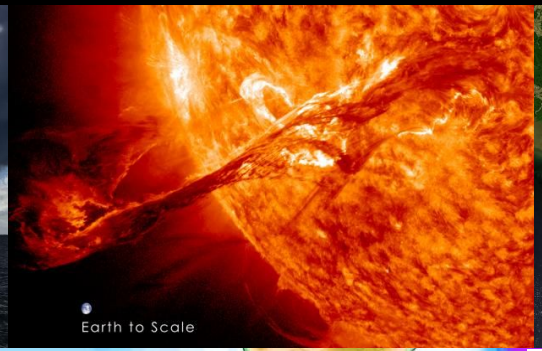
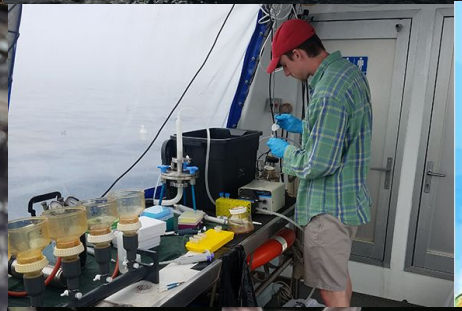
NeSI Futures - eResearch NZ 2019

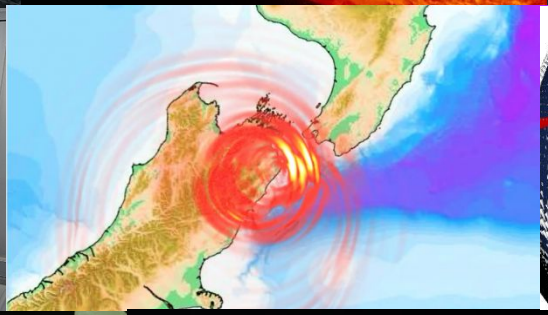
Nick Jones, 18 February 2019

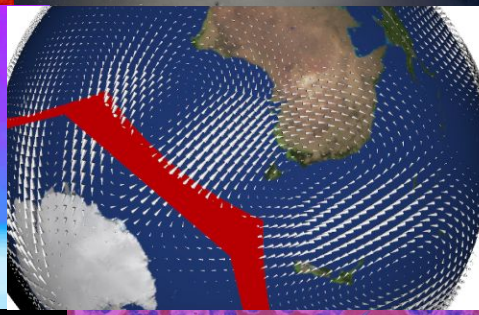
Growing the computing capability of NZ researchers

