

Sustainable C[★]omputing

REGISTER

Monthly bulletin of the IEEE Computer Society Special Technical Community on Sustainable Computing
Providing quick access to timely information on sustainable computing.

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Report from the Chair

by Anirban Mahanti, NICTA



Let me take this opportunity to welcome all new and old members of the STC on Sustainable Computing (STC-SC) as we embark on 2013. As you may remember from the Chair's report in December 2012, our STC has some new officers. Martin is now chair of the STC initiative committee. I have taken over from Martin Arlitt as co-chair of STC-SC.

Martin guided STC-SC through the first year, helping us grow our membership from 24 in January 2012 to 400 by December 2012. Martin pushed the STC-SC officers to work towards creating value for our members. The Register is a very good example of value creation. Other initiatives such as co-sponsorship of conferences, awards for students, and member-to-member engagement are at various stages of development. On behalf of the STC-SC community, I would like to thank Martin for his excellent service.

I would also like to thank Giuliano Casale for his service to the STC-SC as secretary/treasurer. The secretary ensures good "governance" by chasing officers for monthly updates and compiling the updates into a coherent report. Chasing officers for their reports can at times be tedious! I want to thank Giuliano for keeping us on track and doing so without ever getting frustrated. Martin hijacked Giuliano for the secretary/treasurer role within the committee that oversees the STC initiative. Danilo Ardagna has taken up Giuliano's role in the STC-SC.

Our STC is well positioned to become even stronger in 2013. I would like to thank everyone for their continuing support and I'm looking forward to working with the community to make 2013 successful.

- Anirban

Call for Nominations: Pick of the Month

Last year, the register instituted the Pick of the Month series, a feature article that highlights top research papers and projects within our community. The Pick of the Month was one of the Register's most visible feature articles. This year, we will build upon our success with a slightly modified nomination process. Our goal is to make the process even more democratic.

Now, anyone can nominate a paper by simply sending an email to either Prof. Christopher Stewart or Prof. David Chiu. Then vote and converse about your nomination online by:

1. Visiting the URL below and clicking through to the Pick of the Month survey
2. Posting (anonymous) comments describing why the paper deserves pick of the month recognition. You can even comment about why one nominee is better than another.
3. Every month, a nominee with at least 6 votes will be eligible for Pick of the Month. SC STC Information Officers will decide among eligible candidates.

Try it out now. <http://www.cse.ohio-state.edu/~cstewart/potm>

Community Highlights: Margaret Martonosi

by Canturk Isci & Niklas Carlsson

In this feature we ask a prominent researcher in the field of sustainable computing to share their journey and lessons along the way with the broader community. In this issue we have the privilege to sit down with Professor Margaret Martonosi from Princeton University, who shares with us some of her interesting research experiences on energy-efficient and high-performance computing and her views looking forward in the sustainable computing field.

Margaret Martonosi

Hugh Trumbull Adams '35 Professor
Department of Computer Science
Princeton University



Currently working on: I work on a range of topics related to high-performance and energy-efficient computing. Currently this includes power-performance tradeoffs in systems ranging from smartphones to chip multiprocessors to large-scale data centers. A particular focus has been on characterizing and exploiting heterogeneous parallelism, where different specialized compute units can be harnessed to retain performance while reducing power.

Favorite memory as a student/advisor/researcher: As a professor, my favorite moments are always about watching my undergraduate and graduate students mature in their research abilities and move into their own research careers. It is incredibly rewarding to watch the progression from a student's first work on experimental research, towards the point where they are creative and independent researchers attacking interesting challenges of their own devising.

Could you share a research contribution from your research, and explain why this is something that you are particularly proud of? I have two projects of which I am particularly proud. The first of these is Wattch, an architecture-level power modeling tool. When we began work on Wattch, power modeling and power efficiency issues were only slightly a topic of interest for architects; they were typically viewed as being the domain of circuits and devices researchers. Our work demonstrated that early-stage architecture power models could be accurate enough to enable power-aware techniques much earlier in the design pipeline, where they can have more leverage.

The second project of which I am particularly proud is ZebraNet. In the ZebraNet project, our group built GPS-based mobile sensor nodes for wildlife tracking, and we used two generations of our designs on zebras in Kenya as part of two major deployment trips. From a biological perspective, ZebraNet afforded

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biologists with much more detailed and ongoing views of wildlife behavior. From a computing perspective, ZebraNet developed a range of important results: power-efficient peer-to-peer communication protocols, energy-efficient data compression, and several interesting design techniques for sensor systems. ZebraNet demonstrated the utility and value of mobile sensor nodes, of sensor nodes much more capable and coarse-grained than the small and static “smart dust” approach that had prevailed before then.

