

Sustainable C*omputing

REGISTER

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

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Volume 1 Issue 1

January 2012

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Introducing the STC on Sustainable Computing

About STCs

In 2011 the IEEE Computer Society started a pilot project to form “Special Technical Communities” or STCs. STCs are intended to be more flexible and dynamic technical communities than have typically formed. They should embrace new or emerging technologies such as online social networks to quickly form STCs around timely topics, while also “sunsetting” when appropriate. STCs should also explore alternate methods to achieve financial sustainability.

Mission

The STC on Sustainable Computing (STC-SC) is one of the initial set of STCs. The STC-SC takes a holistic view of information technology (IT). Any domain that uses or could potentially benefit from using IT is relevant to STC-SC. The two primary goals of STC-SC are: (1) to promote the design and implementation of sustainable computing; and (2) to facilitate computing for sustainability. With respect to these goals, topics relevant to STC-SC include (but are not limited to):

- Energy efficient design and operation of IT equipment (servers, storage and networks).
- Sustainability across the life cycle of IT equipment and processes.
- Measurement and evaluation of the sustainability of existing IT infrastructures.
- Models or methods that facilitate more sustainable computing.
- Use of computing to systematically improve the sustainability of non-IT processes.

Officer Positions and Roles

The STC-SC was started with the selection of two co-chairs. The co-chairs then identified a set of additional roles they felt were important to help establish a sustainable community. The next step was to identify individuals who are interested in sustainable computing and capable of filling a role.

The (initial) officer roles in the STC-SC are:

- *Secretary-Treasurer*: documents the progress of the STC; in the future, would document finances as well.
- *Conferences Chair*: identifies venues (e.g., conferences, workshops) relevant to STC-SC, explores collaboration opportunities such as technical sponsorship.
- *Academic Chair*: identify needs of educational institutions relevant to the STC-SC; work with Industry chair to facilitate communication and collaboration between universities and businesses pertaining to sustainable computing research
- *Communication Chair*: works with Conferences Chair to identify relevant venues; shares this information with the community
- *Membership Chair*: attract people interested in sustainable computing to join the STC
- *Policy and Procedures Chair*: identify a low-overhead governance model that will help sustain the STC
- *Industry Chair*: identify needs of businesses relevant to the STC-SC; work with Academic Chair to facilitate collaborations between universities and businesses
- *Newsletter Editor*: Determine the format of the newsletter, arrange for content for each month’s issue. The initial focus of the newsletter is to share information on the STC-SC, and aid in attracting members.
- *Information Officers*: Identify and report on topics of interest to the STC.
- *Webmaster*: Maintain a Web presence that facilitates work of the other officers.

The Officers



Co-Chair
Martin Arlitt
HP Labs/U. of Calgary



Co-Chair
Ishfaq Ahmad
U. of Texas at Arlington



Secretary-Treasurer
Giuliano Casale
Imperial College



Conferences Chair
Diwakar Krishnamurthy
University of Calgary



Academic Chair
Niklas Carlsson
Linköping University



Communication Chair
Abhishek Chandra
University of Minnesota



Membership Chair
Anirban Mahanti
NICTA



Policy & Procedures Chair
Stephen Dawson
SAP



Industry Chair
Canturk Isci
IBM



Information Officer
Danilo Ardagna
Politecnico di Milano



Information Officer
Guillaume Jourjon
NICTA



Newsletter Editor
Christopher Stewart
Ohio State University



Webmaster
Raoufhsadat Hashemian
University of Calgary

Resource and Energy Management

by Danilo Ardagna, Politecnico di Milano



The IFIP WG7.3 Performance conference was held this past October in Amsterdam, The Netherlands. The conference brought together researchers interested in understanding and improving the performance of communication systems via state-of-the-art quantitative models. Nowadays, system energy consumption is considered as important as traditional performance metrics, e.g., system throughput or response time. Below I summarize a paper by Prof. Isi Mitrani, Emeritus Professor from Newcastle University.

The paper "Service center trade-offs between customer impatience and power consumption" considers a service center where under light loads servers are set in sleep (low power) mode. In the paper, clusters are managed in blocks. This is very important since in large scale service centers it is neither desirable nor practical to micro-manage power consumption by turning isolated servers on and off.

