ICL NEWSLETTER

December 2007

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Software Enabling Technologies for Petascale Science

Guest Editor Fred Johnson

Introduction
Fred Johnson, DOE Office of Science

Failure Tolerance in Petascale Computers
Garth Gibson, Bianca Schroeder and Joan Digney

Enabling Advanced Scientific Computing Software Steven Parker, Rob Armstrong, David Bernholdt, Tamara Dahlgren, Tom Epperly, Joseph Kenny, Manoj Krishnan, Gary Kumfert, Jay Larson, Lois Curfman McInnes, Jarek Nieplocha, Jaideep Ray and Sveta Shasharina

Performance Engineering: Understanding and Improving the Performance of Large-Scale Codes David H. Bailey, Robert Lucas, Paul Hovland, Boyana Norris, Kathy Yelick, Dan Gunter, Bronis de Supinski, Dan Quinlan, Pat Worley, Jeff Vetter, Phil Roth, John Mellor-Crummey, Allan Snavely, Jeff Hollingsworth, Dan Reed, Rob Fowler, Ying Zhang, Mary Hall, Jacque Chame, Jack Dongarra and Shirley Moore

Creating Software Tools and Libraries for Leadership Computing John Mellor-Crummey, Peter Beckman, Keith Cooper, Jack Dongarra, William Gropp, Ewing Lusk, Barton Miller and Katherine Yelick

DOE's SciDAC Visualization and Analytics Center for Enabling Technologies - Strategy for Petascale Visual Data Analysis Success E. Wes Bethel, Chris Johnson, Cecilia Aragon, Prabhat, Oliver Rübel, Gunther Weber, Valerio Pascucci, Hank Childs, Peer-Timo Bremer, Brad Whitlock, Sean Ahern, Jeremey Meredith, George Ostrouchov, Ken Joy, Bernd Hamann, Christoph Garth, Martin Cole, Charles Hansen, Steven Parker, Allen Sanderson, Claudio Silva and Xavier Tricoche

Emerging Visualization Technologies for Ultra-Scale Simulations
Kwan-Liu Ma, University of California, Davis

End-to-End Data Solutions for Distributed Petascale Science Jennifer M. Schopf, Ann Chervenak, Ian Foster, Dan Fraser, Dan Gunter, Nick LeRoy and Brian Tierney

Scientific Data Management: Essential Technology for Accelerating Scientific Discoveries Arie Shoshani, Ilkay Altintas, Alok Choudhary, Terence Critchlow, Chandrika Kamath, Bertram Ludäscher, Jarek Nieplocha, Steve Parker, Rob Ross, Nagiza Samatova and Mladen Vouk

The Earth System Grid Center for Enabling Technologies: Enabling Community Access to Petascale Climate Datasets Dean N. Williams, David E. Bernholdt, Ian T. Foster, Don E. Middleton

CTWatch Quarterly November 2007

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ICL 2007-2008 Report Now Available

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SuperComputing 2007

This year the SuperComputing conference was held in Reno, Nevada, famous for its huge casinos.

Here is a little joke from ICLer Tom Cortese:
Q: What is the best way to come back from Reno with a small fortune?
A: Go there with a large one.

Highlights of SC07

Many innovations were on display, but below are the essential according to the ICL folks.

ClearSpeed Serves Up a Teraflop [Julie]
"ClearSpeed demo's its new one teraflop server, the ClearSpeed Accelerated Terascale System (CATS)."

Microsoft HPC Server 2008 [Julie]
"Microsoft released a beta version of Windows HPC Server 2008, the successor to Microsoft Compute Cluster Server 2003."

Time Travel Debugging with TotalView [George]
"I managed to get a demo of TotalView Technology's reverse debugging prototype. The feature allows the programmer to step backward through the application and replay sequences of code. This allows you to do things like step backward from a crash to help figure out what caused it. Without this feature, the programmer has to restart the application from scratch. The prototype was developed with GDB, with the idea of transferring the technology to the TotalView debugger at some point in the future."

SiCortex [Jack]
"The SiCortex 5832 is a 5-teraflop single-unit supercomputer. It uses low-power, custom 64-bit MIPS-processor packages, which are basically entire computers on a single chip."

Acumem [Dan]
"They showed an interesting tool for 'fingerprinting' cache and memory access patterns and identifying multi-core access bottlenecks. They claim *not* to be using hardware counters, but it would seem they could benefit from them. Worth investigating."

