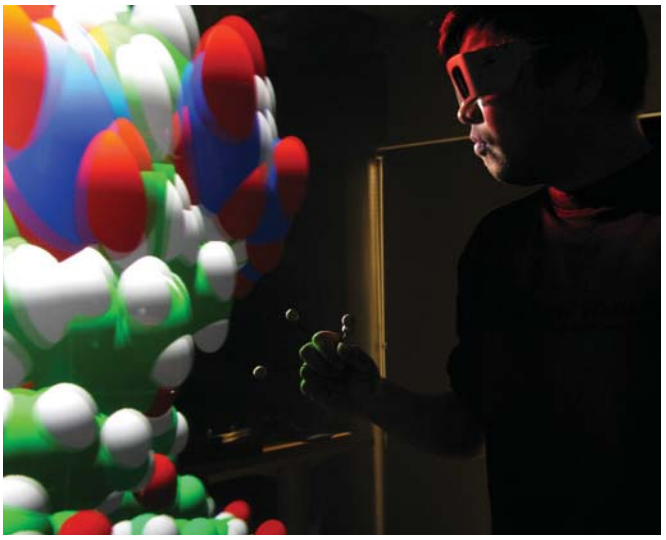
ICHEC NEWS

UPDATES FROM THE IRISH CENTRE FOR HIGH-END COMPUTING

ISSUE 7 : DECEMBER 2009 : WWW.ICHEC.IE

View your data in 3D at the Hub

The huge growth and complexity of data in critical areas of science and engineering presents unprecedented challenges for traditional methods of processing and analysis. Interactive 3D visualisation provides scientists and engineers with a rich visual environment to expose critical details not otherwise transparent in 2D rendering. This summer, ICHEC installed a state-of-the-art 3D simulation and visualisation system at the Hub, offering our users the opportunity to get the most from their data with the help of our highly trained computational scientists and programmers. Where there is complexity, 3D is increasingly becoming an essential tool for understanding large data sets. For the full story on ICHEC's new 3D visualisation service, see pages 4 and 5.



3D visualisation of life science molecular study.

European SGI User Group goes from strength to strength

The European SGI User Group is a collective of Europe-wide expertise on SGI computer clusters. Co-founded by ICHEC and CINES (Centre Informatique National de l'Enseignement Supérieur), a national HPC centre located in Montpellier, France, the Group is currently inviting all other European centres with an SGI installed base to join. So far, about 20 institutions across nine European countries have expressed interest or joined.

The main objective of the European Group is to promote knowledge exchange among its members on SGI-related matters, such as solutions to common hardware issues, joint development of monitoring tools, operational best practices, etc. An official members' website (including a wiki section for collaborative documentation) is now up and running, and it is hoped that a meeting of the Group will be held soon.

Worldwide SGI User Group Meeting 2009

ICHEC Infrastructure Manager Mr Niall Wilson recently represented the European Group at the meeting of the worldwide SGI User Group in San Antonio, Texas.

Niall's presentation was entitled 'One year with ICE – ICHEC's experiences'. Based in NUIG, Niall has overall responsibility for the management of the ICHEC infrastructure, including the SGI cluster "Stokes".

The meeting provided an opportunity for SGI users (mainly from the US, but a number of European users were also present) to meet each other and representatives from the company, who attend to offer advice to and get feedback from users. Niall found the meeting very helpful in this regard. "It was focused and relevant to issues we're coming up against.

The hardware is in constant development and users/customers are part of that process. It's in everyone's interest to have dialogue, to get the best out of the machines," he said.

Niall's paper was delivered on the first anniversary of the arrival of the SGI machine to ICHEC, and the presentation served as an introduction to ICHEC for the international audience as well. At the end of the conference, Niall attended the User Group Board meeting, and was invited to be European Liaison to the Group, which is very enthusiastic about and supportive of the European Group. It is hoped that a board member will attend the European meeting when it takes place.

Success for ICHEC

Welcome to issue 7 of *ICHEC News*, the newsletter dedicated to bringing researchers and institutions up to date with the latest high-performance computing news from Ireland. In this issue you'll find information on the latest supercomputing successes for ICHEC and Irish researchers in Europe and the USA, as well as updates on the launch of the European SGI Users Group. Our special feature focuses on the amazing new 3D immersive suite now available at the Hub for ICHEC users, there is news on the e-Inis Bioinformatics Portal, and we will also bring you up to speed on ICHEC training and education. We hope you will find *ICHEC News* to be a valuable source of HPC news and information.

