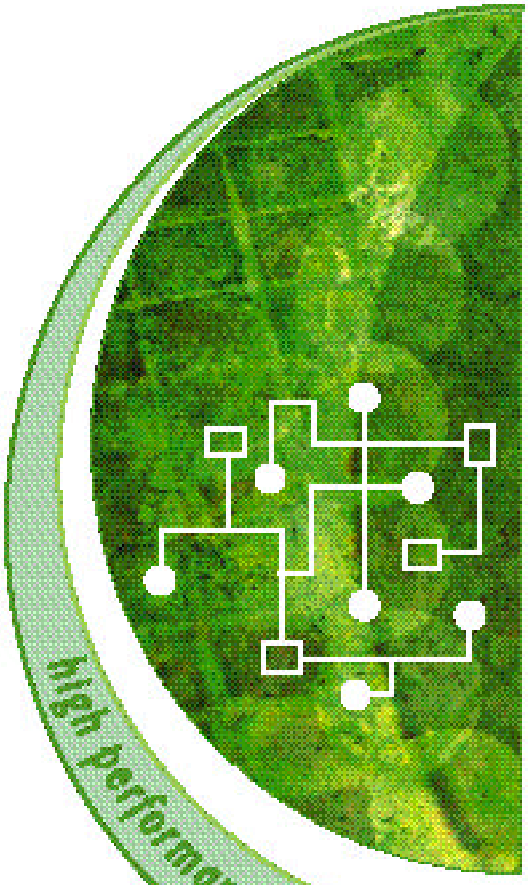

CSAR FOCUS

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high performance computing at Manchester ~ taking research into the future

www.csar.cfs.ac.uk

CUG SUMMIT 2002

Manchester to host Cray User Group Summit 2002

Keynote Speakers:

Dr John Taylor, Director General of Research Councils
Cllr Roy Walters, Lord Mayor of Manchester
David Burridge, Director of ECMWF, Reading
Daniel Reed, Director of NCSA, Champaign, Illinois, USA

Storage Area Network Installation for Green and Fermat

CSAR Technology Refresh - final stages

Totalview, Vampir & Vampirtrace now available on Origins

The University of Manchester

CSC

sgi

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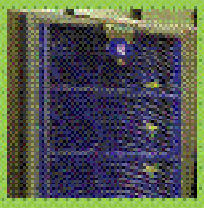

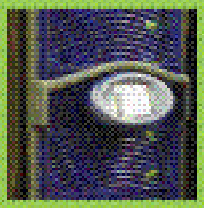
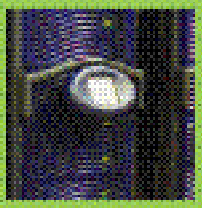
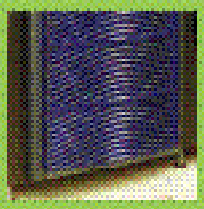




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Editorial

The last phase in the CSAR Technology Refresh schedule has now taken place, and in our new-look, full colour issue of *CSAR Focus*, we look back at the implications of the Refresh and how it has affected our users.

We also feature an interesting article by Andrew Stobart of SGI, on the SAN (Storage Area Network) technology which is about to be introduced to the CSAR systems.

Our Annual CSAR Survey Results for 2001 are also published, and we bring our usual features, including the latest software updates and profiles on new staff joining the HPC team here at Manchester. We are also proud to be hosting the Cray and SGI User Group (CUG) Summit 2002 at the University of Manchester, May 20th - 24th.

If you have any comments on this issue of *CSAR Focus*, or would like to submit articles in the next issue of *CSAR Focus* (Winter 2002) then please contact the HPC helpdesk: csar-advice@cfs.ac.uk.

....And finally....

....a goodbye speech from from me...!

By the time this issue is printed, I will have left the CSAR team and moved into my new role in Grid Computing, still here at Manchester Computing, working for MRCCS. I may well be writing about my new work in future issues of CSAR Focus!

As the editor of CSAR Focus from it's start, I would like to thank all of you who have contributed to CSAR Focus over the last three years, making it a great success within the field of High Performance Computing. I hope that you will continue to support us in the future by keeping up the good work and allow us to feature it in CSAR Focus.

Lastly, a special thanks to design artist Nicola Siddons who has done a great job on the re-design of the new-look CSAR Focus.....and whoever takes over from me, GOODLUCK!

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Eddy Resolved Coupled Physics-Ecosystem Modelling in the Irish Sea

Jason Holt, Roger Proctor ~ Proudman Oceanographic Laboratory
Mike Ashworth ~ CLRC, Daresbury
Icarus Allen, Jerry Blackford ~ Plymouth Marine Laboratory

Among the marine science and management community there is intense interest in how the ecosystems of the shallow seas of the continental shelves are controlled by the physical environment in which they exist. Some of the principle ideas have long been established: tides, wind driven currents and river plumes transport nutrients from the land and the open ocean into coastal waters where rapid production of plankton occurs in spring blooms. In shallow waters these are controlled by the turbidity of the water limiting light levels. In deeper waters, where tidal currents are weaker, blooms occur when seasonal heating reduces mixing near the surface; mixing which would otherwise carry photosynthesizing plankton out of the illuminated region. The plankton produced by the bloom enters a complicated biogeochemical web, much of which is being explored by biological processes studies. But it is only recently, with the advent of sophisticated ecosystem and hydrodynamic models, and massively parallel computers, that the environment at the first few levels of the food chain can be explored in its entirety. Here we examine how coupling two such models at high resolution in four dimensions predicts a rich and complicated behaviour with a strong resemblances to reality.

The Irish Sea presents an ideal location for developing and testing coupled physics-ecosystem models. It is a semi-enclosed sea with a wide range of physical and biogeochemical regimes: the tides propagate inwards from both channels resulting in weak tides and seasonal stratification in the west and very strong tides in the Eastern Irish Sea; nutrient input is both from rivers and from oceanic sources; and the ecosystem is not dominated by a single plankton or zooplankton species. A computationally efficient 3-dimensional coastal-ocean modelling system (POLCOMS, www.pol.ac.uk/home/research/polcoms) has been developed and this acts as 'host' to the ecosystem dynamics. A full description of the hydrodynamic model can be found in Holt and James 2001 (J. Geophys. Res. 106 C7 14015-14034). The structure of the modelling system allows different ecosystem formulations to be explored in an identical physical environment, and this article focuses on one such model: the European Regional Seas Ecosystem Model (ERSEM), developed through a 6 year EU funded project involving 8 institutes in 4 countries is probably the most comprehensive model of its type (see Baretta et al, 1995 , Neth. J Sea Res., 33, (3/4), 233-246). This system has been applied at eddy-resolving lengthscales (~1.5 km) to the Irish Sea in a model domain nested within a hierarchy of models covering the whole of the North West European Continental Shelf.

The whole system has about 2×10^7 inter-related degrees of freedom that are stepped forwards in time, with typically a 20 minute time step. Modelling seasonal and multiyear periods is therefore a computational challenge of the highest order. The system uses domain decomposition to partition a sea area between the processors available at run time and message passing (MPI) is used to communicate the model variables between the processors as required by the equations of motion. As figure 1 shows, the performance of the system scales excellently with the number of processors on the Origin 3000, GREEN, whereas there is a degradation of performance with more than 96 processors on TURING (the CRAY T3E-1200E). This is using

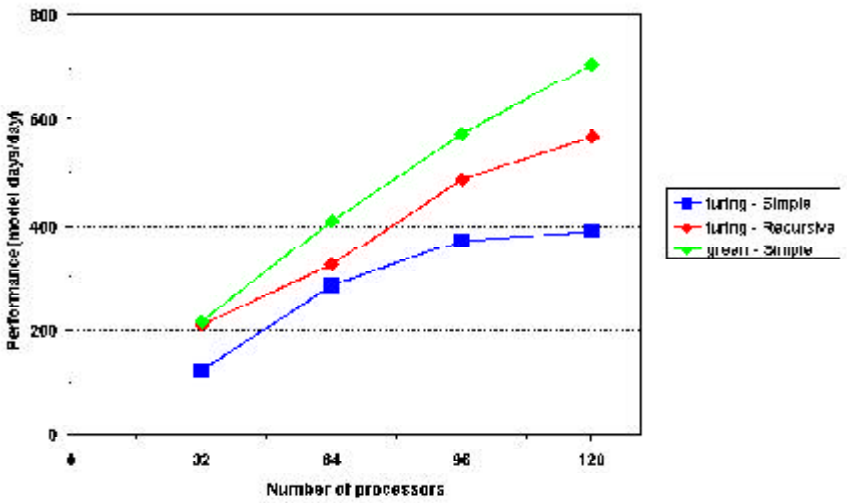


Figure 1: Model performance on Turing with simple and recursive partitioning and on Green with simple partitioning.

simple partitioning, whereby the model domain is divided into equal area boxes with no account as to whether they contain land or sea (about 50% of the domain in these tests is land). If a recursive algorithm, which divides the domain so each processor has a similar load, is used then both performance and scaling are significantly improved.

Model results from a simulation of 1995 show that during the onset of seasonal stratification the weak frontal regions are unstable, resulting in substantial eddy activity (figure 2). This transports water from the well-mixed regions, which are nutrient rich, into the regions where a spring bloom has already occurred and hence are nutrient depleted (figure 3). This provides a new source of nutrients to the phytoplankton in this region and there is enhanced production along the front (figure 4).

