



Australian Research Data Commons

Australian National Research Cloud

Building a Scalable, Flexible, Interoperable Federated Cloud to Power Australian Research

The Nectar Research Cloud is part of the Australian Research Data Commons, which is supported by the Australian Government through the National Collaborative Research Infrastructure Strategy to establish eResearch infrastructure in partnership with Australian research institutions, organisations and research communities.

PRESENTED BY

Jo Morris, User Support Manager, Nectar Research Cloud and Storage, ARDC

Overview

- A bit of history and background of the Nectar Research Cloud & ARDC
- How the Nectar Research Cloud operates today and the services it offers
- Challenges – Past, Present and Future
- Benefits and Lessons Learnt
- Future goals of the Nectar Research Cloud and ARDC

Nectar Research Cloud

Enhance capability and productivity of Australian research by:

- Facilitating knowledge-centred innovation
 - Innovative infrastructure enabling innovative research methodologies
 - Democratising access to *sophisticated digital methods*
- Accelerating access to research infrastructure, data, tools and models
 - Bringing together access to *modelling and observation*; platforms, tools and applications to derive knowledge from data.
- Removing barriers to collaboration
 - Supporting cross-institutional and international research collaboration
 - People build collaborations - technology can reduce barriers to collaboration
 - Self-service, on-demand access to computing infrastructure

Nectar Virtual Laboratories

Climate and Weather Science Laboratory - *Integrated environment for climate and weather science modelling and data*

Lead: Bureau of Meteorology – 6 Partners

Genomics Virtual Lab - *Easy access to Genomics tools and resources for Australian biologists.*

Lead: University of Queensland/University of Melbourne – 9 Partners

Endocrine Genomics Virtual Lab - *Statistical power for clinical research*

Lead: University of Melbourne – 7 Partners

Marine Virtual Lab – *Ocean observations and modelling to improve planning for marine and coastal environments.*

Lead: University of Tasmania – 8 Partners

All Sky Virtual Observatory – *Theoretical and observational astronomy data, simulations and tools accessible from your desktop*

Lead: Astronomy Australia Limited – 4 Partners

Biodiversity and Climate Change Virtual Lab – *Simplifies biodiversity-climate change modelling.*

Lead: Griffith University – 18 Partners

Humanities Network Infrastructure – HuNI – *Integrating 28 of Australia’s most important cultural datasets*

Lead: Deakin University – 13 Partners

Characterisation Virtual Lab – *Integrating Australia’s key research imaging instruments with data and analysis tools on the cloud.*

Lead: Monash University – 11 Partners

Geophysics Virtual Lab – *Easy access to geophysics workflows, simulations and datasets.*

Lead: CSIRO – 7 Partners

Alveo – Human Communications Sciences – *Studying speech, language, text, and music on a larger scale*

Lead: Western Sydney University – 16 Partners

Industrial Ecology Virtual Laboratory – *Supporting comprehensive environmental carbon footprinting and sustainability assessments*

Lead: Sydney University – 9 Partners

Infrastructure
partnerships
Government EIF &
NCRIS Funding: \$18.4M
+ \$17M co investment

More details - <http://nectar.org.au>

Virtual Laboratory Case Studies

Genomics VL

"This is the best exemplar of this kind of platform in the world... Genomics capability for the masses."

Associate Professor Andrew Lonie,
Director, EMBL-ABR.



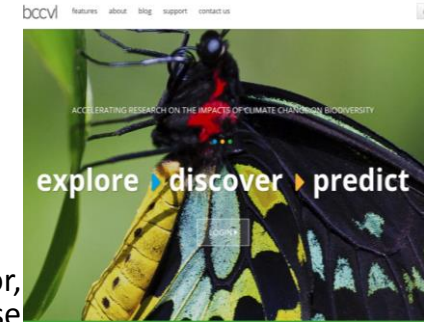
The **Peter MacCallum Cancer Centre** is using the GVL in the NeCTAR **Research Cloud**, providing instant access to Genomics tools and data for Australian biologists

BPA

Biodiversity and Climate Change VL

"..decreases the time to complete biodiversity analysis from 2 months to 5 minutes, supporting new applications in research, government and industry."

Professor Brendan Mackay, Director,
Griffith Climate Change Response Program



Accelerating biodiversity–climate change modelling across large disparate datasets quickly and easily on the **Research Cloud**.

TERN

Virtual Laboratories are:

- Accelerating research
- Bringing together **observation** and **modelling**
- Removing barriers to collaboration
- Leveraging the Research Cloud for wide access

Marine VL

"MARVL enables researchers to start thinking about their problem sooner."

Dr Roger Proctor, Director e-Marine Information Infrastructure Facility.

Ocean observations and modelling for marine and coastal environments

Ian Coghlan is studying coastal erosion. **MARVL saves him 3 months effort** to access local data, wave model simulations and computing resources.



