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**Welcome Message from the Executive Committee**

Welcome to EcoCloud's second annual electronic newsletter!

Our second annual event (in June 2012) was a great success thanks to EcoCloud researchers/staff, keynote and industrial session speakers, and student presenters. In this issue, we are delighted to announce two outstanding new members in our research community bringing a wealth knowledge and expertise, and report a number of achievements by EcoCloud members, making 2012 an even more productive year since we launched the center. Besides these accomplishments ranging from research highlights covered in international media to new projects and faculty and student awards, we are also happy to report that in 2012 we have introduced the EcoCloud Visiting Scholar program to attract world-renowned researchers to spend a sabbatical and collaborate with us.

This year, we will have our **annual retreat on May 31<sup>st</sup>, 2013**, at the same venue as last year, Hotel de la Paix ([www.hoteldelapaix.net](http://www.hoteldelapaix.net)) in Lausanne. We look forward to seeing you there!

**In the News****Automated Software Synthesis CACM Highlight**

Viktor Kuncak and his team have discovered a new method to automatically generate computer software components that are guaranteed to behave correctly. Among the benefits of this line of research is making software development easier and making our computing infrastructure less vulnerable to crashes and hangs. The overall goal is to automatically synthesize computer systems from human intentions. Beyond ensuring the absence of errors and improved productivity, this work can lead to increasing our confidence in the scientific discoveries derived using computers, as well as unleashing the creative potentials of non-expert computer users. The research appeared in PLDI and was selected by CACM's Research Highlights in February. The Research Highlights section is devoted to the most important research results published in CS in recent years.

**Breaking Up Data Jams in Server Farms**

Databases have revolutionized the business world. In **gigantic server farms** around the world, **billions of database entries** are queried every second. This enormous quantity of detailed information allows merchants to optimize their inventories and displays and bankers to optimize the flow of money. Gigantic farms of servers are deployed in an effort to keep up with this breakneck pace of information storage and transfer. Christoph Koch and his team have developed DBToaster, a system that speeds up the pace of operations by a factor of 100 – 10,000. The latest version has just been made available on [www.dbtoaster.org](http://www.dbtoaster.org).

## CloudSuite 1.0 Released

Today's popular online services (e.g., web search, social networking, and business analytics) are characterized by massive working sets, high degrees of parallelism, and real-time constraints. To stimulate research in the field of cloud and data-centric computing, a team of EcoCloud researchers led by Babak Falsafi in collaboration with Anastasia Ailamaki have created CloudSuite, a benchmark suite based on real-world online services. Since its release in February, CloudSuite has emerged as a popular benchmark suite for server researchers in academia and industry including giants such as Intel, AMD and ARM. CloudSuite covers a broad range of application categories commonly found in today's datacenters. More information about the benchmarks may be found in the **overview page**.

## EuroCloud Server Demoed to EU Parliament

EuroCloud Server, an FP7 project that started in 2010 by Babak Falsafi in collaboration with colleagues at ARM, IMEC, Nokia and the University of Cyprus was selected as one of nine projects (out of 500) in the entire EC FP7 funding framework to be demoed to the parliament as an exemplary European project. EuroCloud Server has pioneered a number of server processor design methodologies including Scale-Out Processors, a design to improve silicon efficiency over conventional server processors by 10x, and 3D memory systems that for the first time enable bandwidth-effective die-stacked organizations for emerging online scale-out services such as data serving, video streaming and web search. EuroCloud Server has laid the foundation for the first EU funding program dedicated to servers and datacenters worth over 100M euros of budget in EU's upcoming funding framework, Horizon 2020. For more information please visit [eurocloudserver.com](http://eurocloudserver.com).

## Holistic Power Management in Datacenters

David Atienza's group, in collaboration with our affiliate Credit Suisse, have developed a holistic power monitoring and management system for data centers. The system enables synergistic server load and temperature management and has helped Credit Suisse improve their data center efficiencies by up to 50%. The solution proposed by the team is particularly attractive to Credit Suisse because it is compatible with and complementary to the bank's existing virtualization technologies.

## Information Security Hole in Popular Web Protocol

Internet services such as online shopping, e-banking and e-mail may be a bit harder to protect than expected. Arjen Lenstra and his lab discovered an unanticipated feature of a widely used protection system. The flaw — which involves a small but measurable number of cases — has to do with the way the system generates random numbers, which are used to make it practically impossible for an attacker to unscramble digital messages. While it can affect the transactions of individual Internet users, there is nothing an individual can do about it. The operators of large Web sites will need to make changes to ensure the security of their systems, the researchers said. Their finding appeared in the technology section of the New York Times and in the blog Computerworld.