RapidMind [Dan]
"Rapidmind touts the ability to produce a single binary that will self optimize for cluster and multi-core and architecture at runtime. I had an interesting conversation with their 'Chief Architect' about using performance counters for dynamic optimization during runtime (Right now they don't)."

PAPI on IBM [Dan]
"I discovered that IBM has already implemented PAPI on Blue Gene/P. This is gratifying confirmation that the vendors are taking more responsibility for PAPI on their platforms, but it would be nice if they'd let us know! I met with the architect of the PAPI implementation, who agreed to feed those sources back to us. That process is now underway."

Koolance [Tom]
"The stuff that I thought was particularly neat actually had nothing to do with work/research -- the folks at Koolance with their little tubes-of-liquid heat-exchanger cooling systems for hard disks, chipsets, video cards, CPUs, etc..."

ORNL / UT Booth

As in the past, ICL shared space in the ORNL booth, which highlighted many ICL projects as well as the upcoming supercomputer to be built at the UT-ORNL Joint Institute for Computational Sciences.

A man of many hats

If you had the chance to meet Jack during the conference, you may have noticed that he was never dressed the same. Here is the explanation....

Outfit 1, the official one as member of the SC Steering Committee.

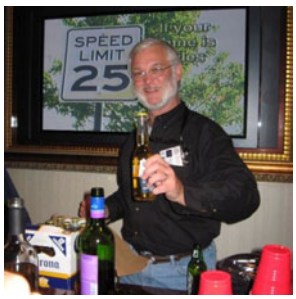
Outfit 2, the Microsoft "groovy" tee-shirt to receive the Microsoft awards.

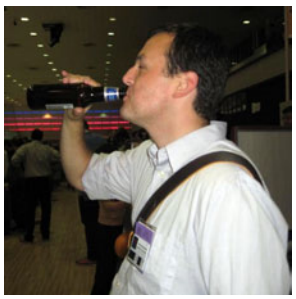
Outfit 3, the outfit as a judge for the Cluster Challenge Competition.

And finally the last one for advertising SC08 that will take place in Austin, TX.

Party Time

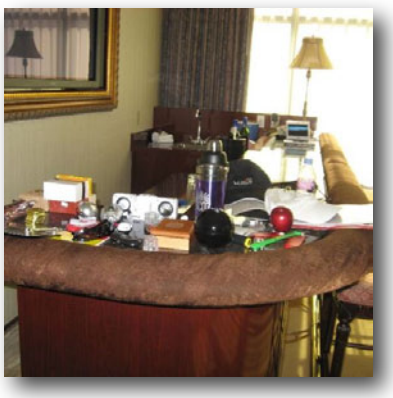
An integral component of the conference are the several parties that take place all week long: the Exhibitor party, the Committee party, the ICL dinner, the Technical program party and of course the many vendor parties.





SC Goodies

On the left, Tom's swag and on the right, Jack's swag.



TOP500

The Top500 List, published every six months, was announced at SC07. This marks the 30th Top500 list.

Retaining its title as the world's fastest computer, the IBM BlueGene/L system at Lawrence Livermore National Laboratory took top honors, with a speed of 478.2 teraflops. A teraflop is equal to 1 trillion calculations per second.

Behind the top system, though, five new computers entered the top 10. A new BlueGene system installed in Germany took second place, and a new SGI computer located at the New Mexico Computing Applications Center. India's first-ever system in the top 10 took fourth place, a new Hewlett-Packard computer in Sweden took fifth place, and a new Cray XT4 system at Lawrence Berkeley National Laboratory took ninth.

The slowest computer on this year's list would have ranked in the top 260 in June's list. The U.S. is home to a large majority of the world's fastest computers, with 284 of the Top500.

The next edition of the Top500 list will be released in June, 2008 at the International Supercomputing Conference in Dresden, Germany. More information and a complete listing of the Top500 is available at http://www.top500.org/.

HPC Challenge

The DARPA High Productivity Computing Systems (HPCS) Program and IDC announced at SC07 the annual HPC Challenge Award Competition (http://www.hpcchallenge.org/), which ICL helped start.