IMOS

ardc

australian research data commons

Built from    www.rds.edu.au

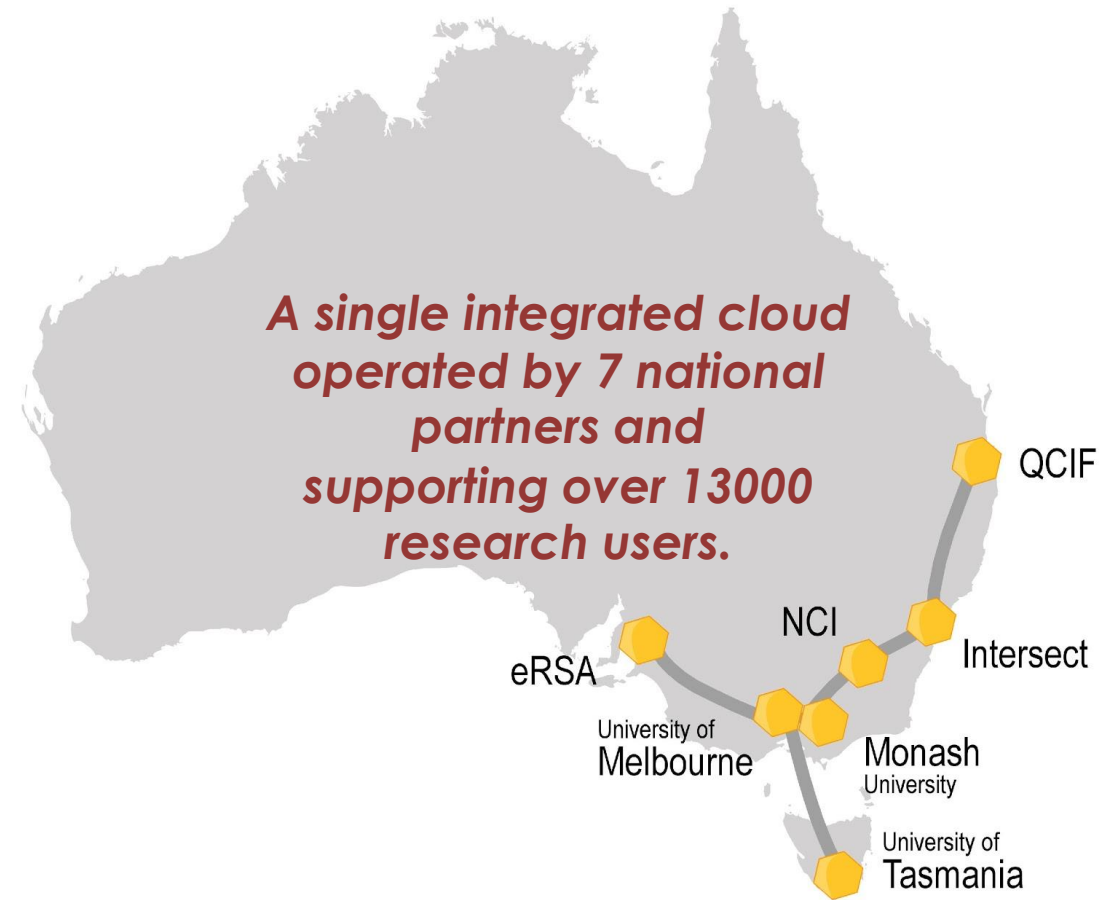
Our Vision

Transforming Australian Research together; Towards an Agile, Interoperable & Sustainable eResearch Infrastructure Ecosystem for Australia.

The Nectar Research Cloud Federation

The Nectar Research Cloud is a partnership between 7 institutions and research organisations who are operating Australia's first federated research cloud.

- University of Melbourne
- National Computation Infrastructure (NCI)
- Monash University
- Queensland CyberInfrastructure Foundation (QCIF)
- eResearch SA (eRSA)
- University of Tasmania
- Intersect, NSW



Nectar Cloud Federation

A single national cloud interface

- *OpenStack cells* to support 7 regional sites
- Other institutions have joined with their own resources (Swinburne, Auckland, UTS, RMIT)
- Users can request a specific site – or *deploy anywhere*.

National services

- Cloud dashboard (Horizon) and API
- Authentication (Keystone, AAF)
- Image repository (Glance)

Federated services

- Object store (Swift)
- Compute (Nova) and volume storage (Cinder)
- User support, help desk, user guides, documentation



Nectar Cloud Services

OpenStack Higher Level Services

- Data Processing Service (*Sahara*)
- Database Service (*Trove*)
- Application services (*Heat, Murano, Magnum*)
- Advanced networking - floating IPs, load balancers, software-defined networks, routers (*Neutron*)
- Shared Filesystem Services (*Manila*)
- Containers Orchestration Service (*Kubernetes*)