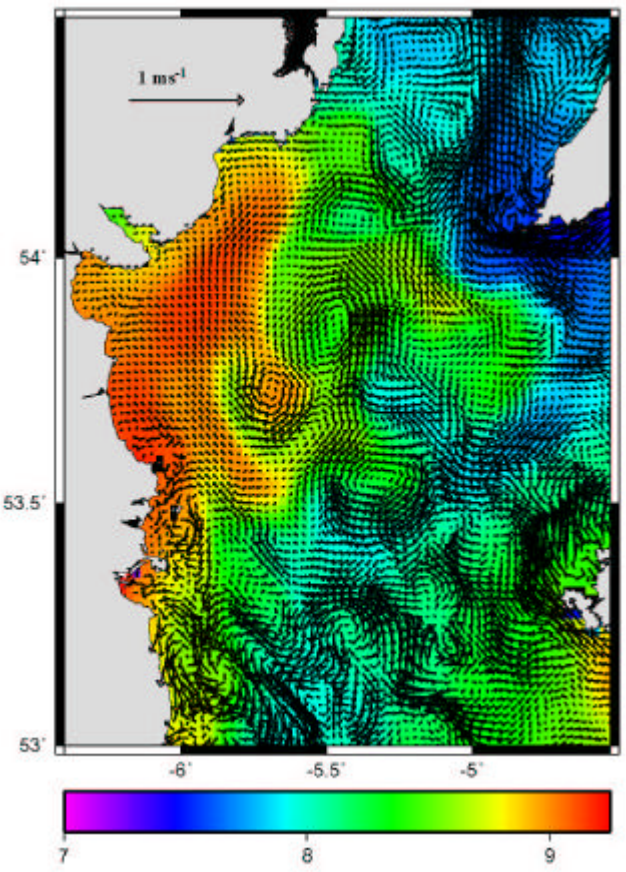


Figure 2: The surface temperature (°C) and Currents on 24th April 1995).

It is only with resolution of these scales that the details of the interaction of primary production and the hydrodynamics become apparent. As well as primary production this work particularly focuses on the next level up in the food chain, zooplankton. These are a major food source for many commercially important fish species, so understanding how they interact with their physical environment, for example why production rates in the North and Irish Seas are so different, is crucial to fisheries management.

This work has been conducted in collaboration with researchers at CLRC Daresbury Laboratory, Plymouth Marine Laboratory and Southampton Oceanography Centre as part of the NERC Marine Productivity Thematic program.

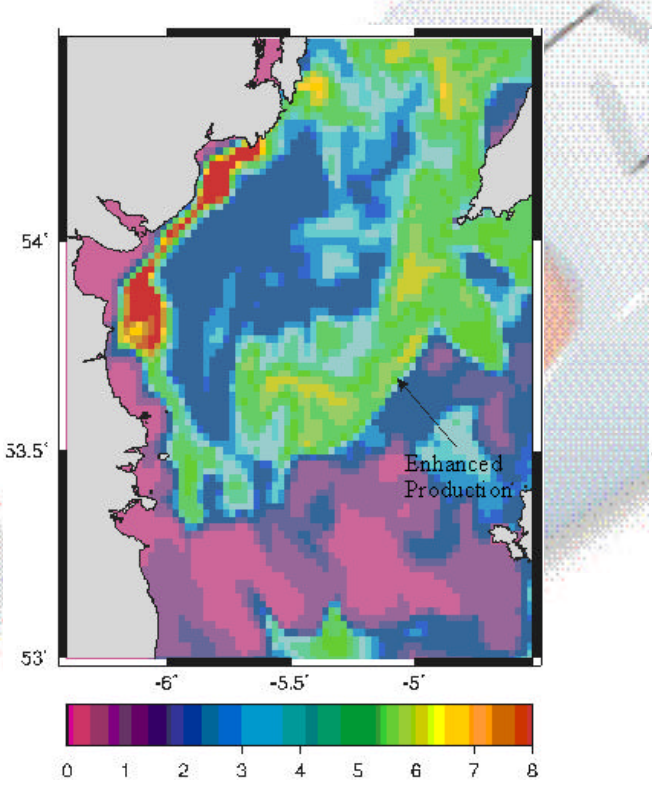


Figure 3: Surface Nitrate (mmol N m^{-3})

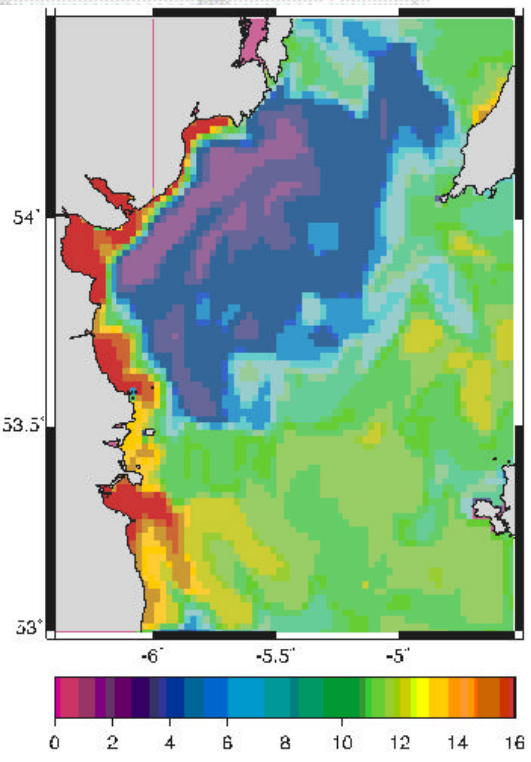


Figure 4: Surface Chlorophyll (mg chl-A m^{-3})

Cray and SGI User Group Summit 2002

Manchester, UK

20-24th May 2002

The annual Cray User Group SUMMIT arrives in Manchester in May. The event is to be held in the Manchester Town Hall, which is a magnificent gothic style building located in the heart of the City.

The mission of CUG SUMMITs are to provide the high performance computing community with leadership and information exchange to enable the development and effective use of Cray and SGI computational tools in achieving the business and research objectives of CUG Members.

With leading members of the Cray and SGI organization present it gives you the ideal opportunity to hear first hand the the aims and current directions of the two companies, to influence the focus of current development and to meet those responsible for bringing the machines and tools of these two companies to you. It is also a great opportunity to hear the experiences and work of others in the HPC user community.

The University of Manchester is delighted to have been chosen as hosts and is sure that you will benefit greatly from attending.

For more information on the conference please see the link in the centre of page:
http://www.cug.org

CSAR's Technology Refresh: How was it for you?

Stephen Pickles,
CSAR Technology Refresh Team Leader

This could be my last article as CSAR Technology Refresh Team Leader, because the CSAR Technology Refresh has happened. Officially. Green passed its acceptance tests in December 2001.

Whatever happened to Napier?

The original plan for the CSAR's mid-life Technology Refresh called for an SGI NUMAflex system running Linux on Intel Itanium processors. The system was to be known as Napier. To smooth the transition from Turing to Napier, we installed a prototype Linux cluster, known as Fourier, consisting of dual-processor workstations with pre-release Itanium chips.

There was a general mood of apprehension. There were whispers about Itanium: Would it perform? Would Intel deliver on time? There were whispers about Linux: Will it scale? Is it mature enough for high performance computing? The prospect of porting codes seemed daunting: Were the user codes too adapted to the ecological niche of T3D/T3E, UNICOS/mk and Cray's compilers? Would everyone leave it until the last minute? Did we have enough staff? Would anyone even care while the HPC(X) procurement was going on?

Everything changed in May 2001, when SGI announced its intention to delay production of SN-Itanium until the general availability of second-generation processors in the Itanium family (code-named McKinley). At the time, I was not best pleased — to put it mildly. All that work on Fourier wasted. CSAR's "mid-life technology refresh" was beginning to feel like a mid-life crisis.

But eventually, I calmed down. Plan B was Green, an Origin3000 system with trusty MIPS processors. And it was sound. In hindsight, SGI's decision has been a wise one - Green *is* a leading edge system.

From the Turing Machine to the Green Machine

Green was commissioned in April 2001 and upgraded to 512 MIPS R12000 processors a few months later. With a massive 512 GB of memory, a state-of-the-art interconnect, and support for MPI, SHMEM and OpenMP, Green is capable of running scientific applications that simply aren't feasible on Turing. Green has more than twice the total memory of Turing and four times the memory of Turing per processor.

It might seem a little strange that Green, which has slower processors and less of them than Turing, should take pride of place as CSAR's flagship machine. But Green typically delivers much greater sustained performance on real world codes, and we're delighted with it.

Green uses the same processors as, and is binary compatible with, the Origin 2000 Fermat. We recommend using Fermat for developing, porting and testing codes intended for production work on Green. Green's faster interconnect delivers improved performance and better scalability on most parallel codes. But a few codes may be more cost effective on Fermat — fortunately Fermat, with 128 processors, is eminently suitable for medium scale production work.

