Galaxy AUSTRALIA

An Australian open-source tool and workflow platform

Melbourne Bioinformatics
BIOINFORMATICS + DATA SERVICES + INFRASTRUCTURE, FOR LIFE SCIENCES TODAY

QFAB
qcif
BIOINFORMATICS | BIOSTATISTICS | BIODATA | BIOIT

ARDC
Australian Research Data Commons

BIOPLATFORMS AUSTRALIA

2019 iAWARDS
Queensland iAward Winner

Galaxy AUSTRALIA

Biosciences: the nature of the Australian research community

30,000 health/biosciences researchers

18,000 health/biosciences HDR students

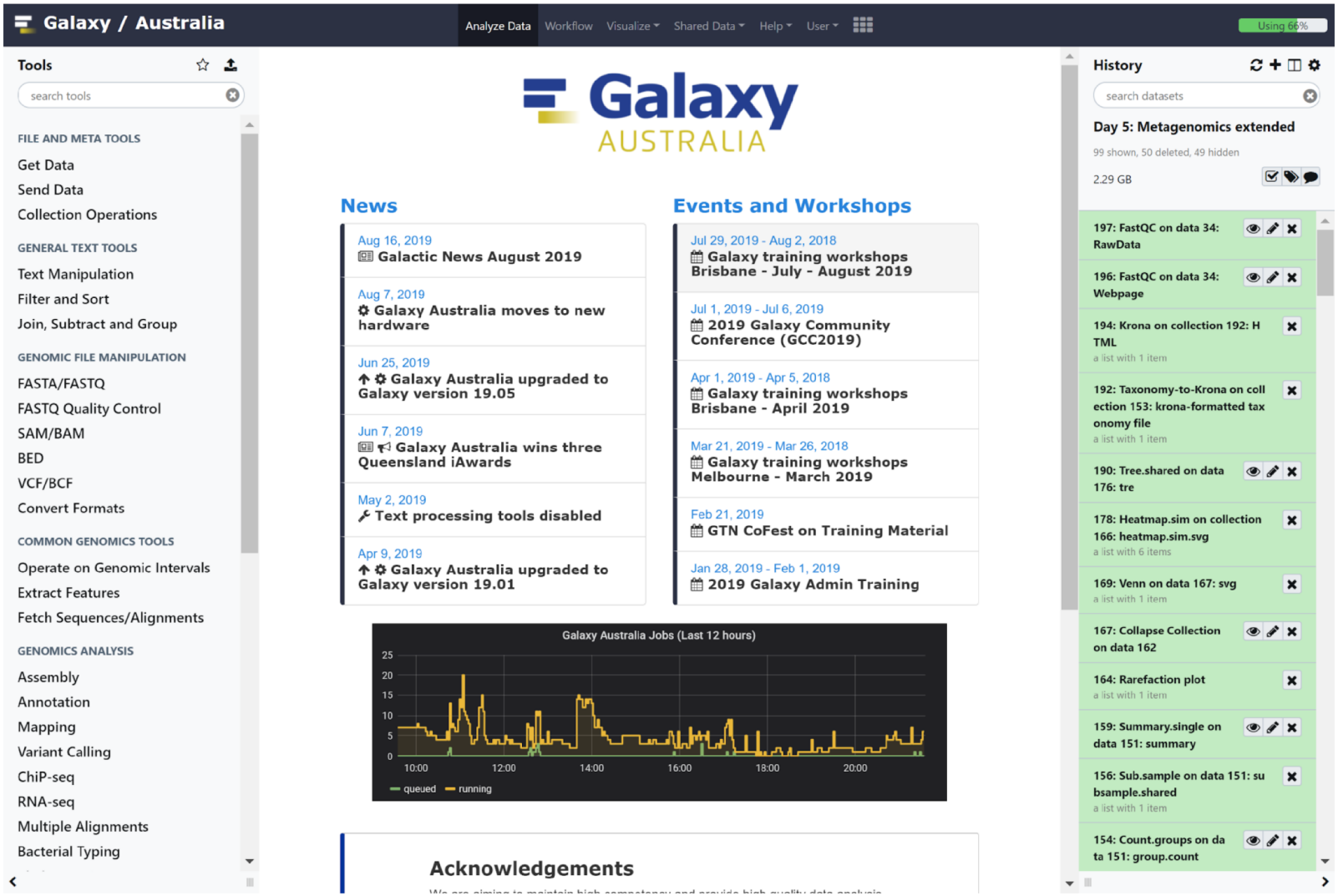
48,000 health/biosciences PG course work students

