

Contents

Welcome to CCGrid 2001	2
Symposium Information	3
Schedule	
Monday	6
Tuesday	6
Wednesday	7
Thursday	8
Friday	9
Tutorial details	10
Workshop details	
Agent Based Cluster and Grid Computing	12
Cluster Computing Education	12
Distributed Shared Memory on Clusters	13
Global Computing on Personal Devices	13
Internet QoS for Global Computing	14
Object and Component Technologies for Cluster Computing	14
Scheduling and Load Balancing on Clusters	15
Map of QUT	16
Map of South Bank	back cover

Welcome to CCGrid 2001

15-18th May 2001, Brisbane, Australia.

Welcome to the 1st ACM/IEEE International Symposium on Cluster Computing and the Grid!

CCGrid2001 is a truly international Symposium with delegates and contributions from all over the world: Austria, Belgium, Brazil, Canada, China, France, Germany, Greece, Hong Kong, India, Italy, Japan, Korea, Macedonia, Netherlands, New Zealand, Philippines, Poland, Portugal, Singapore, Spain, Sweden, Switzerland, Taiwan, UK, USA, as well as from throughout Australia.

We hope you have had a good journey here and are now ready to take part in the many and varied activities that the Symposium has to offer. The Symposium series has got off to an excellent start with a very strong program for this inaugural offering. We have an exceptional field of keynote and invited speakers, tutorial and industry presentations, workshops and a panel discussion, with papers on many cutting edge topics ranging from message passing libraries through to grid testbeds. We gratefully acknowledge these important contributions to the Symposium and the time and effort generously provided by those concerned. Special thanks go also to the members of the Program Committee - the quality of the program is due in great part to their efforts. Finally, we wish to express our appreciation of the work of the organizing committee, especially Wayne Kelly (Local Arrangements Chair), Chris Ho-Stuart (Finance Chair) and Carlie Green (Conference & Special Events Management Officer).

Hosted by the Queensland University of Technology (QUT), the Symposium is sponsored by the IEEE Computer Society's Task Force on Cluster Computing (TFCC) and is being held in cooperation with the Association for Computing Machinery (ACM) Special Interest Group on Computer Architecture (SIGARCH), the IEEE Technical Committee on Parallel Processing (TCPP), and the Society for Industrial and Applied Mathematics (SIAM). The Symposium has received generous support from Akamai Technologies, the Australian Partnership for Advanced Computing (APAC), Distributed Systems Technology Centre (DSTC), Intel Corporation, International Business Machines (IBM), MPI Software Technology, Platform Computing Corporation, and Sun Microsystems.

The Symposium consists of eight sessions of papers commencing Wednesday at 9 am. In addition, there are several tutorials being held on Tuesday and a series of workshops commencing on Tuesday and continuing on until Thursday. Both tutorials and workshops are free to all delegates.

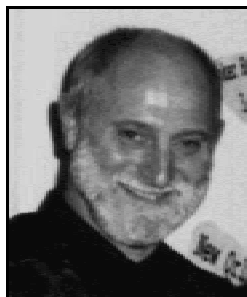
There are several social functions starting with the reception on Monday evening. We hope you will attend these functions and take the opportunity to meet with old friends and make new ones.

Please feel free to contact us if you have any questions. We hope you enjoy CCGrid2001 and that you enjoy your time in Brisbane!

On behalf of the CCGrid2001 Organising Committee



Rajkumar Buyya
Monash University



George Mohay
Queensland University of
Technology



Paul Roe
Queensland University of
Technology

Symposium Information

General Information

The Symposium is being held at the Rydges Hotel, South Bank, Brisbane. All the Symposium workshops, tutorials, plenary and main sessions will be held in the Boulevard rooms B1-4, located on the Boulevard level of the hotel. Rooms B3 and B4 are combined for the plenary sessions.

The reception desk will be just outside the Boulevard rooms and will be open from 5:00pm-7:00pm on Monday and 8:00am-5:30pm, Tuesday through Friday during the Symposium.

Morning and afternoon tea and coffee will be available in this area. While you are having your tea or coffee why not take the opportunity to view the Posters on display in the terrace area just outside the Boulevard rooms.

For those who wish to use e-mail or the web, Internet connections will be available in room 114, on level 1 of the hotel. This will be open 8:00am-6:00pm Tuesday-Friday.

