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## **PROCEEDINGS**

### **Fourth LACSI Symposium**

**October 27- 29, 2003**

**Santa Fe, NM USA**

## **INTRODUCTION**

The Fourth Symposium of the Los Alamos Computer Science Institute ([LACSI](#)) was held in Santa Fe, NM on October 27-29, 2003. LACSI was formed at [Los Alamos National Laboratory](#) to conduct research in computer science issues relevant to DOE's Accelerated Strategic Computing Initiative (renamed [ASC](#)). The Institute focuses on research with a longer time frame than the operational requirements of ASCI, and supports work both at LANL and at LACSI-associated universities.

The technical program for 2003 addressed the current and future state of high performance computing in several ways.

- 11 peer-reviewed technical papers were presented to the Symposium and reproduced in this proceedings.
- 17 posters were presented at the poster session.
- The keynote address discussed security challenges with respect to high performance computing.
- Four panel discussions focused on important issues for researchers and managers in high performance computing.
- Five workshops were held focusing on technical areas of particular importance to the LACSI community.



## TECHNICAL PROGRAM

The Fourth Symposium offered participants a wide variety of opportunities to discuss and learn about technical and policy issues in high-performance computing.

### Monday, October 27: Workshop Sessions

#### All Day Workshop

*Title: Clustermatic: A Revolutionary Approach to Simplified Cluster Computing*

Organizers: Sung-Eun Choi, Ronald Minnich, Matthew Sottile, Gregory Watson (LANL)

*Title: System and Application Performance*

Organizers: Adolfo Hoisie (Performance and Architecture Lab (PAL), (LANL))

Allen Malony (University of Oregon)

John Mellor-Crummey (Rice University)

#### Morning Workshops: 9:00am - 12:30pm

*Title: Interoperability of Object Libraries for Scientific Computing*

Organizers: Anthony D. Padula, William W. Symes (Rice University)

Roscoe A. Bartlett (Sandia National Laboratory)

Craig Rasmussen (LANL)

*Title: Mimetic Methods for Radiation Transport and Diffusion*

Organizers: Jim Morel (CCS-4, LANL)

Yuri Kuznetsov (University of Houston)

Mikhail Shashkov (T-7, LANL)

*Title: High Availability and Performance Computing*

Organizers: Stephen L. Scott (Oak Ridge National Laboratory)

Chokchai Leangsuksun (Louisiana Tech University)

#### Afternoon Workshops: 2:00pm - 5:30pm

*Title: Simulation Driven Optimization*

Organizers: Matthias Heinkenschloss, William W. Symes, Yin Zhang (Rice University)

*Title: Particle Simulation: Challenges and Prospects*

Organizers: Salman Habib (LANL)

Robert D. Ryne (LBNL)

*Title: A Tutorial on Adaptive MPI and Charm++*

Organizers: Laxmikant V. Kale, Orion Lawlor (University of Illinois at Urbana-Champaign)



## **6:00pm – 8:00pm: Welcoming Reception and Poster Presentations**

Workshops/tutorials on subjects of special interest to attendees, and the Welcome Reception and Poster Exhibit were featured. The posters were also made available over the next two days for additional inspection.

### **Poster Presentations**

#### *Connection Management for Massively Scalable TCP*

Patricia Eileen Crowley, Arthur B. Maccabe, and Breanne A. Duncan (The University of New Mexico)

#### *Grid Performance Prediction with Performance Skeletons*

Sukhdeep Sodhi and Jaspal Subhlok (University of Houston)

#### *A Portable High Performance Co-Array Fortran Compiler*

Yuri Dotsenko, Cristian Coarfa, and John Mellor-Crummey (Rice University)

#### *An In-House Development for Visualization in Molecular Science*

Jean M. Favre and Mario Valle (Swiss Center for Scientific Computing)

#### *Dragon: Program Analysis and Development Support for Open MP Codes*

Barbara Chapman, Oscar Hernandez, Lei Huang, Yi Wen, Tien-hsiung Weng, and Zhenying Liu (University of Houston)

#### *A Sample-Driven Call Stack Profiler*

Nathan Froyd, John Mellor-Crummey, Nathan Tallent (Rice University)

#### *Clam: Light Communication Layer for Asynchronous Mobile Computations*

Andriy Fedorov and Nikos Chrisochoides (College of William and Mary)

