Factsheet
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Astronomy Australia Ltd.

National High Performance Computing Access for Astronomy

All astronomers in Australia have access to dedicated high performance computing facilities. These facilities, located at ANU and Swinburne University of Technology, each have 1 million CPU-hours per year available for research projects in the next two years, and each has a dedicated support person to help users. A new national facility Graphics Processing Unit (GPU)-based cluster for astronomical research, gSTAR, is also coming online in 2011.

NCI: National Facility

NCI is Australia's high-end research computing service. The NCI National Facility, hosted by the Australian National University (ANU), delivers a world-class high-end computing service supporting many major research areas, including astronomy. In 2012 NCI will install a petascale system designed to dramatically enhance the modelling capabilities for many fields of high impact research.

Image: The NCI National Facility

Swinburne **Green & gSTAR**

The Green Machine was installed at Swinburne in May 2007. During 2011 Swinburne is undertaking a multi-million dollar upgrade to Green which will make it a leading facility for the Australian research community. Part of the upgrade is the creation of gSTAR – a GPU intensive supercomputer suitable for massively parallel computations.

One million hours

As part of Astronomy Australia Ltd (AAL)'s support for High Performance Computing (HPC) access for the astronomy community, under NCI's Specialised Support Program, one million CPU hours on the NCI peak system, and the same amount on the upgraded Swinburne system, have been dedicated to highly scalable flagship quality astrophysics research problems. Access to these CPU-hours will be through a dedicated Merit Allocation Committee. This coordinated approach will allow the committee to assign access requests to the most suitable machine for the task.

In addition to this allocation, interested users can apply to the general merit-based allocation scheme for access to either NCI compute system or associated storage facilities. Swinburne offers access to Green for astronomers nationally, either through collaborations with Swinburne astronomers or for individual projects of merit. Account requests can be made directly to the Swinburne Supercomputer Manager.

Support

Two support personnel are available to assist the Australian astronomical community by providing high-performance computing technical expertise and provide training and information in order to enhance the uptake of available new hardware rapidly across the community.

Luke Hodkinson is based at Swinburne University of Technology and Jon Smillie is based at NCI.


Luke Hodkinson


Jon Smillie

NCI: National Facility

The present peak system is an Oracle/Sun Constellation providing an internationally significant peak performance of 140 TFlops. The Cluster has 1492 nodes, each containing two quad-core 2.93GHz Intel Nehalem CPUs. The system has a total of 37TB of RAM on compute nodes and approximately 800 TBytes of usable global storage.

Swinburne **Green & gSTAR**

Green is so named because of its use of Clovertown processors giving improved performance per watt compared to previous processors. Green comprises 145 Dell Power Edge 1950 nodes each with: 2 quad-core Clovertown processors at 2.33 GHz; 16 GB RAM; and two 500 GB drives. The nodes are controlled by a head node which distributes jobs to the cluster via a queue system. The Centre for Astrophysics and Supercomputing (CAS) at Swinburne also has over 100 TB of RAID5 disks and 77 TB of magnetic tape available for long-term data storage.

The design minimum of gSTAR will have 160 GPUs, plus 200 TB of dedicated storage. gSTAR will also include 500 CPU cores and 2000 GB CPU RAM, giving a combined CPU/GPU performance of 170 Tflop/s.

Science

Using the NCI National Facility peak system, Dr Chiaki Kobayashi of the ANU's Research School of Astronomy and Astrophysics is simulating the formation and chemodynamical evolution of the Milky Way galaxy at the highest resolution ever attempted. The simulation output includes positions, velocities, some physical quantities, and about 70 elemental abundances for 65,000,000 particles. Dr Kobayashi's simulations will use highly-efficient, massively parallel codes and will consume approximately 100,000 CPU hours per quarter on the NCI National Facility peak system during 2011.

At Swinburne the GiggleZ (the Giga-parsec WiggleZ simulation suite) project is a series of dark matter cosmological simulations designed to supply the theoretical needs of the WiggleZ Dark Energy survey team. The suite consists of control-volume simulations with high snapshot temporal resolution spanning a factor of 512 in mass resolution and a main-volume run consisting of over 10 billion particles. The simulations were run by Dr Gregory Poole, from CAS, Swinburne, on Green and together comprised the largest single astronomical simulation ever conducted in Australia, using approximately one million CPU hours.

Funding

NCI, an initiative of the Australian Government, is hosted by The Australian National University and is jointly funded by the Department of Innovation, Industry, Science and Research under its NCRIS program, CSIRO and ANU.

The Green machine is fully funded by Swinburne University of Technology. Swinburne is funding the upgrade of Green and AAL has contributed $1 million from its EIF grant to Swinburne to create gSTAR.

AAL worked with NCI to enable the two support personnel to be dedicated to the astronomy community, and the allocation of one million CPU-hours per year at each of the NCI National Facility and Swinburne.

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Project suggestions
Fill in the form at http://goo.gl/tS15R