If you need any help with anything, colour-coded badges identify volunteer helpers, and the organising committee; please feel free to contact them if you have any queries. Alternatively, the registration desk may be contacted during working hours on 3864 2915 if you have any urgent requests.

The Symposium is being organised by Queensland University of Technology (QUT).

Speakers

Speakers should make themselves known to their session chairs (see program) well in advance of their presentation. Overhead projectors and data projectors are available in all rooms, also PA systems.

CCGrid 2001 Welcome Reception

The welcome reception will be held in the Crown Lager Bar of Rydges Hotel from 6:00pm-8:00pm on Monday evening. The registration desk will be open from 5:00pm-7:00pm for registration.

Lunches

You need to make your own arrangements for lunch on Tuesday. There are many nearby places to find lunch with cafes and restaurants located in the South Bank parklands, adjacent to the Rydges Hotel.

Wednesday's, Thursday's and Friday's lunches are complimentary. Wednesday and Thursday's lunches are at the Plough Inn, which is situated in the Stanley St Plaza of South Bank: near Paul's Breaka Beach (see South Bank map for details). Friday's lunch is provided by the Parklands Bar and Grill of Rydges Hotel, on the terrace of the Boulevard level.

Dinner in the OJ Wordsworth Room, QUT

On Tuesday 15th May there is a buffet dinner in the OJ Wordsworth room at QUT (Queensland University of Technology), Gardens Point (city) campus, starting at 6:30pm. The OJ Wordsworth room is located on level 12 of S block (see the map at the back of this program). QUT is across the river from South Bank. It is possible to walk there by crossing the Victoria Bridge and turning right to walk along William Street to the campus. Alternatively a ferry can be taken from the South Bank stop to the QUT ferry stop. Note it is not possible to walk across the Captain Cook Bridge.

Symposium Dinner and Cruise

The Symposium dinner cruise to St Helena Island will occur on Thursday night. The boat ("The Lady Brisbane") will depart from the Flag Court pontoon at South Bank promptly at 5:45pm. Don't be late or you'll be left behind! The banquet dinner will include a large selection of local seafood, spit roasts and a variety of vegetarian dishes. The cruise will also include a live comedy – drama production themed on Australia's penal history. Please bring along warm clothing, as part of the cruise is across open bay waters. To protect the polished wooden decks, ladies (and men!) are asked not to wear sharp heels. The trip is scheduled to return to South Bank by around 10:30pm.

Parking

Paid parking is available in the underground car park at South Bank Parklands. It is inadvisable that you park in the city centre as parking spaces are difficult to find and expensive.

Contacts and Other Information

Dress

Smart casual attire is appropriate for the Symposium sessions, the Symposium dinner and the welcome function. A light jacket or a cardigan may be required in the air-conditioned Symposium rooms. For the dinner and cruise warm clothing is necessary.

Messages

A message board will be located next to the registration desk. Please advise all potential callers to attention their message to the CCGrid 2001 Symposium. All delegates are asked to check the message board regularly. No guarantee can be given that messages will be received in a timely manner or delivered personally.

Personal Mail/Faxes

The Symposium secretariat does not accept responsibility for personal mail or faxes. Please have all correspondence sent to your accommodation address.

Business Services

The Rydges Hotel offers business services such as faxing and photocopying facilities. All costs incurred whilst using the business services are the delegate's personal responsibility and cannot be charged to the Symposium. If you require these services, please contact reception.

About Brisbane

Weather

The month of May in Brisbane marks the beginning of the cooler months. May is the shortest month of the year for sunshine in Queensland, averaging 5-6 hours each day. Brisbane often experiences occasional showers in May, being the end of the Queensland wet season, and temperatures range between a minimum of 10C (59F) and a maximum of 25C (77F) on average.

Distances

Brisbane is between two of Australia's most popular coastal destinations, the Gold Coast and Noosa. Both are a short drive from Brisbane: Noosa 120km (approx. 2 hour drive) and the Gold Coast 100km (approx. 1¼ hour drive).

Transport

There are many transport options available to you in Brisbane. The Brisbane City Council offers regular bus services to most places in Brisbane. There are also taxis, an extensive rail network and a ferry service along the Brisbane River. If you would like specific information on the best way to reach a Brisbane destination, call Transinfo on 13 12 30 or ask the concierge at your hotel.

