.

Following this mission, inspectIT is the first open-source tool of its kind. Software performance experts can monitor execution traces from applications under analysis and drill down into traces to isolate the root causes of performance problems. The rich graphical user interface pays attention to deliver great user experience designed to support the tasks of a performance expert’s daily business in diagnosing problems. In the last decade, inspectIT has proven its reason for existence in many customer projects in industry. The recent collaboration with research groups shows the need for an independent performance analysis tool. Providing a standardized data interface enables researchers to collect data, export this data, share the data with other groups and import the data of others for analysis. This objective is already supported by the collaboration with researchers of different universities to standardize a non-proprietary data format for traces (currently referred to as the Common Trace API—CTA). The data format is used to export traces from inspectIT and to import traces from other tools of the community.

The intended users of inspectIT are performance experts and developers. By design, testing and troubleshooting scenarios (so called performance firefights) are the primary task which is intentionally supported by inspectIT. For this particular purpose, inspectIT provides a sophisticated graphical user interface that is tailored based on the experience of a decade to allow easy access to the collected performance data (e.g., traces, timings, CPU and memory utilization, etc.) and quick isolation of a problem’s root cause. inspectIT is divided into three main components: (1) the agents, (2) the Central Measurement Repository, and (3) the graphical user interface. The agents are responsible for collecting the data. inspectIT currently provides an agent for Java-based applications. The Java agent is started with the system under analysis (SUA) and is responsible for instrumenting the system to collect the desired data. The agent is currently capable of collecting HTTP requests, execution traces, timings (e.g., response times, CPU times), thrown exceptions, SQL queries and system measures (e.g., CPU utilization, Memory utilization). One or more agents, depending on the concrete environment, send the collected data to the Central Measurement Repository which is responsible for managing the received data. The graphical user interface enables the performance expert to access the managed data and to execute performance analyses such as digging into traces to isolate the root cause of a problem, browse thrown exceptions, and view resource utilization. The user interface also shows the effective
For more information about the inspectIT project and how to contribute to its development, visit our web page and get in touch with us.

[1] https://github.com/inspectIT

Patrice Bouillet, Christoph Heger, Ivan Senic, Stefan Siegl, Alexander Wert (NovaTec Consulting GmbH)

NEW APM RESEARCH PROJECT: diagnoseIT

January 5, 2016

In the last decade, application performance management (APM) solutions have been developed supporting enterprises with monitoring capabilities and early detection of performance problems. Leading application APM solutions mostly support only alerting and visualization of performance-relevant measures. The configuration of the software instrumentation, the diagnosis of performance problems, and the isolation of the concrete root cause(s) often remain error-prone and frustrating manual tasks. To this day, these tasks are performed by costly and rare performance experts. In order to improve this situation, NovaTec Consulting GmbH and the University of Stuttgart (Reliable Software Systems Group) launched the collaborative research project diagnoseIT on “Expert-guided Automatic Diagnosis of Performance Problems in Enterprise Applications”. Hereby, the core idea is to formalize APM expert knowledge to automatically execute recurring APM tasks such as the configuration of a meaningful software instrumentation and the diagnosis of performance problems to isolate their root cause. By delegating the described tasks to diagnoseIT, experts do not have to deal with similar problems over and over again. Instead, the expert can focus on more challenging (and interesting) tasks.

The automated diagnosis that analyzes traces (individual or as a stream provided by monitoring capabilities of APM solutions) is designed as follows: possible symptoms of performance problems are provided as formalized expert knowledge—an extensible set of rules. When a symptom is detected in a trace, the root cause diagnosis is started without the need for human interaction. Rules that perform localization of the problem are applied first, followed by technology and/or domain-specific rules, which are used to semantically isolate the root cause. If the available data is not sufficient to perform an exhaustive diagnosis, diagnoseIT will request more data from the underlying APM tool, with respect to overall system performance.

diagnoseIT provides the analysis results to its users in the form of comprehensive reports that include qualitative (e.g., problem's location, type, and anti-pattern) and quantitative information (impact of the problem in numbers). A major goal of the report is to describe the problem to non-experts making it possible to provide different report types to individual roles.

The available APM solutions have a proprietary data format to persist and process monitoring data that makes it difficult and inconvenient, if not impossible, for third-party access. In order to enable community collaboration, data exchange, and tool-independent approaches in research, our goal is to make diagnoseIT independent of concrete APM solutions by accessing the monitoring data through the use of an independent API (currently referred to as the Common Trace API—CTA) and adapters for particular tool-dependent data formats. The specification of the CTA is an ongoing task motivated by serving as foundation for community collaboration on APM interoperability.

diagnoseIT started in March 2015 with a duration of two years. It is sponsored by the German Federal Ministry of Education and Research (BMBF), and supported by the SPEC RG DevOps Performance Working Group. For more information about the diagnoseIT project, as well as the CTA and how to contribute to its development, visit our web page and get in touch with us.

http://diagnoseit.github.io/

Christoph Heger, Alexander Wert, Stefan Siegl (NovaTec Consulting GmbH), André van Hoorn, Dušan Okanović (Reliable Software Systems Group, University of Stuttgart)
SPEC AWARDS IN YEAR 2015 AND 2016

January 18, 2016

During SPEC RG's 2015 Yearly Meeting in Austin (Texas, USA), RG members John Murphy, Klaus-Dieter Lange, Walter Binder and André van Hoorn were recognized by the SPEC President for their outstanding service to SPEC in 2014.

John Murphy (University College Dublin) was awarded with the SPEC 2014 Presidential Award for serving as General Chair of the ICPE 2014 recognizing his contributions to the success of the conference. Klaus Dieter Lange (HPE) and Walter Binder (University of Lugano, Switzerland) were recognized with SPECtacular Award for serving as co-general Chair for ICPE 2014. André van Hoorn (University of Stuttgart) received SPEC Award for project leadership in the DevOps Performance Working Group.

The year 2015 was also rich in events and activities that required outstanding work and commitment of Research Group members. During the annual meeting in Freemont, California, USA (January 2016), two Research Group members were awarded with SPECtacular Awards: Aleksandar Milenkoski (University of Würzburg) for his excellence and commitment in IDS Benchmarking Working Group, and Kai Sachs (SAP) for serving as Program Committee Chair for ICPE 2015 held in Austin, Texas.

We congratulate all the winners and thank for their excellent support for SPEC Research Group.

Piotr Rygielski (University of Würzburg), Alan MacKay (IBM) Walter Bays (Oracle)

Klaus-Dieter Lange was SPECtacular and receives the award from SPEC President Walter Bays. Austin 2015. Photo: David Reiner (SPEC)

André van Hoorn receives the SPECtacular award from SPEC President Walter Bays. Austin 2015. Photo: David Reiner (SPEC)

Aleksandar Milenkoski (University of Würzburg) and Kai Sachs (SAP, Germany) were SPECtacular. Jóakim von Kistowski receives the awards in the name of the awarded. Freemont 2016. Photo: David Reiner (SPEC).