2007 HPC Challenge Class 1 Awards

G-HPL	Achieved	System	Affiliation	Submitter
1st place	259 Tflop/s	IBM BG/L	LLNL	Tom Spelce
1st runner up	94 Tflop/s	Cray XT3	SNL	Courtenay Vaughan
2nd runner up	67 Tflop/s	IBM BG/L	IBM T.J. Watson	John Gunnels
G-RandomAccess	**Achieved**	**System**	**Affiliation**	**Submitter**
1st place	35.5 GUPS	IBM BG/L	LLNL	Tom Spelce
1st runner up	33.6 GUPS	Cray XT3	SNL	Courtenay Vaughan
2nd runner up	17.3 GUPS	IBM BG/L	IBM T.J. Watson	John Gunnels
G-FFT	**Achieved**	**System**	**Affiliation**	**Submitter**
1st place	2870 Gflop/s	Cray XT3	SNL	Courtenay Vaughan
1st runner up	2311 Gflop/s	IBM BG/L	LLNL	Tom Spelce
2nd runner up	1122 Gflop/s	Cray XT3 Dual	ORNL	Jeff Larkin
EP-STREAM-Triad (system)	**Achieved**	**System**	**Affiliation**	**Submitter**
1st place	160 TB/s	IBM BG/L	LLNL	Tom Spelce
2nd runner up	77 TB/s	Cray XT3	SNL	Courtenay Vaughan
1st runner up	55 TB/s	IBM Power 5	LLNL	Charles Grassl

2007 HPC Challenge Class 2 Awards

Award	Recipient	Affiliation	Language
Most Productive Research Implementation	Vijay Saraswat	IBM	X10
Most Productive Commercial Implementation	Sudarshan Raghunathan	Interactive Supercomputing	Python/Star-P

Recent Conferences

SC07 - Reno, NV Nov 11th -16th
RDDS 2007 - Vilamoura, Portugal Nov 25th
Thara
PDCAT07 - Adelaide, Australia Dec 3rd- 6th
George

Upcoming Conferences

Workshop on "Building Petascale Applications and Software Environments on the Tera2grid" - Tempe, AZ Dec 11th-12th
Dan, Karl

Recent Friday Lunch Presentations

11-02-2007 George
The HPC World Tomorrow
11-09-2007 Stan
Algorithm Development for Reconfigurable Computing Architectures (FPGAs) and Special Purpose Architectures (GPUs)
[PDF]
11-30-2007 Michael Berry
Automating the Detection of Anomalies and Trends from Text
12-07-2007 Jim Plank
The Assault on Raid-6

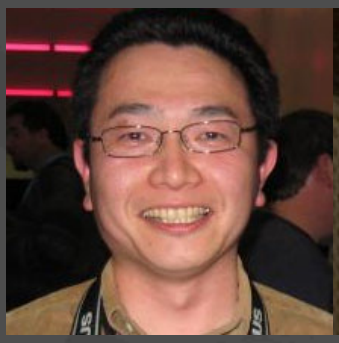
Upcoming Friday Lunch Presentations

12-14-2007 Alfredo
Mastering the Three Amigos on Multicore Systems

Hackers Strike ORNL

Using e-mail attachments, hackers potentially accessed information stored on unclassified machines at ORNL. The targeted data was personal information (e.g., names, addresses) of visitors to the lab from 1990-2004. Letters have been sent to individuals whose information may have been compromised.
More information: knoxnews.com

Interview with ICL Japanese alumni from the 90's



Tomoyuki Hiroyasu
Associate Professor
Doshisha University

Hidehiko Hasegawa
Associate Professor
University of Tsukuba

Daisuke Takahashi
Associate Professor
University of Tsukuba

Satomi Hasegawa
Hitachi

Julie: Who was the first Japanese long-term visitor at ICL?

Satomi: I went to ICL in March 1992 to visit famous Professor Dongarra and later I joined the group in 1994 as a Research Associate. The first visit was a difficult situation for me as I was just married and my husband had to stay more than 3 months alone in Japan. I was enjoying every morning Tracy making jokes about my situation.

Hidehiko: I was a Research Associate from March 1994 to 1995 at ICL. I was awarded a Fellowship for Overseas researcher from Japan.

Daisuke: I was a visiting scholar at ICL from September until November, 2002.

Tomo: in Japan, I had an interview for a position at Jack's lab. I indeed was from the same university as Daisuke and Hidehiko. I held a Visiting Researcher position from April 2002 until August 2003. Osamu Tatebe and Daisuke Takashi were also at ICL at that time.

Julie: Why did you want to visit Jack's lab?

Tomo: I wanted to visit a lab where they had applications and HPC at the same time. Other labs usually just do only one thing. That's why I choose this lab.

Julie: What did you like in Knoxville?

