



eRESEARCHSA

ANNUAL REPORT 2014

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2014 heralded the incorporation of eResearch SA, creating opportunities for organisational growth while still providing the same powerful eResearch tools and services that support cutting-edge research development in South Australia.

About eResearch SA

eResearch SA is the leading provider of computing technology expertise, services and facilities to the research, government and business sectors in South Australia.

eResearch SA enables researchers to explore new and innovative research opportunities by providing access to a suite of advanced, reliable, secure and user-friendly ICT tools and services, including high-performance computing, data management, data storage, cloud computing, software development and consultancy.

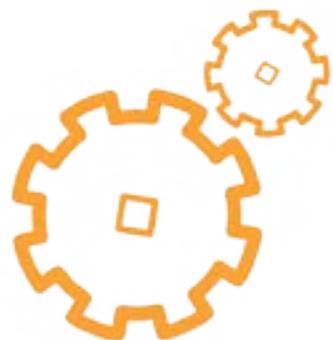
Established in 2007 to coordinate South Australia's implementation of the national and state eResearch strategies, eResearch SA is a collaborative joint venture between the University of Adelaide, Flinders University and the University of South Australia.



eResearch SA technologies
and services facilitate
research innovation and
discovery.



Our services



HIGH-PERFORMANCE COMPUTING (HPC)

We provide world-class, HPC facilities and expert user support, enabling SA's research community to conduct advanced research and development locally, and to collaborate in national partnerships. We maintain extensive supercomputing facilities, giving SA researchers access to shared infrastructure.

The Tizard machine, is SA's most powerful HPC system. It's mix of computing systems, optimised for specific tasks, enable researchers to tackle demanding scientific and technical problems with ease.



CLOUD COMPUTING

Scalable, convenient, accessible and collaborative, Cloud computing allows users to host databases, applications, and other online resources without the burden of maintaining their own server infrastructure.

Discipline specific Virtual Labs and eResearch Tools allows easy access to the cloud with web-based interfaces. Clusters in the cloud, allows researchers to use the Australian Research Cloud for computational work such as simulation, modelling and data processing, in the



RESEARCH DATA MANAGEMENT

As South Australia's leading provider of storage solutions for very large research data sets, we provide a range of data management services, in line with best-practices and funding guidelines.

We have long history of working with researchers in South Australia and have built a reputation as the leading provider of sophisticated storage. We provide data management planning, metadata creation and publication, and data repository services.



RESEARCH DATA STORAGE

We can provide world-class storage and access services for datasets of all sizes. Using our services, you can store, access, transfer, and backup your data, and share it with your collaborators. We also provide support and assistance in the use of our data storage facilities.

Several models of storage are provided, including funded, merit-allocated storage, collection development and general



COSULTANCY

Our consultancy and business analysis services can minimise research budget spend on computing and data storage and accelerate research outcomes.

We develop eResearch software and applications, and have a pool of software developers experienced in creating software to meet the needs of researchers and research services.

As well as designing customised IT solutions for specific research and



TRAINING

We offer technical training programs for all of our products and services, and run regular workshops for HPC, Cloud and Storage. We also provide User guides, FAQs and Service desk support.

In addition to our regular schedule of training workshops, we can also provide personalised, dedicated training for your bespoke technical solution.

Director's report



The transformation of eResearch SA into an incorporated entity in 2014 heralded an exciting phase of growth, underpinned by our foundation of excellent service provision. eResearch SA is looking to the future, while continuing to support the SA research community with accessible, secure and reliable eResearch technologies.

Our key achievements in 2014 Include:

- Phase 2 of our research cloud, added

1200 processors to the existing 1800, making the SA Node of the National Research Cloud fully operational. The service benefits SA's researchers by providing firewall-protected, scalable, high-capacity networks for the conception, design and execution of research, and delivers easier collaboration amongst researchers. Over 70 SA research projects have taken advantage of the cloud to publish research data, manage large-data sets, share knowledge and rapidly deploy and access software.

- 'Clusters in the cloud', a tool for researchers to set up private clusters utilising the Dynamic Torque software developed at eResearch SA which activates virtual machines based on workload. Composed of allocated compute cores on the National Research Cloud, it is being used by the ARC Centre for Excellence in Experimental Particle

Physics to process experimental data from the CERN Large Hadron Collider.

