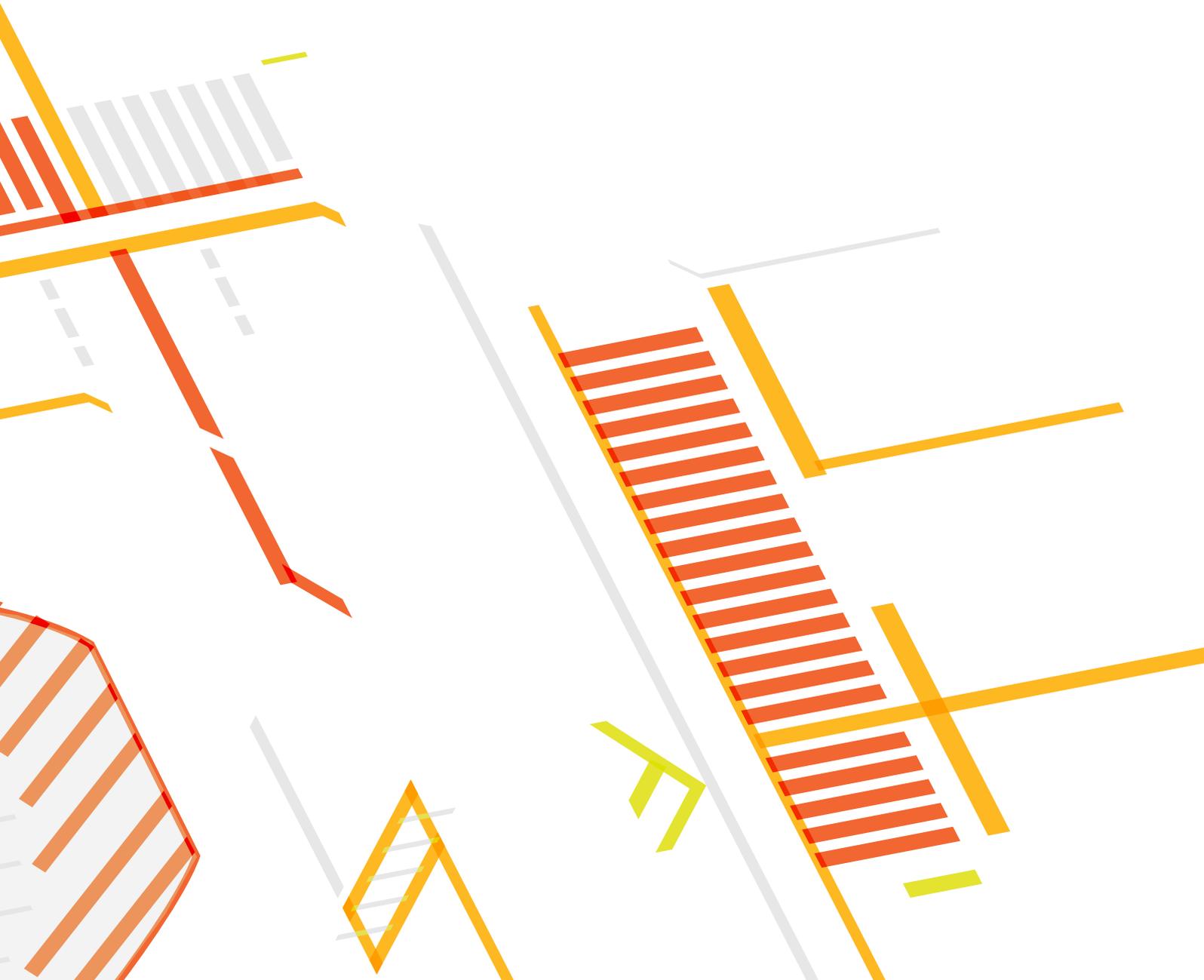


INTERSECT



Annual Report 2013

Excellence • Value • Partnerships

About Intersect

Intersect is owned by its members and was created to provide eResearch services and solutions. Intersect was established in 2008 and currently has eleven university members: the University of Sydney, the University of New South Wales, Macquarie University, the University of Technology, Sydney, the University of Newcastle, the University of New England, Southern Cross University, the University of Wollongong, the University of Western Sydney, Charles Sturt University and the University of Canberra. The NSW Office of Environment and Heritage, CSIRO, the Sax Institute and Sirca are also members.

Mission

To realise research impact through eResearch

“Intersect has become an absolutely pivotal part of the State’s research infrastructure and of the State’s research. All sorts of new research is happening, as researchers in the humanities, creative arts, medical areas see what can be done with eResearch and eResearch platforms.

People think of Intersect as the servant of research, providing the high computing power but I’ve seen Intersect lead people into new research areas by showing them what they can do, by somebody seeing one platform could move across to another field. So Intersect’s actually a creator for enabling and leading the excellence of research in NSW”.

Professor Mary O’Kane, NSW Chief Scientist & Engineer



Funded by:



Members of:



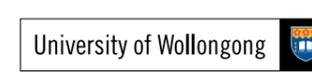
Working with:



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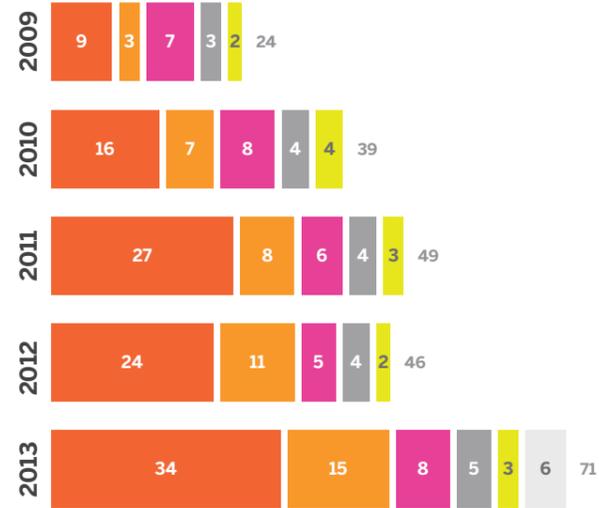
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Intersect Members

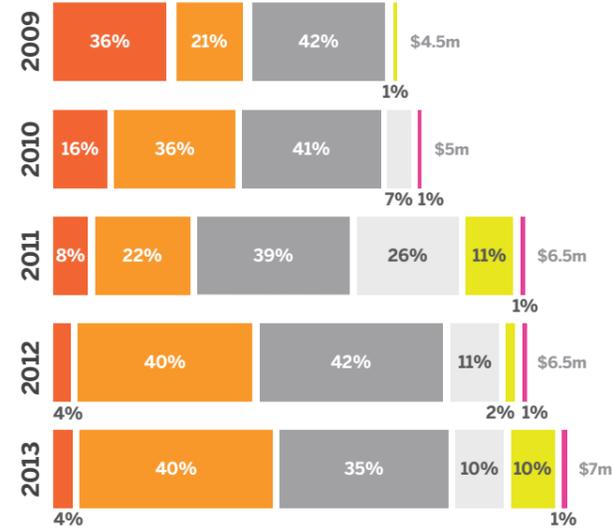


Intersect at a Glance

Staff Numbers

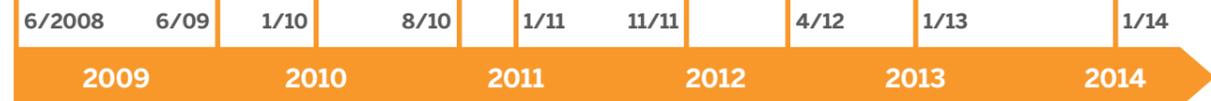


Revenue Sources



Intersect's Growth - Membership

Foundation



2013 Snapshots



Journalists visited the Intersect RDSI node at the IC2 Data Centre to learn about this Australian initiative, seen as a best practice.



70 attended the Sharing Government Data Forum in November.



Dr Joe Thurbon addresses the CSU eResearch showcase.



Intersect's training program has burgeoned in 2013.



Government data featured in GovHack weekend hosted at Intersect.



The first Humanities and Technology Camp, (THATCamp) held in Sydney, was coordinated by Intersect and the State Library of NSW.

Governance, Boards & Committees

Intersect's **Board of Directors** are:

- » Emeritus Professor Mark Wainwright AM FTSE (Chair)
- » Professor Andrew Cheetham, Independent
- » Mr Michael Kirby-Lewis, Director IT@UNSW, University of New South Wales
- » Ms Anne Bell, University Librarian, University of Sydney
- » Ms JoAnne Sparks, University Librarian, Macquarie University
- » Mr John Masters, Independent
- » Mr Damien Israel, Deputy Vice Principal, Finance & IT, University of Wollongong
- » Dr Marilyn Sleigh, Independent
- » Dr Ian Gibson, CEO, Intersect

Providing guidance to the board on service related issues is the **eServices and Strategy Committee**:

- » Professor Andrew Cheetham, Independent, Chair and Board Member
- » Mr Andrew Black, Director, Research Development & Collaboration, USyd
- » Mr Peter Gale, Information Technology Division, UTS
- » Mr Stephen Williams, Business Manager, SCU
- » Dr Peter Sefton, Manager eResearch, UWS
- » Mr Ossie Richards, Manager Research Computing Services, IT, UoN
- » Mr Grant Sayer, Technology Director, Informatics, MQ
- » Mr Rob Irving, Director, ITD Services, UNE
- » Professor Judy Raper, Deputy Vice-Chancellor (Research), UoW
- » Professor Mark Hoffman, Pro Vice-Chancellor (Research), UNSW
- » Professor Andrea Bishop, Director - Research, CSU
- » Dr Ksenia Sawczak, Director, Research Services Office, UC

Providing guidance to the eServices and Strategy Committee on HPC resource allocation related issues is the **Resource Allocation Sub-Committee**:

- » Professor Marc Wilkins, Ramaciotti Centre for Gene Analysis, UNSW
- » Mr Michael Homsey, HPC Support Specialist, USyd

- » Associate Professor Tim Langtry, Mathematical Sciences, UTS
- » Professor Timothy Marchant, Dean of Research and Professor of Applied Mathematics, UoW
- » Dr Craig O'Neill, Department of Earth and Planetary Sciences, MQ
- » Professor Pablo Moscato, Electrical Engineering and Computer Science, UoN
- » Dr Gregory Falzon, Research Fellow, C4D Spatio-Temporal Support Unit, UNE
- » Professor Graham King, Plant Genomics and Epigenetics, SCU
- » Professor Yang Xiang, Dean's Unit, School of Computing, Engineering & Maths, UWS
- » Professor Terry Bossomaier, Director, Research Group for Complex Systems, CSU
- » Dr Joachim Mai, HPC Support Specialist, Intersect.

Providing guidance to the eServices and Strategy Committee on storage related issues is the **Storage Allocation Sub-Committee**:

- » Dr Marilyn Sleigh, Chair
- » Associate Professor Grainne Moran, Director, UNSW Mark Wainwright Analytical Centre, UNSW
- » Mr Ross Coleman, Director, Collections and eScholarship, USyd
- » Mr Peter Gale, Information Technology Services, UTS
- » Professor Nicki Packer, Chemistry & Biomolecular Sciences, MQ
- » Professor Timothy Marchant, Dean of Research, UoW
- » Ms Lyn McBriarty, Director, Research Services, UoN
- » Professor Heiko Daniel, Director, Research Services, UNE
- » Mr Stephen Williams, Business Manager, SCU
- » Mr Wayne Doubleday, Manager CSU Archives, CSU
- » Professor Deborah Sweeney, Associate PVC Research, Health & Science, UWS
- » Dr Ksenia Sawczak, Director Research Services Office, UC
- » Ms Stefania Riccardi, Research Data Officer/ Project Manager, ACU



The Intersect Board of 2014, left to right: Emeritus Professor Mark Wainwright AM FTSE (Chair), Mr Paul Martin (Secretary), Dr Ian Gibson (CEO), Mr Michael Kirby-Lewis, Mr Marc Bailey (in attendance), Ms JoAnne Sparks, Dr Marilyn Sleigh, Mr John Masters, Ms Anne Bell. Absent: Mr Damien Israel, Professor Andrew Cheetham.