(163,000 + 40,000 =) 200,000 health/biosciences UG students

1,000 to 1,500 bioinformatician/computational biologists

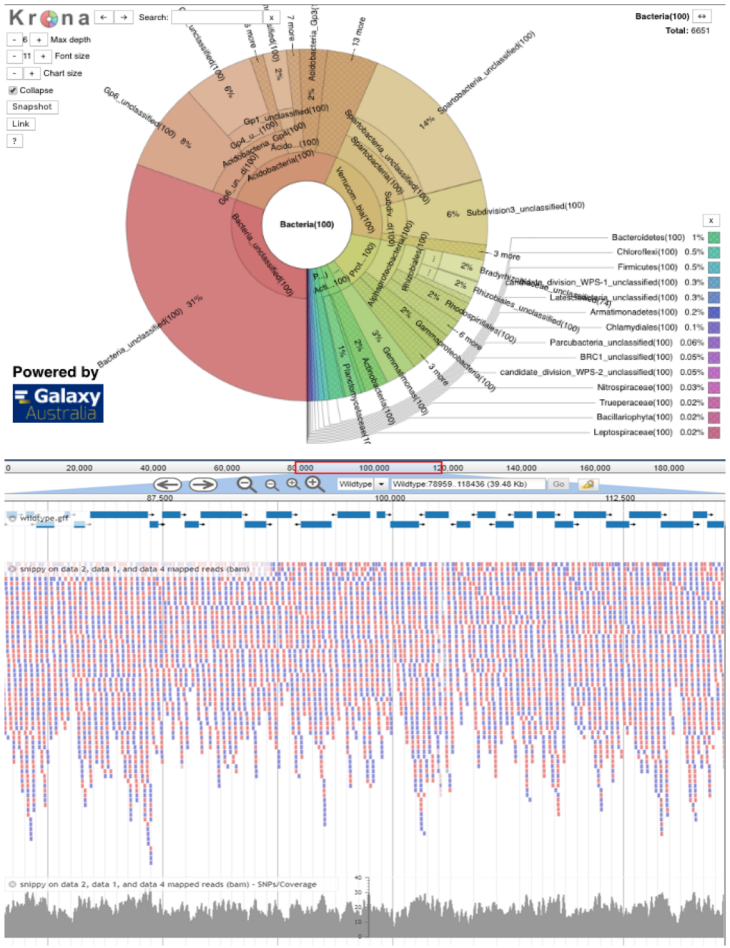
=> the IT smarts need to be packaged up and delivered cleanly

usegalaxy.org.au

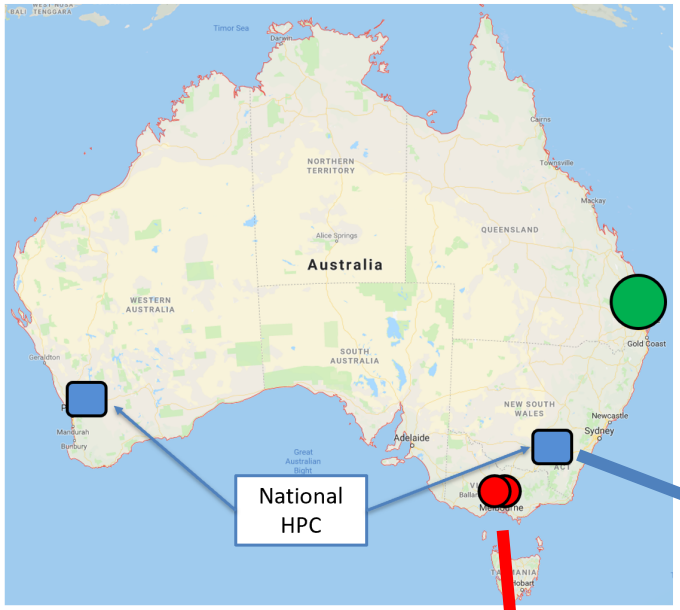


Taking the IT out of bioinformatics

- 946 tools supporting analysis applying more than 200 reference datasets
- simple data upload with optional rule based data management
- retains “histories” of analyses
- a large number of cutting edge tools
- an app store (over 7,000 tools)
- All aspect peer reviewable and transparent
  - Workflows
  - Citations / origins
  - Histories
  - Data



Galaxy Australia – distributed architecture



Brisbane

Head Node - m2.xlarge

2 x web handlers
4 job mules - 1 farm

DB Server - m1.large

PostgreSQL

Training Jobs

Large/Long Jobs

Services server
Slurm controller
NFS server

GPFS Storage

Slurm queue: main

Worker Node - m1.xxlarge

Worker Node - m1.xxlarge

Worker Node - m1.xxlarge

...