Professor Jim Slevin
Director

GPGPU tools advanced by ICHEC scientist

ICHEC computational scientist Christos Kartsaklis recently introduced a newly developed tool called JASM at the prestigious NVIDIA GPU Technology Conference in San Jose, California. His talk discussed ongoing progress regarding the development of a Java-based library for rapid kernel prototyping in NVIDIA PTX and PTX instruction scheduling. The library is aimed at developers seeking total control of emitted PTX, highly parametric emission of, and tuneable instruction reordering. It is primarily used for code development at ICHEC but it is expected that the NVIDIA GPU community will also find it beneficial. GPGPU stands for General-Purpose computation on Graphics Processing Units, and is also known as GPU computing. Graphics processing units (GPUs) are high-performance many-core processors capable of very high computation and data throughput. Once specially designed for computer graphics and difficult to program, today's GPUs are general-purpose parallel processors with specialised software support for accessible programming interfaces and industry-standard languages such as C. Developers who port their applications to GPUs often achieve speedups of orders of magnitude versus optimised CPU implementations. The term GPGPU was coined and GPGPU.org founded by Mark Harris in 2002 when he recognised an early trend of using GPUs for non-graphics applications. The goal of GPGPU.org is to catalogue the current and historical use of GPUs for general-purpose computation, and to provide a central resource for GPGPU software developers. GPGPU.org has grown from an obscure site visited by few into a popular destination for developers and researchers.

Christos Kartsaklis of ICHEC speaking at the recent NVIDIA and GPU Technology Conference 2009.

Next meeting of the Irish Association for High-Performance Computing

In order to promote HPC in Ireland, the Irish Association for High Performance Computing (IAHPC) was founded in 1997 to facilitate interactions between the many groups and companies working in this area. Hence, the core aim of the Association is to promote the exchange of information between groups working on HPC in Ireland. The IAHPC is an unincorporated 'not for gain' organisation. The next meeting of the IAHPC will be held in University College Dublin on Friday December 11, 2009. ICHEC computational scientist Gilles Civario, along with several other speakers from various institutions across academia and industry, will present. There is no cost for attending, but attendees are asked to please register in advance. Further details are available at http://www.iahpc.ie/.

Contents

ACAM workshop places nanoscale simulations at centre stage

Nanoscale computer simulations are becoming increasingly important in guiding the engineering of nanomaterials and biological systems. Now larger system sizes or significantly longer sampling times or both are needed to probe, for example, the collective behaviour of large nanoassemblies, large-scale structural rearrangements in proteins. Simulation of these large systems requires state-of-the-art high-performance computing (HPC).

A recent workshop – 'Towards microscale molecular simulations with high-performance computing' – held at University College Dublin from October 14 to 16, gave current and potential HPC users the opportunity to discuss scientific and computing issues, with particular emphasis on molecular dynamics simulations of synthetic and natural systems for ICT and Bio applications.

The workshop was aimed at advanced HPC users such as postdoctoral researchers and significantly advanced PhD students. Approximately 30 people attended from all across Europe – Italy, Ireland, the United Kingdom, Spain, France, Finland – and the United States.

The workshop's organisers were privileged to welcome a number of eminent speakers, including Nobel Laureate Walter Kohn of the University of California, who spoke on 'Nearsightedness of electronic matter – including questions of long range coulomb interactions', Giovanni Ciccotti of UCD, who spoke on 'Minimum free energy paths: the case of the nucleation path in the two-dimensional Ising model', and Johan Aqvist of Uppsala University in Sweden, who addressed the workshop on 'High-throughput MD simulations for predicting ligand binding affinities and thermodynamic parameters'.

The presence of researchers of this calibre indicated the high regard in which the workshop was held by the international HPC community.

The workshop, which was jointly organised by the Tyndall National Institute, ICHEC and IBM, was part of the ACAM (Atlantic Centre for Atomistic Modelling) series of workshops. For more on ACAM see http://atlantica.ucd.ie/.

Irish success in PRACE prototype access call

Dr Turlough Downes (left) and Dr Niall English (right), who were recently awarded PRACE prototype Call 1 access, are pictured with Dr J-C Desplat, Associate Director of ICHEC.