What do you think is (are) the important problem(s) to be solved in the next 10 years within sustainable computing? Energy-efficiency and sustainability issues in computing are at an interesting crossroads. On one hand, computer systems and information technology use much less energy than other economic sectors such as transportation. As a result, our community should be thinking about ways to increasingly leverage more and more computing technology in order to save power elsewhere. This might include improving tele-presence and teleconferencing systems in order to reduce the need for (carbon-intensive) travel to face-to-face meetings. Computer systems can also improve product logistics and e-commerce to achieve sustainability benefits.

On the other hand, within the field of sustainable computing, we also need to look inward and improve the energy-efficiency, carbon footprint, and overall sustainability of the computer systems we build. Continuing to improve energy efficiency remains important, particularly at the level of data centers. Some other interesting opportunities here might lie in improving recycling and reuse within the supply chain of our computer systems---true sustainability will require us to reduce the amount of computing equipment that ends up in landfills after relatively few years of use.

Do you see the widespread adoption of mobile computing devices playing a central role in sustainability-related research? Around the world, smart phones and mobile handheld devices have increasingly become the dominant computing platform. This brings up interesting research opportunities for location-aware services to improve sustainability. For example, some of our research on SignalGuru has explored lightweight cellphone-based methods for analyzing traffic flow and thereby improving vehicle fuel efficiency by reducing time spent in stop-and-go traffic.

What courses and skills are most important for students wanting to work in this area? Making computer systems truly power-efficient requires holistic approaches that span many system layers. Therefore, students will be best prepared if they have taken key courses at different parts of the systems stack. Compilers, Operating Systems and Computer Architectures are particularly important. These prepare students to think creatively about energy-efficient techniques that span the hardware-software interface and that leverage the capabilities of different system layers.

Sustainable Computing: Informatics and Systems

The journal for sustainable computing research

Sustainable computing research spans computer science, electrical engineering, sustainability science, and many other engineering disciplines. SUSCOM publishes research findings related to energy-aware and thermal-aware management of computing resources, as well as research on the ecological and societal impacts of computing.

Now accepting submissions.

Community Highlights: Partha Ranganathan

by Canturk Isci & Niklas Carlsson

In this feature we ask a prominent researcher in the field of sustainable computing to share their journey and lessons along the way with the broader community. In this issue we have the privilege to sit down with Parthasarathy Ranganathan, known for his research on energy-efficient servers and datacenters.

Partha Ranganathan

Fellow, Hewlett Packard Labs
Alumnus of Rice University &
Indian Institute of Technology, Madras



Currently working on: Data-centric data centers

Favorite memory as a student/advisor/researcher: I don't know if I can point to one favorite memory (there are several!). However, most of my favorite memories have a common theme – the exhilaration around brainstorming a new problem and coming up with an understanding of the space that leads to an “aha” insight. All my contributions that I am very fond of (fuzzy acquires, reconfigurable caches, energy-aware displays, heterogeneous multicores, temperature-aware scheduling, federated management, microblades, memory disaggregation, nanostores) have at least one favorite memory that fit this characteristic.

Could you share a research contribution from your research, and explain why this is something that you are particularly proud of? I would probably pick our recent ASPLOS paper on dematerialized data centers. In this work (which was recently identified as a Pick of the Month by this publication), we developed a new methodology to measure and optimize environmental sustainability, that was usable by computer architects. And, using this metric, we designed a new “dematerialized” solution that included new system architecture improvements, packaging optimizations, and cooling solutions to improve the environmental sustainability by almost a factor of two! Beyond the new ideas in the paper, I also think this paper is a great example of bringing together multiple communities (in this case, systems architecture, power and cooling, sustainability) for some interesting results that we could not have individually come up with.

Explain one thing that makes your work exciting for you? The opportunity to make an impact with my work, while learning new exciting things continually.

What do you think is (are) the important problem(s) to be solved in the next 10 years within sustainable computing? I think a lot of recent design has equated increasing functionality to increased complexity, and this is often the single largest reason for unsustainable solutions. Revisiting our designs for simplicity can lead to a lot of interesting new insights and some significant improvements (e.g., our recent work on nanostores [IEEEComputer11]). For this, I think looking at the problem holistically, from a total lifecycle perspective, and across disciplines, will be very important. We also need to aim higher. I believe there are still orders of magnitude improvements to be harvested, particularly around the energy efficiency of computing systems, and hopefully future research will get to this potential.

STC Updates



By Danilo Ardagna, Politecnico di Milano

Membership: 412

Report from Secretary/Treasurer (Danilo Ardagna):

- Collected officers' activity reports and prepared monthly STC report.