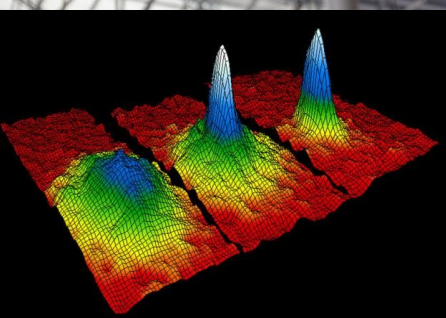
Case Studies across 2018

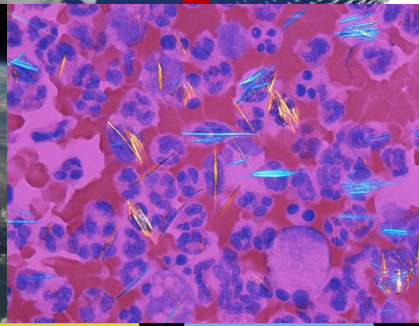




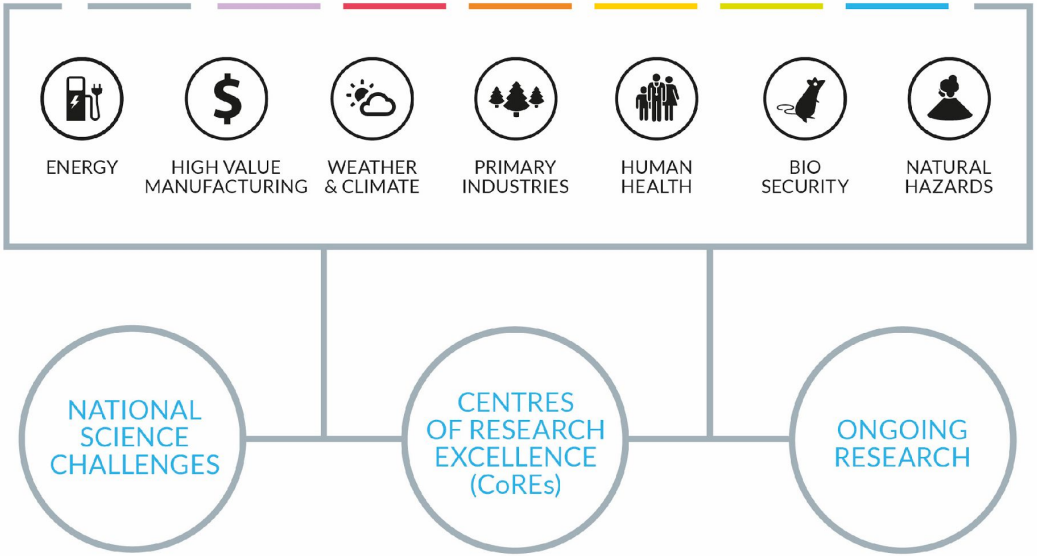


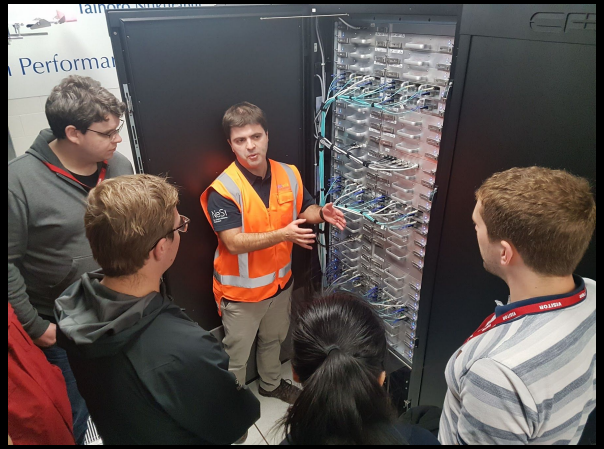






Computing capability for future prosperity






NeSI

NeSI
New Zealand eScience Infrastructure

The Power Behind Researchers

Growing the computing capability of New Zealand researchers to ensure our future prosperity

Delivering value through eScience services

High Performance Computing – computation and data analytics

Consultancy
Training

Data transfer

Mahuika and Māui are housed inside a purpose-built High Performance Computing Facility in Wellington

Services

HPC & Data Analytics

- New integrated HPC platform including data analytics
- Virtual labs, visualisation, pre/post processing
- Cloud integration