Two ICHEC users – Drs Niall English and Turlough Downes – have been successful in the first round of applications for access to Partnership for Advanced Computing in Europe (PRACE) prototype systems. Only three applications in all were approved for access from an open call throughout EU supercomputer centres. It is a considerable coup for Irish researchers to have won two of the three awards, and the two Irish researchers were awarded almost 95% of the available resources allocated for this round of applications. Dr Downes, of Dublin City University, has previously demonstrated the scaling of the HYDRA astrophysics code to 16k cores. He has been granted the very substantial total of 4.2M core hours, allowing him to take his work to another level using, among others, the JUGENE system, the third fastest in the world. The goal of this project is to port HYDRA to two of the prototype platforms (Cray XT5 and the Bull Nehalem systems) and compare its performance across these platforms and the BlueGene/P platform to which it has already been ported, thus using three systems in total. This comparison will be performed in terms of scalability, time-to-solution and cash cost. Dr Michael Browne, an ICHEC computational scientist, will act as co-investigator on this project, providing computational expertise and facilitating ICHEC's support of its users on Europe's fastest systems. Dr English, of University College Dublin, has been granted 214k core hours to test new approaches in applying Carr-Parrinello Molecular Dynamics (CP-MD) methods to simulate interfaces of biological systems with nanomaterials. In particular, the detailed mechanisms of protein and dye binding and adsorption to metal and metal oxide surfaces raise interesting and unresolved questions which only fully dynamic, electronic simulations by CP-MD methods can answer at present. More specifically, the goals of this feasibility study are to assess how these methods may be applied efficiently on PRACE-provided HPC architectures, in particular the IBM BlueGene/P at Jülich, Germany, the Cray XT5 at CSC/CSCS (Finland/Switzerland), and the Intel Nehalem cluster at CEA/Jülich (France/Germany). Code-scaling experiments up to 16,384 cores are planned. Dr English has been awarded time on the JUGENE, JuRoPa and Loviatar systems. Gilles Civario and Alin Elena, also ICHEC computational scientists, are co-investigators.

The PRACE project is a European body that aims to co-ordinate access to the very largest computer systems at a European level. PRACE will create a persistent pan-European high performance computing (HPC) service and infrastructure, which will be managed as a single European entity. The service will comprise three to five superior HPC centres strengthened by regional and national supercomputing centres working in tight collaboration.

ICHEC is a partner in the PRACE consortium. If you are interested in applying for a future round of the PRACE Prototype access scheme, please contact Michael Browne or Gilles Civario at ICHEC to obtain further details and assistance in preparing applications.

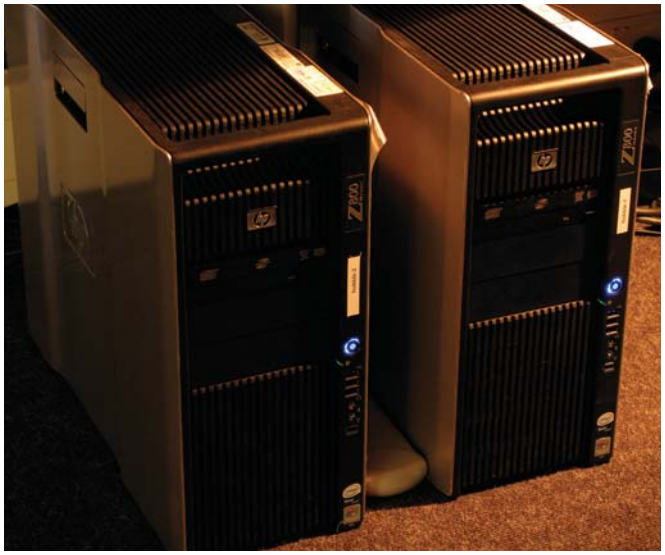
Newsflash

The results of the latest round of applications (Call 2) to the PRACE prototypes have just been announced. For Call 2, the total allocation was 4,450k core hours, of which 4,297k core hours (97%) were awarded to Irish research groups led by Prof. Jim Greer and Prof. Damien Thompson of the Tyndall Institute, and Dr Gary McGuire of UCD. It is worth noting that between Call 1 and Call 2, Irish groups have been allocated a total of 8.7 million core hours, the equivalent of a 1,000 core cluster for a year. Once again, this demonstrates the growing strength of the Irish computational science community and the importance of the partnership between ICHEC staff and the research community.

3D simulation of weather systems over Europe – the jet stream shown as red bands.

Research in 3D at the Hub

The new 3D simulation and visualisation suite at ICHEC will transform data exploration for the Irish research community.