- 'Emu' a compute cluster in the Australian Research Cloud, that uses virtual machines on the SA cloud node as the compute servers. This 'Cluster in the Cloud' has been designed to be used just like other eResearch SA clusters. It has 16 compute nodes, a total of 128 cores, and it also uses the intuitive design of eResearch SA's Dynamic Torque software.

- eResearch SA's largest scale storage system, provides over 3 Petabytes of storage capacity for SA researchers. The Hitachi Data Systems enterprise-level system was funded through a national Research Data Storage Infrastructure project, with co-investment from the three SA universities and the state government.

- Simplifying access to eResearch tools and resources with the Identity Management

Project, providing researchers a single sign on and self-service for all their eResearch SA resources.

- Improvements and system changes including the purchase of another 2.1 petabytes of storage, and Lustre; a parallel distributed file system especially designed for high performance computing.,

- An intranet-like data storage network that allows institutions to connect directly to our storage, HPC and cloud facilities at high speeds through SABRENet. Researchers can host their own databases, applications and other online resources without purchasing or installing any new hardware.

- Leading SA's involvement with national initiatives NCRIS, AeRO, ANDS and NeCTAR to deliver the best tools and services to SA researchers, contributing to the

advancement of eResearch in Australia.

- Developing ways of migrating applications to the cloud, supporting researchers to run them through a remote desktop interface on their Windows PC when high compute or memory is required.

- Deployment of the eResearch SA Research Network.

With the largest research data storage capability in SA, eResearch SA provides researchers with the tools to tackle complex research questions by managing their expanding datasets. We provide advanced data management and storage services that allow researchers to easily store, access, transfer, and backup their data, and share it with their collaborators. In 2015 eResearch SA will endeavor to expand our capability, while maintaining

our foundation of excellent service provision to the SA research community.

I would like to thank our partners Hitachi and Dell for their commitment to providing excellent and reliable hardware. We have built a strong and flexible technology foundation that will support SA's researchers into the future.

I would also like to thank the research community of SA for their continued support, and the eResearch SA staff for their diligence in 2014.

Mary Hobson
Chief Executive Officer,
eResearch SA Ltd

eResearch projects



Bilingual from an early age, Ina Bornkessel-Schlesewsky says she was predisposed to thinking about how the brain uses language to communicate, which led to a career in cognitive neuroscience. “Most of us take our brain function for granted – we learn to talk, read, communicate and problem solve without giving it a second thought – until things start to go wrong,” said Ina, who today heads up the Cognitive Neuroscience Laboratory at the University of South Australia. “Scientists working in the area of cognitive neuroscience play a critical role in helping understand, prevent and treat conditions that challenge the brain’s cognitive function.”

“I work mainly on understanding how our brain supports language based communication but there are many different applications of cognitive neuroscience. We are ultimately aiming to understand the biological underpinnings

of cognitive brain function to pave the way for applications to conditions such as dyslexia, the ageing process and dementia.”

Ina and her team do this by recording huge data sets of brain activity that can then be measured and analysed. With rapid developments in analysis methods, Ina has started to investigate the benefits of eResearch services to ensure her team is not limited by computing capacity when a new technique is available. “There are always new ways to look at brain data and methods are becoming more sophisticated almost on a daily basis. eResearch capabilities such as superior data storage and High Performance Computing, which we can access through eResearch SA, will ensure we can continue to use the latest methods available in our field.

“The hope is that through the use of

these technologies, we will be able to achieve some research outcomes that may otherwise not have been possible. That is the attraction of using eResearch tools,” Ina said.

Ina has been working with eResearch SA on a two tiered data storage system. “We are producing a lot of data and running out of storage space, so we realised that we needed a different model to deal with the data. Our plan is to use our local University servers for data that we are currently processing, and use a Research Data Storage Infrastructure (RDSI) server through eResearch SA to archive data, while still having the ability to retrieve that data and reanalyse it as needed.” Ina and her team will now be able to move completed studies across to the RDSI server, which will provide 10 terabytes of storage capacity over two years, freeing up space on the local servers.