Data

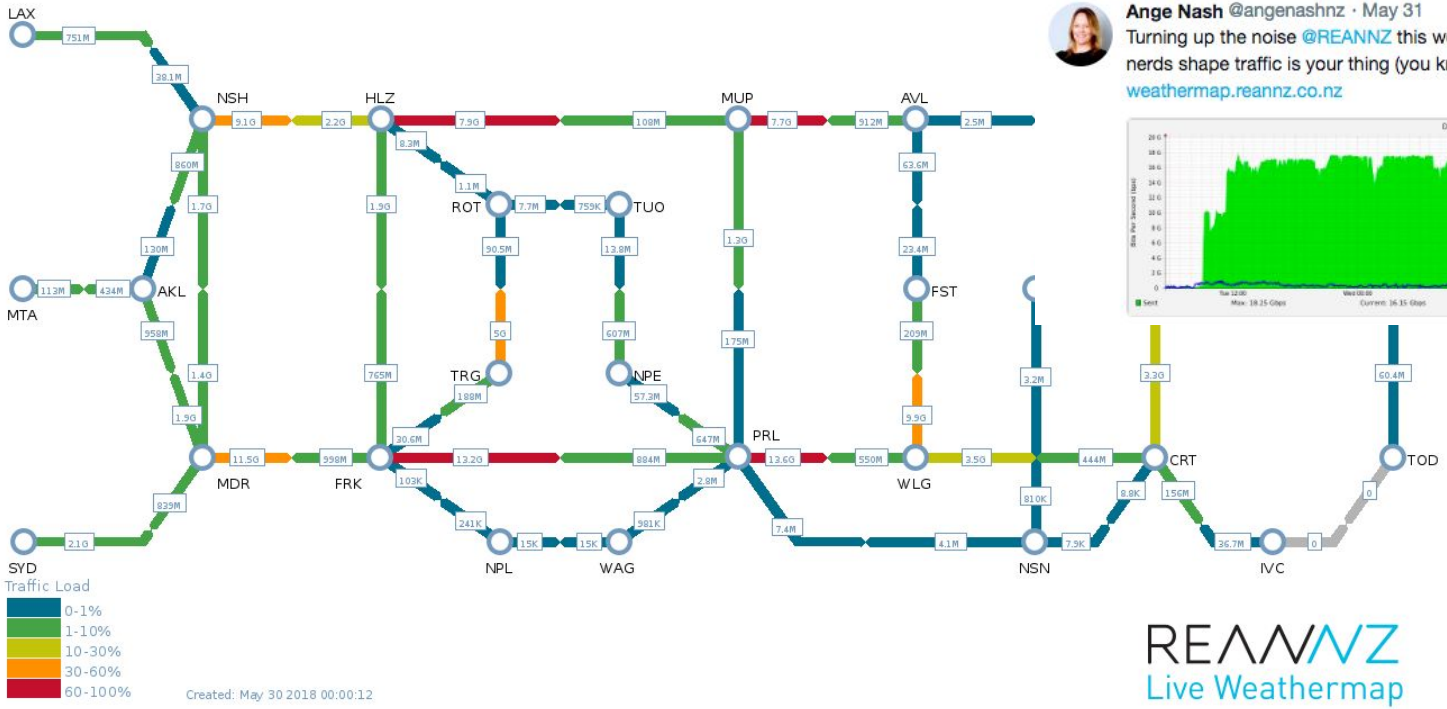
- End-to-end data transfer integration
- Long-term storage for research programmes
- Data resilience through disaster recovery replication

Training & Consulting

- Supporting transitions to the new platform
- Computational science projects to optimise lead users
- Refreshed training strategy aligned with new platform

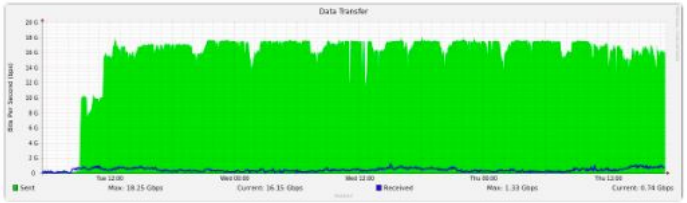
Nicole Ferguson @nicolerferg · May 29

I think we've hit a new @REANNZ record, with 19Gbps of traffic between Wellington to Auckland today; nice work @niwa_nz @AucklandUni @NeSI_NZ who are pushing a big science transfer through 🎉



Ange Nash @angenashnz · May 31

Turning up the noise @REANNZ this week!! 200TB and counting - if watching nerds shape traffic is your thing (you know it is) you can track it here weathermap.reannz.co.nz



REANNZ Live Weathermap


HIGH PERFORMANCE
COMPUTING FACILITY

Welcome to the High Performance Computing Facility

The High Performance Computing Facility (HCPF) delivers the processing power New Zealand science needs to unlock some of the most complex questions we face.