#### *PAPI Version 3*

Jack Dongarra, Kevin London, Shirley Moore, Philip Mucci, Daniel Terpstra, Haihang You, and Min Zhou (University of Tennessee)

#### *Processor-Level Partitioning of Kernel and User Mode Functionality on SMP Systems*

Carl A. Sylvia (The University of New Mexico)

#### *Model Coupling Toolkit Benchmarks*

J. Walter Larson, Robert L. Jacob, and Everest T. Ong (Argonne National Laboratory)

#### *Fault Injection into MPI Programs*

Chang-da Lu, Karthik Pattabiraman, and Daniel A. Reed (University of Illinois at Urbana-Champaign)



*High Performance Object-Oriented Java Programming: Fiction or Reality?*

Zoran Budimlic (Rice University), Giovanni Lapenta (LANL), Stefano Markidis (Politecnico di Torino), and Brian VenderHeyden (LANL)

*Profile-Based Dynamic Voltage Scaling for I/O-Intensive Codes*

Karthik Pattabiraman (LANL and University of Illinois at Urbana-Champaign), Wu-Chun Feng (LANL), and Daniel Reed (University of Illinois at Urbana-Champaign)

*A High-Level Approach to the Synthesis of High-Performance Codes for Quantum Chemistry*

David E Bernholdt, Venkatesh Choppella, and Robert J. Harrison (Oak Ridge National Laboratory); Alexander Auer and Marcel Nooijen (University of Waterloo); Gerald Baumgartner, Alina Bibireata, Daniel Cociorva, Xioyang Gao, Sriram Krishnamoorthy, Sandhya Krishnan, Chi-Chung Lam, Qingda Lu, Russell M. Pitzer, P. Sadayappan, and Alexander Sibiryakov (Ohio State University); So Hirata (Pacific Northwest National Laboratory); J. Ramanujam (Louisiana State University)

*Optimizing Collective Multicast on PSC Lemieux*

Sameer Kumar and Laxmikant V. Kale (University of Illinois at Urbana-Champaign)

*Supporting Generic Programming in a Multi-Language Component-Based Environment*

Wael R. Elwasif, Thomas C. Schulthess, and David E. Bernholdt (Oak Ridge National Laboratory); Gregory Brown (Florida State University)

*Design and Implementation of the Prophecy Automated Model Builder for Parallel and Grid Applications*

Joseph Paris (Northwestern University), Xingfu Wu and Valerie Taylor (Texas A&M University)



**Tuesday, October 28:**

**9:00am Welcoming Remarks**

**9:10am: Keynote Address – "Challenges in Cyber Trust"**

Dr. Gene Spafford, Purdue University  
Center for Education and Research in Information Assurance and Security

**Abstract:**

The last 30+ years of computing have primarily been focused on getting computing to work, at least most of the time. Now we are employing computing equipment in everything from wristwatches to the power grid, from automobiles to air traffic control. It is a vital part of every critical infrastructure to society, as well as most of our research and entertainment industries. Thus, we now need to focus on making the computing reliable and trustworthy. The goal of computing faster may need to be tempered by the question (from another field): Unsafe at any speed? What are some of the ways in which large-scale computing can assist in this effort? Are the security challenges posed by grid and cluster computing unique? This talk will explore some ideas from this space, and encourage the audience to start thinking of their own examples.

**10:00am Break**

**10:30am – Reviewed Papers I: Partitioning, Distribution, and Scheduling**

*Parallel Remote Method Invocation and M-by-N Data Redistribution*

Kostadin Damevski and Steven Parker (University of Utah)



*An Approach to Parallel MxN Communication*

Felipe Bertrand, Yongquan Yuan, Kenneth Chiu, and Randall Bramley (Indiana University)



*A Partitioner-Centric Model for SAMR Partitioning Trade-off Optimization: Part I*

Johan Steensland and Jaideep Ray (Sandia National Laboratories)



*Opportune Job Shredding:*

*An Effective Approach for Scheduling Parameter Sweep Applications*

Rohan Kurian, Pavan Balaji, and P. Sadayappan (The Ohio State University)



**12:30pm – 2:00pm Lunch**



## 2:30pm – Reviewed Papers II: Compilation and Memory Hierarchies

*Investigating Adaptive Compilation Using the MIPSpro Compiler*

Keith D. Cooper and Todd Waterman (Rice University)