## One Billion Euros to Simulate the Human Brain

Anastasia Ailamaki and Christoph Koch are two of leading experts in the Human Brain Project, a consortium of 150 European investigators led by EPFL and funded by the European Commission at the level of one billion euros for ten years to reconstruct the human brain, piece by piece, in computer simulation models. Although life science applications inspire the project, its heart is in computer science and technology — specifically, in management and integration of massive and diverse volumes of data to be used in all aspects of neuroscience, ranging from simulation and visualization to brain neuroinformatics. Anastasia leads the Exascale Data Management, while Christoph is one of the leaders in Large-Scale Data Analytics.

## Shore-MT on BitBucket

In the age of multicores, Shore-MT is a storage manager designed specifically for scalability on modern hardware by Anastasia Ailamaki's team. Since it was first developed in 2005, it has been used as an experimental test-bed library by many researchers from both academia and industry. Even though Shore-MT had several releases featuring significant improvements over the past years, this year Anastasia's team decided to release the source code of Shore-MT and its application layer Shore-Kits in bitbucket to allow for periodic sharing of stable internal codebase changes with other users. The new Shore-MT code repository can be found at [bitbucket.org/shoremt](http://bitbucket.org/shoremt). The information and the latest news on the projects done using Shore-MT are at [dias.epfl.ch/shore-mt](http://dias.epfl.ch/shore-mt).

## New Members

### Karl Aberer

We welcome Karl Aberer, the VP of Information Systems at EPFL. Karl was the director of the Swiss National Research Center for Mobile Information and Communication Systems (MICS) from 2005 until 2012. Karl's research interests include foundations, algorithms and infrastructures for distributed information management, including peer-to-peer overlay networks, semantic interoperability, trust management and applications to scientific and sensor data management. He is a member of the editorial boards of VLDB Journal, ACM Transaction on Autonomous and Adaptive Systems and World Wide Web Journal, and has been a member of the Swiss Research and Technology Council (SWTR).

### Ed Bugnion

We welcome Ed Bugnion, the co-founder of VMWare, Nuova and a former VP at CISCO, Ed comes with 18 years of experience in datacenter virtualization and networking technologies in the US. Ed's research interests include operating systems, datacenter infrastructure (systems and networking), and computer architecture. Together with his colleagues, he received the ACM Software System Award for VMware 1.0 in 2009, and ACM SIGOPS Hall of Fame Award in 2008 for his paper titled "Disco". He was the recipient of the Infoworld "Top 25 CTO Award" (2004) while at VMware.

## New Projects

### Implicit Programming

Viktor Kuncak, received the prestigious ERC grant to develop implicit programming, a new software development paradigm that aims to address longstanding bottlenecks of software construction. Implicit programming aims to make software construction substantially easier at several levels, from new declarative programming language constructs to new software development tools. The project also aims to develop new software development tools, application manipulation interfaces, and techniques to handle ambiguity, making development easier for both experts and non-experts. More information is available at [lara.epfl.ch/w/impro](http://lara.epfl.ch/w/impro).

### NoDB Query Processing on Raw Data

At VLDB in 2012, Anastasia Ailamaki and her team showcased a new philosophy for designing database systems called NoDB. NoDB aims at minimizing the data-to-query time, most prominently by removing the need to load data before launching queries. The emergence of BigData means that more time, resources and energy are needed to prepare data, load data into the database and execute the desired queries. A prototype implementation, called PostgresRaw, was presented which is built on top of PostgreSQL and allows for efficient query execution over raw data files with zero initialization overhead. PostgresRaw performance is competitive with that of commercial DBMS over large classes of queries. More information is available at [dias.epfl.ch/NoDB](http://dias.epfl.ch/NoDB).

## TRANSCEND

TRANSCEND is a multi-disciplinary consortium funded by NanoTera led by David Atienza and with the collaboration of Babak Falsafi, John Thome, colleagues from ETH and our affiliates and industrial partners Credit Suisse and BrainServe. TRANSCEND promises to research inter-disciplinary technologies for energy management in datacenters covering a broad spectrum of research areas from server and cooling infrastructure design to energy-proportional networks, datacenter-level system simulation, and model-predictive control theory.

## Awards

### Conference Awards

Alexsander Dragojevic and Rachid Guerraoui received the ACM **Middleware 2012 Best Paper Award** for the paper titled “Unifying Thread-Level Speculation and Transactional Memory”. Middleware is a premier forum for the discussion of innovations and recent advances in the design, implementation, experimentation, deployment, and usage of middleware systems.