Banking Information & Currency Exchange

The major Australian banks, the Commonwealth Bank, The National Australia Bank, Westpac and ANZ will be able to exchange your travellers cheques or currency. Banks are open from 9.30am-4.00pm on weekdays only. There are also foreign exchange bureaus open in the Queen Street Mall seven days a week.

Shopping

Most of the retail outlets in Brisbane are open from 8.30am-5.30pm from Monday-Thursday and open until 9.00pm on Fridays (CBD only). On weekends CBD stores are open between 9.30am-4.30pm. Duty-free stores in town are open extended hours most days. For your convenience, there is a supermarket at the end of the Queen St Mall and a chemist in the middle of the Mall.

Nearby Attractions

South Bank Parklands

South Bank Markets (Friday, Saturday and Sunday)

Queensland Museum

Queensland Art Gallery (the current "from Renoir to Picasso" exhibition is highly recommended!)

Queensland Performing Arts Centre

IMAX cinema

Queensland Maritime museum

Citycat - explore the city by river

Web pages

These web pages contain useful information if you are looking for additional information on things to do in Brisbane and other tourism destinations in Queensland (the organisers do not accept responsibility for the content of these pages!).

South Bank Parklands

<http://www.south-bank.net.au>

Brisbane Tourism

<http://www.brisbanetourism.com.au>

Destination Queensland

<http://www.destinationqueensland.com>

Tourism Queensland

<http://www.queensland-holidays.com.au>

Australian Tourist Commission

<http://www.australia.com>

Monday 14th May

5:00 - 7:00	<i>Registration: outside Boulevard rooms</i>
6:00 - 8:00	<i>Welcome Reception: Crown Lager Bar, Rydges Hotel</i>

Tuesday 15th May

8:00 - 5:30	<i>Registration: outside Boulevard rooms</i>			
9:00 - 12:30 (Morning tea: 10:30 - 11:00)	Tutorial @B1 The Globus Toolkit for Grid Computing <i>Ian Foster</i> <i>(Argonne Nat. Lab. and Univ. of Chicago)</i>	Tutorial @B3 Three Tools to Help with Cluster and Grid Computing: ATLAS, PAPI, and NetSolve <i>Jack Dongarra</i> <i>(University of Tennessee and Oak Ridge National Laboratory)</i>	Workshop @B2 Internet QoS for Global Computing chair: Mahbub Hassan and Sanjay Jha	Workshop @B4 Scheduling and Load Balancing on Clusters chair: Y K Kwok
12:30 - 2:00	<i>Lunch: own arrangements</i>			
2:00 - 5:30 (Afternoon tea: 3:30 - 4:00)	Tutorial @B1 An Introduction to OpenMP <i>Tim Mattson</i> <i>(Intel Corp.)</i>	Workshop @B3 Global Computing on Personal Devices chair: Franck Cappello and Spyros Lalis	Workshop @B2 Agent based Cluster and Grid Computing chair: Omer F Rana	Workshop @B4 Scheduling and Load Balancing on Clusters chair: Y K Kwok
6:30 -	<i>Dinner: OJ Wordsworth Room, S block, Queensland University of Technology (QUT)</i>			

For tutorial and workshop details see the following pages.

Session Acronyms

CAGE:	Component and Agent Approaches
DSM:	Distributed Shared Memory
GRID:	Grid Computing
I/O:	Input/Output and Databases
MSGP:	Message Passing and Communication
PERF:	Performance Evaluation
SCHE:	Scheduling and Load Balancing
TOOL:	Tools for Management, Monitoring and Debugging