In addition to improving storage capacity, Ina is keen to have access to more powerful computer processing. “In some cases when we use more complex analysis methods we can’t run them on our own computers because we overload the processing capacity. “I don’t want to be in a position where we can’t do a certain type of analysis because we don’t have the right equipment, or enough power,” she said. Ina has started to look into how her lab could use eResearch SA’s Tizard super computer, South Australia’s most powerful high-performance computing (HPC) system, to provide her team with additional processing power as needed.

Tizard provides a 40 Teraflops of compute power. “I have been to an eResearch SA workshop on Tizard and am now working with the team to look at how we can modify our research methods to take full advantage of Tizard’s processing power.”

eResearch projects



Just a few years ago, in order to understand what was happening in an ecosystem, researchers had to spend significant time and money venturing into the field. But with the help of organisations like eResearch SA, ecologists such as Professor Megan Lewis and Doctor Kenneth Clarke are now beginning to map and monitor environments with the touch of a fingertip. "In broad terms, our research involves using satellite and earth observation images from NASA, the US Government or the Australian Government to assess and monitor land conditions over very big areas," Professor Lewis said.

"We analyse this data which gives us information about soils, vegetation and other indicators of land cover and land condition. Most of our work is for Governments, both State and Federal, in order to monitor data and assess how ecosystems are tracking – are they stable,

getting worse or getting better. Or if they're investing large sums of money in land management programs - what is the outcome of that? Traditionally ecologists have done this work by going out into the field and counting plants, or sampling vegetation and soils at isolated locations around the country. That's very expensive and time consuming, and it only gives you little bits of information at infrequent intervals.

"One of the really big benefits of using this satellite imagery is it covers the whole landscape, comprehensively. And it can do it on a repeated basis. Much of the data we use is available free, which also makes it extremely cost effective." Professor Lewis and Dr Clark have established a partnership with eResearch SA on a national project, AusCover, which aims to develop new information sources for environmental management agencies

to enable them to carry out their role more effectively. AusCover is a facility of TERN, the Terrestrial Ecosystem Research Network. "Each of the AusCover nodes in the States around Australia generally has a specific area of expertise. Ours is monitoring soil exposure for soil erosion risk," Dr Clarke said. "We've developed a national remote soil exposure index and using eResearch SA servers, put that into the AusCover online data pool that anyone can access for free around Australia."

Dr Clarke said the pair hoped to further develop the capabilities of the online data. "Ideally, we would like to use eResearch SA's advanced processing capabilities to have scripts set up to acquire the satellite imagery as it's acquired by the satellite. When users go to the data portal they'll see the soil exposure index up to the most recent date," he said. "eResearch SA have been very easy to work with and

they've been able set-up the server and link it nationally without me having to get heavily involved in the process. "It's very reassuring to have the professional expertise of a large group like eResearch SA to draw on to do that rather than having to do it all ourselves."

eResearch projects



Marine biologist Dr Claudia Junge has had a fascination with the ocean since she first went scuba diving at the age of 14. So after studying biology in Germany and undertaking a PhD at the University of Oslo, Norway, she decided to discover the deep seas of the South.

An ARC Research Associate at the University of Adelaide, Dr Junge is using eResearch SA and the Nectar Cloud to power her research into Australia's Dusky Shark and Bronze Whaler Shark populations.

Dr Junge is working with a multidisciplinary team of researchers as well as multiple government and industry partners to find out how many genetic stocks of Dusky and Bronze Whaler Sharks there are in Australia, in order to sustainably manage the species. After extracting DNA from shark tissue

samples, Dr Junge uses next-generation sequencing (NGS), applying a method that involves cutting the genome into smaller fragments at specific recognition sites. "Because of this, I end up with thousands of single nucleotide polymorphisms (SNPs) across the whole genome," Dr Junge said.

"To run bioinformatics analyses on so many SNPs and samples you need a number of resources and it's just not possible to have all of these on your desktop computer – this is where eResearch SA really comes in handy".

"The software and Nectar Cloud resources I have been able to use through eResearch SA have been incredibly useful, especially for the population analyses, because you need specific programs, which they're always willing to install.