Providing guidance to the Board on budget related issues is the **Board Audit and Risk Management Committee**:

- » Mr John Masters (Chair)
- » Mr Garry McLennan, Chief Financial Officer, FlexiGroup Limited
- » Mr Damien Israel, UoW
- » Satish Nair, CFO, Sirca & Intersect (in attendance)
- » Dr Ian Gibson (in attendance)

Providing guidance to the Board on infrastructure related issues is the **Infrastructure Committee**:

- » Emeritus Professor Mark Wainwright AM, Chair
- » Professor Lindsay Botten, Director, National Computational Infrastructure
- » Mr John Nicholls, Infrastructure Development Manager, AARNet
- » Mr Steven Kuk, Acting Senior Manager ICT Infrastructure and Networks, USyd
- » Mr Jim Leeper, Acting Delivery Services Manager, UNSW

- » Ms Sarajane Hansen, CIO Cancer Institute NSW, State Government





Emeritus Professor Mark S. Wainwright AM FTSE

Intersect has again seen rapid growth throughout 2013, now employing 70 people across its operations, achieving a turnover of \$7M for 2013 and now supporting 14 members.

In the first phase of Intersect's life it built a robust base of engineering and service provision. In this recent phase of growth, Intersect secured funding for infrastructure through the Research Data Storage Infrastructure project, NeCTAR and the State Government, and is now well into implementing those research infrastructures. On the back of these major infrastructure investments, Intersect is building partnerships with the providers such as Hitachi Data Systems and Macquarie Telecom, the sole aim of which is to deliver benefits to members.

Partnerships are a growing theme, and throughout this report brief case studies highlight partnerships across the research field, in areas such as health and medical research, and open data across the State Government. Intersect plays an active role too in strengthening the federated collaborations operating across the sector: with the Australian Access Federation; AARNet; other State based nodes of the Research Data Storage Infrastructure project and the NeCTAR Research Cloud.

During 2013 an independent review was conducted into Intersect's performance to date, led by Professor Robin Stanton of the Australian National

University. The report from this review became a useful input into the forward planning conducted by the Intersect Board late in 2013 and the resultant Strategic Plan 2014 – 2018.

Intersect's next phase of growth will continue to focus on providing excellence across its offerings, delivering value to its members and partners, building new and strengthening existing partnerships. Intersect will look to expand and diversify its income, in particular by maturing the provision of services and infrastructure to data and research-intensive areas in NSW State Government agencies and not-for-profit organisations.

None of this would be possible without the focussed leadership of the Intersect executive, led by our CEO Dr Ian Gibson, and the impressive skill and professionalism of Intersect's staff.

I thank the NSW universities for their continued support of Intersect as members and clients, collaborators and board and committee members. I am grateful too for the ongoing support of the NSW government and the Chief Scientist & Engineer of NSW Professor Mary O'Kane.



Dr Ian Gibson

It is with great pleasure that we present this, the latest annual report from Intersect Australia. 2013 was a watershed year for us as we matured from a start-up organisation built on a good idea to a sustainable small to medium enterprise offering high value services to our members and the broader Australian research community.

As we enter our sixth year of operation we are now starting to see some of our members' significant research outcomes that have been supported by Intersect activities. This report mentions a small sample of those.

Intersect had another very busy year this year, delivering dozens of major projects supporting many groups of researchers. We also established our presence at our new data centre, deployed millions of dollars of storage and computing infrastructure and firmed our service catalogue.

A major highlight for us was entering into an agreement with Hitachi Data Systems to work towards establishing a Research and Development facility. This agreement has the potential to deliver substantial benefit for Intersect, for its members, and for NSW.

2014 will see our technical operations scaling up substantially and investing in user support – steps enabling us to provide high value services to the

largest possible research community. Also next year will provide us with an opportunity to reuse our extensive back catalogue of technologies to build a rich set of valuable eResearch tools and services.

As the complexity of information technology as applied to research intensifies, the scope of services that Intersect can valuably provide continues to grow. In order to deliver the best portfolio of services in the world, we will be entering into more partnerships with technology services providers and research institutes.

I would like to make a special thank you to Intersect's Chair, Mark Wainwright, the Intersect Board and Committees who all volunteer their time to help Intersect succeed in its mission. I would also like to thank all of the Intersect staff whose dedication and passion continue to drive us to excellence.

Finally, I would like to thank Intersect's members and clients for choosing to do business with us. We strive to provide high quality, high reliability and high value services that directly assist in achieving high impact research outcomes.

Infrastructure

A significant infrastructure capability is being assembled by Intersect to support Australian research disciplines at member institutions. It brings together High Performance Computing, peta-scale data storage and elastic computing.

Our coordinated approach in providing this infrastructure is essential for our research communities to remain competitive at a national and international level.

Intersect has partnered with Macquarie Telecom to host the greater part of this infrastructure at its new data centre at Macquarie Park, IntelliCentre 2. We are also continuing negotiations with the NSW Department of Finance & Services to establish a presence at the new State Government Data Centre at Silverwater. This would provide an important pathway for researchers to access State Government research data and facilitate collaborations.

High Performance Computing

Intersect's new supercomputer *Orange* was launched by NSW Chief Scientist and Engineer Professor Mary O'Kane on 11 March 2013 at the Macquarie Telecom IC2 Data Centre. Assembled by SGI and hosted at IC2, *Orange* supports world-class research from our member universities.



NSW Chief Scientist & Engineer Professor Mary O'Kane launches the supercomputer *Orange* with, left to right: Lead CI Prof Leo Radom; Intersect Chair Prof Mark Wainwright; Macquarie Telecom Chair Robert Kaye; Intersect CEO Dr Ian Gibson; CEO of SGI Jorge L. Titingier; Macquarie Telecom's David Hirst.

Intersect's previous HPC, *McLaren*, was taken out of production at COB on Friday, March 1.

Orange was officially moved into production at the conclusion of the launch providing a local facility with 33 TFlops of computational power, a 25-fold increase. See *The Juice* on *Orange* on page 15.

Orange is funded through the Australian Research Council's Linkage Infrastructure, Equipment and Facilities (LIEF) scheme. The LIEF grant, led by the University of Sydney's Professor Leo Radom is supplemented by investments from the University of Sydney, UNSW, UTS, Macquarie University, the University of Newcastle, the University of Wollongong, Southern Cross University and the University of New England.

In addition Intersect, as a partner in the National Computational Infrastructure (NCI) National Facility, has a 4.5% share of NCI's new peta-scale Fujitsu Primergy, *Raijin*. *Raijin* is a high-performance cluster with 57,472,160 Tbytes of main memory and 10 Pbytes of useable fast file system. Named after the Japanese God of Thunder, *Raijin* debuted at number one in Australia, and number 24 in the world on the TOP500 list of best supercomputers.

A 2014 LIEF proposal coordinated by Intersect and led by UNSW's A/Prof Evatt Hawkes was successful and awarded \$1,025,000 by the Australian Research Council. The funding goes to renew Intersect's share of the National Computational Infrastructure's

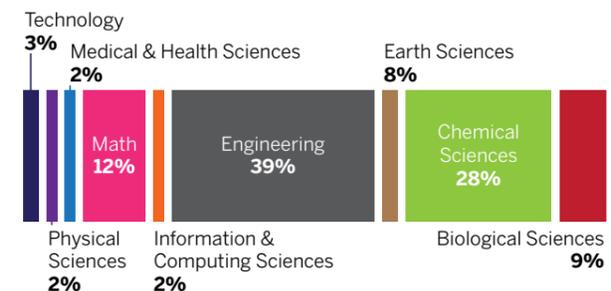


NCI's HPC system, *Raijin*.

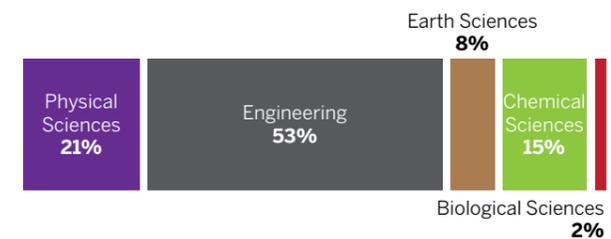
peak facility for the Intersect consortium of eleven universities from 2014 - 2017. This access enables consortium researchers to tackle grand challenge research problems in a diverse range of fields.

Together this provides Intersect members with access to a local HPC facility and, when required, the ability to scale up their computations for submission to the NCI National Facility. Both *Orange* and *Raijin* use the same job submission system, PBSPro, and both machines are based on the same Intel SandyBridge architecture, thus simplifying the task of moving jobs from one facility to the other.

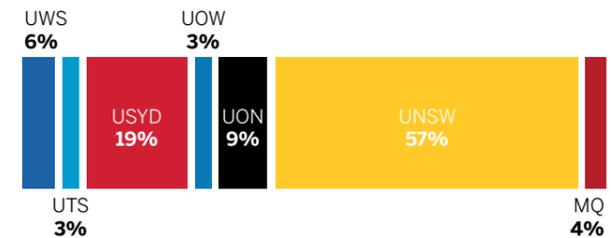
HPC Usage by Discipline - Orange



HPC Usage by Discipline - NCI/Vayu



HPC Usage by Members



Virtual Machines and Elastic Computing

During 2013 Intersect finalised the contract to become a NeCTAR Research Cloud node.

Our node will provide researchers with access to a pool of compute resources which can be used as traditional virtual machines or provide a more elastic computing environment. The RFQ was released in Q1 2014 and the node will be in production in Q3 2014.

The NeCTAR Research Cloud Node will be co-located with, and tightly coupled to our RDSI Storage Node. This will provide researchers who already have their data on our RDSI Storage Node with the computing resources required to analyse and process this data.

Our NeCTAR Research Cloud Node will also provide persistent storage to support processing of research data which is not eligible for RDSI storage and for other uses where local data stores are important.

These resources will allow us to investigate how to migrate suitable jobs from our HPC resource into a cloud-computing environment offering elastic computing facilities. Strategically, this will provide a cost-effective alternative to the traditional approach of providing HPC facilities.

Intersect is now well placed to provide cost-effective infrastructure to support researchers in NSW. We have a good track record in accessing Federal and State infrastructure programs. The facility that we have established at IntelliCentre 2 brings together High Performance Computing, petascale data storage and cloud computing to provide our research communities with specialised infrastructure, which would otherwise be unavailable to them.

See also Focus on Data Safety, on page 14.

Intersect acknowledges funding from the NeCTAR project <http://www.nectar.org.au> NeCTAR is an Australian Government project conducted as part of the Super Science initiative and financed by the Education Investment Fund.

Research Data Storage

As research becomes increasingly collaborative and data intensive it requires tools and infrastructure on an unprecedented scale and opens up new research questions and techniques. Intersect has become a major node of the Research Data Storage Infrastructure to help researchers and member institutions avail themselves of enabling technologies.



A tour of Intersect's research data storage late in 2013

Intersect focusses on areas that have the most impact on research at its member institutions. By providing services to the membership as a whole, Intersect is well placed to achieve efficiencies of scale.

By leveraging state and federal funding, the services are offered at a cost far below that in the broader market.

Intersect has so far secured approximately \$5M from the RDSI project and the ReDS program to develop storage infrastructure. Operating costs are met by the universities and the NSW Government has provided an additional \$1M via the Science Leveraging Fund.

Solutions in Partnership

Intersect is working in collaboration with researchers to help solve important research problems, across increasingly data-intensive disciplines including health and medical research, life sciences, and ecology.

Increasingly, we work with medical research institutes to address many of their recurrent issues; these include the Children's Medical Research Institute, the Hunter Medical Research Institute, the Garvan Institute, the Charles Perkins Centre and the Breast Cancer Tissue Bank. At the Lowy Cancer Research Centre, Intersect is providing local access to important international databases such as The Cancer Genome Atlas. In particular, this initiative led to a UNSW/ Intersect partnership being awarded the Big Data Big Impact at the 2013 Premier's Awards for Outstanding Cancer Research for a project entitled 'Exploring the Dark Matter of Cancer Genomes'.

Regional universities play an important role in the custodianship of cultural heritage, and we are working with archives at universities including the University of New England, the University of Newcastle and Charles Sturt University to provide long term storage and access for their collections.



The inaugural Big Data Big Impact award was presented to Dr Jason Wong, Dr Luke Hesson and Intersect's Dr Joe Thurbon at the 2013 Premier's Awards for Outstanding Cancer Research, by NSW Chief Scientist Professor Mary O'Kane and Emeritus Professor Mark Wainwright AM FTSE.