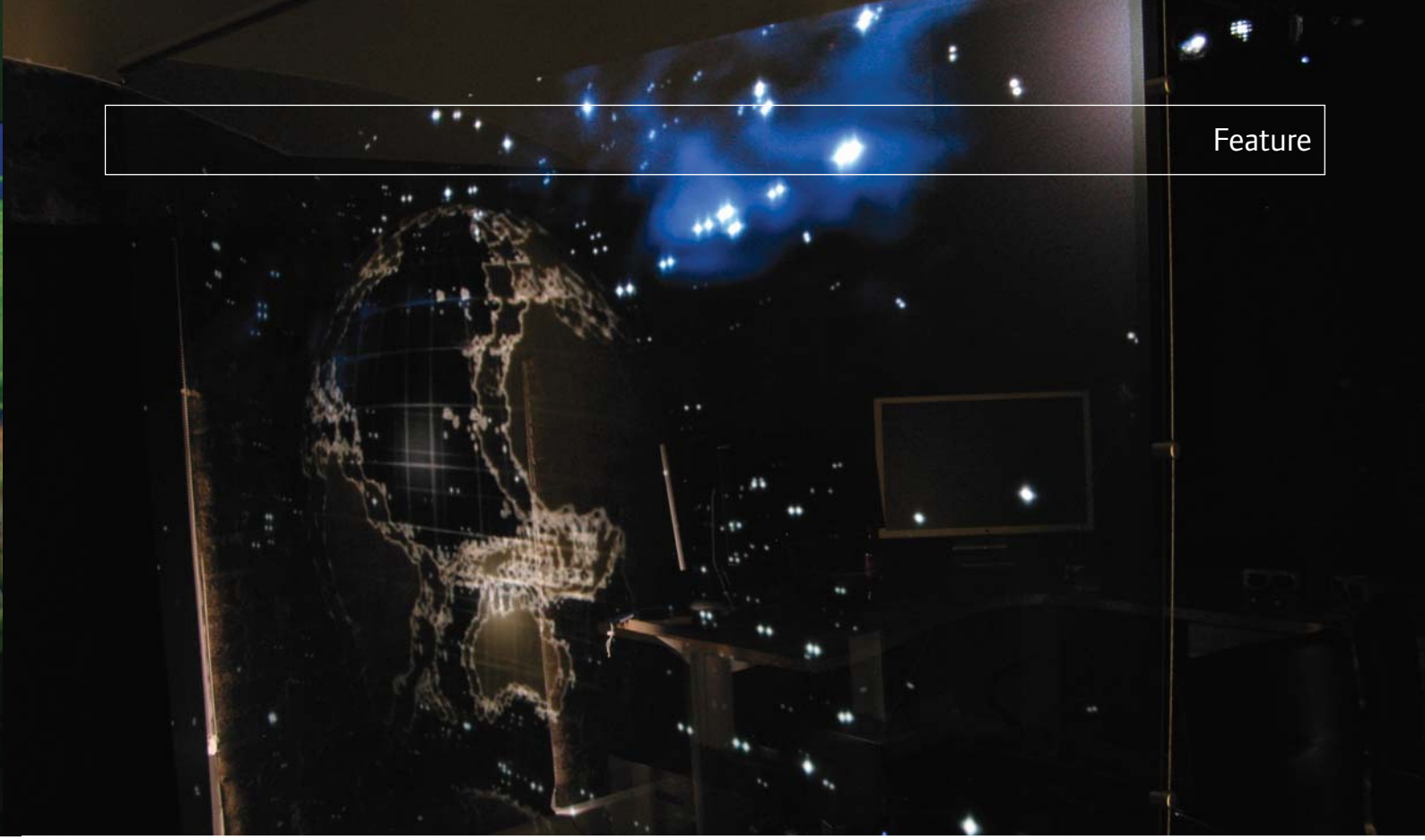


The 3D system is capable of processing large volumes of data.

The exponential growth and complexity of data in critical areas of science and engineering challenge and increasingly overwhelm traditional methods of computational processing and analysis. Immersive visualisation suites, however, provide a richer and more compelling environment for analysing massive data sets, and help to provide the valuable insight needed to make sense of this complexity. It was with this in mind that ICHEC decided earlier this year to develop visualisation facilities as part of the national high performance computing service and train ICHEC staff to provide the software support needed to make visualisation a practical tool for researchers who deal with large and complex data sets.