Wednesday 16th May

8:00 - 5:30	<i>Registration: outside Boulevard rooms</i>		
9:00 - 9:15	Welcome @B3: Jack Dongarra, <i>University of Tennessee and ORNL</i> Symposium opening: John O'Callaghan, <i>APAC</i>		
9:15 - 10:15	Keynote @B3: <i>Greg Pfister (IBM): The Promise of InfiniBand for Cluster Computing</i>		
10:15 - 10:45	<i>Morning tea</i>		
10:45 - 12:25	<p>I/O(1-4) @B1 chair: Ian Foster</p> <p>Document Distribution Algorithm for Load Balancing on an Extensible Web Server Architecture <i>B. Ng and C. Wang</i></p> <p>KelpIO: A Telescope-Ready Domain-Specific I/O Library for Irregular Block-Structured Applications <i>B. Broom, R. Fowler, and K. Kennedy</i></p> <p>Cluster Computers and Grid Processing in the First Radio-Telescope of a New Generation <i>C. De Vos, K. van der Schaaf, and J. Bregman</i></p> <p>A Cluster Architecture for Parallel Data Warehousing <i>F. Dehne, and T. Eavis, A. Rau-Chaplin</i></p>	<p>MSGP(1-4) @B3 chair: Amy Apon</p> <p>OVM: Out-of-Order Execution Parallel Virtual Machine <i>G. Bosilca, G. Fedak, and F. Cappello</i></p> <p>A New Software Architecture for the BIP/Myrinet Firmware <i>R. Westrelin</i></p> <p>An Adaptive, Reconfigurable Interconnect for Computational Clusters <i>A. Shafarenko and V. Vasekin</i></p> <p>xBSP: An Efficient BSP Implementation for cLAN <i>Y. Kee and S. Ha</i></p>	<p>Workshop@B2 Distributed Shared Memory on Clusters</p> <p>chair: Laurent Lefevre</p>
12:25 - 1:30	<i>Lunch: Plough Inn, South Bank</i>		
1:30 - 2:30	Keynote @B3: <i>Ian Foster (Argonne Nat. Lab. and Univ. of Chicago): The Anatomy of the Grid: Enabling Scalable Virtual Organizations</i>		
2:30 - 3:20	<p>I/O(5-6) @B1 chair: Greg Pfister</p> <p>Managable Storage via Adaptation in WiND <i>R. Arpaci-Dusseau, R. Arpaci-Dusseau, J. Bent, B. Forney, S. Muthukrishnan, F. Popovici, and O. Zaki</i></p> <p>Parallel Processing of "GroupBy-Before-Join" Queries in Cluster Architecture <i>D. Taniar and J. Rahayu</i></p>	<p>MSGP(5-6) @B3 chair: Jack Dongarra</p> <p>Implementing <i>Virtual Interface Architecture</i> on top of the GM Message Passing Interface <i>G. Chelius</i></p> <p>TACO — Exploiting Cluster Networks for High-Level Collective Operations <i>J. Nolte, M. Sato, and Y. Ishikawa</i></p>	<p>Workshop@B2 Distributed Shared Memory on Clusters</p> <p>chair: Laurent Lefevre</p>
3:20 - 3:50	<i>Afternoon tea</i>		
3:50 - 4:40	<p>I/O(7-8) @B1 chair: Robert Ross</p> <p>Parallel I/O Support for HPF on Clusters <i>P. Brezany and V. Sipkova</i></p> <p>Armada: A Parallel File System for Computational Grids <i>R. Oldfield and D. Kotz</i></p>	<p>MSGP(7-8)@B3 chair: Tony Skjellum</p> <p>OPIOM: Off-Processor IO with Myrinet <i>P. Geoffray</i></p> <p>Gekko: A Metalevel for Adaptation in Nexus <i>D. Webb and A. Wendelborn</i></p>	<p>Workshop@B2 Distributed Shared Memory on Clusters</p> <p>chair: Laurent Lefevre</p>
4:40 - 5:05	Industry track 1 @B3: Platform: Effective Internet Grid Computing for Industrial Users <i>Ming. Xu (Platform Computing Corp.)</i> chair: Rajkumar Buyya		
5:05 - 5:30	Industry track 2 @B3: Sun Grid Engine: Towards Creating a Compute Power Grid <i>W. Gentsch (Sun Microsystems)</i> chair: Rajkumar Buyya		