Report from Conferences Chair (Diwakar Krishnamurthy):

- Solicited collaborations from the organizers of EASyCoSe 2013, ACM e-energy 2013, CGC 2013, ICPE 2013, and SMART GREENS 2013. Continuing to build the master list of conferences related to the STC.

Report from Academic Chair (Niklas Carlsson):

- Working with Industry chair and Publicity chair to finalize the first two community highlight features

Report from Membership Chair and vice-Chair (Sergey Blagodurov, Matthew Forshaw):

- Counted the number of members every week for the past month.
- Added the Twitter support to STC-SC membership counting script
- Together with Webmaster, set up the Twitter page for the group
- Began working on the new invitation list

Report from Communications Chair (Abhishek Chandra):

- Created list of upcoming CFPs and events for inclusion in February newsletter

Report from Policies and Procedures Chair (Stephen Dawson):

- Contacting colleagues to find a vice-chair

Report from Industry Chair (Canturk Isci):

- Working with Academic chair to finalize the first two community highlight features

Report from Information Officers (Danilo Ardagna, David Carrera, Fan Dongrui, Guillaume Jourjon):

- Contributed material for the Register and blogs

Report from the Register Editors (Christopher Stewart & David Chiu):

- Finished structural changes to the Register
- Working with web master to create online version of the Register

Upcoming Events

By Abhishek Chandra, University of Minnesota
and Bhuvan Urgaonkar, Penn State University

The following venues are all requesting submissions on subtopics related to sustainable computing or IT for sustainability.

Short Name	Main Topic	Location	Dates	Abstracts Due	Papers Due	Notification
IGCC	Green Computing	Arlington, VA, USA	Jun. 27-29		Mar. 2	Apr. 15
ICAC	Autonomic Computing	San Jose, CA, USA	Jun. 26-28	Feb. 25	Mar. 4	Apr. 15
HotCloud	Cloud Computing	San Jose, CA, USA	Jun. 25-26		Mar. 7	Apr. 22
HotStorage	Storage Systems	San Jose, CA, USA	Jun. 27-28		Mar. 11	Apr. 15
SOSP	Systems	Nemacolin, PA, USA	Nov 3-6	Mar. 21	Mar. 28	Jul. 1
MASCOTS	Modeling, Analysis and Simulation	San Francisco, USA	Aug. 14-16	Mar. 22	Apr. 8	Jun. 8
Performance	Modeling, Analysis and Simulation	Vienna Austria	Sept 24-26	Apr. 3	Apr. 10	June 19
GreenMetrics	Sustainable Computing	Pittsburgh, PA, USA	Jun. 17		Apr. 15	Apr. 30
SustainIT	Sustainable Internet and ICT	Palermo, Italy	Oct. 30-31	Apr. 12	Apr. 19	Jun. 30
CGC	Cloud and Green Computing	Karlsruhe, Germany	Sep 30-Oct 2		May 12	Jul. 10

Journal and Special Issue Call For Papers
Sustainable Computing

(Open)

Conference, Workshop & Symposium Call for Participation

Short Name	Main Topic	Location	Dates
	<i>Architectural Support for Programming</i>		
ASPLOS 2013	<i>Languages and Operating Systems</i>	Houston, TX, USA	Mar. 16-20
NSDI	<i>Network Systems</i>	Lombard, IL, USA	Apr. 3-5
E2DC	Energy-efficient Data centers	Berkeley, CA, USA	May 20

Visit <http://stc-sustainable-computing.ieee.net/venues> for more information.

STC-SC Officers

Chair: Anirban Hahanti, NICTA	Policies and Procedures: Stephen Dawson, SAP
Chair: Ishfaq Ahmad, Univ. of Texas at Arlington	Industry Chair: Canturk Isci, IBM
Secretary/Treasurer: Danilo Ardagna, Politecnico di Milano	Editor: Christopher Stewart, Ohio State University
Conferences: Diwakar Krishnamurthy, University of Calgary	Editor: David Chiu, Washington State University Vancouver
Conferences: Amarjeet Singh, IIIT-Delhi	Information: David Carrera, UPC BarcelonaTech
Academics: Niklas Carlsson, Linköping University	Information: Danilo Ardagna, Politecnico di Milano
Membership: Sergey Blagodurov, Simon Fraser University	Information: Fan Dongrui, Inst. of Computing Technology
Communication: Abhishek Chandra, University of Minnesota	Information: Guillaume Jourjon, NICTA
Communication: Bhuvan Urgaonkar, Penn State	Web Master: Yan Shvartzshnaider, University of Sydney