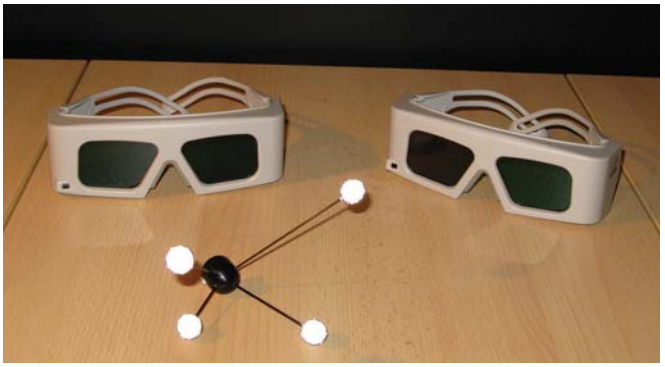
In early August, a 3D visualisation system was installed in the ICHEC HPC hub. The intention is to allow researchers to come along and get assistance with transforming the raw data from their simulations into a graphical representation that can be explored and examined in a stereoscopic three-dimensional environment. Two powerful workstations, capable of processing large volumes of data, run the visualisation software.

Visual output in 2D or 3D is then sent to a large transparent diffusion screen via a high performance projector. 3D stereoscopic visualisation is enabled by the use of active glasses, and a motion tracking system provides awareness of user position and allows for the manipulation of



The diffusion screen enables 3D simulations.

A high-performance projector sends images to the diffusion screen.

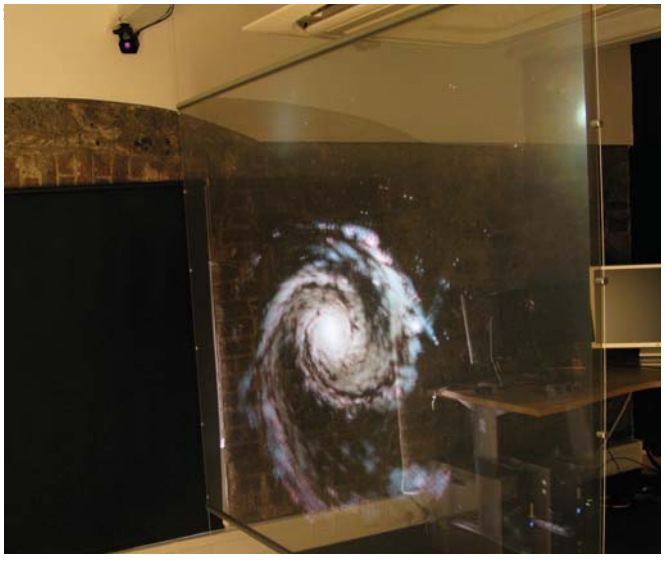


3D stereoscopic visualisation is enabled by the use of active glasses.

virtual objects/environments (e.g., changing viewing angle or rotating virtual objects). ICHEC staff are on hand to develop the visualisation application for users, thus removing the need for researchers to learn a new application or programming environment. Users of the 3D visualisation system will work in a collaborative environment with ICHEC computational scientists and programmers. Users simply need to provide ICHEC with the

If a picture is worth a thousand words, then real time 3D is worth a thousand pictures

data, explaining the research goals, and ICHEC staff will put everything in place to allow them to focus on their research aims.
A number of software packages (such as VTK, ParaView and COVISE) can be used, depending on requirements.
Researchers interested in using this facility or seeking help with visualising their simulations can avail of ICHEC support by simply logging a request via the Helpdesk and arranging to visit the hub.



Researchers provide ICHEC staff with data which is prepared for their use.

Summer scholarships

As highlighted in the previous issue of this newsletter, ICHEC awarded summer scholarships to two students – Tim Hayes (Trinity College Dublin) and Colin MacSweeny (University of Limerick) – who completed their projects in late August. Details of one of the projects feature in this issue's Research Update (p.7), and you can also hear from Tim and Colin in the Summer Scholarships review (p.8). Our thanks to Tim and Colin again for all their dedication and hard work!

ICHEC participates in NSI graduate programme

For the second year running, ICHEC has delievered a series of 10 online lectures (via video conferencing technology) for the Nanoscale Simulators of Ireland (NSI) graduate programme. The lectures make up a module in the programme entitled 'Programming Concepts'. Further details are available on our website – http://www.ichec.ie/education_training/graduate_programmes.