Thursday 17th May

8:00 - 5:30	<i>Registration: outside Boulevard rooms</i>		
9:00 - 10:00	Invited talk 1 @B3: <i>Gul A. Agha (Univ. of Illinois at Urbana-Champaign)</i> The World Wide Computer: Prospects for Parallel and Distributed Computing on the Web		
10:00 - 11:00	<i>Poster session and morning tea</i>		
11:00 - 12:15	TOOL(1-3) @B1 chair: David Abramson M3C: Managing and Monitoring Multiple Clusters <i>M. Brim, A. Geist, B. Luethke, J. Schwidder, and S. Scott</i> Efficient Tracing for On-the-Fly Space-Time Displays in a Debugger for Message Passing Programs <i>R. Hood and G. Matthews</i> NwsAlarm: A Tool for Accurately Detecting Resource Performance Degradation <i>C. Krintz and R. Wolski</i>	DSM(1-3) @B3 chair: Andrzej Goscinski Containers: A Sound Basis for a True Single System Image <i>R. Lottiaux and C. Morin</i> View-Based Consistency and its Implementation <i>Z. Huang, S. Cranefield, and M. Purvis and C. Sun</i> Coupling DSM-Based Parallel Applications <i>Y. Jégou</i>	Workshop @B2 Object and Component Technologies for Cluster Computing chair: Rajeev Raje and Barrett Bryant
12:15 - 1:15	<i>Lunch: Plough Inn, South Bank</i>		
1:15 - 2:15	Keynote @B3: <i>Satoshi Matsuoka (Tokyo Inst. of Tech.)</i> Grid RPC meets Data Grid: Network Enabled Services for Data Farming on the Grid		
2:15 - 3:30	TOOL(4-6) @B1 chair: Hai Jin XML-Based Visual Specification of Multidisciplinary Applications <i>A. Al-Theneyan, A. Jakatdar, M. Zubair, and P. Mehrotra</i> A Preliminary Topological Debugger for MPI Programs <i>S. Huband and C. McDonald</i> Simgrid: A Toolkit for the Simulation of Application Scheduling <i>H. Casanova</i>	CAGE(1-3) @B3 chair: Barrett Bryant Design of a Generic Platform for Efficient and Scalable Cluster Computing Based on Middleware Techniques <i>S. Vanhastel, F. De Turck, and P. Demeester</i> Declarative Flow Control for Distributed Instrumentation <i>B. Parvin, G. Fontenay, J. Taylor, and D. Callahan</i> Optimizing Execution of Component-Based Applications Using Group Instances <i>M. Beynon, A. Sussman, and J. Saltz, and T. Kurc</i>	Workshop @B2 Cluster Computing Education chair: Dan Hyde and Barry Wilkinson
3:30 - 4:00	<i>Afternoon tea</i>		
4:00 - 4:25	Industry track 3 @B3: High Performance Computing at Intel: The OSCAR Software Solution Stack for Cluster Computing <i>T. Mattson (Intel Corp.)</i> chair: Rajkumar Buyya		
4:25 - 4:50	Industry track 4 @B3: MPI/FT: Architecture and Taxonomies for Fault-Tolerant, Message-Passing Middleware for Performance-Portable Parallel Computing <i>R. Batch, et al. (MPI Software Tech. Inc. and Mississippi State Univ.)</i> chair: Rajkumar Buyya		
5:45 - 10:30	<i>Cruise to St Helena Island & dinner</i>		