Satomi: I liked Knoxville a lot, this is a beautiful city. I met Susan, Victor and Roland, we got along together very quickly. This is why I stayed.

Hidehiko: If you watch too many American movies, US may look dangerous, but Knoxville is really not.

Julie: What was the biggest difference when you came back to Japan with your US experience?

Hidehiko: Most of us became important researchers in Japan, because of our stay at ICL. In Japan, I did not have any chance to use the latest technologies (JICS is a good chance to use machines).

Daisuke: No big difference for me. During my time at ICL, I developed the FFT that has been incorporated in the HPC Challenge Benchmark.

Tomo: I am very impressed of the influence of my visit to US. I would have been "minor" if I did not stay at ICL.

Julie: Do you have a story about something funny that happened at ICL?

Satomi: I have a story about Tracy. When we arrived in Knoxville, Tracy, a Tennessee native, was very hard to understand for us. She had to change her language to be able to be understood by the Japanese crew!

Satomi: Jack influenced my career by asking me which computer I was using and if Hitachi was in the TOP 500. From that point, I decided to sell Hitachi computers to the world.

Tomo: I think Jack can really be considered as a Japanese, maybe we should call him Jack Dongarra-san. His mind looks like a Japanese mind. TOP500 looks like a Japanese Project. He always says that is accidental.

Hidehiko: Jack likes news things, small things like Japanese. He enjoys when I take him to sushi bar, barbeque chicken.

Daisuke: Jack is a very kind person for every people. Before I visited ICL, Jack is already very famous in Japan.

Satomi: We thought he was Japanese as he takes care about all the persons.

Hidehiko: His message is usually very short, like we do in Japan ...I like it.

Tomo: And of course, he likes gadgets like me!

Tomo: I have a question for Satomi. In the US they have a lot of women in research in HPC company. In Japan, there are very few female Japanese researchers. Could you describe?

Hidehiko: No, no, no

Tomo: Japan follows the American trend after 10/15 years. Satomi is a candidate , a leader.

Hidehiko: In Japan, a woman should not become famous, but here in the US, many women specialists at IBM are very famous.

Tomo: In universities, we do not have solar power, so we always follow the female students, they have the power!

Satomi: More and more researchers are women in Japan.

Tomo: I am curious, a lot of female leaders in US. Why is it happening, will we have leader in Japan in 10 / 15 years?

Satomi: I don't know about Academics. Seriously speaking they are few.

Tomo: And it is true that nowadays universities are trying to hire women more and more. To me, an experience in the US is a big plus for them.

Interview with Thara Angskun

PhD Student
At ICL since 2003

Thara successfully defended his PhD dissertation on November 10th and will graduate in December. Congratulations Thara! He is the third PhD student to defend in two months at ICL, following Jelena and Erika.

Could you retrace your path to the PhD?

I joined the department and the MPI team of ICL in January 2003. I took courses, the qualifying exam and whatever required by the department for the degree. In the meantime, I also got lots of experience from working with the MPI team and eventually found the topic for my PhD.

In your opinion, what was the hardest and most demanding part of the PhD program?

Finding a (good) topic is probably the most difficult part of the program.

What general advice would you give to students that are in PhD Program or want to enroll in a PhD program? What are the keys to success?

"Do what you love (or at least love what you do)".

What are you future plans? When are you leaving Tennessee?

I will take a faculty position in a university in Thailand. December 4 will be my last day at ICL. I will go to Thailand on December 5.

What will you miss about ICL and Tennessee? The flexibility of your schedule? The cold weather of Tennessee?

I have lots of good memories and met lots of nice people in ICL. That is what I will miss when I leave.

Will you keep in touch? Are you thinking of future collaborations with ICL? Are you going to keep on reading the ICL Newsletter? ;-)

Definitely, yes.

Where do you see yourself 10 years from now?

Besides 10 years older, I should still be in the academic area and able to send some students to ICL.

People

Daniel Becker left ICL November 24th, but may be returning. Stay tuned.

Thara Angskun left ICL December 4th (see interview).

Departure

Gene Golub - Stanford University Passed away November 16th

Reminders

December 4th: Last day of class
December 6th-13th: UT Exam period
December 24th-28th: Winter Break - UT is closed
January 1st: New Year's Day - UT is closed
January 9th: Spring classes begin

The newsletter is available online at: **http://icl.cs.utk.edu/newsletter/2007/icl-news-2007-12.pdf**

Comments and contributions can be sent to: **icl-news@cs.utk.edu**