Success Stories

We are aware of many individuals and groups who have ported their codes from Turing to Green with very little effort, and who are, in general, seeing the expected improved sustained performance - the article by Jason Holt/Roger Proctor describes one such example. Another major consortium has been running codes which could not be run on Turing because of memory constraints. Further examples of such successes will be highlighted in the next edition of CSAR Focus.

Teething pains

The introduction of Green into service hasn't been entirely without incident. Solutions have been found for most of the problems reported, but there are still two issues important enough to rate a special mention here.

Variable timings

Whenever you find yourself engaged in performance optimisation or benchmarking, it's important that whenever you run the same job on the same system with the same input data, the elapsed time is the same, more or less. On Turing, this is generally the case, as all parallel jobs run on dedicated application PEs. But on Green (and to a lesser extent on Fermat), we've seen the occasional large variation in run times, larger than the few percent that might be deemed acceptable.

Don't get the impression from this that there's anything wrong with the Irix scheduler — it's highly sophisticated, copes with migration of processes and data between processors very successfully, and does exactly what most users want — but for a work-mix dominated by tightly synchronised parallel jobs, it needs a little help from the batch queueing system.

The right solution, we believe, is to move to a batch system that dynamically creates a *cpuset* (effectively reserving the requested processors for exclusive use) at the start of every batch job. NQE does not support dynamic cpusets, but both LSF and PBS(Pro) do. We are completing a thorough, technical comparison of the two rival systems, and hope to make an announcement soon.

I/O performance

Your home directories on Green are the same as your home directories on Fermat. They actually reside on local disk on Fermat, and are exported using NFS. As a consequence, an application running on Green that reads and writes to Fermat filestore can achieve only a fraction of the I/O performance that could be achieved by accessing only local disk. Problems with the Gigabit link between Fermat and Green - now resolved - made the situation worse.

The good news is that our proposed plans to introduce a Storage Area Network have finally been ratified. Alan Stobart's article in this issue of CSAR Focus explains the SAN in gory detail. The change, which will be transparent to most users, will mean that you can expect to see high-speed access to your home directories from applications running on either Green or Fermat.

So how was it for you?

A universal problem faced by HPC centres is getting feedback from users. At CSAR, not only do we operate the helpdesk, but we also run an annual user survey, a User Steering Group, and a User Liaison Forum, and we provide web-based feedback mechanisms (black marks and gold stars). Yet despite all this, the feedback we get is patchy. We're not so naïve that we actually think it's valid to equate silence with approval, but from a pragmatic, operational point of view we sometimes have to do just that. We'd love to hear about your experiences with Green, both the good and the bad, so do let us know. But most importantly, don't suffer in silence – it's the squeaky hinge that gets the oil.

We do know that there are still some of you who are yet to bite the bullet and try porting your production codes to Fermat and Green. We also know that some of you have good reasons to adopt a cautious, "wait-and-see" attitude. My message to you is simple. Sooner or later you will have to port your codes somewhere. The Cray-T3E is the end of a line. There will be no Cray-T3F. So why not let us help?

We can help in a number of ways, from simply providing advice and training, through to code porting, benchmarking, profiling, performance tuning, parallelisation, and improving scalability. Our free Code Portability Assessment Programme (see www.csar.cfs.ac.uk/using/portability.shtml) was set up to help you through this period of transition. But this programme could close very soon, so please don't delay if you would like to take advantage of it.

Storage Area Network Installation for Green and Fermat

Alan Stobart
SGI Professional Services

The 512 Processor SGI Origin 3800 machine "Green" was installed in 2001 to satisfy CfS's contractual obligations to the Research Councils with respect to technology refresh of CSAR. Green achieved the formal acceptance performance criteria in December 2001, and is performing well, but its installation has resulted in an environment where the increased compute performance is not matched by the older I/O infrastructure. It is also recognised that data access via NFS and XCP to the MP (fermat) disk can be a problem, requiring more careful planning and thought by the users to access data efficiently.

CfS are planning to address this issue by upgrading the available disk subsystems and installing a storage area network (SAN) fabric to create a more balanced and user-transparent environment for the post technology refresh compute resource.The aim is to create an homogenous data environment in which users can access files equally without concern over the physical location or the available bandwidth to a specific storage resource. Within the SAN structure, direct data access provided by SGI's CXFS filesystem will replace the current NFS XCP/ greencopy model of data access.

SGI have successfully installed SAN fabrics with CXFS at many sites throughout the world, including the NCF/SARA advanced computing centre in The Netherlands, where a total of 1024 Origin 3000 processors access 10TB of online disk storage are attached.

Why a Storage Area Network?

A Storage Area Network (SAN) is a High speed, scalable fabric of servers and storage devices providing: ·

- Resource consolidation
- Data Access & Availability
- Centralized management
- High bandwidth
- Shared Data Access
- Modular scalability

In a SAN, a Fibre Channel fabric is installed between all servers and all storage devices. This creates a storage data network, separate from the Local Area Network (LAN).

SAN technology seeks to address the shortcomings of the currently prevalent direct attach model by removing the LAN bottlenecks direct attach storage creates and maximizing availability and usage of all compute-related assets.

The ultimate goal of the SAN environment is to provider the users with a seamless shared storage pool amongst all the systems, with higher access bandwidth, and that is easier to administer than the current configuration.

CXFS Filesystems

CXFS is based on SGI's high-performance XFS filesystem. It is a clustered XFS filesystem that allows for logical file sharing, as with network filesystems, but with significant performance and functionality advantages. CXFS allows multiple computers direct access to shared filesystems while delivering the same performance as XFS.

This means that all systems in a CXFS cluster have access to the same file at the same time at local or near-local filesystem speeds. CXFS runs on top of a SAN, where each host in the cluster has direct high-speed redundant data channels to a shared set of disks, able to take advantage of the full bandwidth of the SAN to read and write data directly to and from the disks where it resides without network or host bottlenecks.

SAN Structure

The planned SAN installation will be centred on a redundant fabric of 2GB/sec switches connecting Green and Fermat to shared disk resources comprising new installations of SGI TP9400 and TP9100 RAID systems. In addition to general improvements in data access this structure has been designed to offer a greater range of options on disk performance characteristics aimed at providing a better fit to all user requirements. A new SGI Origin 300 server will also form part of the cluster. Together with admin and CXFS cluster hosting functionality, this new machine will be partitioned to provide interactive and development services, with the aim of improving performance of these aspects of the service whilst at the same time freeing up all 128 processors on Fermat for batch work.

Another advantage of the SAN and CXFS installation will be the enhanced level of resilience achieved through removal of single points of failure within the CSAR systems. Hardware redundancy in the SAN switch fabric, data connections, and RAID disk subsystems, allied to the CXFS server node failover capability will provide increased assurance of system availability. In a CXFS cluster no single system is needed to maintain data or service availability, in the event of a system failure or maintainence session associated with any machine another host can pick up the responsibilities for data serving services without service interuption. Ultimately, as well as online filesystems, access to the /hold filesystem and tape store can also continue to be available in these situations.

Once this structure is in place it will provide CFS with the ability to provide any future growth of either compute or storage resource as a seamless and scaleable operation. Up to 8000 processors can be attached to the new SAN/ CXFS fabric before any change that affects the model of how users access their files and data. The design allows more (and more tailored) storage resources to be added transparently as needed to respond to future growth in demand.

Installation Programme

It is intended that hardware installation will take place during May 2002. This will be done without impact on the current service as the new components can be configured as a stand-alone SAN for commissioning without incorporation of Green and Fermat. The two Origins will then be incorporated within the SAN CXFS cluster during a normal maintenance shutdown. Details of actual dates, along with information regarding the procedures for migrating users' data will be provided in later bulletins.

People Focus

Claire Green - HPC Frontline Support

Upon graduating from the University of Sunderland in 1996 with a 2:i in English, my first "real" job was with the Inland Revenue, where I worked on the Regional Complaints and Compliance team - compiling and analysing the targets and results for the Yorkshire region and organising conferences/seminars etc.

From here I moved to the fluffier world of charities as a Regional Administrator for Help the Aged. My role was mainly accounts-based but also involved organising events such as the Leeds Abbey Dash and liaising with schools regarding the charity's fundraising programme.

Then, in September 2000, following my move across the Pennines to the North West, I started work at Manchester Computing in the Administration section. In August 2001 I joined the CSAR team as part of the Frontline Support for the CSAR Service.

When I am not at work I spend my spare time watching Barnsley Football Club, which is not always as enjoyable as it should be but I am hopeful that there is a revival just around the corner! I also enjoy all the usual stuff ... going to the pub, reading and diy (although the latter is more out of necessity and I am looking forward to the day when I can hang up my hammer for good).

Claire Green

Penny Adamson - HPC Frontline Support

I joined the CSAR Frontline team on 1st October 2001. Previously I have worked in administration, but always had an interest in computing. Looking for a challenge, change of career, and with an interest in Unix I applied to CSAR and well, here I am. To friends and work colleagues I prefer to be known as Pen.

I graduated with a 2:2 LLB(Hons) Law & History degree from Keele University in 1997. Since then I have worked for the former Guardian Insurance as a Project Administrator in the Information Systems Development department, a Trainee IT Contract Recruitment Consultant, and a university Examinations Officer!!

My current areas of interest are linux, perl and web based databases.