Friday 18th May

8:00 - 5:00	<i>Registration: outside Boulevard rooms</i>		
9:00 - 10:00	Keynote @B3: <i>Andrzej Goscinski (Deakin University)</i> Making Parallel Processing on Clusters Efficient, Transparent and Easy for Programmers		
10:00 -10:30	Invited talk 2 @B3: <i>Jeffrey M. Bradshaw (Univ. of West Florida)</i> , Terraforming Cyberspace		
10:30 - 11:00	<i>Morning tea</i>		
11:00 - 12:40	<p>GRID(1-4) @B1 chair: John O'Callaghan</p> <p>Effective Metacomputing Using LSF MultiCluster <i>M. Xu</i></p> <p>Replica Selection in the Globus Data Grid <i>S. Vazhkudai, S. Tuecke and I. Foster</i></p> <p>User Preference Driven Multiobjective Resource Management in Grid Environments <i>K. Kurowski, J. Nabrzyski, and J. Pukacki</i></p> <p>Data Staging Effects in Wide Area Task Farming Applications <i>W. Elwasif, J. Plank, and R. Wolski</i></p>	<p>PERF(1-4) @B3 chair: Craig Lee</p> <p>Evaluating the Performance of CORBA for Distributed and Grid Computing Applications <i>T. Es-sqalli, E. Fleury, J. Guyard, and S. Bhiri</i></p> <p>The Characteristics of Workload on ASCI Blue-Pacific at Lawrence Livermore National Laboratory <i>A. Yoo and M. Jette</i></p> <p>Lessons Learned While Operating Two Large SCI Clusters <i>A. Keller and A. Krawinkel</i></p> <p>Performance Evaluation of an Agent-Based Resource Management Infrastructure for Grid Computing <i>J. Cao, D. Kerbyson, and G. Nudd</i></p>	<p>SCHE(1-4) @B2 chair: Henri Casanova</p> <p>Scheduling Aspects for Image Retrieval in Cluster-Based Image Databases <i>O. Kao, G. Steinert, and F. Drews</i></p> <p>Evaluation of Strategies to Reduce the Impact of Machine Reclaim in Cycle-Stealing Environments <i>E. Heymann, M. Senar, E. Luque, and M. Livny</i></p> <p>Latency Hiding in Dynamic Partitioning and Load Balancing of Grid Computing Applications <i>S. Das, D. Harvey, and R. Biswas</i></p> <p>Developing a Cost/Benefit Estimating Service for Dynamic Resource Sharing in Heterogeneous Clusters: Experience with SNL Clusters <i>D. Katramatos, M. Humphrey, and C. Hwang, S. Chapin</i></p>
12:40 - 1:40	<i>Lunch: Boulevard level terrace of Rydges Hotel</i>		
1:40 - 2:40	Keynote @B3: <i>Bruce Maggs (Akamai Technologies)</i> Global Internet Content Delivery		
2:40 - 3:30	<p>GRID(5)&SCHE(7)@B1 chair: John O'Callaghan</p> <p>Early Experiences with the EGrid Testbed <i>G. Allen, et al.</i></p> <p>Using Consensus for Solving Conflict Situations in Fault-Tolerant Distributed Systems <i>N. Nguyen</i></p>	<p>I/O(9) & MSGP(9)@B3 chair: Robert Ross</p> <p>Software Environments for Cluster-Based Display Systems <i>Y. Chen, H. Chen, D. Clark, Z. Liu, G. Wallace, and K. Li</i></p> <p>Supporting Disconnectedness — Transparent Information Delivery for Mobile and Invisible Computing <i>P. Sutton, R. Arkins, and B. Segall</i></p>	<p>SCHE(5-6) @B2 chair: Ricky Kwok</p> <p>Preferential Load Balancing for Distributed Internet Servers <i>M. Rumsewicz and M. Dwyer</i></p> <p>A Group-Based Load Balance Scheme for Software Distributed Shared Memory Systems <i>Y. Zhuang, C. Shieh, T. Liang, J. Lee and L. Tseng</i></p>
3:30 - 4:00	<i>Afternoon tea</i>		
4:00 - 5:00	Panel @B3: The Grid: Moving it to Prime Time, moderator David Abramson		
5:00 - 5:10	Closing remarks @B3		

Tutorials

The Globus Toolkit for Grid Computing

Ian Foster (Argonne Nat. Lab. And Univ. of Chicago)

This tutorial is a practical introduction to programming for high-performance distributed computing systems, or “computational grids,” and the capabilities of the Globus grid toolkit.

Emerging high-performance networks promise to enable a wide range of emerging application concepts such as remote computing, distributed supercomputing, tele-immersion, smart instruments, and data mining. However, the development and use of such applications is in practice very difficult and time consuming, because of the need to deal with complex and highly heterogeneous systems. The Globus grid programming toolkit is designed to help application developers and tool builders overcome these obstacles to the construction of “grid-enabled” scientific and engineering applications. It does this by providing a set of standard services for authentication, resource location, resource allocation, configuration, communication, file access, fault detection, and executable management. These services can be incorporated into applications and/or programming tools in a “mix-and-match” fashion to provide access to needed capabilities.

The tutorial covers three topics. First, we review basic principles of Grid computing and requirements for Grid architecture, describing the key protocols and services required. Then, we introduce the capabilities of the Globus toolkit. Finally, we show how Globus services can be applied in specific applications, examining in particular Data Grid, remote instrumentation, and distributed computing examples.

For more information on Globus, see <http://www.globus.org>.

Three Tools to Help with Cluster and Grid Computing: ATLAS, PAPI, and NetSolve

Jack Dongarra (University of Tennessee and Oak Ridge National Laboratory, USA)

In this tutorial we will look at some methods for generating automatically fast robust numerical kernels for numerical operations and methods for measuring the performance on today's processors. In addition we will look at a system, called NetSolve that allows users to access computational resources, such as hardware and software, distributed across the network. This project has been motivated by the need for an easy-to-use, efficient mechanism for using computational resources remotely. Ease of use is obtained as a result of different interfaces, some of which do not require any programming effort from the user. Good performance is ensured by a load-balancing policy that enables NetSolve to use the computational resource available as efficiently as possible. NetSolve offers the ability to look for computational resources on a network, choose the best one available, solve a problem (with retry for fault-tolerance) and return the answer to the user.