Maturing the set of services

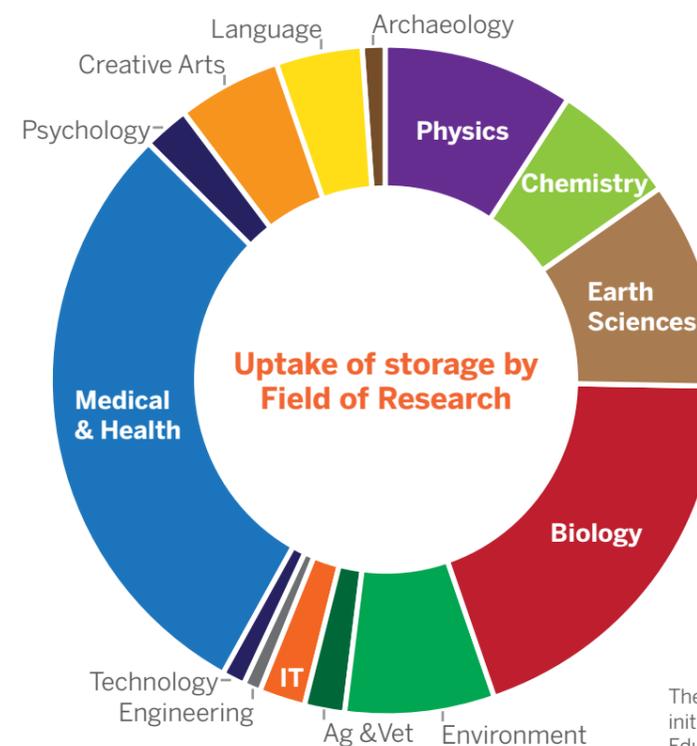
NSW undertakes an extraordinarily wide variety of research involving a wide stakeholder base. There is a large cohort of researchers with data management issues that can be resolved with general-purpose solutions. For these challenges, we have rolled out FTP, and are in the process of rolling out LiveArc, and Aspera.

Intersect runs a Storage Allocation Committee, a representative member panel, which approves collections for storage, based on merit and relevance to the members of the node. (Membership of the Committee is on page 6).

We also work in collaboration with other nodes of the RDSI, particularly those supporting a wide diversity of disciplines, such as eResearch SA and QCIF, to roll out a national data repository called data.edu.au. This service will provide a single point of access to the canon of Australian research data for those disciplines that do not already maintain their own repositories.

We are working with approximately 60 different collections across all fields of research. To date we have 575 TBs of data stored on the Intersect node and a further 1.5PBs ready for transfer.

The Intersect node will provide members with direct access to up to 50 PBytes of research data storage capacity by 2015.



“Getting our act together with data storage has been one of the things we have recognised as an issue we have needed to address. Intersect has been able to come in and assist us with both the mechanics of data storage but also with the logistics around it and the mechanisms by which you store data, particularly in a research intensive environment.”

Professor Les Field AM



Case Study

Intersect works closely with BioPlatforms Australia in the following ways:

- » hosting their flagship datasets (eg melanoma, wheat, soils) on the storage node
- » collaborating on a successful tender to the NSW Office for Health and Medical Research; to
- » deliver Bioinformatics training to NSW and ACT Health and medical researchers and clinicians
- » providing cloud based infrastructure and help desk support to deliver bioinformatics tools and training material
- » planning for storage and sharing of significant and long lasting collections of genomics, proteomics and metabolomics data.

The Research Data Storage Infrastructure (RDSI) Project, an initiative of the Federal Government, and is funded from the Education Investment Fund under the Super Science (Future Industries) initiative.

FOCUS ON DATA SAFETY A FUTURE PROOF DATA CENTRE

In 2012 Intersect faced a number of business and technical challenges in terms of locating our infrastructure hardware. Our existing High Performance Computer (HPC), *McLaren* had reached its end-of-life. Our new HPC, *Orange* had been purchased and delivered and researchers were keen to access it. However, negotiations with our then data centre stalled over the provision of high-density power and cooling.

Orange is a distributed memory cluster computer and as such has special needs. Its high speed processors, high speed interconnect and high speed IO result in a high power density of ~20kW per rack.



Orange is 25 times the computing capacity of its predecessor.

Intersect was seeking a long-term partner who could provide:

- » high density power and cooling
- » best possible power usage effectiveness (PUE)
- » AARNet connectivity
- » high availability
- » room for future expansion and
- » a short deployment time.

Macquarie Telecom is an Australian hosting and telecommunications provider founded in 1992. It has been in the data centre business since 2001, making large investments over the last 3 years (approx \$100M). In particular, in September 2013, the company opened a new data centre, IntelliCentre 2 (IC2). IC2 is a Tier III facility, with Government Security (ASI, DCD), and ISO 27001 rating. Importantly for our research users, the Macquarie Telecom data centres are Australian owned, and the data resides in Australia.



In November 2012 Intersect and Macquarie Telecom signed a contract for the delivery of co-location services with defined scope around space, power and cooling requirements.

What followed was a complex project which was able to be successfully completed in a short time. In fact, Macquarie Telecom delivered the required high-density solution including AARNet access, in just five weeks, with final handover occurring just before Christmas.

This was made possible by taking a partnership approach rather than supplier approach. Key factors were transparent communication, clarity on business outcomes and technical challenges, a common understanding of the complex design, and operational engagement from start to finish.

The benefits are clear. *Orange* has achieved a 25-fold performance increase in research capability over its predecessor, and the load on *Orange* has been close to 100% since going live. Researchers now have access to considerable local HPC resources located in a state-of-the-art data centre.

For more on *Orange*, see opposite page.

RESEARCH IMPACT CASE STUDY THE JUICE ON ORANGE

Our previous High Performance Computer (HPC) *McLaren* was extensively utilised by researchers mainly due to its shared memory architecture which allowed researchers to use up to 1TB memory in a single threaded program.

HPC dates faster than conventional computing and *McLaren* was no exception. By 2013 we outgrew its 256 cores, its Itanium processors were exotic, and disk storage expansion was no longer cost effective.

The Challenge

Our researchers needed a much bigger machine in terms of compute cycles, a higher clock frequency, more disk space and a large amount of memory for parallel and sequential programs. We also wanted to enable better and wider application support.

After an exhaustive selection and procurement process, the solution was identified as an SGI ICE cluster of 100 nodes providing 1,600 Intel Sandy Bridge cores running at 2.6GHz cycle frequency. The memory of this machine, called *Orange*, is heterogeneously distributed over the nodes: 90 nodes have 64GB memory while 10 nodes have 256GB memory.

The nodes are connected via Infiniband QDR which has a very low latency and a high bandwidth. All big memory nodes are connected to the same switch allowing large parallel jobs with up to 2.5TB memory. Genomic projects, for instance, require large memory space. To enable high speed I/O to local scratch disk space each node contains a 2TB disk. For global storage we chose a Panasas disk subsystem. Programs and home directories reside on a SGI NAS which is connected via NFS, this being the most reliable system.

The verdict

Not long after being commissioned *Orange* was running close to 100% utilisation. The high speed interconnects enable large simulations (combustion simulations can use up to half the machine in a single job) as well as projects in computational chemistry and physics. The big memory nodes are enabling genomics projects to analyse complete data sets rather than breaking data into smaller subsets for analysis. The local scratch disks provide fast access to local storage commonly required for intermediate results in biology and genomics analysis.

Key advantages

Intersect's HPC cost is 2.8 cents per Service Unit, comparing very favorably with other well-known larger systems. *Orange* easily allows for a co-investment model where specific nodes can be reserved as purchased by members.

Orange is hosted in a Tier III data centre and is isolated from issues sometimes faced by campus-based systems. And, there is more time for our HPC staff to commit to end users. *Orange* also caters for beginners in addition to expert users with larger jobs. *Orange* has proved very reliable with very little downtime.



Orange was launched in March 2013.

Orange is funded through the Australian Research Council's Linkage Infrastructure, Equipment and Facilities (LIEF) scheme. The LIEF grant was led by the University of Sydney's Professor Leo Radom.

FOCUS ON PARTNERING WITH HITACHI DATA SYSTEMS



Intersect and Hitachi Data Systems shake on it: (L to R) Laurence Cole, HDS; Dr Ian Gibson, Intersect; Neil Evans, HDS; Shane Youl, Intersect; Willie Lusted, HDS.

During 2013 Intersect selected Hitachi Data Systems to build the NSW node of the Research Data Storage Infrastructure (RDSI) project. Hitachi Data Systems provides information technologies, services and solutions that help companies improve IT costs and agility. Contracts were signed on 30 July 2013. Hitachi Data Systems deployed the equipment, and acceptance testing was completed in Q4 2013.

Intersect and Hitachi Data Systems (HDS) also signed Australia's first teaming agreement to further serve the network's members over the long term. The memorandum gives Intersect and its members:

- » access to HDS technology stack and partnership programs
- » highly competitive pricing across their product range and
- » the potential to build custom solutions for research.

Significantly, the Teaming Agreement supports the creation of a research centre, with research being

undertaken primarily at member universities, and development being undertaken by Intersect to solve "big data" research problems in partnership.

Intersect's relationship with HDS continues to strengthen. In November, as part of Hitachi Oceania 30th anniversary celebrations, HDS hosted an international delegation of journalists in Sydney. Seventeen journalists travelled from eight countries to learn about Australian initiatives, particularly the Intersect RDSI node, seen as a best practice implementation of big data storage and access.

Intersect worked closely with HDS to engage with media and delegates across the two day program which included presentations to international journalists, an Australian media and analyst roundtable, and a tour of the IC2 Data Centre.

The Research Data Storage Infrastructure (RDSI) Project, an initiative of the Federal Government, is funded from the Education Investment Fund under the Super Science (Future Industries) initiative.

FOCUS ON PLANNING FOR THE FUTURE

Between April and November 2013 an independent review was conducted into Intersect's performance to date. The coming years will see significant changes in Intersect's highly dynamic environment:

- » ICT platforms and expertise underpinning Intersect activities evolve rapidly
- » Intersect's members' requirements and expectations of Intersect evolve with technology and individual business opportunities
- » funding models for eResearch infrastructure and associated services will continue to change in the future.

There were two primary triggers for the review. Intersect's fifth birthday milestone was seen as a sensible point for reviewing progress against strategic goals. The overarching goal was to provide members with an assessment of the value Intersect has provided to date. It was also seen as a timely opportunity to assess whether Intersect's business model is likely to be robust in the face of the substantial changes taking place in Intersect's operating environment.

The Review was conducted by a panel consisting of:

- » an independent Chair (Professor Robin Stanton, Pro Vice Chancellor, E-strategies, ANU)
- » two representatives of Members – Professor Andrew Cheetham (UWS), Professor Mark Hoffman (UNSW)
- » an external expert, Ms Mary Hobson (Executive Director, eResearchSA), with
- » Intersect providing secretariat support.

The Intersect Review Report, which includes six findings, was circulated to members in Q1 2014.

The outcome of the review informed the development of the new Intersect Strategic Plan, covering the period 2014 to 2018.

Intersect's Strategic Plan 2014–2018 is framed around our portfolio of activities designed to achieve our mission: to realise research impact through eResearch.

Underpinning the plan are the following guiding principles, that is, Intersect should:

- » provide high value for members and customers
- » enable new research
- » enable new research methodologies and collaborations
- » support research of high impact and strategic value
- » enable a greater level of eResearch capability in its members
- » partner with organisations with relevant capabilities
- » partner in member's research endeavours, and
- » introduce new eResearch technologies of value.

Intersect's Strategic Plan 2014–2018 is available online and in hard copy. Copies are available by emailing enquiries@intersect.org.au.





Intersect's member services grew and matured in 2013, delivering value-added services atop our growing infrastructure offerings. As always, our service offerings evolve and develop in close collaboration with our member institutions. Learning and Development delivered courses in research data cleaning, manipulation and visualisation; the Grants team worked with researchers to size and scope their research infrastructure requirements for grant-funded activity; and the Storage team worked with institutions to identify, approve and ingest research data collections. Each of these activities assists researchers to leverage Intersect's infrastructure, as well as services provided internally by members.