In my spare time I enjoy the cinema, DIY, real ale, computer strategy games and ride a motorbike - not all at the same time though!! I also rescue stray animals, particularly those of the hamster variety.

Penny Adamson

Adrian Tate - HPC Consultant

Having just left full time education, I was appointed HPC consultant at CSAR in October 2001. My background means I am likely to work on mathematical and physics applications, since my Bachelors degree was in Theoretical Physics (Newcastle) and my recently-completed Masters degree was in Numerical Analysis and Computation (UMIST). My MSc project was to create an infinite precision extension to the BLAS/ LAPACK routines. The source code for this will be made available soon and I will place a link for the interested.

My spare time is spent listening to, mixing and dancing to progressive house music, which is more an obsession than a skill or hobby. If I really have lots of time on my hands I pursue my other academic interests in cultural theory - I wrote a dissertation on Foucault and Nietzche during my undegraduate degree, and I continue this work as a hobby.

Adrian Tate

Neil Stringfellow

Neil Stringfellow

I joined the CSAR team in October 2001 from the Royal Military College of Science site of Cranfield University.

There my main research areas were in the use of modern computing techniques to solve problems in Boundary Element Methods.

These techniques included High Performance Computing using MPI and OpenMP on an SGI Origin 2000, and also tuning the MPI codes to work efficiently on a cluster of workstations.

My main outside interests are Football (as my body starts to creak it will become more watching than playing), and making cheap trips to Europe with Ryanair

Mike Jones - eScience Consultant

My background is in both Technological Physics and Particle Physics, a large fraction of which was computing.

Over the past 8 years as a student, I have studied at the University of Manchester, Liverpool University and the Deutsches Elektronen Synchrotron in Hamburg.

My main hobbies are ninjutsu and hovercrafting.

As my job title suggests, the work I do is shared between two activities. The first involves helping scientists use new grid computing techniques. The second involves deploying and helping to deploy grid toolkits onto PC's workstations, clusters of machines and high performance computers.

In the eScience area I am currently working on a project to 'gridify' an existing database retrieval system. The new system will involve grid features such as single sign-on, grid-ftp and remote use of computing resources. I am also involved in the organisation of the next GridPPmeeting here at Manchester on May 9th and 10th. (GridPP is a group developing a grid for High Energy Particle Physics.)

In the grid-support role I am slowly replacing Globus 1.x with the Globus2 beta software on CSAR machines. I deal with queries from both CSAR users and non CSAR users. I maintain gridmap files which authorise grid users who present an authentic proxy certificate (signed by their eScience certificate) by mapping their proxy credentials to their existing CSAR account.

I am also studying part time for a PhD in Experimental Particle Physics.This currently involves work with grid software for the Babar experiment at the Stanford Linear Accelerator Centre.

Left to right: Andrew Porter, Adrian Tate, Neil Stringfellow, Jon Gibson, Michael Jones.

Andrew Porter - RealityGrid Parallel Programmer

Originally from Birmingham, I completed an MPhys in computational physics at the University of York in 1997. As I wished to continue with the theme of physics and computing, I decided to do a PhD and so joined the Theory of Condensed Matter group in Cambridge. It was there that I had my first experience of using machines like the T3E in performing calculations using Gaussian 98 and the group's own quantum Monte Carlo code (CASINO). At the end of my three years I headed off into IT consultancy where I spent a year working on fairly numerical, multi-threaded applications.

Having come to the conclusion that consultancy wasn't for me and wanting to return to working in the HPC environment that I had enjoyed during my PhD, I applied for and obtained the post of Parallel Programmer within the RealityGrid project (see http://www.realitygrid.org/). This project aims to allow condensed-matter physicists to work more efficiently by generalising the concept of a virtual-reality centre through the use of Grid technology. My part in all of this will be to work on developing the VIPAR (Visualisation In Parallel) project to tackle bottlenecks that exist in the visualisation process.

I enjoy cycling (mainly of the on-road variety) a but am also quite keen on hill walking. The latter gives me the opportuntiy to have a go at taking the odd photograph but this only seems to get serious when I go abroad. I also enjoy playing the acoustic guitar.

Lee Margetts - Research Associate

While studying Geology at Durham University, I set up a small landscape gardening business to support myself financially. The business was a great success and I ended up with four employees!

Next came Visual Image Dynamics, a computerised image analysis company. I was invited by some old school friends to set up a new business. We developed a real time image analysis system that was used in two products, a car number plate reader and a human intruder detector. Initially we used standard security video cameras and department store computer hardware. At the time, the best budget graphics system was the Commodore Amiga. This was brought to our attention by its use in Star Trek - Voyager for its impressive rendering of the ship and other special effects. We secured an offer of investment from a Venture Capital Company to expand the business. It's common for these outfits to put in their own management and take a 90% stake of the company. We couldn't bring ourselves to take this route. In the end we were beaten and Visual Image Dynamics was sold to an IBM start-up.

I then went to work for Surrey County Council in the Engineering Consultancy Division. Unable to progress in the geotechnics department without relevant qualifications, I enroled on the MSc Geotechnical Engineering course at Manchester. The Manchester course is unusual in that its main focus is in numerical modelling and computational mechanics. After one year I was hooked on finite elements and stayed to study a PhD in parallel finite element analysis. I have been working in CSAR as a Research Associate since October.

As well as continuing my research in collaboration with the engineering department, I provide applications support for both the University and CSAR supercomputers. In my short time here, I have been greatly impressed by the enthusiasm, expertise and creativity of my colleagues - something that you take for granted when you're a student, requesting help from HPC- or CSAR-advice.

Zoe Chaplin - HPC Consultant

My role at CSAR is HPC consultant, which I began in April. Before starting here, I spent 4 years working for the Met Office in Bracknell on the latest version of the Unified Model. Before that I spent 3 years working for a transport consultancy in London on the Terminal 5 enquiry at Heathrow.

My hobbies are playing the flute, swimming, badminton, drawing, gardening and orangutans. Yes, you have read that correctly. I absolutely adore orange apes so be warned - I'm involved with a charity that raises money to help protect them (they're highly endangered) so expect to hear from me in the future when I'll try and persuade you to part with all your cash!

Joyce Dodson, CSAR Secretarial Support

I have been secretary to Terry Hewitt, Head of CSAR Scientific Support, and Julia Chruszcz, Director of MIMAS and Head of Department (Academic Computing) since August 2001. Part of my duties also include giving secretarial help to the groups within Terry & Julia's departments.

I am married with three adults who call me Mum and one grandchild who tells people I am lovely – so he is definitely one of my favourite people! My hobbies, are gardening, reading, taking the dog for a walk and a grandchild who meets me in the kitchen at 6.45am for breakfast every morning!

SC2001 Conference Report

Robin Pinning
MRCCS, University of Manchester

Supercomputing 2001 took place in November of last year in Denver, Colorado, USA. The team, consisting of Kaukab Jaffri, Mike Robson, John Brooke, Terry Hewitt, Mark Clark and myself, set off from Manchester to Denver.

The first thing that struck me about the event, held in the Denver Convention Centre, was the sheer scale of the proceedings compared to conferences I've attended in the UK. The main hall was a huge NEC-style exhibition centre and as we'd arrived early to arrange the Manchester Computing stand we could see the main exhibits from vendors to research exhibits, such as ours, evolve from a patch of coloured carpet into huge constructions, many sporting enough hardware to shame most machine rooms. The Manchester stand itself was located in a prime position directly opposite the SC Global Access-Grid main stage in an area known as the European Village, and close to many familiar people such as Eurogrid, HLRS (Stuttgart), EPCC and CLRC. This site proved convenient later in the conference when members of the team took part in some of the worldwide collaborative events that took place on the main stage.

SC2001 took place last November at Denver Convention Centre, Colorado

The event comprises of a full conference workshop program, presentation of technical papers, tutorials, panel discussions and of course the exhibition held on the 195,000 sq. ft. main floor. As if this was not enough for each of the 5,000 attendees to take in during the week, many other events held in hotel seminar rooms had also been arranged for selected guests by many of the hardware and software vendors wishing to showcase their technology in more exclusive surroundings.

The whole event takes place over a five day period with the core of the exhibition taking place on the Tuesday, Wednesday and Thursday.

Overview

Any overview of the conference would be lacking without a brief summary of some of the best stands. All the usual suspects were present representing the hardware vendors with Cray and SGI occupying the stands directly visible as soon as you walk in. The SGI stand was equipped with a large seminar area where Terry Hewitt presented some of our work during the week. Sun's stand was also impressive with a massive array of hardware on show.

The US research sites also put on a fine show with many sites organising their own small Access-Grid facilities.

This is but a mere glimpse of what happens at a Supercomputing conference. So much happens at a conference of this size that is impossible for one person to take in everything of interest in the week. I hope I have imparted a flavour of how stimulating it is to be around so many people working hard in all areas of HPC, Grid computing and visualisation. The whole experience has also shown what is possible for a research exhibit to achieve at such an event and inspired our team with many ideas for this year's Supercomputing to be held in Baltimore, USA in November, see www.sc2002.org.

More information on Manchester's contribution to SCGlobal can be found at http://mrccs.man.ac.uk.