An Introduction to OpenMP

Tim Mattson (Intel Corp.)

OpenMP has emerged as the standard way to write multi-threaded software on shared memory computers. It may seem strange to talk about OpenMP at a cluster computing and Grid conference, but shared memory APIs like OpenMP play an important role in high performance computing. Some distributed memory systems require a hybrid OpenMP/MPI model to take advantage of all the processors on a system. Also, there have been some attempts to extend OpenMP so it runs over a cluster of computers using some type of distributed virtual shared memory. In this tutorial, we introduce OpenMP. We then discuss how it is used in cluster computing with particular focus on how to safely mix OpenMP and MPI in a single program.

Workshops

Agent Based Cluster and Grid Computing

Organized by: O. Rana (University of Wales, UK)

Reflections on Qualitative Attributes of Mobile Agents for Computational, Data, and Service Grids
D. Marinescu (Purdue Univ.)

On the Use of Mobile Code Technology for Monitoring Grid System
O. Tomarchio and L. Vita (Univ. of Catania)

Modelling and Simulation of Aggregation Nets
A. Poylisher (Univ. of Warwick) and M. Luck (Univ. of Southampton)

Enhancing a Multi-Agent System's Performance: From Implementation to Simulation Analysis
F. Andriamasinoro, R. Courdier, and E. Piquet (Univ. of Reunion Island)

While You're Away: A System for Load-Balancing and Resource Sharing Based on Mobile Agents
N. Suri, P. Groth, and J. Bradshaw (Univ. of West Florida)

Cluster Computing Education

Organized by: D. Hyde (Bucknell Univ.) and B. Wilkinson (University of North Carolina at Charlotte)

Cluster Computing in the Classroom: Topics, Guidelines, and Experiences
A. Apon (Univ. of Arkansas), R. Buyya (Monash Univ.), H. Jin (Univ. of So. Calif.) and J. Mache (Lewis & Clark College)

Teaching Distributed and Parallel Computing with Java and CSP
C. Nevison (Colgate Univ.)

A Distributed Shared Memory Programming Course
B. Wilkinson, T. Pai, and M. Miraj (Univ. of North Carolina at Charlotte)

ORESPICS: A Friendly Environment to Learn Cluster Programming
G. Capretti, M. Laganà, L. Ricci, P. Castellucci, and S. Puri (Univ. di Pisa)

Distributed Shared Memory on Clusters

Organized by: L. Lefevre (Universite Claude Bernard Lyon, France)

Teamster: A Transparent Distributed Shared Memory for Cluster Symmetric Multiprocessors
J. Chang and C. Shieh (Nat. Cheng Kung Univ.)

A Two Level Checkpoint Algorithm in a Highly-Available Parallel Single Level Store System
C. Morin, R. Lottiaux (IRISA), and A. Kermarrec (Microsoft)

Adaptative Prefetching Technique for Shared Virtual Memory
S. Lee, H. Yun, J. Lee, and S. Maeng (Korea Adv. Inst. of Science and Tech.)

An Efficient Lock Protocol for Home-Based Lazy Release Consistency
S. Lee, H. Yun, J. Lee, and S. Maeng (Korea Adv. Inst. of Science and Tech.)

Parallel Pull-Based LRU: A Request Distribution Algorithm for Clustered Web Caches Using a DSM for Memory Mapped Networks
E. Cecchet (INRIA-SIRAC)

Mosaic: A Non-Intrusive Complete Garbage Collector for DSM Systems
D. Munro, K. Falkner, M. Lowry, and F. Vaughan (Univ. of Adelaide)

A DSM Cluster Architecture Supporting Aggressive Computation in Active Networks
P. Graham (Univ. of Manitoba)

Distributed and Parallel Execution of Java Programs on a DSM System
T. Hou, J. Lee, Y. Cheng, and F. Chen (Nat. Cheng Kung Univ.)