Intersect continues to work with members, helping define and deploy policy, procedure and infrastructure, assisting members to respond to a changing research data management landscape. Intersect fosters collaboration between universities, hosting round-table events for researchers, IT professionals and research administrators to compare notes and work together. In welcoming our newest member, the University of Canberra, and an invigorated partnership with the Australian National Data Service, (ANDS), Intersect has expanded its footprint into the ACT, with three staff now located there.

Partnerships

Important partnerships are being forged and strengthened, including with Bioplatforms Australia, the Terrestrial Ecology Research Network, the Office of Environment and Heritage, and ANDS. These partnerships help us develop services that can be rolled out to the membership efficiently.

ANDS now delivers most of its services to NSW through Intersect. Intersect also provides support to ANDS's Institutional Engagement and National Collections programs, and we are working in close partnership to develop and deliver advice to researchers on grant-related research data management and curation.

Learning and Development

Intersect's Learning and Development offerings grew substantially in 2013, delivering courses to 459 attendees, (up on 143 the previous year). To manage increased demand dedicated trainers and Eventbrite cloud management are now deployed. We added courses on Data Visualisation with Google Fusion Tables and how to manage the changeover from the National Computational Infrastructure's *Vayu* supercomputer to *Raijin*. 2014 adds new courses on Excel and Research Data Management.

Grants

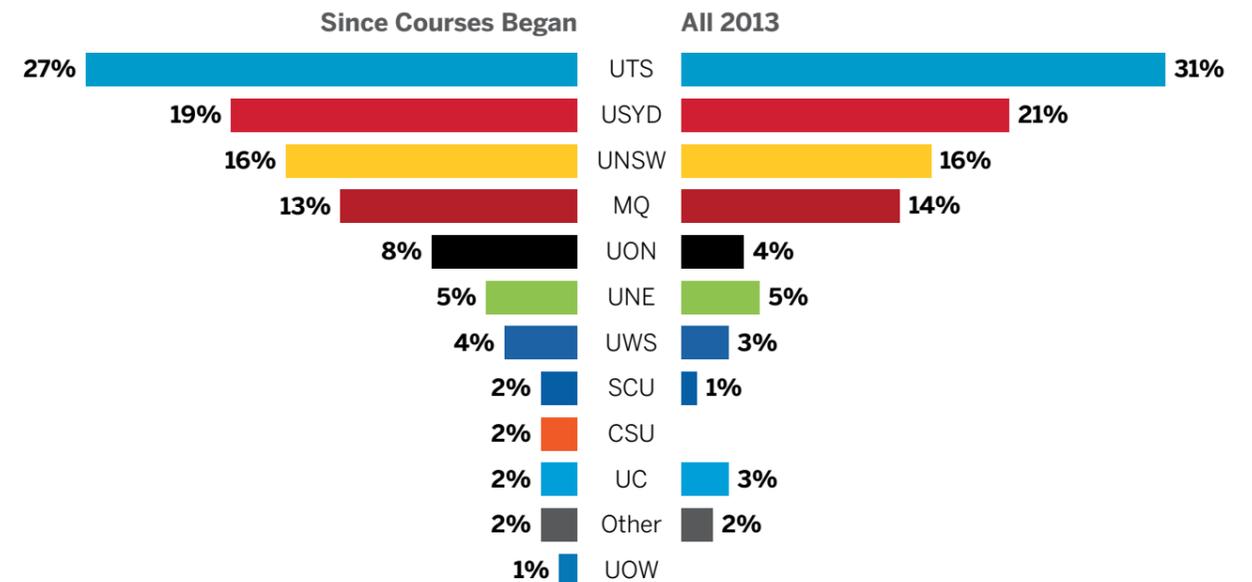
Intersect has matured its Grants service offering. Intersect assists researchers during and after grant preparation by committing infrastructure as in-kind contribution to grants, scoping software and hardware required to conduct research, and by acting as a development and infrastructure partner during the execution of grant-funded research. In 2013, Intersect assisted in the preparation of 30 grant proposals, across each of these areas, and committed approximately \$5.4m of infrastructure and professional services to them. This new service is growing rapidly; we expect at least a three-fold increase in activity next year.

Research Data Management

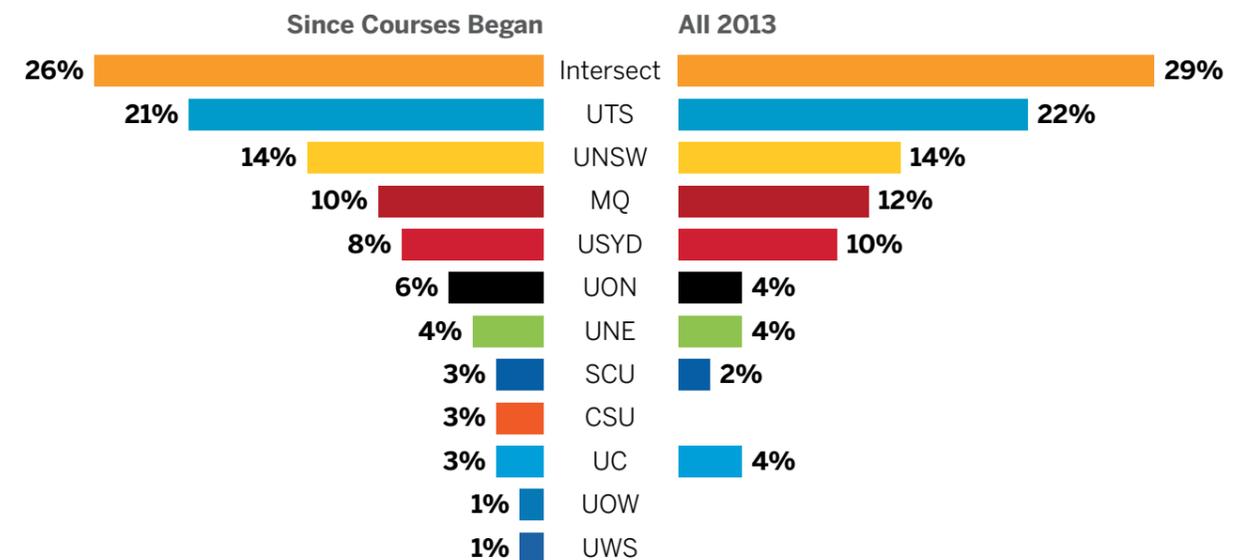
Through the RDSI project, and in partnership with ANDS, Intersect assists members manage their research data from policy, procedural and infrastructure points of view. Intersect assists researchers and institutions to make applications for research data storage, design the services that provide access to research data, and ingest their data into storage technology that offers long-term stability, security and access for research data.

Assistance has been provided in project management and oversight, policy and procedural development for research data management, infrastructure design and piloting for research data storage services.

Training Attendance



Course Venues



HPC support

All eleven member universities use our HPC facilities. Some of the diverse projects we support include:

- » designing improved antioxidants to stave off age-related diseases such as diabetes and Alzheimer's disease
- » studying turbulent combustion in next generation engines and combustion of new fuels
- » risk modelling of future air transport system for sustainable air traffic growth
- » studying tropical cyclone formation

Services

- » transport of groundwater contaminants through fractured soils
- » genomic analysis of schizophrenia and
- » real-time dose evaluation for radiation therapy.

Intersect provides member institutions with cost-effective and efficiently administered high performance computing capacity. It is strategically positioned to provide both computation scale that is otherwise unavailable to the majority of researchers in NSW, and a pathway to national peak facilities for those researchers who are capable of using that scale. Intersect's investment in HPC is predominantly subsidised through a series of LIEF grants, which enables Intersect to provide HPC services at reduced cost to its members. Intersect has a 100% success rate in LIEF applications to fund its HPC program. Members increasingly rely on Intersect as an alternative to providing institutionally managed HPC facilities.

Research impact of Intersect's HPC facility is assured through two mechanisms:

- » Intersect's strategy for HPC is to target high-quality research that is enabled by the application of high performance computing. The Resource Allocation Committee is a member-representative committee of domain experts that allocates time on HPC based on research merit and its applicability to HPC. The charter of the committee includes fostering the uptake of HPC by new users.
- » the architecture of Intersect's HPC facilities is driven by the research requirements of our members. As the research requirements of Intersect's members change, so too does the nature of Intersect's HPC infrastructure.

In 2013 we assisted in 90 different research projects using HPC, approximately half via troubleshooting and advice, and the other half in installing and upgrading software.

Intersect delivers a variety of benefits via HPC:

- » **Leverage** - approximately two thirds of Intersect's HPC capacity is provided through a partnership with the National Computational Infrastructure. This is funded through LIEF and member contributions, and leverages \$85M of investment in NCI through EIF SuperScience, LIEF and NCRIS programs. This model provides the maximum national economy of scale for HPC for our members.
- » **Flexibility** - approximately one third of Intersect's HPC capacity is managed directly by Intersect. This gives Intersect the flexibility to provide specialised HPC services, for example for disciplines that require large memory architectures. We have a lower barrier of entry and provide more support to users who can then take on use of national peak facilities.
- » **Specialisation** - we provide experienced, specialised HPC expertise in the form of technical administration and assistance, as well as experiment design and code optimisation.
- » **Common platform** - Intersect's HPC facilities are both co-located with RDSI nodes, allowing high-speed access to both large-scale research data owned by researchers, and significant international datasets.
- » **Efficiency** - Intersect's shared services model allows for collaboration between researchers at multiple institutions without the need for any single institution to bear the administrative overhead of providing core infrastructure.
- » **Effectiveness** - members can co-invest in our HPC facilities to dedicate HPC to their research cohort and allow seamless access and scale to the wider HPC infrastructure as required.

RESEARCH IMPACT CASE STUDY

PROTEOMICS AND GLYCOMICS

Intersect first engaged with Prof Marc Wilkins and his team at the School of Biotechnology and Biomolecular Sciences at UNSW in 2008. In 2009, when ANDS called for applications to their data capture program, Intersect was central to the UNSW response. Using ANDS funding as well as funding through the Intersect 'innovation program', Intersect engineered the Genomic Data Analysis system that addressed data management needs for the next-generation sequencing community for UNSW and Southern Cross University.

In early 2013, Intersect helped Prof Wilkins develop an innovative tool (the "Genomic Proteomic Nexus") that allows proteomics data to be efficiently used to validate gene predictions made through computational analyses of gene sequences. Intersect has also supported Prof. Wilkins and his group by providing high performance computing facilities, consultancy, and training courses from 2009 to date.

As well as making use of Intersect's HPC facilities through our resource allocation process, and being a regular CI on our LIEF grants, Prof. Wilkins is also a co-investor in our HPC facility *Orange*, which provides professionally managed HPC capacity to his research group.

UniCarbKB is an online collaborative information storage and search platform for glycomics and glycobiology research that has been developed over the past 3 years, using both ANDS and NeCTAR funding. In both cases, Intersect was instrumental in securing the funding.

Intersect has also provided a variety of skills in the project's execution including analysis, project management and specialist interface design and

development. We will further support this project by storing all the project data on the Intersect RDSI node and providing hosting of the application via the Intersect Research Cloud. UniCarbKB contains entries for 864 related publications and 3238 structures.

” *It's immensely helpful to work with Intersect as a provider of High Performance Computing. When we go to use the computers we don't need to worry about system administration issues, we don't need to worry about network administration issues, we don't need to worry about user administration issues, we don't need to worry about how information is going to be backed up and stored from those computers. That's all taken care of in the package of support that Intersect provides. So essentially it means that my researchers can concentrate on doing their research”.*

Professor Marc Wilkins, Director Ramaciotti Centre for Genomics



RESEARCH HEALTH IMPACT AND CASE STUDY BIOBANKING

The Australian Government places a strategic emphasis on the well-being of the Australian community, while the NSW government promotes health and clinical research through a network of medical research institutes. In line with this, Intersect has worked with the existing capabilities of several NSW medical research institutions to develop and deliver effective ICT-enabled platforms to enable research innovation.

Intersect's support has varied widely and includes 'technical audits' for medical research institutes including Victor Chang Institute, Centenary Institute, Woolcock Institute, and the UNSW electronic Practice Based Research Network.