"I have datasets that include over 10,000

SNPs for up to 300 different individuals and just one of these analyses can take 150 hours, not to mention that I then have to do this in replicates of 20 for 10 different settings – if I even attempted to do this on a desktop it would take forever.

"It's great that researchers like me can use eRSA's resources – I use the cluster in the cloud to access a high-performance computing cluster that uses virtual machines – it makes my life a lot easier and so much faster to get the results I need."

The long-term result of Dr Junge's research will be better fisheries management.

"As both species are fished in Australia – Bronze Whalers predominately in South Australia and Dusky Sharks predominately in Western Australia – and only produce very few offspring, compared to most commercially fished species, our

studies are also important in ensuring that Australasian stocks are not being overfished."

Contrary to previous studies, results from Dr Junge's project have already shown that Dusky Shark populations around Australia are made up of the same genetic stock.

"This is important for fisheries management to keep in mind, particularly when making sustainability agreements interstate and internationally.

"Interestingly, Bronze Whaler sharks in Southern Australia are also very mobile and seem to be connected genetically.

"But from what we can tell, samples from Western Australia and also from around the Great Australian Bight are somewhat different, genetically, from the southern and eastern side of Australia as well as New Zealand."

eResearch projects



While his classmates took a welcome break from the books, University of South Australia engineering student Andrew McMillian spent a recent summer holiday investigating the potential of video games to rehabilitate children with cerebral palsy.

Andrew received an eResearch SA Summer Scholarship in 2010-11, which opened the door to using advanced information and communication technologies to solve research questions.

Andrew was offered a selection of projects which incorporated eResearch activities, such as collaboration, data management and sharing, high performance computing, or visualisation and haptics. He was intrigued by a Flinders University project, which harnessed data visualisation to measure video game interaction data.

“The project, which is ongoing, aims to

provide custom-made video games for children with cerebral palsy to use at home over extended periods of time,” Andrew explains. “The player’s interactions with a game are logged and this data can be used to track the rehabilitation of their motor skills.

“My role was working on a new way to collect data, using 3D visualisation to capture the player’s experience. I would not have had the opportunity to develop skills in visualisation without this scholarship – it opened up a whole new area.”

eResearch SA’s advanced visualisation and haptics facilities are used by researchers to tactically manipulate data to build their understanding of the structure of objects, find patterns in complex data sets or, like Andrew, to visualise abstract concepts.

The data collected during the Flinders University project included the player’s screen location in the game, the position of the joystick, the duration and intensity of vibration feedback and how this relates to the game played.

“For each point of data logged from the game, a time-stamp, joystick position and controller vibration were recorded, and then read in by my program,” Andrew explains. “The program proceeded to build the visualisation using time-stamp and joystick position for the position of each point of data, and colour to record vibration for each point of data.

“By using 3D visualisation, we could represent the data provided and identify if there was any joystick bias over time, to see if the subject’s motor skills are more advanced in one side of their body.”

Andrew’s research supervisor at Flinders University was Dr Brett Wilkinson. Brett has also supervised another eResearch SA scholarship student in a project which utilised haptic devices for epidural simulation.

“The eResearch SA scholarship provides the research community with the opportunity to access new techniques,” Brett says. “The main project was developing video games for rehabilitation, but eResearch SA facilitated the connection with Andrew, who contributed important skills in visualisation to our project.”

eResearch SA Board

eResearch SA is governed by a Board comprised of the Deputy Vice-Chancellors (Research) of the three South Australian universities, an independent Chair, and the eResearch SA Chief Executive Officer as a non-voting member.

Mr Bruce Linn, Chair

Bruce Linn is an experienced Company Director, Chairman and former CEO who heads a successful governance and strategic management consulting business operating in Australia and the USA.

Formerly CEO of Finlaysons Lawyers, his previous executive roles include CE for EDS (now HP Enterprise Services), where he was responsible for all State Government business of EDS in Australia and CEO of Camtech, one of Australia's leading Internet and Electronic Payments technology innovators.

A Science graduate of The University

of Adelaide, Bruce is a technologist with over thirty five years experience in strategy, governance, leadership, business management and commercialisation of a broad range of technologies including IT, telecommunications, Internet and social media.