SCGlobal – The World's First Distributed Computing

John Brooke, Mike Daw
MRCCS, Manchester Computing, University of Manchester

SCGlobal was the first truly distributed conference with participants in six continents (including Antarctica) joining across the Internet to present meetings, workshops and live demonstrations in tandem with the events being held at SC2001 in Denver.

The University of Manchester's Access Grid node – the UK's first – was host to a number of SC Global events. Attendees included people from *BT* and the arts organisation *Digital Summer [inter:face]* as well as staff from University departments as diverse as Engineering, Computer Science, Social Anthropology and Intensive Care Medicine.

Access Grid technology may be described as 'next generation videoconferencing'. It employs large, life-size displays and authentic, natural-sounding audio to produce a 'sense of presence'. There is an emphasis in using the technology to support collaboration between groups of scientists. We were able to establish our Access Grid node via funding from EPSRC, the UK e-Science programme and the University of Manchester.

In order to participate in SCGlobal, Manchester had to join in the intensive programme of training and test cruises leading up to the event in November. At time of writing there are 12 Access Grid nodes built or being built in the UK and regular UK test cruises are being held between the UK nodes. The expertise gained by Manchester as part of the intensive preparation for SCGlobal has fed into this programme and has undoubtedly helped to accelerate deployment of the UK Access Grid.

The logistical and technical coordination necessary was daunting. We were broadcasting events that spanned three quarters of the world's time zones. We had to train and put in place – at Manchester and Denver – technical assistants, producers and Masters of Ceremony. We also had to ensure that sites had a script for passing control between the various locations and presenters had precisely timed PowerPoint presentations to be run via the distributed PowerPoint server. Keeping track of the differing Daylight Saving Time rules at all the sites was another headache, as these changed in different locations as we moved from summer to late autumn.

Our scripts and rehearsals had to be resilient enough to be able to continue if video or audio were lost at any of the sites. Access Grid supplements video and audio via communication on a "backchannel" – a distributed chat system originally created for role-playing games like *Dungeons and Dragons*. This sounds like a joke and exchanges over it are often very funny but they are indispensable for fine-tuning during meetings and in disaster recovery when all other channels are lost.

Along with the events planned and organised by the UK, we also relayed other workshops and keynote speeches hosted by other sites. This enabled a full audience in Manchester to hear the keynote address given in Denver by Craig Ventner of Celera. The full programme as broadcast by Manchester can be seen at:

http://mrccs.man.ac.uk/global_supercomputing/SCGlobal/index.html

The four UK events were of exceptionally high quality; we describe them below as events 1-4. The solar-terrestrial physics event (no. 3) was mentioned by the SCGlobal organisers as one of the most successful of the whole conference.

Event 1 – Shrinking the Ponds

This workshop was organised jointly by the University of Manchester (UK) and HLRS (Germany). The US partner is Pittsburgh Supercomputing Center. It was the culmination of a project to establish Global Metacomputing funded by the UK and managed by UKERNA who provide the UK research network (equivalent to Abilene and vBNS). This project involved collaboration with Internet2 partners and was intended to promote international uptake of the technology being developed under Internet2, hence the PSC involvement. The moderator was Dr John Brooke of the University of Manchester.

The presenters were: Dr Stephen Pickles of CSAR University of Manchester; Dr Matthias Mueller of HLRS, Stuttgart; Dr Sergiu Sanielevici of PSC; Dr Satoshi Sekiguchi of AIST Japan and Dr Ed Seidel of Albert Einstein Institute for Gravitational Physics.

This workshop brought together major centres in Europe, USA and Asia who have been involved in experiments to exploit global metacomputing via trans-continental links. The purpose of the workshop was to discuss the results and experiences gained over the last few years, and to link this with current initiatives in Global Grid computing.

Event 2 – Remote Teleradiology

Andrew Dodd, of Manchester Visualization Centre, demonstrated a collaborative teleradiology tool that can be used by doctors to aid remote diagnosis of conditions such as cancer tumours. The Access Grid was a particularly appropriate venue for this demonstration because, whilst the teleradiology tool is valuable in its own right, using it in conjunction with the Access Grid enables doctors to talk to each other in an environment that is almost as effective as a face-to-face meeting. Without technologies such as Access Grid, this collaboration may not happen at all.

Event 3 - Tools for collaboration in Solar-Terrestrial Physics

This workshop was organised jointly by the University of Manchester (UK), EPCC (UK), World Data Center for STP (Boulder, US) and the Arctic Region Supercomputing Center (Alaska, US).

The concept arose out of a meeting in January 2001 between John Brooke of the Global Supercomputing Project and Mike Lockwood the Director of the WDC for STP at RAL. There is currently a massive influx of data from ground-based and satellite-based observation of the whole Sun-Earth continuum. The challenge of collaborating to understand this data and to compare observation with theory and simulation involves workers at many different sites who have different areas of specialist expertise. It was felt that the establishment of virtual meetings with the possibility of simultaneously combining data assimilation, visualization and simulation in the free discussion of a live meeting would be an important tool in the investigation of phenomena in STP.

It was particularly timely to hold this first meeting in conjunction with SC2001 since the core node is at Denver, close to the NOAA STP World Data Center for Solar-Terrestrial Physics at Boulder.

The coordinator was John Brooke and speakers were: Dr Rob Baxter (EPCC), Joanna Leng (MVC), Dr Sergei Maurits (ARSC).

Event 4 – Art on the Grid

This event was a joint discussion between artists Kelli Dipple of the *Site Gallery* (Sheffield) who presented from Manchester and Keith Armstrong of the *Transmute Collective* (Brisbane) who broadcast from Sydney. It was a live spontaneous discussion of reactions to the spectacular preceding event, Dancing Beyond Boundaries, which involved the coordination of musicians and dancers across four distributed sites. Such arts-based events are of great importance in understanding the human issues behind communication over the Access Grid and this is an important research topic in its own right. As Kelli said, "The Access Grid is an exciting frontier for arts based research…[it drives] a new relationship to time and an extended patience for lag, interruption and collapse, as well as a renewed affiliation with the human characteristics of fragility and degradation."

No groundbreaking global conference would have been complete without a technical hitch. On the first day of the conference, networking on the Denver conference floor suffered sporadic breakdowns that forced quick thinking by node operators and event producers. Quite apart from the SC Global distributed conference – never attempted on this scale before – there were network hits by other parts of the conference that contributed to the problems. However, part of what this kind of conference was about was pushing the boundaries of the possible.

In concluding we must thank all those in the University of Manchester who participated and helped with all aspects of the UK Constellation site. We also acknowledge our huge debt to the SCGlobal organisers and technical team – in particular, Julie Wulf, Barbara Kucera, Jennifer Teig von Hoffman and Terry Disz, but there were many others. SCGlobal felt like the start of something. Maybe in the future, all conferences will be like this.

Acknowledgements: We would like to thank Professor Tony Hey (EPSRC/eScience), Ray Browne (DTI) and Hugh Pilcher-Clayton (EPSRC Central Facilities) for financial support of this project.

Art on the Grid, SCGlobal 2001(Manchester Access Node)

Manchester Computing - Host to Major International Conferences

Europar 2001 - Manchester, UK, August 2001,

Euro-Par - the European Conference on Parallel Computing is an international conference series dedicated to the promotion and advancement of all aspects of parallel computing.

Euro-par 2001 was organised by the University of Manchester and UMIST. There were originally 20 topics for this year's conference one of which was included for the first time: Parallel and Distributed Embedded Systems. The call for papers attracted 207 submissions of which 108 were accepted, 69 were presented as regular and 39 as research notes. There were 830 reviews collected, an average of 4.01 reviews per paper. Submissions were received from 38 countries (based on the corresponding author's country), 25 of which were represented at the conference. The principal contributors by country were Spain and the UK, which 29 submissions each, USA with 26, France with 21 and Germany with 20.

The programme of Euro-Par 2001 also featured invited talks from Jack Dongarra, Ian Foster, Dennis Gannon, Tony Hey, Martin Kersten and Thomas Sterling.

The Conference Dinner was held at the prestigious Manchester Town Hall, and was hosted by the Lord Mayor of Manchester, John Smith. The internationally acclaimed Manchester Boys Choir performed at the dinner, which was enjoyed tremendously by all.

The conference website is http://europar.man.ac.uk.

Euro-Par 2002 is being hosted by the University of Paderborn, Germany, 27th - 30th August 2002. For further details, see http://europar.upb.de/.