*On Reducing Storage Requirement of Scientific Applications*

Guohua Jin and John Mellor-Crummey (Rice University)



*Regression-Based Multi-Model Prediction of Data Reuse Signature*

Xipeng Shen, Yutao Zhong, and Chen Ding (University of Rochester)



## 3:30pm – 4:00pm Break

## 4:00pm Reviewed Papers III: Cluster Communication and Storage

*Implementing Scalable Diskless Clusters Using NFS*

James Howard Laros III and Lee Ward (Sandia National Laboratories)



*The LAM/MPI Checkpoint/Restart Framework: System-Initiated Checkpointing*

Sriram Sankaran, Jeffrey M. Squyres, Brian Barrett, Andrew Lumsdaine, Jason Duell, Paul Hargrove, and Eric Roman (Indiana University and Lawrence Berkeley National Laboratory)



*Fault Tolerant Communication Library and Applications for High Performance Computing*

Graham Edward Fagg, Edgar Gabriel, Zizhon Chen, Thara Angskun, George Bosilica, Antonin Bukovsky, and Jack Dongarra (ICL/University of Tennessee, Knoxville)



*High Performance Broadcast Support in LA-MPI over Quadrics*

Weikuan Yu, Sayantan Sur, and D.K. Panda (The Ohio State University); Rob T. Aulwes and Rich L. Graham (LANL)





## **Wednesday, October 29: Panel Discussions**

Four panel discussions took place focusing on important issues for researchers and managers in high performance computing and a Closing Reception ended the LACSI Symposium.

### **8:00am Breakfast**

#### **9:00am – Panel I**

##### *Panel I: The Earth Simulator: One Year Later*

Discussants will review aspects of hardware, software, and applications of the system that has caused much controversy when first introduced in 2002.

#### **10:30am Break**

#### **11:00am – Panel II**

##### *Panel II: Experiences with TOP500 Linux Systems*

Systems running Linux have made steady progress in invading the high end of the TOP500 list. Representatives from organizations with the most powerful systems will discuss their experiences.

#### **12:30 Lunch**

#### **2:00pm – Panel III**

##### *Panel III: High Productivity Computer Systems, Phase II*

Representatives from Cray, IBM, and Sun will discuss their efforts in Phase II of DARPA's HPCS program.

#### **3:30pm Break**

#### **4:00PM – 5:30pm Panel IV**

##### *Panel IV: Federal Programs in High-Performance Computing*

Panelists from Federal agencies that support HPC and that have participated in HECRTF will present perspectives on the future of Federal programs that support the research, development, and use of high performance computing platforms.

#### **5:30pm – 7:00pm Closing Reception**





## **SUPPORTING CAST**

The 2003 LACSI Symposium was successful because of the combined efforts of many people.

### **LACSI Co-Directors**

Andy White, Los Alamos National Laboratory Ken Kennedy, Rice University

### **Organizing Committee**

Rob Fowler, Program Chair, Rice University; Rod Oldehoeft, General Chair, LANL; Barney Maccabe, Local Arrangements Chair, University of New Mexico

### **Program Committee**

Patrick Bridges, University of New Mexico; Lennart Johnsson, University of Houston; Chuck Koelbel, Rice University; Celso Mendes, University of Illinois at Urbana-Champaign; Shirley Moore, University of Tennessee; Neil Pundit, Sandia National Laboratory; Bill Rider, LANL; Jeff Vetter, Lawrence Livermore National Laboratory; Greg Watson, LANL

### **External Reviewers**

Sarala Arunagiri, Pavel Bochev, Ron Brightwell, Sung-Eun Choi, Karen Devine, Richard Graham, Richard Hanson, James Lawrence Horey, Tao Ju, Cris Pedregal Martin, Matthew Sottile, Carl Albert Sylvia, Wenbin Zhu

### **Conference Arrangements**

Deborah G. Cole, Registration Coordinator, University of New Mexico; Barbara Daniels, Meeting Coordinator, Local Arrangements, University of New Mexico

### **Submission and Review Management Software and Service**

John Konkle, [Linklings](#)

### **Symposium Web Pages and LACSI CDROM**

Sarah Gonzales Rice University; John Konkle, [Linklings](#)

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