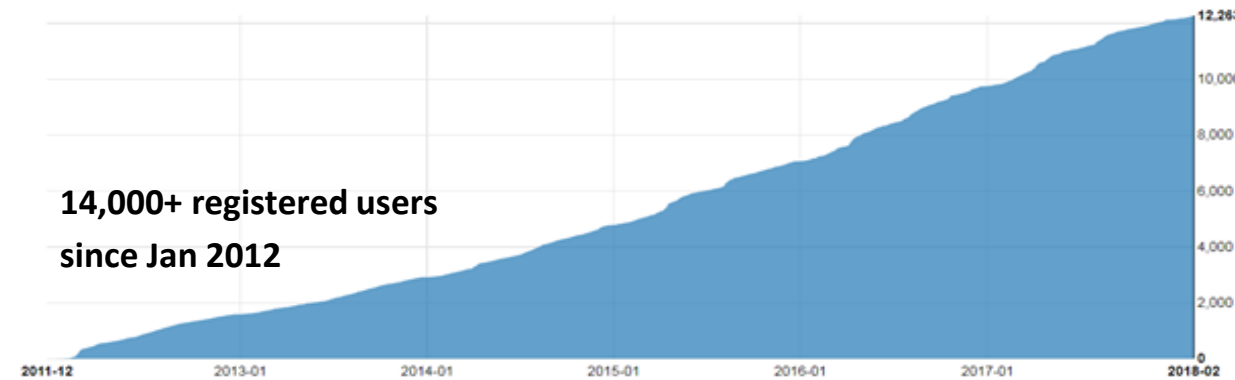
National and local resources

- Nationally and locally funded cloud resources
- National and/or local resource allocations
- National standards and local customisations
- Standard and specialised instance configurations (GPUs etc)
- Nectar Official Images and community contributed images



Usage

Provisioning resources at scale to researchers



- 7500 VMs in use now
- 28,000 cores in use now
- 2000 users running VMs now
- 4000 users ran VMs last year
- Tens of thousands of users of VMs and services
- 200 new registered users per month
- 2500 project allocations
- 700 multi-institutional allocations
- 300 projects with national grants supported



SEARCH THE EHELP SITE HERE



The eHelp portal incorporates both Nectar support services and RDS support to form a national unified RDS/Nectar user support service. The support portal allows users to obtain support from one location for both RDS and Nectar Services. You can search using the search bar above, or if you can't find what you're looking for then please ask for help through our many support channels, which include email, live chat or phone us 1300 080 431 from 9AM - 6PM AEDT.

QUICK LINKS

- Data Storage Basics
- Cloud Basics
- Applying for Storage
- Cloud allocations

POPULAR ARTICLES

- Accessing Instances
- Transferring Data to your VM
- Introduction to Cloud Storage
- Nectar Dashboard
- Backing Up Data

[ASK FOR HELP](#)[CHECK ANNOUNCEMENTS](#)[DISCUSSION FORUMS](#)

support.ehelp.edu.au

NeCTAR Research Cloud Ops Team

- ...a federation of 7 operators (~ 16 FTE total)



Core Services



Cloud Operators



Distributed Help Desk

Reflections – Federation and Support

- User Support crucial
- Building a culture across the federation that supports knowledge sharing and development
- Mechanisms to evaluate provision of services and support
- Continual Service improvement
- Have to make it straightforward and worthwhile for organisations to federate into a national service

Federation Challenges – Going Forward

Collaboration is great but not always easy

Federated organisations in Nectar are all very different

Need equitable model for resource allocation and co-investment/charging

Have to make it worthwhile to federate into a national service

Security, access

Security challenges with broad access self-service vs managed service

Patches and incident response within Nodes and across the federation

AAF authentication is great but doesn't easily cover all collaborators

Future Directions: Interoperability

Goals

Make it easy for researchers to collaborate and share infrastructure, data, applications across institutions, states, countries, research domains

Through involvement with

OpenStack Scientific Working group

Research Data Alliance Global e-Infrastructures Interoperability Working Group

Open Research Cloud initiative

Public clouds

Other research clouds

Working with NZ institutions to develop an interoperable NZ research cloud

REANNZ Tuakiri allows easier Trans-Tasman collaboration and NZ unis to join Nectar

Future Directions: ARDC

- National Research Infrastructure Roadmap highlighted increasing need for eResearch, including cloud computing and research data storage
- Recommended more alignment between existing eResearch organisations, and with international activities especially EOSC
- Already combined ANDS/RDS/Nectar projects targeted at research disciplines
- Now working on better integration of national cloud, storage, and data services and alignment with institutional eResearch services
- Long-term sustainability and capital funding are major issues - being addressed with the formation of ARDC and allocation of future funding

Other Future Activities

- Making research cloud services easier to use
- Aiming to improve support for higher-level cloud services, e.g.
 - Data analytics including Jupyter, R Studio, etc
 - High-throughput computing
 - Managed services and platforms
- Better integration of cloud with external storage services and repositories
 - E.g. simpler access to Cloudstor for users
- Improving support for requirements of research domain areas and NCRIS research infrastructure programs
- Hybrid cloud and multcloud support



<https://www.youtube.com/watch?v=QXvQjDa4WJo>



Australian Research Data Commons

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