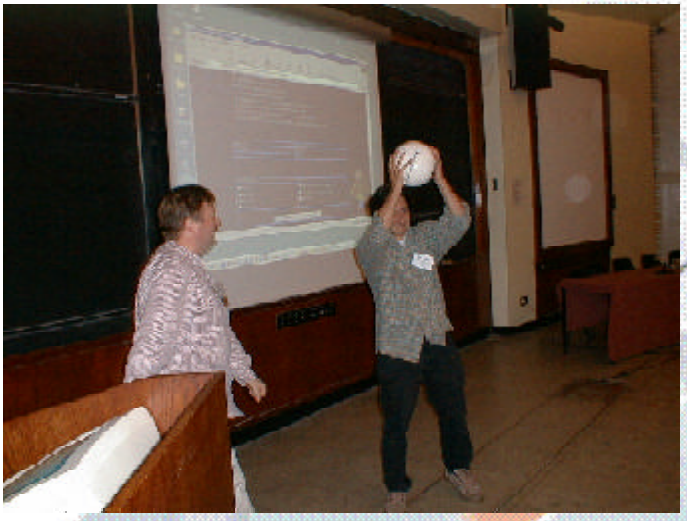
Contact: k.jaffri@man.ac.uk

Left to right: Europar Conference Chair - John Gurd with speakers - Ian Foster, Tony Hey and Martin Kersten

The annual Eurographics conference was a great success, attracting almost 300 delegates from across the world. Over 50 high quality papers were presented (following a record number of paper submissions), and was complemented with a very high standard short presentation programme of 46 work in progress papers. As usual, the conference also included State of the Art Presentations, Industrial Sessions, tutorials, workshops, and much more. EG 2001 also saw the first occasion of the Web 3D conference game. Check out the winners at: http://www.man.ac.uk/MVC/EG2001/TreasureHunt/.

All visitors to Manchester were impressed with the city and the University and thoroughly enjoyed the conference dinner at the Town Hall.

Contact: nigel.john@man.ac.uk



Prize giving at the closing ceremony, Eurographics 2001.

Optimising Linear Algebra on SGI Origins

Adrian Tate
CSAR Applications Support, University of Manchester

In this article I outline some optimisation work that I have carried out for a user group, and how we intend, with information from the user community, to survey the use of linear algebra libraries with the intention of improving their performance.

ScaLAPACK, BLAS and Scalability

The code that was passed to me by Patrick Briddon from Newcastle University Physics was dependent upon a ScaLAPACK routine that affected scalability to the extent that a complete revision of the techniques was necessary. Scalapack is regarded as the standard distributed linear algebra library, so to deviate from this tradition is perhaps surprising, but if we take a look at the history of Scalapack and its emergence then we can perhaps see some validation in the decision. Many of the Scalapack authors are familiar names that created the BLAS and LAPACK (e.g. Dongarra, Demmel) and the package is infused with those features that are characteristic of BLAS. The PBLAS (Parallel BLAS) were designed to act as parallel version of Levels 1,2 and 3 BLAS whilst the BLACS (Basic Linear Algebra Communication Subprograms) were developed as the communications layer on which the PBLAS would operate.

It seems to me that the field of High Performance Computing has developed hugely since Scalapack was unearthed and that the term *scalable* is seen in a different light. Whilst a numerical analyst may require a code to be parallelised over a number of processors, his main concerns are the numerical stability and error propagation within the resultant code.

In the field of High Performance Computing, as the number of processors of production machines increases and as the availability of resources is more carefully administered, the overriding concerns are to produce truly scalable codes that can be used effectively on *any* number of processors. Hence, the use of ScaLAPACK routines for such purposes could well be described as an over-extension of its original design purpose. Benchmark figures for ScaLAPACK (see [1] ,[2] or [3]) reveal sub-linear scaling to be a generic feature since the ratio of communication/computation is very high. Thus, if we are to improve the scaling potential of Scalapack it is not by improving the computational efficiency but by reducing the time spent in communications.

Routine PBDTRNV

To continue we must imagine a large array (matrix) held on a distributed environment. The distribution in ScaLAPACK is always block-cyclic [4]. Figure 3 shows a 5x5 matrix distributed over a 2x2 BLACS process grid. The benefits of 2-d block cyclic storage lay in the feature of row elements remaining as row elements and column elements remaining as column elements. The code in question uses various ScaLAPACK and PBLAS routine to operate on this distributed process grid.

$a_{11}\ a_{12}$ $a_{21}\ a_{22}$	$a_{13}\ a_{14}\ a_{15}$ $a_{23}\ a_{24}\ a_{25}$
$a_{31}\ a_{32}$ $a_{41}\ a_{42}$	$a_{33}\ a_{34}\ a_{35}$ $a_{43}\ a_{44}\ a_{45}$
$a_{51}\ a_{52}$	$a_{53}\ a_{54}\ a_{55}$

	0	1
0	$a_{11}\ a_{12}\ a_{15}$ $a_{21}\ a_{22}\ a_{25}$ $a_{51}\ a_{52}\ a_{55}$	$a_{13}\ a_{14}$ $a_{23}\ a_{24}$ $a_{53}\ a_{54}$
1	$a_{31}\ a_{32}\ a_{35}$ $a_{41}\ a_{42}\ a_{45}$	$a_{33}\ a_{34}$ $a_{43}\ a_{44}$

Figure 1. 2-d block cyclic distribution as used in Scalapack

To be brief, much of the lack of performance in the code was found to be due to Scalapack routine named PBDTRNV. This routine performs a seemingly simple operation upon a vector held in a process grid. Looking at the 3x3 process grid of Figure 4, we can visualize the transposition.

represent a) a natural overhead in terms of latency b) an over complication in terms of the linear algebra involved. In the case in question, the vector was never held within a two-dimensional array, so the extraction element of the routine was unnecessary, additionally the arrays were contiguous and required no condensing/stretching. This vastly simplifies the necessary options, especially if we can use one-sided communications.

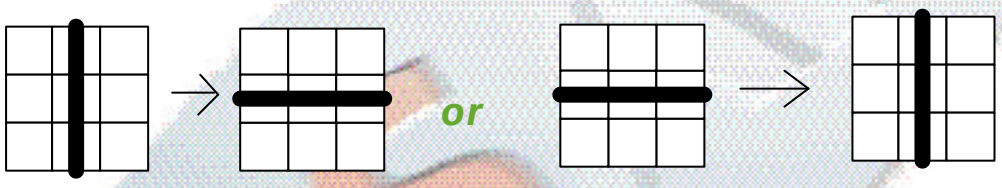


Figure 2. Transpose on a 3x3 process Grid

Though this operation appears simple, routine pbdtrnv is intricate and complex. The corresponding vector segments are extracted from the array within which they are contained, condensed (if not held contiguously), copied to a WORK array, sent to the appropriate processor (using the MPI BLACS), re-stretched and then copied into the appropriate array. Optionally the transposed vector is then copied across all process columns (or rows).

The problem here lays in the use of MPI as the message passing primitive on which the operations are performed. Though a simple operation, the two sided communications

Shmem point-to-point calls are tremendously efficient in comparison to their MPI counterparts. Figure 3 shows the relative performance of BLACS, MPI and shmem point-to-point data transfers. BLACS comms are via MPI so the figures for these are not surprising, but their inclusion in this data is important since they form the communication layer of Scalapack.

Vector length	MPI(SEND)	BLACS(DGERV2D)	SHMEM(GET)
100	0.221	0.249	0.0085
500	0.356	0.385	0.0379
1000	0.576	0.649	0.0602
1500	0.867	0.902	0.0884
2000	1.122	1.175	0.1180

Figure 3. Relative performance of point to point comms (based on 10000 data transfers)

The resultant replacement to pbdtrnv used shmem 1-sided communications to directly extract the necessary blocks of data for each processor. The work is thus reduced to 1) calculating the necessary target processor, and 2) using *shmem_get* calls to directly obtain the vector segment from the processor's memory. There are synchronization issues which will prevent the full performance gain one may expect from the data in figure 3, but with careful coding there is still a notable performance increase. We will present the results for this specific study at the CUG conference in May.

The natural conclusion to draw from this work is that there should be some work going into ScaLAPACK and its use of MPI_BLACS. Cray developed a shmem implementation of the BLACS some years ago, though on the Origins it remains standard to use the MPI version. There is scope to develop an optimised communications layer to existing ScaLAPACK routines specifically on Origins. One option would be, as with the Cray version to entirely use shmem comms. A problem with this is shmem's dependency upon powers of two numbers of processors for its collective routines (stride in collective routines are declared using $\log_2$stride). I'm addressing this issue and hope to create a shmem 'branch' broadcast [5] that can be used on any grid size and which will still outperform MPI_BCAST or the BLACS routine DGEBSD2D. This should improve the code mentioned above significantly for process grids that don't have the desirable grid lengths, whilst otherwise the normal shmem_bcast can be used (which outperforms MPI_BCAST by figures comparable to those in Figure 3.

Further, as we have proved with PBDTRNV, 1-sided comms can improve things at the routinelevel so there is a real possibility of CSAR staff being able to optimize specific library routines in this way. Further work will be to utilise the virtual shared-memory aspect of the Origin. Using careful data placement, remote data may be accessed and copied, thus reducing further the latency in data transfer). So, a library of high-performance replacements to commonly used routines will be developed.

.To aid us in this work it would be very beneficial to survey the CSAR community's relationship and dependency of ScaLAPACK or of any other distributed libraries, if you have got this far through this article you have some interest in this, so please contribute by letting us know if you have any kind of ScaLAPACK dependency in your code, what it is, and if it is causing performance problems. Please send your useful (or critical) comments to adrian.tate@man.ac.uk.