In past years we collaborated with the Public Health

” *“The Intersect team provided an excellent review and audit of Centenary's IT services. The review has greatly assisted the organisation plan its IT strategy for the coming years.”*

Nick Pearce, COO, Centenary Institute of Cancer Medicine and Cell Biology

Research Network (PHRN) and the SAX institute to develop and implement a virtual laboratory for epidemiologists. The Secure Unified Research Environment (SURE), commissioned by the PHRN is a central component of the PHRN Infrastructure project, allowing brokered access to highly sensitive data, while providing complex analytical tools. Intersect assisted in the architecture, design, workflow analysis and implementation and testing of the laboratory.

A portable tablet device was completed in 2013 for

” *The final WOMBAT application achieved a superior outcome. We are now sharing this software with overseas research teams. The Intersect team displayed a high level of professionalism and our team enjoyed working with them. As a result of our experience with the WOMBAT application we have commenced another project with Intersect. We are particularly impressed with the new team assigned to work with us on the current project.*

Professor Johanna Westbrook, Director, Centre for Health Systems and Safety Research, Australian Institute of Health Innovation, Faculty of Medicine, UNSW

the Centre for Health Informatics at UNSW. Named WOMBAT (Work Observation Method by Activity Timing) it allows efficient, accurate and reliable collection of clinicians' tasks by researchers. Its successor system POSSUM was begun in 2013 and is currently under development. WOMBAT is now central to the efforts of a growing international collaboration, including research groups at UNSW, UTS, the United Kingdom and United States.



Work Observation Method by Activity Timing (WOMBAT) in use.

A data collection web service interface for the diverse network of local neonatal intensive care units was



Image courtesy of A/Prof Daniel Catchpoole, Children's Hospital at Westmead Paediatric Tumour Bank.

also completed in 2013. It assists the Australia/New Zealand Neonatal Network to monitor the care of high-risk newborn infants. This data capture project facilitates secured data uploading, data verification and feedback to the network's data providers.

Biobanking refers to the practice of warehousing tissue samples for long-term preservation and their subsequent re-distribution for research. Usually, diseased tissues are removed during medical procedures, however non-disease tissue is also stored. A significant amount of accompanying information is required to provide context about the sample and patient – e.g. clinical, demographic, lifestyle information, pathology reports and images. This information is managed by biobanks or other related organisations such as hospitals.

The power of biobanks is that they can provide access to large numbers of tissue samples required for population studies to identify underlying causes of complex genetic conditions, or biomarkers associated with different diseases.

Recently Intersect has helped individual biobanks streamline their research support operations by:

- » Preparing a successful application for ANDS funding on behalf of the Breast Cancer Tissue Bank (BCTB) at the University of Sydney, and subsequently building a tool for the BCTB to allow streamlined management of pathology images digitised on a high throughput Hamamatsu digital slide scanner. This has now been in use for two years saving considerable time.
- » Modifying the caTissue data management system for UNSW's Lowy Biorepository to store Australian-specific data (Australian ethnic groups, 4 digit postcodes), and removing

dependencies on US-centric data.

- » Helping prepare a successful funding application for storage of digital Colorectal Cancer images from the UNSW Lowy Biorepository on RDSI infrastructure and working to move the images from the Lowy onto Intersect storage. Between 100 and 1000 researchers will access this data when accessible through the RDSI.

Traditionally, biobanks (including those above) arose independently of each other, and with a particular tissue/disease focus. However linking data across biobanks and identifying samples from multiple biobanks increases sample numbers for use in study and strengthens research outcomes.

Collaborating with researchers at the John Hunter Hospital and at the University of Western Sydney Intersect helped prepare successful funding applications to the Cancer Institute of NSW. The work to harmonise biobanking information management and image storage systems began in late 2013. Harmonisation will facilitate data exchange and increase efficiency and efficacy of the cancer biobanking network in NSW, for all researchers.



Professor David Currow
CEO Cancer Institute NSW

” *The strength of Intersect, for us, is their connection across the system. Intersect, because of the all the organisations that have helped to create it and help sustain it, means that there is a vast array of people out there who really are excited about making sure Intersect works. That gives us access to a network of people who really can ensure we are at the cutting edge of key areas.*

Professor David Currow, CEO Cancer Institute of NSW

WATCH THIS SPACE RESEARCH MEETS GOVERNMENT

Opening NSW Government data to university research

Intersect has in the last year begun to work with NSW Government agencies towards opening their data to university research. The NSW Government is committed to Open Government and to the release of data sets through its ICT Strategy.

There are three key areas in which both the research sector and the NSW Government benefit each other:

- » The research sector has significant capacity, both current and anticipated, across the technical aspects of storing and releasing data. Government may be able to benefit by drawing on this.
- » An understanding of how the research sector need to use government data, and what specific government-held datasets are of greatest use, would provide a useful demand signal to NSW agencies. Identifying priority data sets may enhance research on local issues and ensure that government agencies are not subject to duplicate requests.
- » Research outputs generated by the research sector and based on government data may be valuable to government and assist in informing effective public policy and strategy. Channeling research outputs to appropriate areas of government may increase efficiency.



In April and November Intersect partnered with the NSW Government to host an Open Data forums, both well attended. above and above right.

Intersect has partnered with NSW State Government agencies to host three events engaging government and the research sector. Around 60 people attended the Sharing Government Data Forum in Sydney in April 2013, with large contingents from NSW Government agencies and the research sector – universities, CSIRO and NICTA. Headline speaker Deirdre O'Donnell, NSW Information Commissioner in opening said, "This is the start of a dialogue that is needed. It is profoundly important".



Aligned with Vivid Sydney: LIGHT, MUSIC & IDEAS, Intersect hosted 60 developers over the May June weekend as part of the first national GovHack. Nationally the competition involved over 1000 participants, 130 competition entries and \$170,000 in prize money. apps4nsw, the NSW Department of Trade and Investment and the Dictionary of Sydney attended and offered eight prizes including "Greatest Potential for Research Impact", and "Best use of NSW data".

In November Intersect partnered with the NSW Government Department of Finance and Services and the Sax Institute to host an Open Data forum, workshop on data linkage, and subsequent panel discussion, as part of the NSW Government Open Data and ICT policies. The forum featured addresses by then Minister for Finance and Services, the Hon Andrew Constance; Director General NSW Department of Finance and Services, Laurie

Glanfield; Australian Information Commissioner, Professor John McMillan AO; and NSW Privacy Commissioner Dr Elizabeth Coombs. As part of the forum, Intersect and the Sax institute hosted an Open Data workshop titled "Innovating with Open Data – Data Linkage" following on from April forum.



Intersect hosted 60 developers as part of the first national GovHack. At the end of the weekend, the participants shared the apps they had developed, many of which used government data.

NSW 2021

In the context of the NSW Government's ten-year plan NSW 2021, Intersect engaged in the following activities.

Intersect provided a submission on the draft NSW Open Data Policy discussion paper and positioned the events mentioned to raise recognition of the research sector as an important user and contributor to increasing the value of government data.

As a result Intersect was invited to present to the Enabling Information Sharing Working Group meeting on 18 July, involving senior representation from all major NSW government agency clusters. Intersect has also been invited to help plan and take an active role in promoting release of government data through the apps4nsw program. Intersect has also been invited in an advisory capacity to be a member of the Enabling Information Sharpening Working Group.

Intersect was asked to provide commentary on the draft NSW Location Intelligence Strategy pre-release. NSW Land and Property Information has also invited Intersect to be a member of its recently created industry advisory body: Location Information Leadership Advisory Committee.

Intersect has provided advice on NSW Biobanking and Bioinformatics strategies, respectively.

More recently, the Office for Health and Medical Research (OHMR) hosted a mini-forum of medical research institutes to identify how Intersect's eResearch services may benefit the medical research sector. That forum occurred in early 2014 and led to an Intersect proposal to the Federal Government to establish a national Medical Research Data Storage Facility.

Other ongoing engagements

Intersect is part of the UNSW - Lowy Institute team awarded the inaugural Big Data, Big Impact grant, co-funded by the Cancer Institute NSW, the NSW Office of the Chief Scientist and the Office for Health and Medical Research. The team from UNSW and Intersect will work on a project entitled 'Exploring the Dark Matter of Cancer Genomes'. Intersect will provide a data analysis pipeline, HPC facilities, research data storage, a mirror of the Cancer Genome Atlas, and the services of our specialists.

For the Office of the Chief Scientist and Engineer we produced a paper outlining data management issues relevant to NSW Coal Seam Gas operation, reporting and compliance. The Chief Scientist's report recommends that the "Government commission the design and establishment of a whole of environment data repository for all State environment data including all data...associated with water management, gas extraction, mining, manufacturing, and chemical processing activities."

Additional ongoing engagement involved the Department of Primary Industries, the Office of Environment and Heritage, the Australian Museum, the Department of Primary Industries, the Royal Botanic Gardens & Domain Trust and the NSW Institute of Sport.



The following projects have been identified by their Field of Research as below:



The focus of 2013 engineering work was very much on NeCTAR funded projects. Working on a number of NeCTAR Virtual Labs allowed us to achieve significant synergies and efficiencies through sharing knowledge, code and experience across the projects, thus delivering a large benefit to our members. 2013 also saw an increase in repeat business and extensions to existing systems.

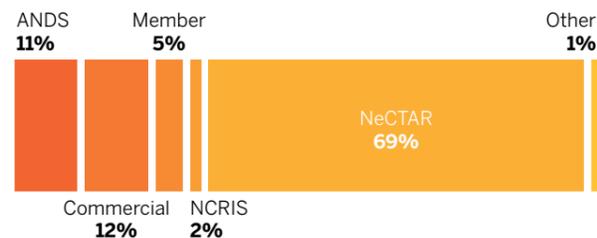
Intersect's software technology spread continues to be broad, with approximately 40% of work using Ruby on Rails, 25% Python and 21% Java. There was an increase in mobile development (both Android and iOS) compared to previous years. The range of technologies is partly a result of working on projects in partnerships with other organisations. We continue to find that the reuse of both code and knowledge on Ruby on Rails projects give us significant efficiencies, and for most web application projects Ruby on Rails is our strategic platform.

Project Type Stats



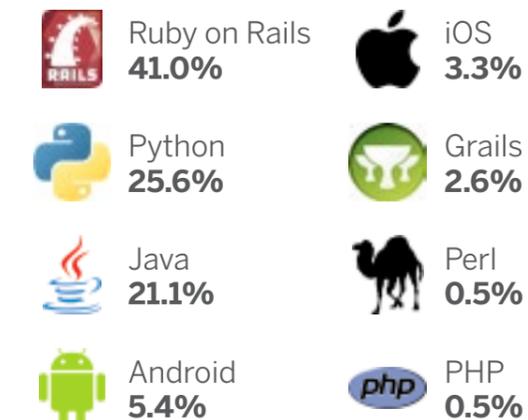
92% of engineering effort was software development with some business analysis and consulting projects.

Funding stats

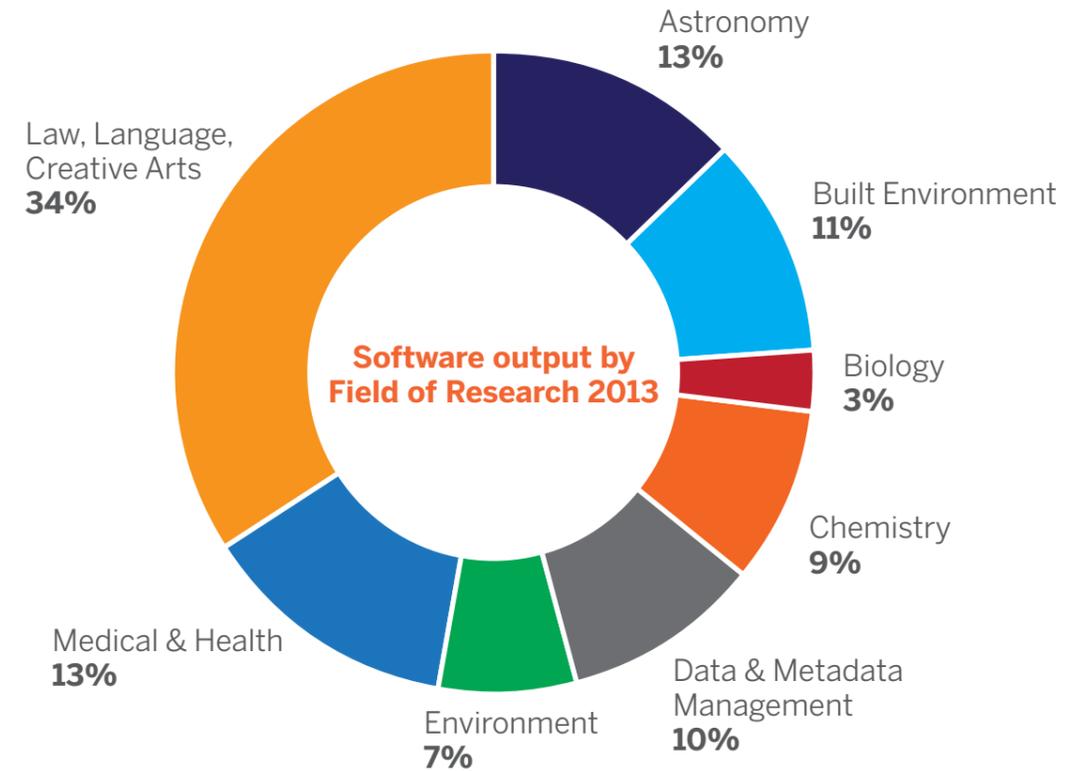


Around 70% of our engineering income came through NeCTAR funding. The remainder was spread across ANDS, member-funded, commercial and other work.