Irish research successes

Readers may be aware that a number of Irish-based researchers have successfully applied for access to top-tier European HPC infrastructure through the PRACE (Partnership for Advanced Computing in Europe) initiative (see p.3). Apart from mediating access to world-class computational resources, our collaboration with other European HPC centres within PRACE may soon offer other opportunities in training. ICHEC will contribute towards giving pan-European researchers access to a pool of top-class training material and the chance to participate in specialised HPC courses all over Europe. We are also confident that a HPC seasonal school will be held in Ireland within the next couple of years. Keep an eye on our website for future updates.

Education and training calendar

Recent events

Oct. 5-8:
Introductory HPC courses at Tyndall National Institute
Oct. 12, 19, 20; Nov. 2:
Introductory HPC courses at UCD
Oct. 14-16:
ACAM workshop: 'Towards microscale molecular simulations with high-performance computing'
Nov. 25-27, 30:
Introductory HPC courses at NUI Galway

Courses on demand

We deliver HPC courses on demand and free of charge to any third-level institution in Ireland. In order for us to deliver a course at your institution, all you need is the following:

- at least eight interested people;
- a person to co-ordinate matters at the host institution; and,
- a suitable venue with laptops/computers for each attendee.

If fewer than eight people are interested, we also have facilities to hold courses for small groups at our HPC Hub in Dublin – http://www.ichec.ie/infrastructure/hpc_hub. So if you know a few people in your research group or department who would be interested, please visit our website – http://www.ichec.ie/education_training/training_courses or contact us at training @ichec.ie for further details.

New courses available

ICHEC has developed two new courses: a two-day course entitled 'Advanced MPI' and a three-day course entitled 'Software Design and Carpentry for Scientists'. More information about the courses can be found on our website – http://www.ichec.ie/education_training/training_courses and they will be provided on demand by interested parties from early 2010 onwards.

Dr Simon Wong
Computational Scientist and Training Co-ordinator

Irish BioPortal Project

Ireland has a strong reputation for bioinformatics software development. Providing an efficient computational web service enhances the reputation of Irish bioinformatics research, and also provides tools to Irish researchers. As a partner in the e-INIS initiative, ICHEC is involved in the development of an e-infrastructure (including web services) for the Irish and international bioinformatics communities. The goal of the Irish BioPortal Project is twofold:

- to establish a central web portal where Irish researchers are able to interface with a suite of bioinformatics applications; and,
- to promote Irish bioinformatics applications to the international community.

The portal submits jobs to back-end computer systems (not limited to ICHEC systems) and obtains their results – all in an efficient, timely and user-friendly fashion.

Project highlights

- The BioPortal Project is now an active member of the Edugate federation. This development will allow Irish researchers at universities and other third-level institutions that are part of the Edugate federation to gain access to BioPortal applications.
- We acknowledge the kind support of the OMII (Open Middleware Infrastructure Initiative) team in adapting the GridSAM (Grid Submission and Monitoring) system for the Irish Project. With the adoption of GridSAM, BioPortal is now able to define jobs in a high level language (i.e., JSDL) and to submit jobs to multiple resource back-ends (e.g., PBS, Globus, Condor).
- As part of the project, preliminary investigation has been done on how to best design the user interface for the various bioinformatics applications. Mobyle, a bioinformatics application framework, has been evaluated for this purpose.

Upcoming features

- Development of an intuitive job management user interface.
- Full integration of the front-end interface with heterogeneous back-end computer resources.
- Kashif Iqbal is the technical architect for the project; Simon Wong represents the interests of the bioinformatics community; and the project is managed by Nicola McDonnell within the PRINCE2 project management framework.

Development of an MPI process placement profiling and reordering tool

Mr Timothy Hayes and Mr Gilles Civario, Irish Centre for High-End Computing.

Introduction

The mapping of virtual processes onto physical nodes is a very significant issue in high-performance computing (HPC). Depending on the topology of a machine's interconnect, a poor layout of process can lead to network congestion, increased latency, decreased bandwidth and additional CPU time spent on networking rather than computation. An ideal mapping should therefore optimise the overall process-to-process communication, based on the physical topology of the network. The aim of this project has been to develop a set of tools to evaluate the process placement of MPI jobs on a variety of HPC systems. The end product allows its user to observe the exact point-to-point bandwidth matrix, to infer the breakdown of bandwidth ordered by hop-count, and to provide estimates of better process placement when possible. Two separate but symbiotic tools were created: a profiling library called prmpi and an evaluation application called pranalysis. Their efficiency has been mostly tested on IBM BlueGene machines, but provided that information describing the physical network topology is made available, the tools are portable to any system.

