

SPECIAL COLLECTION: e-RESEARCH

In September 2005, the Australian Partnership for Advanced Computing (APAC), held its bi-annual conference at the Gold Coast in Queensland, APAC 05, hosted by APAC's Queensland Partner, the Queensland Parallel SuperComputing Foundation (QPSF). APAC is a Partnership of state-based organizations in all states, the Australian National University, and CSIRO, that has been the Peak Body for High Performance Computing in Australia since 2000. APAC has been funded by the Commonwealth Government of Australia since 2000, and has operated a wide range of programs including operation of the APAC National Facility for High Performance Computing, hosted by the ANU.

Since 2003, APAC has had a Grid Computing program that has focused on development and deployment of a pilot computational grid across Australia, with an application focus that supported a range of pilot grid computing projects in areas such as Chemistry, Geosciences, and Astronomy.

The theme of the APAC 05 conference was "Empowering Research Communities", and the focus of the conference was thus largely on e-Research – large scale collaborative research projects relying on compute and data infrastructure, and the "middleware", or software services, needed to support e-Research projects and communities.

At the four days of the conference there were several hundred attendees from all across Australia and significant international attendance. Of the more than 20 refereed papers accepted for the conference, five outstanding papers were selected to be revised, updated, and extended for consideration for JRPIT, together with a lead article which reviews the state of the art and practice in e-Research.

e-Research is an emerging theme across Australia and internationally, as researchers, research institutions, and funding agencies all cast a focus on larger-scale collaborative research projects enabled by the internet. However, it is fair to say that not all e-Research projects and collaborations have been successful. By and large, the unfavourable experiences are due to organizational barriers, and a lack of understanding or experience in e-Research in many fields. For example, academic institutions typically confer rewards and resources to renown research specialists and their research teams, rather than supporting the broader multi-disciplinary research teams that are the corner-stone of many e-Research projects.

The first paper, "e-Research – Paradigm Shift or Propaganda" by Bill Appelbe and David Bannon, sets the scene by surveying the range and scope of e-Research, and then evaluating the APAC Grid e-Research program – its outcomes and lessons learned. The APAC Grid program was probably the largest and most diverse e-Research project run in Australia, as it encompassed over fifty researchers at dozens of institutions over three years, with more than \$10M of funding in cash and in-kind.

The second paper, "Towards a Standards-Based, Message-Oriented Advanced Collaboration System", by Steve Smith and Masahiro Takatsuka, discusses a re-implementation and extension of a popular open-source videoconferencing tool, Access Grid. The redesign is motivated by the desire to base Access Grid on a more open and extensible protocol, XMPP. The paper illustrates a common theme and problem in e-Research, which is the rapid evolution and immaturity of many tools and standards for e-Research, and the difficulty of maintaining and using such tools for production research projects.

The third paper, "Secure Federated Authentication and Authorisation to Grid Portal Applications Using SAML and XACML", by Erik Vullings, Markus Buchhorn, and James Dalziel, describes an emerging standards-based solution to the problems of authentication and authorisation that bedevil large scale collaborative e-Research projects. The fundamental problem is that traditional

interactive internet security based on passwords and permissions associated with account names does not scale at all well to e-Research.

The fourth paper, “Towards Belle Monte Carlo Production on the APAC National Grid Infrastructure”, by Marco La Rosa, Glenn Moloney, and Lyle Winton, discusses a long-term international e-Research project in experimental High-Energy Physics that is pushing the limits of what can be over a Grid.

The fifth paper, “Designing and Implementing a Grid Application for Cumulative Agrichemical Residue Tracking Using Third-Party Data Sources and Software Components”, by Elizabeth Post, focuses on the modular design and deployment of a multi-user distributed application. Like the second paper, it illustrates the need for careful design for adaptability and extensibility of production e-Research tools and applications.

The sixth paper, “AusCOM: The Australian Community Ocean Model”, by Jason Roberts, Petra Heil, Steven Phipps, and Nathan Bindorff”, discusses an initiative by the Australian climate sciences community to develop a unified coupled ocean-sea-ice model. Coupling models and applications that have been independently developed is a common problem in e-Research projects and an area where great gains can be made.

The final paper, “BLUElink – Development of Operational Oceanography and Servicing in Australia” by Gary B. Brassington *et al* illustrates how e-Research is emerging to have a major practical impact. Real-time oceanographic forecasting has obvious importance including predicting ocean circulation (and climatic changes), coastal waves, tides, storm surges, and tsunamis.

e-Research continues to grow in scope, importance, and impact both in Australia and internationally. International problems such as modelling climate change and the effect of different human interventions and natural variation can only be tackled by large scale e-Research. The Australian government has committed to continued funding of e-Research infrastructure, through its recently announced funding for Platforms for Collaboration through the NCRIS program.

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