The paper proposes a dynamic operating policy where a subset of the servers available in a cluster is designated as 'reserve'. The state of the servers in the reserve is controlled by two thresholds: servers are powered up when the number of jobs in the system becomes sufficiently high, and are powered down when that number becomes sufficiently low. The goal is to determine the optimal trade-off between the energy consumption and the number of customers that leave the system due to impatience.

The optimal policy is determined by modeling a cluster of servers by a Quasi-Birth-and-Death Markov process, where the steady state probability distribution is obtained by relying on generating functions. A cluster includes N homogeneous servers, where n are considered as reserve, i.e., under light load $N-n$ are running and n are in sleep mode. The paper investigates the optimal size of the reserve n and the value of the upper U and lower L thresholds. A very simple heuristic close to the optimal policy is also identified. If λ denotes the overall incoming arrival rate, while $1/\mu$ is the average service time (exponentially distributed), then in practice one should set: $n=\lambda/\mu+1$; $U=N$; $D=n-1$. In other words, it is convenient to use the reserve when the number of jobs in a cluster equals the overall number of servers. The largest deviation of this heuristic to the optimal policy is around 10% when the load is light.

Sustainable Computing Register - the STC-SC Newsletter

The intention of this newsletter is to share information about the IEEE Computer Society's Special Technical Community on Sustainable Computing, and to encourage anyone with an interest in the area to join the STC. The newsletter will be published monthly, both in print and digital forms.

About the Logo

The logo shown on the cover of the newsletter is intended to symbolize both the sustainability and technology aspects that the STC represents. In the 1800's, Chief Crowfoot of the Siksika First Nation in southern Alberta, Canada, indicated that sustainability means "as long as the sun shines and the water flows". Our logo includes a graphic of the sun, and a "wave" of water. "Computing" is represented by a Turing machine, with the "wave" serving as the infinite tape of symbols, and the "sun" as a head to read each symbol.

Contact Information

For information on becoming a member of the STC on Sustainable Computing, please visit our Web site, our Facebook group or our LinkedIn group. URLs for these are provided on the front cover.

To comment on any of the articles, please visit our Web site.

To suggest topics to cover in future issues of the newsletter, please contact the Newsletter Editor, Christopher Stewart, at cstewart@cse.ohio-state.edu.

To provide information on upcoming events not included in our list on page 8, please contact our Communication Chair, Abhishek Chandra, at chandra@cs.umn.edu.

Networks & Distributed Systems

by Guillaume Jourjon, NICTA



The Green Star Network

I have recently come upon the GreenStar project (www.greenstarnetwork.com) in Canada. It is a good example of sustainable computing with a particular focus on networking and data delivery.

This project aims to provide a data delivery service that will use only renewable energy. Critics might argue that using only renewable energy is easily achievable in the context of using energy in Canada (60 % of their energy is hydroelectric) but researchers in this project try to push this idea to the maximum. Indeed, renewable energy can be produced by many means. Currently in Canada, renewable electricity is produced with hydroelectricity, wind, and (in a lower proportion) solar.

In their proposal, the GreenStar project aims at automatically migrate data from different datacentres according to the availability of renewable energy. In other words, if there is wind in the north the project will use the datacentre next to the northern wind farm.

In terms of network, the GreenStar project is based on the CANARIE network and aims at extending their solution across other international projects such as the GÉANT network through their participation in EU FP7 project, Mantychore. In terms of technical solution, they use a middleware in order to migrate data from different datacentres according to the availability of the "green energy". This availability is detected by a network of smart meters acting as sensors. Then the middleware build a hub-slave architecture between the different components in order to redistribute the data.

This solution might be considered as one of the first large scale attempts towards sustainable computing in terms of network and distributed services. Nevertheless, as I have written in my fist post, I am wondering how these researchers will assess their solution in terms of GHG emissions. Indeed, the GreenStar network claims they would apply the GHG protocol to evaluate their solution. Thus it will be very interesting to see how they address the following points:

- what is the service quantifier?
- on what scale they are going to use their solution?
- and finally, is it really efficient?