prmpi (profile mpi)

prmpi is a very lightweight library that collects various statistics of an MPI job. It is constructed as a static library that is linked to MPI programs and overloads many of the MPI functions using a technique called interposition. The library is portable, relying on standard C libraries and standard MPI functions (i.e., not tied to specific MPI implementations). prmpi records four pieces of information: (a) the amount of information exchanged between unique processes; (b) the frequency of individual exchanges between unique processes; (c) the total amount of time spent in MPI communication routines; and, (d) the overall time of the application. One point to note is that the library is designed to log data cumulatively, rather than event-based. This has the important implication that one could determine the total amount of time a process spends waiting for all MPI functions to complete, and not the amount of time any individual function took to complete.

pranalysis (profile analysis)

pranalysis is a complementary tool to prmpi, which parses and analyses the information contained in the XML trace files produced by the latter. It performs a variety of basic tasks such as generating various statistics of the MPI program and exporting the communication matrix to various formats. In order to maintain portability (as for prmpi), pranalysis uses a plug-in system to store architecture-specific information.

A secondary goal for pranalysis is to suggest a better process placement scheme that may lower the overall time of the application. One approach is to associate a cost value between two processes based on their physical locations and subsequently find an arrangement that minimises the summation of all cost values. Hence, consider the cost function:

$$\sum_{i}^{n-1}\sum_{j}^{n-1} hop(i,j) \times sent(i,j)$$

where i and j represent process IDs; n is the total number of processes; hop(i,j) is the number of physical hops between process i and j; sent(i,j) is the amount of data sent from i to j. The problem becomes a search for a process arrangement that minimises this cost function. It would be naïve to permutate every possible arrangement – even for a small job involving 32 processes, there are 2.6×10^{35} permutations, a number that grows exponentially as the number of processes increases, i.e., it is an NP-hard problem.

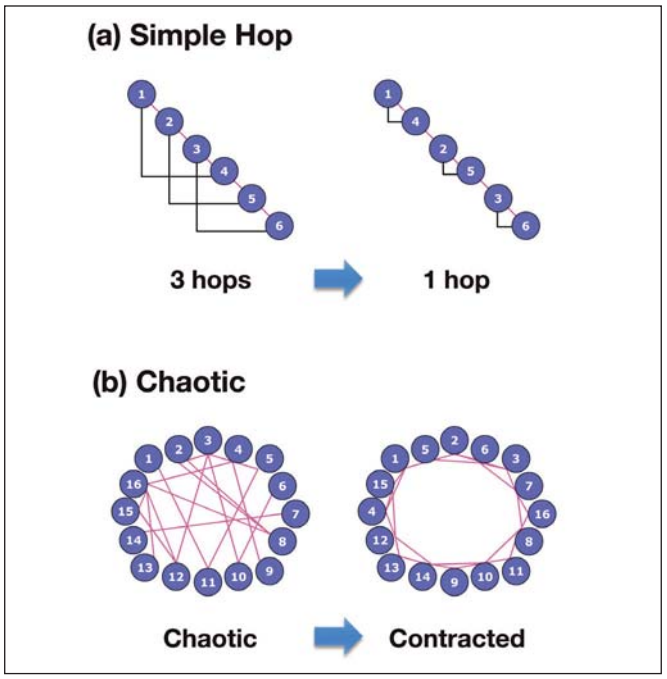


FIGURE 1: (a) A hypothetical scenario where the initial process placement was deliberately arranged to result in simple 3-hop communication only. In this case, pranalysis remaps the processes such that all communication would involve only one hop. (b) Another hypothetical scenario where the initial process placement was arranged in a pseudo-random, chaotic manner. While multi-hop communication is not totally eradicated, process remapping by pranalysis reduces the number of long-distance communication and contracts the overall hop-count.

Previous research from IBM has examined a similar issue on the BlueGene toroid topology. It was proposed that simulated annealing (SA) can be used to reduce overall bandwidth by pseudo-randomly mutating the physical location of processes in order to find the global minimum of the cost function. This is achieved using a Markov chain Monte Carlo method, as implemented by the Metropolis-Hastings algorithm. SA is analogous to the physical annealing of metals, which involves heating followed by controlled cooling of the material, in order to yield extra strength. When searching a large solution space, SA avoids getting stuck in local minima (which other "greedy algorithms" are prone to do) by allowing negative (cost-increasing) changes to be accepted at the initial high temperatures; as the temperature gradually decreases, there comes a point where only positive (cost-decreasing) changes are accepted.