References

[1] NCSA Scalapack Origin 2000 Benchmarks: http://www.ncsa.uiuc.edu/People/sirpa/all.html

[2] UCLA Scalapack benchmarks http://www.ats.ucla.edu/at/beowulf/parallel/parallel_benchmarks.htm#SCALAPACK%20Benchmark

[3]Lemans Scalapack benchmarks http://weblotus.univ-lemans.fr/w3lotus/node15.html

[4] Scalapack users guide http://www.netlib.org/scalapack/slug/node75.html#SECTION04431000000000000000

[5] A branching algorithm applied to a process grid of length n will require $\log_2$ n shmem_put/get operations, as such it is likely that such a routine will out-perform the MPI_BCAST and BLACS_BROADCAST routines. Further work would be necessary to generalize shmem_barrier calls that are similarly dependent upon $\log_2$ strides.

SOFTWARE UPDATE

As part of CSAR's continuing efforts to provide systems and tools to enable the UK research community to run effective applications, we would like to introduce 3 new applications for use on our origin machines. Totalview, Vampir and Vampirtrace are the new applications which will help you to develop new codes or to maintain existing ones. Totalview is used to help debug both serial and parallel programs, once you have a working code you may wish to optimize your code to get the most out of the machine and using VampirTrace and Vampir can help greatly.

Totalview

The Etnus Totalview debugger is a sophisticated tool that allows you to debug, analyze, and tune the performance of complex multiprocessor or multithreaded programs.

Totalview should be familiar to all code developers as it is available on all major UNIX platforms. It collects together groups of processors and can operate on these individually or collectively. Action points can be set in your code; when reached, your code stops and you can begin investigating the properties of your code such as values of variables and call trees. Watch points wait for the value of a variable being changed, and halt your program allowing you to investigate further or change this variable so that the program could proceed in a different way.

One of the most powerful features is the ability to examine array data, totalview provides the functionality to filter the data or to show statistical values based on your data or to visualize the data. The visualizer allows you to graphically view array data and give you an overall picture of the data and helps you find incorrect data quickly and easily.

Totalview also provides functionality to examine the call tree graphs and MPI message queue graphs. There is an extensive context-sensitive help and full documentation is available on the web.

Vampir

Experience shows that it is much harder to debug and tune parallel programs that sequential ones with only one instruction stream. The much larger state space and the necessary communication between processes greatly complicate the task of analysing the behaviour of a parallel application. The reasons for performance problems, in particular, are notoriously hard to find.

A tool that assists the programmer in getting an overview about an execution trace quickly, that enables him/her to focus on important parts of the program execution easily and conveniently, and that assists in distilling the relevant performance information out of the deluge of irrelevant data would be a great help indeed.

Vampir is such a tool. It converts the trace information into a variety of graphical views, e.g., timeline displays, profiling statistics, communication statistics indicating data volumes and transmission rates and much more. The profiling and communication statistics help in identifying performance bottlenecks while the detailed timeline views gives clues as to their cause.

Vampirtrace

Vampirtrace records all the calls to the MPI library and all transmitted messages, and allows to define and record arbitrary user defined events. Using Vampirtrace merely requires the relinking the application with its profiling library. This will enable the tracing of all calls to the MPI routines as well as explicit message passing.

However to define and trace user-defined events calls to the simple Vampirtrace API have to be inserted into the source code.

For further information on access and recommended use of these products, please see http://www.csar.cfs.ac.uk/software/tools.

The Life of Turing (the Human!)

Michael Daw,
University of Manchester

In the last issue of CSAR Focus, we profiled mathematician George Green. Continuing this series of articles profiling the mathematicians who have lent their names to the CSAR computers, we look at the life of Alan Turing, after whom the Cray T3E is named. (As you will be aware from other articles in this issue, Turing the machine is approaching retirement. However, Turing the man is too interesting a character not to be included in the series!)

Turing was a particularly apt choice to name what has been CSAR's flagship supercomputer sited at the University of Manchester. The last post he held was in this institution, where he was appointed to a specially created readership in the theory of computing in 1953. It was also in Manchester where he designed the programming system of the Ferranti Mk I – the world's first commercially available computer.

His contribution to the field of computing has been exceptional. As part of a groundbreaking paper on computable numbers, he outlined what became known as the *Turing machine*. This is an idealized mathematical model that outlines the essential components of a computing device, that is, input/output mechanisms, a central processing unit (CPU), and storage for the CPU (memory). The imaginary machine uses instructions; it exists in finite states (the final one containing the solution); and it does its work in discrete steps. This model was (and still is) used for all digital computers.

During World War II, Turing worked as a code-breaker at Bletchley Park. He and others were responsible for building a machine to crack German ciphers. This machine was far more effective than its predecessor (which was known as the *Bomba*, after a type of Polish ice-cream) because it did not rely on knowledge of German operating procedures, which could only be gleaned from spies and other such sources. Colossus was the world's first electronic digital computer. The details of Colossus's make-up were thought sensitive enough to remain an official GCHQ secret until last year.

Turing spent some time after the war in research on Artificial Intelligence. He devised what became known as the *Turing test*. This is used to measure whether a computer can really be said to be 'intelligent'. The test involves a remote human interrogator who attempts to distinguish between a computer and a human subject based on their replies to various questions. After a series of such tests, a computer's success at 'thinking' can be measured by its probability of being misidentified as the human subject. Turing believed that, by the year 2000, the average interrogator would have no more than a 70% chance of identifying the computer. This proved to be more than a little

Alan Turing in 1946

optimistic (unless the subject area of the questions is severely restricted, in which case computers stand a markedly better chance of imitating humans). Neural nets – computers modeled on the human brain – have their origin in this aspect of Turing's work.Outside of his brilliant research and work that has helped enable the technology of the modern world, he was also an excellent long-distance runner. Among his achievements in this field was the fact that he ran a Marathon in a time that was only eleven minutes slower than the winner of the 1948 Olympic Games.

Turing was always concerned to be open about his sexuality, despite the prevailing mood of the times and the unsympathetic world of Manchester engineering. However, he was prosecuted for homosexuality in 1952 when this was still a crime in Britain. He was sentenced to a year of hormone "therapy" in an attempt to cure him. His new status as a criminal meant that he was also stripped of his security clearance because he was deemed to be at risk of blackmail by foreign agents.

Turing running in 1946

ATHLETICS

MARATHON AND DECATHLON CHAMPIONSHIPS

The Amateur Athletic Association championships for this year were concluded at Loughborough College Stadium, Leicestershire, on Saturday, with the second, and last, day of the Decathlon and the decision of the Marathon championship.

MARATHON CHAMPIONSHIP (26 miles 385 yds.) (record: 2hrs. 30min. 57.6sec., by H. W. Payne, Windsor to Stamford Bridge, on July 5, 1929; standard time: 3hrs. 5min.).—J. T. Holden (Tipton Harriers), 2hrs. 33min. 20 1-5sec., 1; T. Richards (South London Harriers), 2hrs. 36mni. 7sec., 2; D. McNab Robertson (Maryhill Harriers, Glasgow), 2hrs. 37min. 54 3-5sec., 3; J. E. Farrell (Maryhill Harriers), 2hrs. 39min. 46 2-5sec., 4; Dr. A. M. Turing (Walton A.C.), 2hrs. 46min. 3sec., 5; L. H. Griffiths (Reading A.C.), 2hrs. 47min. 50 2-5sec., 6.

DECATHLON CHAMPIONSHIP.—H. J. Moesgaard-Kjeldsen (Polytechnic Harriers, London), 5,965 points, 1; Captain H. Whittle (Army and Reading A.C.), 5,650, 2;

From "The Times" in 1947

In June 1954 he was found dead at his home in Wilmslow, Cheshire. The official verdict was that his death was suicide as a result of cyanide poisoning. Whether he committed suicide as a result of being hounded by the authorities or for some other reason is not known, as he left no note or indication of his actions. At the time of his death, he was in the midst of yet further groundbreaking work (looking at the chemical mechanisms of genes) using the computer he helped to develop, the Ferranti Mk I.

I am indebted to the on-line Brittanica Encyclopaedia *for most of the information in this article. The rest has come from a variety of sources, including* The Code Book *by Simon Singh and the Turing home page, maintained by his biographer Andrew Hodges, at* http://www.turing.org.uk

2001 CSAR User Survey Results

Claire Green
CSAR Frontline Support

The CSAR User Survey for 2001 was conducted between 23rd November and 20th December 2001. An online form was made available for completion and submission via the CSAR website and comprised of 13 questions designed to encourage feedback on a wide range of aspects of the CSAR service, including systems, dealings with CSAR staff, training and the mechanisms used for feedback. This year there was also the added incentive of a prize draw, with the winner receiving a bottle of single malt whisky.

The number of completed forms was very low, only 24, but the responses are still very valuable and echo responses received via other routes, most notably via the User Liaison Forum and User Steering Group, both of which provided feedback at the same time as the User Survey. Although survey submission was entirely anonymous, users were given the opportunity to provide their names on the form - 21 of the people who submitted chose to do so.

The views expressed in this third annual survey are very similar to those that have been given for the previous two years. Most significantly they reflect the fact that the CSAR user community is still satisfied with the level of the service provided. The overall level of satisfaction has improved with 100% of the respondents to this year's survey satisfied and 78% viewing it within the top two categories (good and very good). Figure 1 details the levels of satisfaction given for the overall service in this year's survey.