Trip Report - Highmark Renewables

On June 30, 2010, STC-SC co-chair Martin Arlitt visited Highmark Renewables, a company specializing in anaerobic digestion technology. The visit began with a guided tour of Highmark's research facility in Edmonton, AB, followed by a guided tour of a digester facility located near Hairy Hill, AB.

Today, the facility produces 2.5MW of electricity, which is sold to the local utility. A nearby feedlot with 36,000 head of cattle provides the feedstock for the digesters. The thermal mass of the "soup" in each digester enables methane production even during the cold prairie winters. Besides producing methane that is used for electricity generation, the digestion process destroys pathogens in the waste, eliminates the odor, and produces eco-friendly fertilizer.



Pick of the Month in Sustainable Computing

by Christopher Stewart, Ohio State University



Pick of the Month in Sustainable Computing

Recognizing the research and researchers that are shaping our field

Each issue of the Sustainable Computing Register will feature a Pick of the Month, a research publication that has significantly advanced the field of sustainable computing. This feature has two goals. First, we want to increase awareness within our community about high-impact, transformative research. With so many top-tier venues worldwide accepting papers in the area of sustainable computing, it is easy to miss jewels published in an unfamiliar forum. The second goal is to provide deeper insight into author's thoughts about their own work. Rather than republishing the picks (as many other communities do), we will interview the authors, asking questions that enrich the community's understanding the work as a whole. We hope that this community will embrace the Pick of the Month as a prestigious award of merit.

What is a Pick of the Month?

Over the next months, we will set up a formal, democratic process allowing all STC members to nominate papers. STC-SC officers will ensure the quality of selected picks. Please visit the Web page (listed on the front cover) to help us as we set up the process. Nominations can be sent to me at cstewart@cse.ohio-state.edu. Below, we provide baseline criteria for Picks of the Month. We also discuss features that could distinguish picks from nominees.

Minimum requirements for nominees:

- The paper must have been published in a peer-reviewed, research forum.
- The paper must be related to sustainable computing, e.g., energy efficiency, renewable-powered computing, smart grid, life cycle of ICT, smart buildings, etc.
- At least 1 author must agree to be interviewed about the work.
- The paper should reflect an ongoing research interest of at least 1 author.
- The paper must have been published in the last 2 years.
- The paper must have strong intellectual merit or practical consideration.
- Industry projects can be considered in lieu of a publication *if* they have demonstrated significant practical impact or intellectual contribution.
- Industry projects should not be protected from disclosure.

Features that will distinguish top picks:

- The paper was published in one of the most prestigious research forums.
- The paper received an award, such a best paper or best student paper.
- The paper closes an important open problem in sustainable computing.
- The paper bridges the gap between theory and practice in a way that suggests it will have high impact.
- The paper has been cited frequently.
- The industry project has had demonstrable impact on sustainable computing metrics, e.g., reducing carbon footprint, reducing energy consumption, or improving efficiency.

STC Updates

by Giuliano Casale, Imperial College



Membership: 24

Report from Co-Chairs (Martin Arlitt and Ishfaq Ahmad)

- Top priorities: newsletter (Q1 2012); event (Q2 2012); membership growth (2012).

Report from Secretary/Treasurer (Giuliano Casale)

- Collected officers' activity reports and prepared monthly STC report.
- IEEE reports via chairs that STC-SC does not need to file L-50 form for 2011.

Report from Conferences Chair (Diwakar Krishnamurthy):

- Contacted general chairs of several conferences to discuss collaboration with STC-SC.

Report from Academic Chair (Niklas Carlsson):

- Refined high-level academic targets: academia-industry interface, partnerships, education.
- Investigating with industry chair the use of STC-SC newsletter to achieve academic targets.

Report from Membership Chair (Anirban Mahanti):

- STC-SC Facebook group now has 24 members (+11 from last month).
- Contacted IIT Delhi, IIIT Delhi, and U. Swinburne to advertise STC-SC.

Report from Communications Chair (Abhishek Chandra):

- Searching for and identifying conferences, workshops and journals relevant to SC.
- Prepared monthly digest listing conference call for papers/call for part., posted on website.

