



South Australian Partnership for Advanced Computing

The role of the South Australian Partnership for Advanced Computing (SAPAC) is to provide e-Research support to the South Australian research community through the provision of the full spectrum of e-Research infrastructure, services, training and expertise.

SAPAC is an unincorporated joint venture of the three South Australian universities – Flinders University, the University of Adelaide, and the University of South Australia. It first began operations in October 2002 and was formally constituted as an unincorporated collaborative venture on December 12, 2003. SAPAC has built on the prior work of the S.A. Centre for Parallel Computing (a three university collaborative venture that continuously operated from 1991) and the Centre for High-Performance Computing and Applications (at the University of Adelaide).

Major research groups supported:

- Australian Centre for Plant Functional Genomics
- Cooperative Research Centre for Molecular Plant Breeding
- Adelaide Proteomics Centre
- Special Research Centre for the Molecular Genetics of Development
- Special Research Centre for the Subatomic Structure of Matter
- Ian Wark Research Institute, UniSA
- Applied Centre for Structural and Synchrotron Studies, UniSA
- Institute for Telecommunications Research, UniSA
- Teletraffic Research Centre, University of Adelaide
- Computational chemistry groups at University of Adelaide and Flinders University
- Physical oceanographers at Flinders University
- South Australian Museum
- Australian state, territory and national herbaria

Major research areas supported include life sciences, high-energy physics, synchrotron studies, chemistry, materials science, physical oceanography, geology and geophysics, parallel and grid computing research, turbulence and combustion modeling (computational fluid dynamics), telecommunications network analysis, environmental science and biodiversity informatics.

e-Research Services offered:

- High-performance computing; Grid computing infrastructure and services; Grid applications development;
- Information infrastructure and data management (e.g. the South Australian Sustainable Repository);
- Visualisation, haptics and virtual reality;
- Access Grid and remote collaboration toolsets; Remote access to instruments;
- Portals and application-specific tools for research communities;
- Induction and specialised training;
- Helpdesk and user support services;
- Specialist e-Research support (e.g. bioinformatics);
- Contract R&D and consulting to industry and government;
- Outreach, e-Research and research promotion; Seminars and workshops.

Some examples of specific support to research areas and research groups are:

- **Bioinformatics:** As part of the APAC grid bioinformatics project, development of software and web portals for standard bioinformatics jobs such as BLAST, ClustalW and HMMER. For wider applications we also provide customised portals, workflows as well as grid and database support. Bioinformatics is one of the main growth areas at SAPAC.
- **High-energy physics:** development, optimization, documentation and improved software engineering of parallel applications for the Centre for the Subatomic Structure of Matter, which is one of the largest users of SAPAC facilities and the APAC National Facility.
- **Materials Science:** ARC e-Research project to provide remote monitoring, and real-time data download, storage and processing of data, for synchrotron experiments; working with national and international groups. The expertise gained will be applied to other instruments.
- **Biodiversity informatics:** a new version of Australia's Virtual Herbarium, a federated database system linking plant specimen databases of all the major Australian herbaria. SAPAC will also participate in the Atlas of Living Australia project.
- **Research Data Repositories:** data repositories for high-energy physics, synchrotron experiments, bioinformatics and biodiversity informatics, and humanities and social sciences; including the South Australian Sustainable Repository (SASR) project to support SA research data management needs.

Some data on SAPAC users and facilities:

Users: SAPAC currently has around 375 registered users (120 active users of supercomputer facilities in 2006H1), up from 100 registered users in January 2004.

Staff: SAPAC currently has 17 paid technical and administrative staff (11.5 FTE), compared to 5 paid staff (3.5 FTE) in January 2004.

Several academic staff and students also work on SAPAC projects, providing an additional in-kind contribution. SAPAC also pays several summer interns to work on various projects.

Supercomputer development:

<i>January 2004</i>	A total of 1.45 Tflops, 548 CPUs, 5 Tbytes RAID storage
<i>October 2006</i>	Aquila added to give a total of 2.28 Tflops, 708 CPUs, 20 TBytes RAID storage
<i>1st Quarter 2007</i>	With new ARC LIEF-funded SA Supercluster Facility will provide a total of ~6 Tflops, ~900 CPUs, ~30 TBytes RAID, plus robotic tape silo with > 40 TBytes

Description of individual supercomputer facilities:

- *SA Supercluster Facility* – Architecture to be decided but approximately 3.5 Tflops, around 340 to 400 CPUs, Infiniband interconnect. To be installed in early 2007.
- *Aquila* – SGI Altix 3000, 0.83 Tflops, 160 Itanium 1.3 GHz CPUs. Installed August 2004.
- *Hydra* – IBM eServer 1350 Linux Cluster, 1.2 Tflops, 256 Xeon 2.4 GHz CPUs, Myrinet interconnect. Installed June 2003 and was second fastest computer in Australia and #106 in Top 500 list.
- *Orion* – Sun Technical Compute Farm, 0.14 Tflops, 160 UltraSPARC II 450MHz processors, Myrinet network. Installed June 2000 and was fastest computer in Australia and #188 in Top 500 list.

Other facilities and infrastructure for e-Research support:

SAPAC manages two stereo 3D visualization facilities, the South Australian Virtual Reality Centre (SAVRC) and the SAPAC VisLab, as well as a haptics lab. The SAVRC, SAPAC VisLab and the SAPAC meeting room all have Access Grid facilities; all developed since January 2004.

SAPAC is developing the South Australian Sustainable Repository, a federated distributed research data repository for the three SA universities.