We have therefore implemented SA within pranalysis and tested the algorithm's ability to remap processes onto physical nodes of the BlueGene system effectively. In cases where the process arrangement of a communication-expensive MPI program was deliberately made to be poor (Figure 1a), or was randomly assigned (Figure 1b), pranalysis was successful in remapping the processes to achieve 2-3x and >1x overall program speed-ups, respectively.

When tested against a real-world case, on the molecular dynamics simulation package DL_POLY3, pranalysis was able to reduce overall hop-counts but did not achieve significant overall speed-up. However, this may be due to the findings that DL_POLY3 spent relatively small amounts of time in waiting for communication, and that disk I/O, rather than process arrangement, appeared to be the more significant bottleneck.

This project was supported and funded by the ICHEC Summer Scholarships 2009 scheme. Please refer to http://www.ichec.ie/research/ for the full report and availability of the software described above.

ICHEC Summer Scholarship Programme 2009

Both recipients of the first of ICHEC's summer scholarships programme – Tim Hayes (Trinity College Dublin) and Colin MacSweeny (University of Limerick) – describe the projects they worked on.

Tim Hayes

I was one of the two interns in the initial conception of ICHEC's summer scholarship programme and worked at their offices in Dublin. I had already developed an interest in high-performance computing, having worked with IBM's HPC group the summer before and then subsequently doing my undergraduate final year project in this area. The goal for participants is to complete an individual research project over 10 weeks. Students have a variety of topics to choose from, which have all been scoped by the ICHEC computational scientists. All the projects were very interesting and I was very happy with the one I ended up with: developing a suite of profiling/optimisation utilities for the BlueGene supercomputers. ICHEC provided all the resources required to see the project to completion: a library rich with the latest books in the HPC field (and many more); access to all of ICHEC's high-performance clusters; and, most importantly, the support and mentoring of all the highly experienced staff in the Dublin and Galway offices, who were always eager to help and add insightful comments and suggestions. ICHEC staff come from an array of backgrounds, hailing from many different HPC-related centres around the world; they are always enthusiastic to share their experiences with you and to advise you about your career and options. Since finishing the ICHEC summer scholarship I have begun a research position at the supercomputing centre in Barcelona, Spain. The opportunity came about primarily from the skills I developed during the summer programme and also the helpful advice and support I received from ICHEC staff.

The intern programme is an excellent one and I hope it continues for a long time; it offers ambitious students a chance to develop their skills and expose themselves to a specific but very interesting niche in computer science. I took a lot more away with me than just another paragraph on my CV.

Colin MacSweeny

The object of my project was to implement a real world application in Chapel, a new next-generation parallel language being developed by Cray for HPC users. The application we chose was a program for generating a social network, which could then be used in an agent-based simulation to model the spread of diseases. I had no previous knowledge of any HPC languages before joining ICHEC, so for my first couple of weeks I spent a lot of time familiarising myself with MPI and OpenMP.

The application I was porting to Chapel was written using C++ and MPI so it was necessary for me to have a good understanding of MPI before I began coding in Chapel.

When porting the program to Chapel, it was very interesting to compare the differences between programming in Chapel and programming in MPI. Chapel contains several high level statements which aim to simplify the process of writing parallel programs. Chapel also contains the concept of a 'Locale', which usually represents one node on the computer cluster the application is run on. I had to modify the application slightly in order to take full advantage of Chapel's high level features but I did find that these abstractions were quite successful in their goal of making HPC programming simpler. Chapel is still in the early stages of development, however, and the compiler generates memory leaks, which adversely affected the scalability of the program I ported.

I had a very enjoyable summer and I'd like to thank my supervisor Michael Browne and everyone else in the Galway office for their support during my project!

User tips

Can I run fewer than eight tasks per node using the taskfarm?

If for memory reasons you need to run fewer than eight tasks per node with the taskfarm2 utility you can control the number of tasks that will be launched per node by setting the TASKFARM_PPN=n variable in your PBS script. Note that project hours will also be deducted for the unused cores.

How do I run remote graphical X applications?

If you are connecting from an MS Windows machine you will need to have Xming, Hummingbird Exceed or similar installed and running on your workstation. You also need to ensure that X11 forwarding is enabled.

On a typical Unix system X11 support will already be in place and you need to connect using:

$ ssh -X username@stokes.ichec.ie.

Now you can execute any of your X applications and it should forward the X application via SSH to your local screen. For example:

$ xclock &

You should now see the Xclock is running on your local screen. The DDT debugger is one of the most useful X11 applications ICHEC provides.