Worker Node - m1.xxlarge

Workers are **minimal** GVL image, version controlled, updated, with telegraf. Can be swapped into cluster by draining and re-deploying.

Head Node m2.xlarge

Worker Node m1.xlarge

Worker Node m1.xlarge

...

Worker Node m1.xlarge

NFS & CVMFS Refs

Melbourne Pulsar

Head Node m2.xlarge

Worker Node m1.xxlarge

Worker Node m1.xxlarge

...

Worker Node m1.xxlarge

NFS & CVMFS Refs

Canberra Pulsar

Slurm Queue

Pulsar Queue

DB/Disk Activity

Galaxy AUSTRALIA

Community Impact Summary

A complete bioinformatics analysis platform with:

>621k bioinformatics jobs run

946 bioinformatics tools

213 reference genomes

... and on average 2 new tools or references added weekly on user request

Supporting published research across many areas:

- Cardiac
- Toxicology and Drug Discovery
- Cancer
- Vision
- Agriculture and land management
- Obesity
- Ecology
- Infection and immunity
- Evolution

54 publications mentioned the GVL

31 studies used the GVL in their publication

An active and engaged user community

4545 registered users.

724 active users (last 90 days)

User growth 2016 - 2019 Q2

Registered users in Australia from:

30 Australian Universities

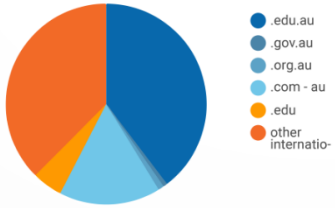
22 Medical Research Institutes or Organisations

19 Other Research Organisations

4 teaching courses utilising GVL annually

1064 people trained in hands-on workshops

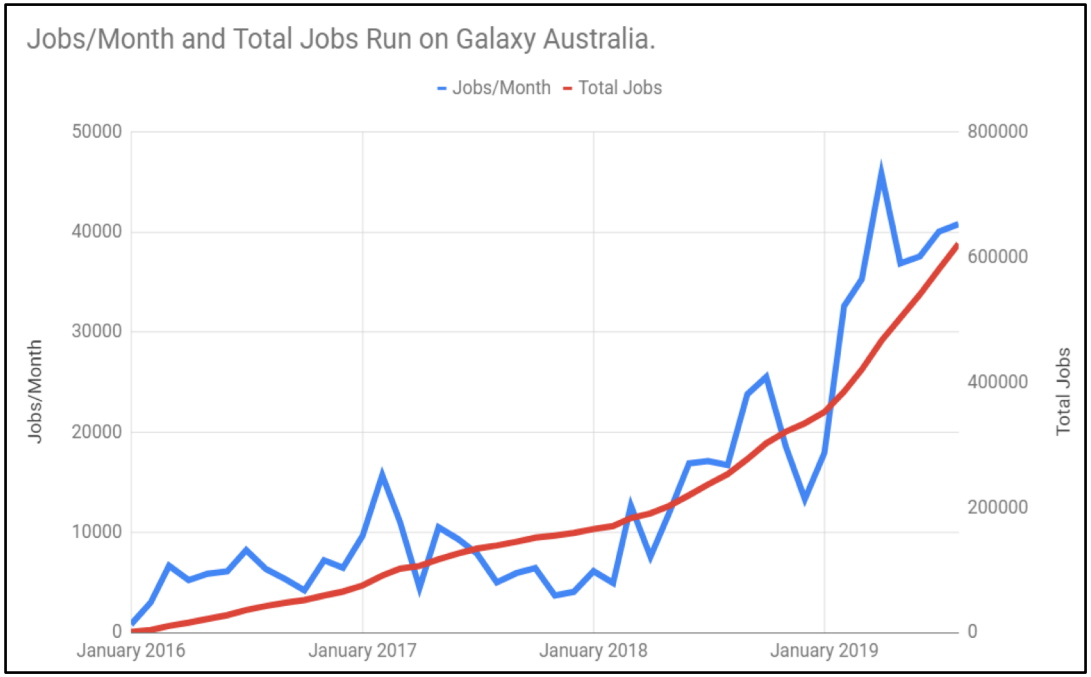
Users per domain



Users represented across 420 organisations

Users represented across 49 countries

Community Impact



"We have sequenced well over 500 transcriptomes and genomes, and routinely use Galaxy Australia for many bioinformatics processes.

It is easy to use, has high computational power, a sophisticated support structure and enables global collaboration through straightforward data sharing.

We greatly appreciate the service."