Immediate past President of the Australian Institute of Company Directors (SA/NT Division), his current Directorships include the Council of The University of South Australia where he Chairs the Finance Committee and the Foundation Committee, the boards of SABRENet Limited, ITEK Ventures Pty Ltd and SA Heart Centres Pty Ltd. Bruce is Chairman of Anglicare SA, eResearch SA and St. Peter's Girls' School.

He is also a fellow of the Australian Institute of Company Directors and the Australian Computer Society, and has been awarded a University Fellow by the University of South Australia.

Professor Mike Brooks, Deputy Vice-Chancellor and Vice-President (Research), University of Adelaide

Professor Mike Brooks was appointed to the position of Deputy Vice-Chancellor and Vice-President (Research) at the University of Adelaide in July 2008, following almost a year as Pro Vice-Chancellor (Research Strategy).

A former head of the School of Computer Science, Mike is a leading international researcher in computer vision and image analysis. His work has seen wide commercial use in the security and defence industries and has resulted in international awards. He has published many influential papers in the areas of auto-calibration, structure from motion and video surveillance. Mike is a former Head of the School of Computer Science where he still holds the Chair in Artificial Intelligence.

Mike is a Fellow of the Australian Computer

Society, a Fellow of the Australian Academy of Technological Sciences and Engineering, Associate Editor of the International Journal of Computer Vision, and serves as a non-executive director on several boards, including National ICT Australia (NICTA).

Professor Robert Saint, Deputy Vice-Chancellor (Research), Flinders University

Professor Saint has 118 publications to date, two patents and numerous honours and awards. He currently holds National Health and Medical Research Council (NH&MRC) research funding and has held significant grants from both Australian Research Council (ARC) and NH&MRC over a period of 25 years, including an ARC Special Research Centre from 2000-2008.

He has been a member of the ARC College of Experts, Chair of the ARC Biological Science and Biotechnology panel, a member of the Human Frontier Science Program Grant Review Panel and has

served on National Health and Medical Research Council (NHMRC) panels. From 2012 to 2014 he was a standing member of the Prime Minister's Science, Engineering and Innovation Council (PMSEIC).

A PhD graduate of the University of Adelaide, Professor Saint's research career has also taken him to Stanford University, The Walter and Eliza Hall Institute, The University of Melbourne, CSIRO (Canberra), and ANU. His experience in academic leadership includes a number of management roles at Adelaide University and ANU, followed by his appointment as Dean of Science at Melbourne University.

Mr Paul Sherlock, Chief Information Officer (Library and IT), University of South Australia

Prior to joining the University in 2001 Paul held senior ICT management roles at the Defence Science & Technology Organisation (DSTO) and BHP.

Paul is Director and Chair of SABRENet Ltd. and the Project Director for the Federal Government funded National Research Network (NRN) Project. He is also a member of the National eResearch Collaboration Tools and Resources (NeCTAR) Project Board and the Treasurer at the Australian Access Federation (AAF). Paul is a former President of the Council of Australian University Directors of IT (CAUDIT) and was a founding Member and President of the AAF. He was also formerly a Member of the Australian eResearch Infrastructure Committee (AeRIC). Paul leads CAUDIT's benchmarking activity and is the author of the complexity index which is used by CAUDIT members to make meaningful comparisons of benchmarking data across the ANZ HE sector and internationally. Paul was a member of the AARNet Advisory Committee between 1998 and 2014 (including as Deputy Chair 2004-2008) and is a past faculty member of the CAUDIT Leadership Institute (2004-08).

Financial report

For year ending 31 December 2013

OPERATING INCOME

Member & Participant Subscriptions	900,000
HPC & Data Storage	483,538
Reimbursements	39,980
Hosting	15,128
Other Project Income	170,461
Other Income	167,180

TOTAL OPERATING INCOME	1776,288
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OPERATING EXPENSE

Admin	266,941
Infrastructure	69,523
Software	3,184
Salaries and Staff Costs	1,374,388

TOTAL OPERATING EXPENSES	1,714,036
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TOTAL NET PROFIT / LOSS FROM OPERATIONS	62,252
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Harness your research
potential with eResearch
technologies and services.



RESEARCHSA