Technologies Stats



2013 saw an increase in reuse of both whole software systems and well as system components. For example, the software developed for the DC21 (ANDS) project was enhanced to suit the Faculty of Business and Economics at Macquarie University,



showing that it is a very versatile product with applications across a variety of disciplines. With a relatively small amount of effort we delivered a full-featured data capture application for the group at Macquarie University.

Many of the NeCTAR projects had common goals or underlying problems and were well suited to component level reuse. We continue to build a library of reusable components that provide benefit across projects.

In 2013 Intersect started a new initiative of half-yearly "Hackfests", one-day events involving teams building software to solve a particular problem. The solutions included: creating a shared library for AAF authentication; a quick way to deploy our applications to the NeCTAR cloud; and a number of utilities to make day-to-day software development more efficient. The outputs of two Hackfests have been very useful to the team and have been

developed for further use.

Looking ahead, we see a shift to a greater number of smaller and shorter projects. NeCTAR funding is winding down and the large virtual lab style projects will be infrequent. Smaller projects allow us to achieve high efficiency and reuse as we build a library of reusable components.

We also see a trend towards projects that reuse or enhance existing software. We have undertaken a number of these already. Enhancing existing systems and repurposing for different research needs allow us to deliver significant value to our stakeholders relatively inexpensively.

We also anticipate growth in projects that are purely integration or implementation based - for example integrating or customising best of breed open source products for particular research needs.

Member & non-member Projects

DIVER Data Is Valuable for Empirical Research



A data management tool to support marketing research conducted by the Faculty of Business and Economics at Macquarie University, this project extended the UWS Environmental Sensor Data Capture project, (DC21).

The software system is a web-based data management repository allowing researchers to store and access data in a structured manner. All related data (and associated metadata) is linked to the study conducted.

The system:

- » reduces the risk of data loss
- » increases efficiency and reduces the cost of data collection
- » increases discoverability of data
- » provides secure and centralised access to the latest data and assists with the correct interpretation of data.

Cr8it Securing, archiving and citing long-tail research data



Cr8it is a UWS initiative that aims to provide the general community of researchers with a simple and consistent way to manage, archive and advertise their research datasets. It was developed in-house by UWS and was further developed by Intersect with funding from the University of Newcastle. Cr8it is now receiving further feature development and quality assurance.

Building Value Realistic costs of building



A sophisticated IT system for the storage and management of benchmarking data based initially on the Building the Education Revolution (BER) program of school infrastructure projects. The BER P21 program is delivering over 10,000 projects in more than 7,000 schools across Australia,

and derives statistically valid comparative data on the cost, value and quality of those projects.



Radar plot display of select values in Building Value Online.

Intersect designed and developed the database application to contain, manage and enhance the Building Value project data. The database system provides users with unprecedented analysis options to determine the best value for money spent on school infrastructure. UNSW directs the consortium which includes the Royal Institution of Chartered Surveyors, Queensland University of Technology, the University of Melbourne and Intersect.

RICS LEASA Energy management for commercial tenants



RICS LEASA earned national recognition at the 2013 CitySwitch Green Office Awards for leadership in energy-efficiency. Sydney Lord Mayor Clover Moore presented the award at Sydney Town Hall.

This mobile app uses government data to assist commercial office tenants to estimate energy costs before deciding on the most energy-efficient space to lease. Aimed at small and medium sized enterprises (SME) businesses, the Android and iPhone app enables SME tenants to make comparisons and calculations of their likely energy costs based on a range of variables, including the energy efficiency of the space they lease. A complimentary web site hosts the guidance notes and mobile applications.

The 'LEASA' app was developed by Intersect for the Royal Institution of Chartered Surveyors (RICS) and funded by the Department of Climate Change and Energy Efficiency. Download from www.rics.org/leasa.

AustLII Providing skilled development staff



Intersect staff worked on developing databases of legal material and an Android app which works on both phones and tablets and is available from the Android market. AustLII is Australia's online free-access resource for Australian legal information, and is a joint facility of the UTS and UNSW Faculties of Law.

UNE Herbarium Sharing herbaria via the internet

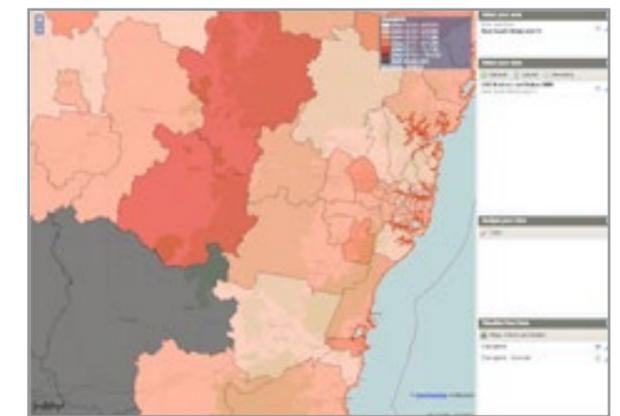


A web-based herbarium system manages the 'lifecycle' of plant specimens at the University of New England's internationally recognised N.C.W. Beadle Herbarium, making this significant collection of nearly 100,000 plant specimens more discoverable, and its database useable and manageable.

The relational database provides easy access for multiple users, with defined privileges, both on and off campus. Authorised users are able to edit data, to enter new specimens records which conform to Australian HISCOM standards and output the data in the range of required formats for production of labels, interrogation of data, delivery of data across

the web. The risk of accidental data loss has been eliminated and data errors reduced with look up tables and authoritative name libraries.

AURIN, The Australian Urban Research Infrastructure Network Integrating urban research datasets



Percentages of low birth weight babies across NSW.

An integrated database of key housing data is being drawn from a variety of sources and is known as the NSW Housing Demonstrator Data Hub. The central aim is to build a fully spatially co-referenced set of interlinked data bases on the property record of all residential properties in NSW.

The NSW Housing Demonstrator will combine online, offline and value-added datasets including those of Australian Property Monitors and the NSW



Member & non-member Projects

Department of Planning and Infrastructure Housing datasets. External access to this system is provided through AURIN, with technical work undertaken by Intersect. Intersect is providing business analysis, software development and software testing.

POSSUM analysis

Android and web app for observing drug administration in hospitals

A tablet based project in the health and medical research space, POSSUM stands for Precise Observational System for the Safe Use of Medications.



Fully operational and mobile, the POSSUM tablet app keeps collecting data when offline, syncing with a central database when back in wifi range.

The POSSUM study aims to:

- » adapt and test an observational method for measuring medication administration errors suitable for use in Australian hospitals
- » compare the type, rates and severity of medication administration error rates before and after various interventions
- » assess whether interruptions and multi tasking impact on medication administration errors rates.

(POSSUM) is being developed for the Centre for Health Systems and Safety Research, Faculty of Medicine, UNSW. Requirements analysis was undertaken by Intersect in 2013 and development will be complete in 2014.

Victor Chang Institute IT Review

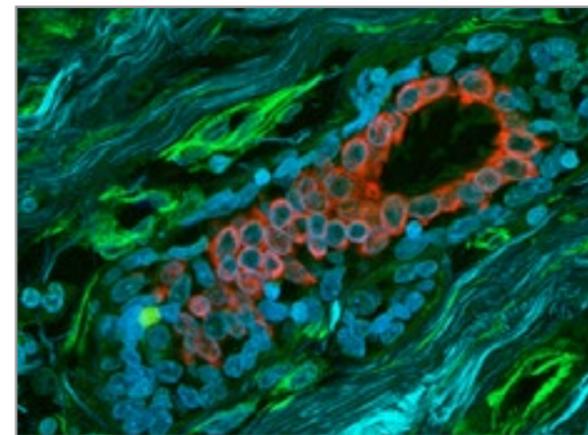
MRI IT review

In May 2013 the Victor Chang Cardiac Research Institute (VCCRI) engaged Intersect to conduct a review of the Institute's information technology (IT) systems and services. The goal of the review was to identify current issues with the Institute's delivery of IT services and to ascertain the Institute's expected IT needs for the upcoming three year period. The resulting report made a number of recommendations.

Biobank Stakeholders Network

Harmonising image and IT platforms

Biobanking refers to the practice of collection and storage of human tissue samples and biopsies for use in subsequent research projects.



A biopsy of a patient with breast cancer, the red area is a milk duct. Visualised using confocal microscopy by A. Chien, E. Kable & L. Soon, University of Sydney.

The Cancer Institute NSW's Biobanking Stakeholders Network (BSN) involves 23 biobanks. Intersect is working with the biobanks to:

- » survey the IT platforms/data sharing and pathology image capture/analysis systems in use across the BSN
- » ascertain attitudes and barriers to the harmonisation of IT and imaging platforms, and

- » prepare recommendations for implementation of streamlined IT and imaging systems across the entire BSN.

Work began in 2013 and continues in 2014. Intersect is conducting:

- » a survey of current data (including image) management systems and information standards used by all 23 BSN associated biobanks
- » a user requirements survey, which gauges levels of satisfaction with current systems. This included gathering requirements for how these systems could function more efficiently across the network, in NSW, nationally and internationally.

Ongoing work in 2014 will result in:

a report on what data (including image) management IT systems are currently in use across the BSN.

- » specifications documents that describe the BSN's views of what members believe a biobanking data management system and a image collaboration software system should provide
- » recommendations regarding best short-to-medium term approach to network BSN Biobank data/IT platforms
- » recommendations for IT/data management in establishment of new BSN biobanks.

Coal Seam Gas Data Management paper

Achieving accurate oversight of CSG activity in NSW

For the Office of the NSW Chief Scientist and Engineer Intersect delivered a background paper which argued that effective data management is an important element in achieving accurate oversight of CSG activity in NSW, contributing to real-time and long-term monitoring of environmental impact and resource management. The paper identified appropriate data management practices.

Australia and New Zealand Neonatal Network (ANZNN)

Enhancements to the web app

Extensions were added to a web service previously developed by Intersect. The service collects data through its member network of neonatal care units.



By Paul [CC-BY-SA-2.0 (<http://creativecommons.org/licenses/by-sa/2.0>)], via Wikimedia Commons.

Run-Hub

Regional Universities Network research data

This project scoped the scripting and automation of an analysis of grants and other data for the Regional Universities Network. The objective of a RUN research hub is "To enhance and promote the RUN universities' research impact by profiling the researchers, projects and collaborations that exist across the RUN universities."



Intersect's engineers at work.



The following projects were subsidised by the Australian National Data Service (ANDS). Intersect provides support for the Australian National Data Service (ANDS) through the assignment of three staff who assist with ANDS project outreach and community building at NSW universities. This enables Intersect to deliver workshops and consolidated reporting that are focused on meeting the needs of NSW partner institutions.