Dr Fabio Cortesi & Prof Justin Marshall, Queensland Brain Institute

Solutions for Data Analysis

- **Freeware**
  - Galaxy
  - R Studio
  - Command Line / HPC

Most equivocal solution

Galaxy Australia user numbers (as of Sept 2018 - 2268) as CLC-Bio users is a difference of 750k funds (+750K in kind) vs approx. $11million annual licence fees

This does not include the cost of computers to support CLC-Bio installations

- **Commercial**
  - **Office**
    - Excel
  - **Agilent**
    - Cartagenia Bench Lab for Molecular Pathology
  - **Illumina**
    - BaseSpace
  - **Qiagen**
    - CLC-Bio Suite of Analysis Products
  - **ThermoFisher**
    - Ion Reporter

Galaxy AUSTRALIA

Growing our Australian Community

- Ongoing funding (for 4years) with a view to establish an enduring national research infrastructure
- adding to service functionality by adding metabolomics and phylogenetics
- greater security through institutional authentication, linking this to higher resourcing for authenticated users
- providing data sharing and data movement options through AARNET Cloudstor
- anticipating needs of other additional communities – esp. single cell and genome assembly
- adding new resources: Galaxy slave servers (aka Pulsars) around the country

METABOLOMICS AUSTRALIA

OMG OZ MAMMALS GENOMICS

AUSTRALIAN ACCESS FEDERATION

aarnet Australia's Academic and Research Network

usegalaxy.* - a global platform and support network

Distributed reference data between .* servers

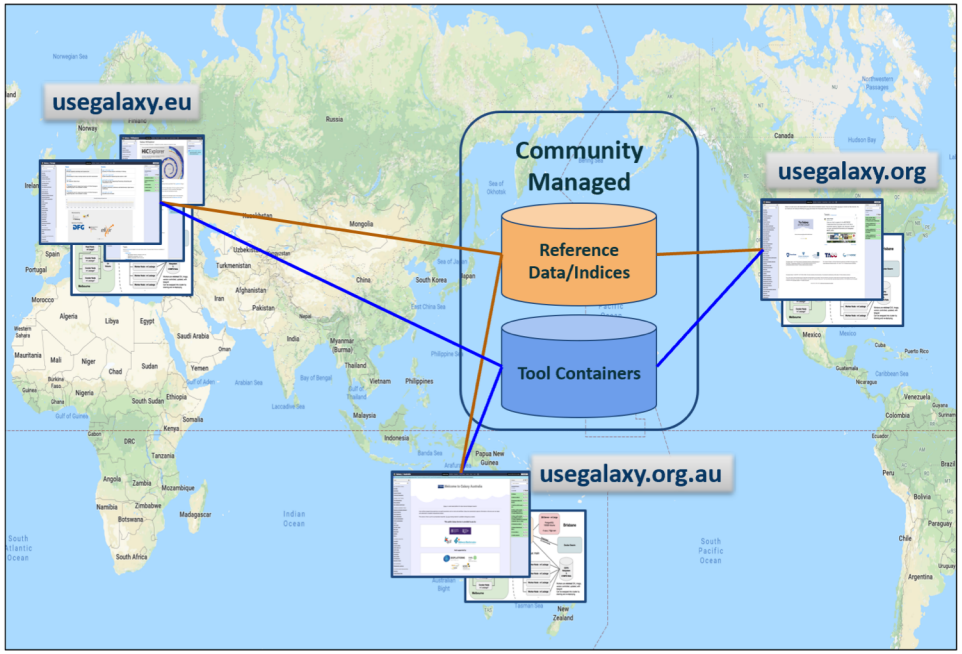
- reduced System Administration per locale
- Australian contribution to global efforts
- users are not restricted to “local” content

Intergalactic Data Commission

- formed in 2018
- regulation, automation and documentation of the CVMFS reference collections
- Australian representation on the IDC

Galaxy Project Executive Steering Committee

- formed in 2019
- Australian representation on the Committee



Galaxy Australia Team Members

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Special Thanks:

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Anna Syme, Royal Botanical Gardens, AU

Grahame Bowland, QCIF

Kylie McKenzie Carmel Akhavari Stephanie Heyneke

More Galaxy at INCOB2019

- Workshop: Wednesday 11th 1:30pm – 5pm, Workshop Room 1
    - An introduction to the Galaxy platform for computational biology – with real-world hands-on demonstration
- Breakout: Thursday 12th 11:00am – 12:00pm, Ar-rahim Auditorium
    - Building a regional Galaxy Community and Platform

Galaxy Australia

Please join us

Galaxy PROJECT

Thank you and hope to see you all in Brisbane one year soon