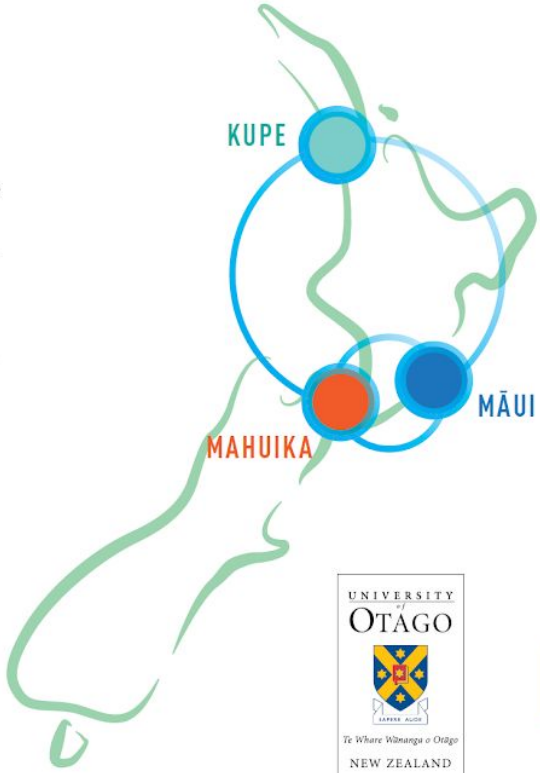
The three powerful supercomputers in this network drive highly complex research projects ranging from unravelling the sequence of our genes to modelling how climate change will impact our environment and our lives.

The HCPF consists of three interconnected Cray supercomputers. Māui and Mahuika – housed inside this purpose-built facility – and Kupe based in Auckland.

Together these three interlinked clusters make a formidable computing platform – capable of processing more than 1400 trillion calculations per second. Their high speed data transfer is underpinned by more than 15 petabytes of storage and disaster recovery capability to ensure every calculation is fully backed up.

NIWA works with the New Zealand eScience Infrastructure (NeSI) to ensure researchers from universities and institutions across the country can harness this computing power for the benefit of all New Zealanders.

NIWA and NeSI – supercharging New Zealand science



MĀUI

- 464 compute node Cray XC50
- 18 650 x 2.4GHz Skylake cores
- CS500 Virtual Labs

MAHUIKA

- 234 compute node Cray CS400
- 18 424 x 2.1GHz Broadwell cores
- CS400 Virtual Labs

KUPE

- 104 compute node Cray XC50
- 4 160 x 2.4GHz Skylake cores
- CS500 Virtual Labs
- Disaster recovery platform for Maui and Mahuika