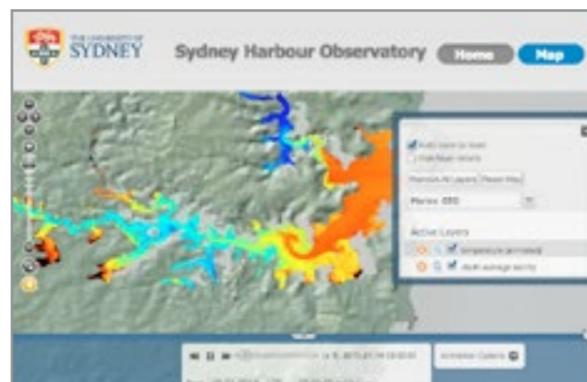
By aligning the support for ANDS services with our Member Services activity, Intersect is ideally placed to identify synergies for our partners across institutional and national eResearch programs. Intersect was instrumental in identifying synergies between the ANDS applications and NeCTAR Virtual Laboratory Programs, subsequently successfully facilitating funding for several.

Sydney Harbour Environmental Data (SHED) Project (DC2B)



Data analysis

The vision for this project run by the University



Salinity and temperature variation across Sydney Harbour. Users can select layers of data, maps and rendering styles.

of Sydney is to provide a continuous picture of harbour water properties for both public and professional use. With Internet access and assimilation of quality-controlled data, the modelled properties provide reliable information about harbour waterways and display quality

information in near real time visualisation.

Intersect contributed to the overall SHED project by engineering a system to visualise the data and enable research access. The main effort was in integrating existing software such as GeoServer, GeoNetwork, Sensor Web, 52 North SOS. Data generated will be served to Research Data Australia.

UTS Metadata Stores Project (MS22)



A university-wide metadata store

Establishing a university-wide metadata store that will be integrated with existing enterprise research information systems, this project will help UTS administer and plan research data storage and other infrastructure. The metadata store will be used to make research data available for re-use within UTS and the wider community via data harvest and discovery services such as Research Data Australia, and to ensure that access takes place in accordance with ethics approvals and licensing restrictions.

Intersect analysed, designed, built and tested the discrete units of development for MS22.

This metadata store supports the following activities:

- » manual registration of datasets by researchers and administrative staff
- » automated registration of datasets (metadata ingest) as they are collected
- » maintenance of metadata
- » feeds of metadata records made available to Research Data Australia
- » search and discovery of data collections by staff.

MS22 will be integrated with institutional sources of truth for:

- » staff identities
- » organisational units
- » research projects and grants.

Proteomic-Genomic Nexus (AP11)



Workflow and analysis/visualisation capabilities for next gen sequencing

With the large amount of genomics and proteomics data currently available there was a lack of tools to integrate data from these two fields. This project provides a new and unique 'nexus' for integrating genomics and transcriptomics data generated from next-generation sequencing with proteomics data generated from protein mass spectrometry.

Intersect developed tools which allow users to:

- » co-visualise genomics, transcriptomics and proteomics data using the Integrated Genomics Viewer (IGV)
- » validate the existence of genes and mRNAs using peptides identified from mass spectrometry experiments
- » validate alternatively spliced mRNA isoforms.

This project will result in 'omics data of different types (for example, agricultural and medical) and from multiple sources being integrated to produce an analysis resource. This will help elucidate biological and molecular function to ultimately assist in advancing diagnosis and treatment of diseases and increasing crop yields and quality.

Data Management Policy Guide (SC11)



Identify, collect, share

This Seeding the Commons project for Macquarie University:

- » investigated the best solution for research data and metadata storage at the University
- » audited existing research data collections held by the Faculty of Business & Economics and the Faculty of Arts to be assessed, catalogued and published into the Australian Research Data Commons
- » developed data management guidelines and support material for researchers.

Spectral Library (DC10)



Exposing spectral datasets

Collating and sharing spectral datasets amongst the remote sensing community to promote long-term reusability and sharing is the aim of this project. Thousands of legacy spectral libraries exist amongst multi-disciplinary communities, consisting of spectra captured from a variety of instruments.

These data are extremely valuable yet are not discoverable by others. There are also generally no linkages between the remotely-sensed data, the field validation spectra and the independent validation data (eg. vegetation moisture content for bushfire fuel assessment).



Pair programming is used by Intersect for particularly challenging software issues. One writes the code; the other reviews the code line by line.

A University of Wollongong project, the software deliverables will be of use to other research groups who also have spectral databases. Its availability will ensure any future libraries are built on specifications based on protocols and metadata requirements, thus, facilitating use and growth of the system.

Since libraries can be built at multiple scales and levels, the potential use of this development offers high return on investment, based on a common need across the entire remote sensing community.

ANDS is supported by the Australian Government through the National Collaborative Research Infrastructure Strategy Program and the Education Investment Fund (EIF) Super Science Initiative.

NeCTAR projects

The National eResearch Collaboration Tools and Resources (NeCTAR) project is attempting, on multiple levels, to provide systematic research infrastructure for important research programs. Virtual Laboratories approach this from a specific research perspective and were designed to be domain led. As a consequence each Virtual Laboratory offers a unique experience.

The Research Cloud approaches the challenge from an infrastructure perspective, and by contrast will look relatively homogenous. The eventual home of the Virtual Laboratories will ideally be the Research Cloud.

The NeCTAR Research Cloud also positions itself for the gap in institutional provision. While researchers have traditionally been supplied with desktops on which to work and HPC to scale-up their research computationally, their needs have evolved. NeCTAR's Research Cloud aims to fill the gap between the two; providing scalable commodity computing with a familiar desktop face. Intersect is one of the eight organisational node sites in the federated Research Cloud subsidised by NeCTAR.

In 2013 Intersect was involved in differing capacities and varying degrees in eight NeCTAR virtual laboratories.

The Australian Schizophrenia Research Bank Enhancements to the ASRB



Clinicians at the Schizophrenia Research Institute.

Supporting all scientists investigating schizophrenia across Australia and internationally, the Australian Schizophrenia Research Bank (ASRB) is now utilised by over 21 national & international institutes.

In 2009 Intersect rebuilt the existing database, built a web interface and tools to enable authorised researchers to search, filter and browse the database, and link metadata and clinical information. In 2012 NeCTAR funding was awarded to undertake further development and Intersect continued as the development partner through 2012-2013. For more on this project see page 37.

All-Sky Virtual Observatory Linking observational and theoretical capabilities



The All-Sky Virtual Observatory (ASVO) provides a direct link between the theoretical and observational aspects of astronomical data collection and analysis. Development is a collaborative effort between Astronomy Australia Ltd, the National Computational Infrastructure, Swinburne University of Technology and Intersect.



A composite image of a proto-cluster in the Theoretical Astrophysical Observatory. Darren Croton, Hubble Space Telescope.

The All-Sky Virtual Observatory:

- » provides access and functionality to key astronomical resources of national significance
- » links observational data archives and theoretical infrastructure capabilities in an

- » innovative fashion, enabling new approaches to astronomical research; and
- » establishes a platform from which to optimally exploit the exponential growth in astronomical data in the coming decade. For more on this project see page 38.

Federated Archaeological Information Management System



Unearthing Android's potential for archaeology
The Federated Archaeological Information Management Systems, (FAIMS) project builds tools for Australian researchers to facilitate digital data collection in the field, their processing and archiving online.



Dr Adela Sobotkova comparing the collection capabilities of the new Android version of FAIMS against its predecessor in Greece.

The system allows data from field and laboratory work to be born digital using mobile devices, processed in local databases, extracted and exchanged online.

Key features include:

- » offline multi-device recording
- » rendering locally stored maps
- » customised recording per research project
- » complete multimedia integration to the record.

FAIMS includes an Android application and Ruby server built by Intersect.

This project was led by UNSW in collaboration with 40 Australian and overseas university partners. For more on this project see page 39.

Alveo, the Human Communication Science VLab Above and beyond speech, language and music



Steve Cassidy (MQ) and Dominique Estival (UWS) testing Alveo.

Focusing on the manner in which humans communicate with each other via speech, music, text and audio, this UWS led project will allow a diverse range of researchers to access corpora and analytical tools, and share their analyses.

Human Communication Science research encompasses areas such as speech science, computer science, behavioural science, linguistics, music cognition and musicology, and sonics and acoustics. The cross-disciplinary nature of the tools and corpora in Alveo promises to facilitate research that will provide new insights into old problems, and involve novel combinations of old ideas to approach new problems. For more on this project see page 40.

The Characterisation Virtual Laboratory Exploring the nexus between structure, chemistry, function & properties



Integrating Australia's research imaging equipment with its computational and data storage infrastructure will create a powerful Australian

NeCTAR projects

platform that is essential to the future capability of Australian scientists who “explore inner space”. The Characterisation Virtual Laboratory (CVL) connects Australia’s imaging equipment, specialised HPC capabilities provided by MASSIVE and NCI, with data collections, and a common desktop environment for analysis and collaboration.

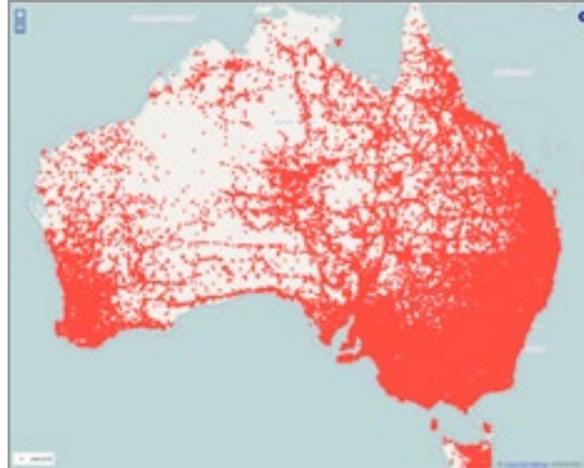
Monash University leads the overall project and University of Sydney’s AMMRF led the Atom Probe component. Intersect built the Atom Probe workbench, making use of the existing scientific software developed by the University of Sydney.

Biodiversity and Climate Change Virtual Laboratory (NeCTAR)



Modelling biodiversity & climate change

Providing a portfolio of tools, data and portals for modelling the responses of Australia’s biodiversity



A visualisation of magpie populations across Australia.

to climate change is the aim of this VLab. Headed up by Griffith University, Intersect is one of the development partners in the Biodiversity & Climate Change Virtual Laboratory (BCCVL).

The BCCVL project aims to enable a phase shift in biodiversity modelling, the application of models to virtual experiments, and the links to enable the uptake of the model outputs for adaptation planning. The BCCVL will provide an interface linking data and

model algorithms with high performance computing infrastructure, and enabling novel analyses including potential climate change impacts on biodiversity through multi-model ensemble forecasts.

UniCarb

An infrastructure for glycomics



An online information storage and search platform for glycomics and glycobiology research, this project offers a freely accessible and information-rich resource supported by querying interfaces, annotation technologies and the adoption of common standards to integrate structural, experimental and functional data.

Intersect provided user interface, technical and project management staff to the Macquarie University led project.

Humanities Networked Infrastructure (HuNI)



Australia’s cultural datasets online

Combining data from Australia’s humanities and creative arts datasets, the Humanities Networked Infrastructure (HuNI) links together information about the people, places, events and works that make up our cultural heritage. HuNI is being developed as a partnership between 13 public institutions, led by Deakin University. Intersect provided support in the form of user interface, semantic and business analysis capabilities.



All projects acknowledge funding from the NeCTAR project, an Australian Government project conducted as part of the Super Science Initiative and funded by the Education Investment Fund.

RESEARCH IMPACT CASE STUDY

AUSTRALIAN SCHIZOPHRENIA RESEARCH BANK

Developed as a resource to support all scientists investigating schizophrenia across Australia and internationally, the Australian Schizophrenia Research Bank (ASRB) is now utilised by over 21 national and international institutes.

Intersect has a long and valued relationship with the Schizophrenia Research Institute supporting their efforts to build up the internationally renowned ASRB. From 2009 - 2010 Intersect rebuilt the existing database, built a web interface and tools to enable authorised researchers to search, filter and browse the database, and link metadata and clinical information.

” *The Schizophrenia Research Institute has expertise in abundance in the areas of clinical science, neuro-imaging and genetics. It has virtually no software or IT expertise, and that is precisely what Intersect has provided for us, enabling the material and the richness of the data in our bank to be more widely available to scientists around the world.*

We have had a very good relationship with Intersect, a very smooth, harmonious working relationship between our staff and the Intersect staff. It has been a pleasure.