The full report of the survey will be published shortly at http://www.csar.cfs.ac.uk/admin/reports/user_surveys however a few of our findings are highlighted here:

The aspects of the CSAR systems that users are most satisfied with are service availability with 96% either very or fairly satisfied and temporary disk space (90% very/fairly satisfied). The least satisfaction is with the provision for interactive use (59% very/fairly satisfied) and job turnaround times (64% very/fairly satisfied). Please see figure 2 for the full breakdown of responses to user satisfaction with the systems-related aspects of the service.

92% of the users who completed the 2001 Survey are satisfied that sufficient information is being made available to users. Only 17% would like to see more information distributed by email. Awareness of the machine status page has improved, with only one respondent of this year's survey unaware of its existence. Following user feedback a recent addition has been made to the status page with details of forthcoming maintenance sessions now included.

Users were asked which of the various feedback mechanisms they had used to express their views on the CSAR service. The majority that answered this question had used the Helpdesk, with the second most popular mechanism being the use of Service Quality Tokens. 94% of those that had used the various feedback mechanisms thought that the response they had received to their query had been acceptable.

100% of the total respondents felt that using the CSAR systems had contributed to advancements in their research. 82% also said that they could not have carried out their research without using the CSAR service.

We would like to take this opportunity to thank all of the users who participated in the User Survey for 2001. User feedback is the best means we have of working to improve the service we provide. Please do not hesitate to contact us at csar-advice@cfs.ac.uk should you have any service-related problems or suggestions. Your views are always welcome.

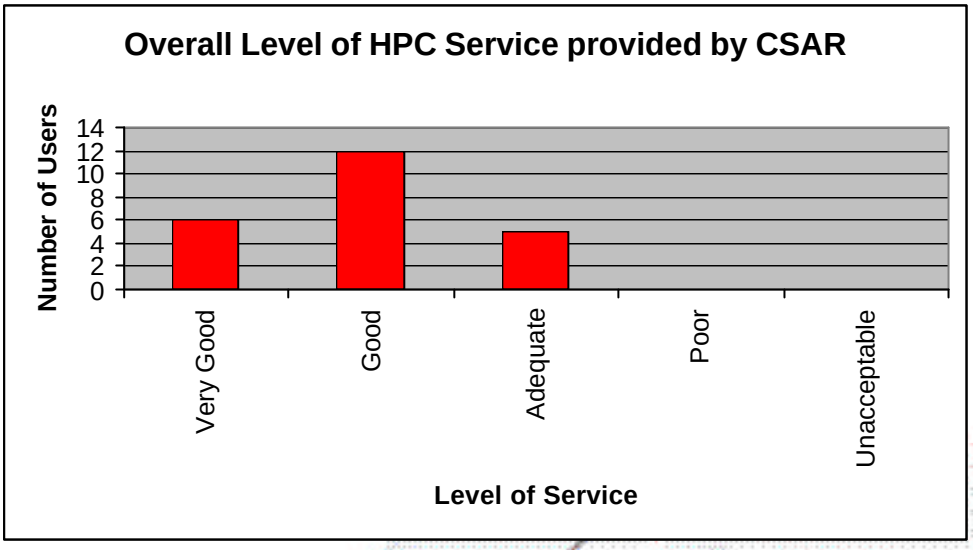


Figure 1: User view of the CSAR Service

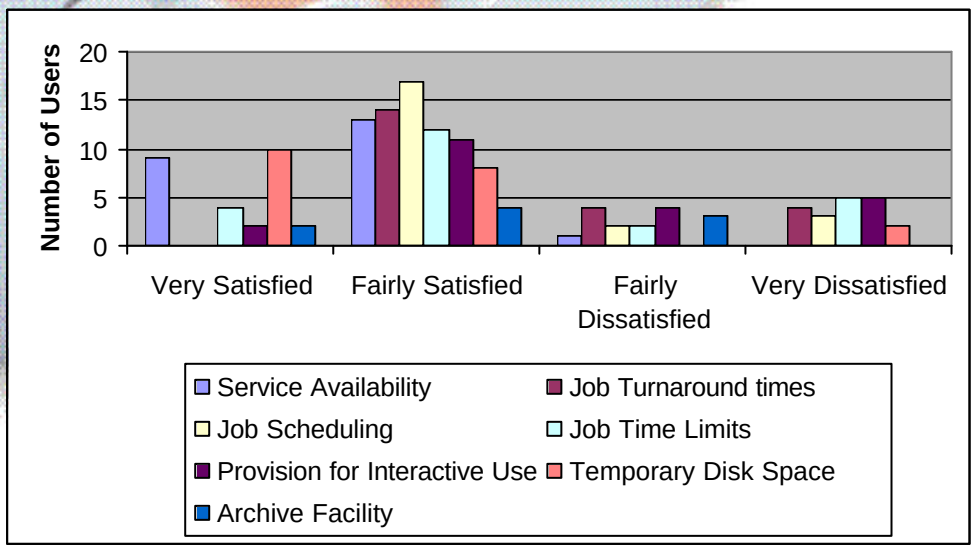


Figure 2: User satisfaction with the various system aspects of the service

CSAR User Steering Group (USG) Meeting - December 2001

Mike Pettipher
HPC User Services

The 7th CSAR User Steering Group meeting took place on Wednesday December 19th at *both* Imperial College and the University of Manchester, chaired by Professor Ken Taylor from Queen's University Belfast. The meeting was held jointly at the two locations using the Access Grid facilities at both sites to allow participation over the internet. This was the first time that such technology has been used for such a meeting and was deemed to be very successful. The primary benefit to participants is to minimise travelling time and as more Access Grids become available, this should improve further, hopefully allowing and encouraging more participation from members, all of whom have a very busy schedule. We would like to record our thanks to the people at both sites who spent much time ensuring that the event ran smoothly and was deemed to be so successful, notably to Steven Newhouse from Imperial College and to Michael Daw at Manchester.

It was partly a result of using the Access Grid technology that this USG was very lively with many issues being addressed. One item on the agenda was topics raised via the User Liaison Forum (ULF) - following an email to all users from the chair of the ULF, Dr Lois Steenman-Clark. Some of the issues raised were:

Poor interactive reponse on Fermat.

· This is an intermittent problem, most often arising when somebody runs a large parallel program interactively, slowing interactive response for other users. There is no simple solution to this problem. It is not possible simply to prevent an interactive process from using more than 8 processes, as debugging an 8 process program interactively would require about 30 processes. Similarly, imposing a very restrictive time limit on interactive use would prevent some users from performing 'legimate' code development work.

Thus we request users do not run programs interactively that require more than 8 processes or more than 15 minutes duration - at least not without a prior arrangement. Use outside these guidelines may result in the processes being killed. The implementation of the Storage Area Network (SAN), described elsewhere in this newsletter will also help to address this problem, in that the new Origin 300 system with 16 processors will provide more resources for interactive use, although we will still ask users to comply with guidelines rather than impose very restrictive limits.

Variable timings on Fermat/Green

· A number of users have noticed variability in the timing of their codes on Fermat and Green. Two major steps are being taken to address this issue. One problem has been caused by the use of large amounts of I/O between Green and Fermat. This has been alleviated by using temporary directories directly on Green and will be further resloved when the previously mentioned SAN is installed, providing much improved access to disk from both Fermat and Green. On other occasions, competition for resources between different programs, and in particular the movement of data from one processor to another, has resulted in some timing variability. The approach adopted to resolve this is to use of dynamic cpusets, either via the Load Sharing Facility (LSF) or PBSPro. By the time you read this, it should be clear which of these two systems will be installed and when. Changes to job submission will be kept to a minimum and documentation will be provided.

Poor performance in accessing data in /hold

This has resulted primarily from the problems with some of the tape drives used. These tape drives have now been replaced with newer more reliable drives and we are in the process of migrating data from old to new tapes.

Once this operation is complete, there should be a noticeable, sustained improvement in the service.

While I have concentrated here on problems raised, as would normally be reflected in such meetings, it should be noted that there was also substantial positive feedback with the service. In particular there were comments about the excellent turnaround for work on Green, and the ease of portability from Turing to Green.

Thus the User Steering Group meeting in conjunction with the User Liaison Forum is seen as an excellent way for you to ensure that your views are heard not only by the CSAR service staff, but also by representatives of the user community and by the research councils. Your views are of course always welcome by other means - the CSAR helpdesk, the annual survey and the service quality token facility.

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The CSAR Web site (http://www.csar.cfs.ac.uk/) has help and information on all aspects of the service, and includes sections on Software, Training, Courses, Registration & Project Management, and links to other HPC sites.

CSAR Focus is published twice a year and is also available to view on the Web: http://www.csar.cfs.ac.uk/general/newsletter.shtml.

CSAR News Pages

All aspects of the service are described via these web pages (http://www.csar.cfs.ac.uk/general/news.shtml), and we also provide additional information via a monthly bulletin by email each month, particularly on new developments and other events associated with the service.

Getting help

If you require help on any aspect of CSAR, you can contact the CSAR Helpdesk team who will deal with your query promptly and efficiently.

CSAR Helpdesk phone: 0161 275 6824/5997

Alternatively, you may contact the CSAR Helpdesk via email, which is just as prompt to respond, as your call will automatically be logged using the latest call logging system (Remedy Action Request System).

CSAR Helpdesk email: csar-advice@cfs.ac.uk

The CSAR Helpdesk is open from 8.30am to 6pm Monday to Friday, except on Public Holidays.

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