NeSI

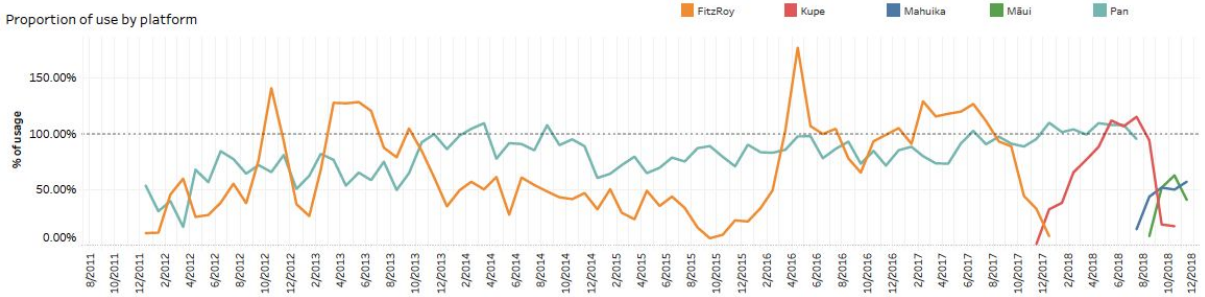
NIWA
Taihoro Nukurangi

University of Otago
Te Whare Wānanga o Otāgo
New Zealand

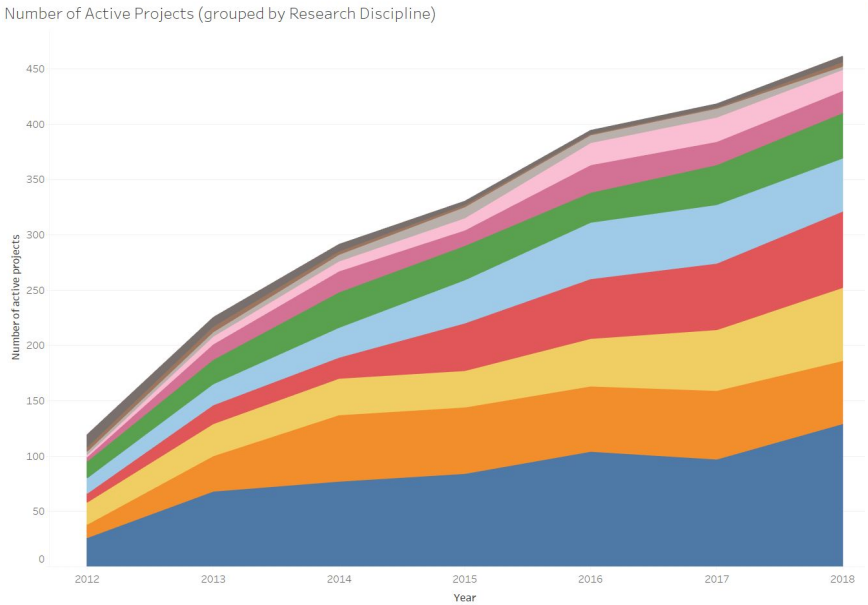
The University of Auckland
Te Whare Wānanga o Tāmaki Makaurau
New Zealand