Global Computing on Personal Devices

Organized by: F. Cappello (Universite Paris-Sud, France) and *S. Lalis (Foundation for Research and Technology, Greece)*

A Market-Based Protocol with Leasing Support for Globally Distributed Computing
G. Kakarontzas (Univ. of Thessaly) and S. Lalis (Inst. of Comp. Sci., Hellas)

A WOS™-Based Solution for High Performance Computing
N. Abdennadher (Univ. of Applied Sciences), G. Babin (HEC-Montreal), and P. Kropf (Univ. de Montreal)

Compute Power Market: Towards a Market-Oriented Grid
R. Buyya (Monash Univ.) and S. Vazhkudai (Univ. of Mississippi)

XtremWeb: A Generic Global Computing System
G. Fedak, C. Germain, V. Néri, and F. Cappello (Univ. Paris Sud)

XPulsar@home — Schools help Scientists

C. Weth, U. Kraus, J. Freuer, M. Ruder, R. Dannecker, P. Schneider, M. Konold, and H. Ruder
(*Inst. für Astronomie und Astrophysik*)

Sabotage-Tolerance Mechanisms for Volunteer Computing Systems

L. Sarmenta (MIT and Ateneo de Manila Univ.)

(this paper is from the Scheduling and Load Balancing main session)

Internet QoS for Global Computing

Organized by: M. Hassan and S. Jha (Univ. of New South Wales, Sydney, Australia)

Charging Distributed Services of a Computational Grid Architecture

B. Stiller, J. Gerke, P. Flury, P. Reichl, Hasan (Swiss Federal Inst. of Tech.)

A Relative Bandwidth Differentiated Service for TCP Micro-Flows

T. Soetens, S. De Cnodder, and O. Elloumi (Alcatel Network Strategy Group)

Markovian Model of RED Mechanism

R. Laalaoua, T. Atmaca (Inst. National des Telecomm.), and T. Czachórski (IITiS PAN)

Group Communication in Differentiated Services Networks

R. Bless and K. Wehrle (Univ. Karlsruhe)

Universal Network of Small Wireless Operators (UNSWo)

M. Chalmers, S. Jha, W. Lau, J. Hassan, S. Yap, and M. Hassan (The Univ. of New South Wales)

QoS-Aware Discovery of Wide-Area Distributed Services

D. Xu, K. Nahrstedt, and D. Wichadakul (Univ. of Illinois at Urbana-Champaign)

(this paper is from the Grid Computing main session)

Object and Component Technologies for Cluster Computing

Organized by R. Raje (Indiana University Purdue University Indianapolis) and *B. Bryant (University of Alabama at Birmingham)*

Automating the Construction of Replicated Objects in a Cluster of Workstations

W. Zhou (Deakin Univ.) and L. Wang (Phoneware Comm. Sys.)

On Component-Based Communication Systems for Clusters of Workstations

A. Fröhlich (GMD-FIRST) and W. Schröder-Preikschat (Univ. of Magdeburg)

A CORBA-Based Architecture for Parallel Applications: Experimentations with the WZ Matrix Factorization

D. Dhoutaut (Ecole Normale Sup. de Lyon) and D. Laiymani (IUT Belfort-Montbéliard)

Scheduling and Load Balancing on Clusters

Organized by: Y.K. Kwok (The University of Hong Kong)

A Benefit Function Mapping Heuristic for a Class of Meta-tasks in Grid Environments

Q. Ding and G. Chen (Univ. of Science and Technology of China)

Divisible Load Scheduling on a Hypercube Cluster with Finite-size Buffers and Granularity Constraints

X. Li, B. Veeravalli, and C. Ko (The National Univ. of Singapore)

A Protocol for Load Sharing among a Cluster of Heterogeneous Unix Workstations

D. Gupta, A. Gupta (Indian Institute of Tech.), S. Agrawal (Veritas Software), V. Agarwal (IBM), and P. Bepari (Ionic Microsystems)

A Bayesian RunTime Load Manager on a Shared Cluster

L. Santos and A. Proenca (Univ. do Minho)

A General Scheduling Framework for Parallel Execution Environments

G. Cavalleiro (PIP/CA/UNISINOS)

Cooperative Scheduling for Multimedia Services and Computation Intensive Applications for Cluster Server

H. Wan and X. Lin (The Univ. of Hong Kong)

A Fuzzy Approach to Load Balancing in a Distributed Object Computing Network

L. Cheung (The Univ. of Hong Kong)

Map of QUT