Mike Ferdman, Mutaz Adileh, Onur Kocberber, Stavros Volos, Mohammad Alisafae, Djordje Jevdjic, Cansu Kaynak, Adrian Popescu, Anastasia Ailamaki and Babak Falsafi received the **ASPLOS 2012 Best Paper Award** for the paper titled “Clearing the Clouds”. ASPLOS is one of the flagship computer systems conferences and the award goes to EcoCloud researchers for two years in a row.

Boris Grot and his colleagues at Carnegie Mellon, NVIDIA and the University of Texas have published a paper titled “Kilo-NOC: A Heterogeneous Network-on-Chip Architecture for Scalability and Service Guarantees” in the flagship computer architecture conference, ISCA, that was selected to appear in IEEE **Micro's Top Picks 2012**. This annual edition of IEEE Micro collects the year's dozen most significant publications in computer architecture with the highest likelihood of impact.

Tian Guo, Zhixian Yan and Karl Aberer received the ACM **MobiDe 2012 Best Paper Award** for the paper titled “An Adaptive Approach for Online Segmentation of Multi-Dimensional Mobile Data”. MobiDe is an international forum that brings together experts from data management, wireless networking, and mobile computing communities.

### Faculty Awards

David Atienza is the recipient of the prestigious **ACM SIGDA Outstanding New Faculty Award** in 2012. The award recognizes junior faculty members early in their academic career who demonstrate outstanding potential as educators and/or researchers in the field of electronic design automation. This is the first time the award goes to an awardee outside North America.

Babak Falsafi was elected an **IEEE Fellow** in 2012 “for contributions to multiprocessor architecture and memory systems.” These contributions include scalable multiprocessors prototyped by Sun Microsystems in the 90's, power-aware memory systems used into IBM BlueGene/P, and showing that memory consistency models (prevalent in all microprocessors) are neither necessary nor sufficient to achieve high performance in servers.

Rachid Guerraoui was elected an **ACM Fellow** in 2012 “for his contributions to the theory and practice of reliable distributed computing.” The ACM Fellows personify the highest achievements in computing research and development from the world's leading universities, corporations, and research labs, with innovations that drive economic growth in the digital environment.

Viktor Kuncak was awarded an **ERC Starting Grant** for the Implicit Programming project in 2012. The ERC Starting Grant “aims to provide adequate support to researchers that demonstrate the potential

to perform world-class research” with awards up to 2 million euros.” EcoCloud now boasts five ERC winners with EPFL ranking among the top with the highest number of ERC awardees in all of Europe for a single campus.

Willy Zwaenepoel is the recipient of the **Swiss ICT Champion Award** in 2012. The goal of the Swiss ICT Awards is to recognize the entrepreneurial accomplishments of members of the Swiss ICT industry, and more broadly to promote the ICT industry in the Swiss society. The winners “serve as role models for entrepreneurs and employees in the ICT industry.”

## Student Awards

Pejman Lotfi -Kamran and Cristian Zamfir are awarded the **Intel Doctoral Student Honor Program**. The program awards fellowships to exceptional PhD candidates pursuing leading-edge innovation in fields related to Intel's business and research interests in the European Union, Switzerland and Russia. This is a prestigious and highly competitive program with a limited number of fellowships awarded annually. Selected students receiving this award are recognized as being amongst the best in their specific areas of research.

Vitaly Chipounov and Volodymyr Kuznetsov received a **Silver Prize at the Open Source Software World Challenge 2012** and the KOSSA President's Prize. The prizes were given for their project titled “The Device Driver Tester”, describing a system for automatically testing closed-source binary device drivers against undesired behaviors, like race conditions, memory errors and resource leaks.

## Publications

### Analytics

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- **Information-Theoretic Regret Bounds for Gaussian Process Optimization in the Bandit Setting**,  
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- **Large Scale Variational Bayesian Inference for Structured Scale Mixture Models**,  
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- **Model-Based Similarity Measure in TimeCloud**,  
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### Data Clouds & Management

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- **A Decentralized Recommender System for Effective Web Credibility Assessment**,  
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- **OptiMoS: Optimal Sensing for Mobile Sensors**, Z. Yan, J. Eberle and K. Aberer, 13th International Conference on Mobile Data Management, 2012.
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- **A SOFT Way for OpenFlow Switch Interoperability Testing**,  
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- **Clearing the Clouds: A Study of Emerging Scale-out Workloads on Modern Hardware,**  
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