Professor Vaughan Carr, Director
Schizophrenia Research Institute

With increasing researcher use and over time, it became clear that further enhancement was required. Intersect identified NeCTAR funding for the development and worked closely with the ASRB group to complete the application in 2011. This application was successful and a total of \$639,000

of NeCTAR funding was awarded to undertake further development. Intersect then continued as the development partner through 2012-2013.



Since the establishment of the ASRB online database, more than 85 studies into schizophrenia have been undertaken using the database, 58 of which are ongoing. Upwards of 45 papers have been published, 27 presentations have been given at conferences as well as 3 conferences posters.

In addition, the ASRB collection was involved in a major international psychiatric genetics consortium of over 100,000 samples, which led to the replication of known genetic susceptibility loci and the discovery of several new associations. This landmark study was published in Nature Genetics and helped raise the profile of Australian research internationally.



This project acknowledges funding from the NeCTAR project.

CASE STUDY ALL-SKY VIRTUAL OBSERVATORY



Intersect's involvement with Astronomy Australia Ltd (AAL) began in 2011 when we undertook a Concept Design Study, a five-year 'eResearch' plan. In 2012 AAL retained Intersect to prepare the AAL proposal to NeCTAR for an All-Sky Virtual Observatory. The All-Sky Virtual Observatory (ASVO) proposal was successful, and during 2013 Intersect has continued its support of Australian astronomers by taking a leading role in the development of ASVO.

The ASVO project, funded by NeCTAR and AAL, is building the national infrastructure to federate Australia's astronomy datasets.

” *Rather than having me and my group try to design something that quite frankly isn't going to be anything other than a prototype, a group like Intersect can really do it right. So we have a system that works for me and works for everyone in Australia, and has the ability to be added on to and linked in with everyone else's systems in the world, so that we have a system that actually works for everyone, rather than just be a plaything. That expertise is what Intersect brings to the equation and it's expertise we simply don't have in-house.*

Professor Brian Schmidt AC, Nobel Laureate, Director of Astronomy Australia

The first element for ASVO project is TAO, the Theoretical Astrophysical Observatory. TAO leverages the Swinburne University of Technology's GPU high-performance computing cluster to generate custom synthetic universes from existing dark-matter simulations and galactic formation models. These synthetic universes allow researchers to compare theoretical models with cosmological observations. In the past the generation of synthetic universes would require manual preparation by specialist researchers and potentially weeks or months of time. Now, using TAO, astronomers from all over Australia can configure the parameters for their own synthetic universe and have it ready in a matter of days.

The second phase of the ASVO project will integrate the SkyMapper Southern Sky Survey into the federation. The SkyMapper survey will collect over 1.5PB of imagery of the southern sky and record observations of some one billion objects in the night sky. Once integrated into the ASVO, federation researchers will be able to access this first of its kind dataset with next generation data analysis tools direct from their desktops. The work to integrate SkyMapper into the ASVO has already begun with Intersect working closely with NCI, ANU and the Mt. Stromlo Observatory.



This project acknowledges funding from the NeCTAR project.

CASE STUDY UNEARTHING ANDROID'S POTENTIAL FOR ARCHAEOLOGY

The FAIMS application has the capability to radically improve the workflow of archaeology. It is a comprehensive information system, built for the digital collection and management of archaeological data, be it text, image, audio or video.

In late 2013 the The Federated Archaeological Information Management System (FAIMS) group was successful in attaining a LIEF grant from the Australian Research Council to deploy the tool Australasia wide. The system is now in its second year of development.

The system allows data from field and laboratory work to be born digital using mobile devices, processed in local databases, extracted to data warehouses suitable for analysis, and exchanged online through cultural heritage registries and data repositories. Key features of the mobile application include:

- » offline multi-device recording
- » rendering locally stored maps
- » customised recording per research project
- » complete multimedia integration to the record.

FAIMS includes an Android application and Ruby server built by Intersect and funded by NeCTAR.

Amongst the innovative aspects of the FAIMS Mobile Platform is a customisable android interface and data structures in the database. FAIMS is fully operational when offline to cope with archaeological sites in remote locations without network access. And it keeps a near identical copy of the database for users to navigate outside wifi range to continue to collect data.

The mapping software provided by Nutiteq has similar functionality to Google maps but works in an offline environment.

The android application syncs the database and attached files (e.g. videos, audios) to the Ruby server in real time. This is then propagated to other android devices to keep the data between users of the system up to date.

FAIMS uses a versioning system to keep track of all records saved and their history so people can fully recover and revert their data. Researchers can customise the language used in their modules to provide for semantically similar language terms used by different archaeologists in different settings.

FAIMS is led by UNSW, currently collaborating with ten organisations, including universities, archaeological consultancies and heritage agencies. FAIMS acknowledges funding from the NeCTAR project during 2012 - 2013. NeCTAR is an Australian Government project conducted as part of the Super Science initiative, financed by the Education Investment Fund.



Take up in the field has Intersect creating modules for practising archaeologists. The android tool is also being used in other fields where off-line data collection is required, e.g by GNS Science, New Zealand, who are "keen to continue using it". Above Rose Turnbull, of GNS Science is using the FAIMS Android app in the New Zealand Geological Survey.

RESEARCH HUMAN IMPACT COMMUNICATION CASE STUDY SCIENCE

The Alveo Virtual Laboratory provides on-line infrastructure for human communication data sets and specialised tools for searching, analysing and annotating that data.

Human Communication Science (HCS) encompasses the areas of speech science, speech technology, computer science, language technology, behavioural science, linguistics, music science, phonetics, phonology, and sonics and acoustics. In turn HCS research depends upon datasets (corpora) of speech, music, text, faces, sounds, and specialised tools by which to search, analyse and annotate these data.

Alveo connects HCS researchers, their computers, labs and universities to accelerate research by applying previously unshared tools to analyse previously difficult to access data sets.

Alveo is remarkable amongst the NeCTAR Virtual Laboratories for being multi-disciplinary and broadly supported. Designed to be used by a range of researchers across the various disciplines, Alveo involves 13 universities, 3 organisations, and 47 key investigators. Importantly those involved are supporting it via cash and in-kind commitments to allow for new tools and corpora to be added in future. Launching in July 2014, Alveo enables a quantitative and qualitative leap to increased capability, collaboration and output.

Alveo acknowledges support from the NeCTAR project which is funded by the Australian Government through its Super Science initiative and financed by the Education Investment Fund.



Steve Cassidy (MQ) with Intersect's Karen El-Azzi and Dominique Estival (UWS).

Intersect developed Alveo between Q2 2013 and Q2 2014.

Alveo provides two principal access mechanisms to the system – a web app through which users can search for and bookmark linguistic items in which they are interested, and a RESTful API which not only allows researchers to access items programmatically, but also facilitates the integration of Alveo with other tools, such as the Galaxy scientific workflow management system. Ruby on Rails was the natural choice for this – combining a fast development cycle suited to our Agile development process with the benefit of providing both web and API access through the same codebase.

The major technical issues to solve were incorporating diverse object models from different data collections, and storage management for large data collections.

The end product integrates multiple diverse technologies to provide a seamless environment.

RESEARCH AUSTRALASIAN IMPACT LEGAL INFORMATION CASE STUDY INSTITUTE

AustLII, the Australasian Legal Information Institute, provides free internet access to Australasian legal materials. AustLII's broad public policy agenda is to improve access to justice through better access to information and has become one of the largest sources of legal materials on the Internet, with over four million searchable documents.

Intersect's association with AustLII dates back to 2009 when we began providing AustLII with technical staff on a rotating basis. AustLII is Australia's most popular online free-access resource for Australian legal information, serving the needs of a multitude of users including the legal community with over 750,000 hits daily. A joint facility of the UTS and UNSW Faculties of Law AustLII was set up in 1995.

” *Intersect does provide the mechanism for people's careers. We can actually keep a pool of people without having to retrain everyone everytime. They know AustLII, and given that they may have been here before makes it much easier for us to take on those projects, which we wouldn't have otherwise taken on.*

Phillip Chung
Executive Director AustLII



Approximately 50% of all AustLII users are practising lawyers, and the rest are a mixture of academics and students, government departments and commercial organisations.

Prior to the existence of AustLII online legal information was being provided by a government-endorsed, commercially run service at a cost of up to \$720 an hour.

Today, AustLII publishes over 530 Australasian legal databases, including decisions from over 100 courts and tribunals. AustLII is one of the largest sources of legal materials on the Internet, with over 20 gigabytes of raw text materials and over four million searchable documents. It is regarded as the broadest national service that exists anywhere in the world.

As a testament to the usefulness of AustLII, the foundation receives approx. \$1M of funding by way of donations by the site's users to ensure that it remains a free service.

The AustLII website has received over 70 awards and has continually been ranked in the top ten of Australian websites by Hitwise. In the Excellence in Research for Australia 2012 report, both Sydney University and the University of New South Wales received a 5 for Law and Legal Studies (18) with University of Technology, Sydney receiving a 4.

Last year, AustLII's research impact was recognised when it was selected by the Australian Technology Network of Universities (ATN) and the Group of Eight (Go8) as one of the case studies used to highlight the impact of research produced by the Australian university sector.

Financial Report (Profit & Loss 2012-2013)

	Actual	Budget	\$ Variance
Ordinary Income/Expense			
Income			
Membership Subscription Fees	2,497,500	2,500,000	-2,500
Affiliate Membership Fees	40,000	40,000	0
PFC Consulting	292,212	267,600	+24,612
Full Member Project Fees	159,865	858,840	-698,975
Affiliate Member Project Fees	39,520	150,900	-111,380
ANDS Project Fees	736,554	393,230	+343,324
NECTAR Project Fees	1,789,652	1,774,630	+15,022
Non-Member Service Fees	588,326	269,981	+318,345
Hosting Fees	10,842	20,000	-9,158
Other Research Projects	25,675	231,413	-205,738
Other Income	18,750	20,000	-1,250
RDSI SLF Grant	320,000	320,000	0
RDSI Member Contribution	265,000	272,000	-7,000
RDSI Income	52,400	894,000	-841,600
RDSI Science DMZ Income	82,028	0	+82,028
HPC Income	150,179	0	+150,179
Recharges Income	7,490	0	+7,490
Total Income	7,075,992	8,012,594	-936,602
Gross Profit	7,075,992	8,012,594	-936,602
Expense			
Resourcing Costs	5,261,865	5,625,069	-363,204
Network & Telecom Costs	892,297	704,232	+188,065
Membership & Licence Costs	39,915	10,300	+29,615
Occupancy Expenses	341,532	342,776	-1,244
External Professional Services	132,598	151,000	-18,402
Marketing & Promotions	36,862	50,000	-13,138
Travel & Entertainment Expenses	141,469	135,100	+6,369
Insurance	47,568	38,445	+9,123
Office Expenses	51,750	40,000	+11,750
Other Expenses	6,450	5,500	+950
RDSI Expenses	50,000	330,000	-280,000
Total Expense	7,002,307	7,432,422	-430,115
Net Ordinary Income	73,686	580,172	-506,486
Other Income/Expense			
Other Income			
Interest Income	34,351	60,000	-25,649
RDSI SLF Interest Income	19,394	22,000	-2,606
RDSI Interest Income	33,607	13,000	+20,607
Total Other Income	87,353	95,000	-7,647
Other Expense			
Depreciation & Amortisation	88,894	73,346	+15,548
RDSI Depreciation	364	594,000	-593,636
Total Other Expense	89,257	667,346	-578,089
Net Other Income	-1,905	-572,346	+570,441
Net Income	71,781	7,826	+63,955

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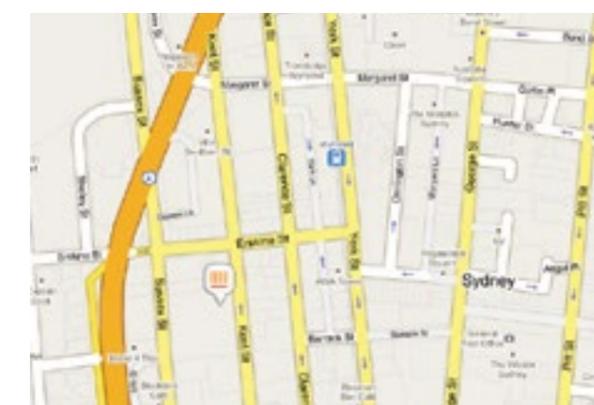
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