Report from Policies and Procedures Chair (Stephen Dawson):

- P&P draft on its way. It covers purpose, officers, membership, meetings, and publications.

Report from Industry Chair (Canturk Isci):

- To meet with academic chair to discuss how to present industry/academia on newsletter.
- Working with IBM data center strategic initiative for first industry feature on SC research.

Report from the Newsletter Editor (Chris Stewart):

- Drafted the layout and skeleton for issue #1 of STC-SC newsletter
- Creating a system for content generation

Report from Information Officers (Danilo Ardagna, Guillaume Jourjon):

- Prepared reports on pages 3 and 4.
- DA: next blog post on Isi Mitrani's paper at IFIP Performance 2011
- GJ: next blog post on P2P networks, home gateways, data centers, and core networks.

Report from Webmaster (Raoufhsadat Hashemian):

- Website maintenance.
- Added commenting capability to the news and created Venues page.

Upcoming Events

by Abhishek Chandra, University of Minnesota



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

Conference, Workshop & Symposium Call For Papers

Short Name	Main Topic	Location	Dates	Abstracts Due	Papers Due	Notification
e-Energy	Future Energy Systems	Madrid, Spain	May 9-11, 2012		Jan. 10, 2012	Mar. 25, 2012
E2DC	Energy-Efficient Data Centers	Madrid, Spain	May 8, 2012		Jan. 10, 2012	Mar. 25, 2012
HPPAC 2012	Power-Aware HPC	Shanghai, China	May 21, 2012		Jan. 13, 2012	Feb. 6, 2012
USENIX ATC'12	Experimentation	Boston, MA	Jun. 13-15, 2012	Jan. 10, 2012	Jan. 17, 2012	Mar. 26, 2012
IGCC'12	Sustainable computing	San Jose, CA	Jun. 5-8, 2012	Jan. 13, 2012	Jan. 20, 2012	Apr. 4, 2012
HPDC'12	Parallel and Distributed Computing	Delft, Netherlands	Jun. 20-22, 2012	Jan. 16, 2012	Jan. 23, 2012	Mar. 19, 2012
SIGCOMM 2012	Networking	Helsinki, Finland	Aug. 13-17, 2012	Jan. 20, 2012	Jan. 27, 2012	Apr. 30, 2012
IWQoS 2012	Quality of Service	Coimbra, Portugal	Jun. 4-5, 2012		Feb. 8, 2012	Apr. 5, 2012
GreenTech 2012	Eco-Technology and Green Computing	Chennai, India	Aug. 10-11, 2012		Feb. 24, 2012	Apr. 6, 2012
ICT-GLOW'12	ICT against Global Warming	Vienna, Austria	Sep. 3-7, 2012		Mar. 23, 2012	May 15, 2012
HotCloud '12	Hot Topics in Cloud Computing	Boston, MA	Jun. 12-13, 2012		Mar. 8, 2012	Apr. 23, 2012
HotStorage '12	Hot Topics in Storage and File Systems	Boston, MA	Jun. 13-14, 2012		Mar. 12, 2012	Apr. 14, 2012
GreenMetrics 2012	Sustainable computing	London, UK	Jun. 15, 2012		May 1, 2012	May 15, 2012

Journal and Special Issue Call For Papers

Journal	Papers Due	Notification
Green Engineering	Jan. 12, 2012	Feb. 29, 2012
Sustainable Computing	(Open)	

Conference, Workshop & Symposium Call for Participation

Short Name	Main Topic	Location	Dates
FAST'12	File and Storage Technologies	San Jose, CA	Feb. 14-17, 2012
ASPLOS 2012	Architectural Support	London, UK	Mar. 3-7, 2012
EuroSys 2012	Computer Systems	Bern, Switzerland	Apr. 11-13, 2012
NSDI'12	Networked Systems Design and Imp.	San Jose, CA	Apr. 25-27, 2012

In the digital version of the Register, the venue short names are hyperlinked to the corresponding Web sites.

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

To advertise a relevant venue, email Abhishek Chandra at chandra@cs.umn.edu.

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