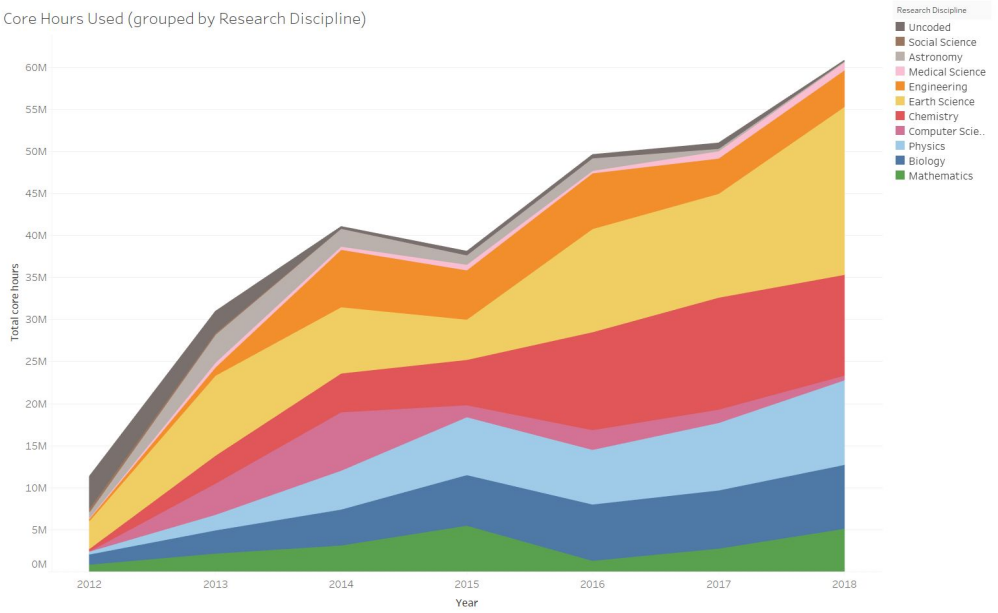
Manaaki Whenua
Landcare Research

Measures of use and satisfaction

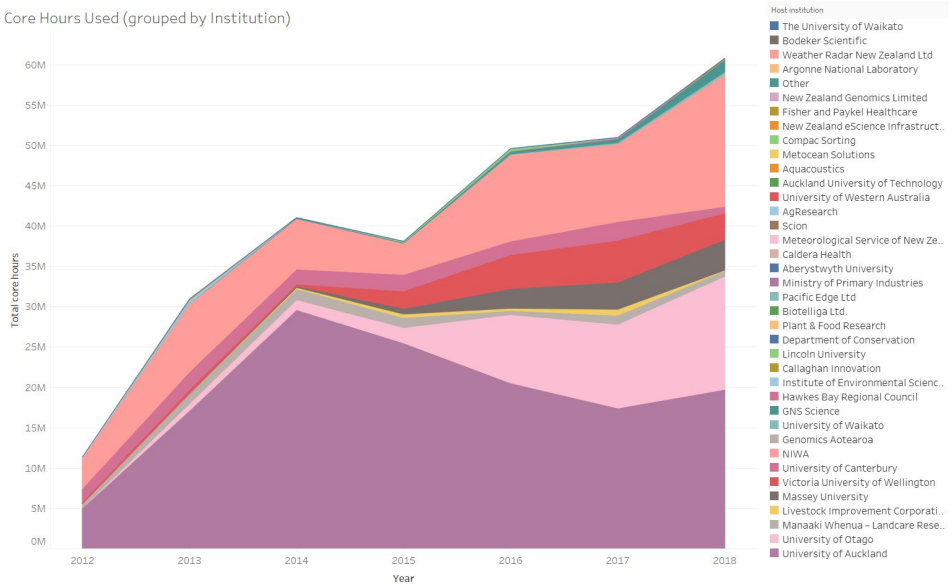


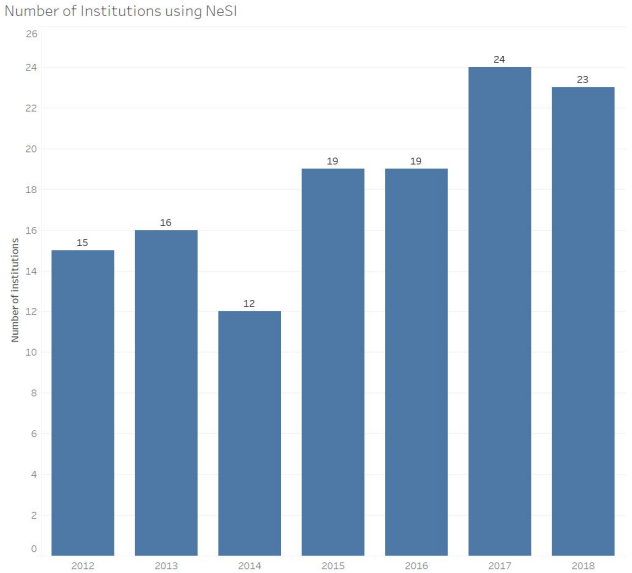
Projects vs usage across disciplines





Usage by and numbers of institutions





Ministry for Primary Industries
Manatū Ahu Matua

Fisher & Paykel
HEALTHCARE

Department of Conservation
Te Papa Atawhai

MASSEY UNIVERSITY

HAWKE'S BAY
REGIONAL COUNCIL

THE UNIVERSITY OF
WAIKATO
Te Whare Wānanga o Waikato

CALDERA
HEALTH

BIOTELLIGA
Harnessing nature's genius

NeSI @ eResearch NZ 2019

Monday 18 Feb

2:30 - 2:50 pm - How NeSI helps Manaaki Whenua - Landcare Research monitor land cover changes

3:30 - 3:50 pm - NeSI Futures

3:30 - 3:50 pm - International Benchmark Study

4:30 - 5:30 pm - Training Community BoF

4:50 - 5:10 pm - Catering to domain (Genomics) specific eResearch needs

Tuesday 19 Feb

11:00 - 11:20 am - The NeSI HPC Compute and Data Analytics Service

Tuesday 19 Feb (cont.)

11:00 am - 12:30 pm - Open Space Session - BYO topics!

11:20 am - 11:40 am - Deploying a Globus endpoint in an NZ institution

1:30 - 1:50 pm - Visualization capabilities of NeSI's new high performance computers

1:30 - 1:50 pm - A day in the life of NeSI's Apps Support

1:50 - 2:10 pm - NeSI and your data: Scalable storage

1:50 - 2:10 pm - Research Software Engineering (RSE): What's in a name?

2:10 - 2:30 pm - Kicking On: Scaling new data services at NeSI

Tuesday 19 Feb (cont.)

2:30 - 2:50 pm - Insight into the new NeSI platforms

2:50 - 3:10 pm - Understanding research drivers for NZ's advanced research computing

3:30 - 4:30 pm - (Inter)national collaborative research infrastructure strategies BoF

3:30 - 4:30 pm - Research Software Engineering BoF

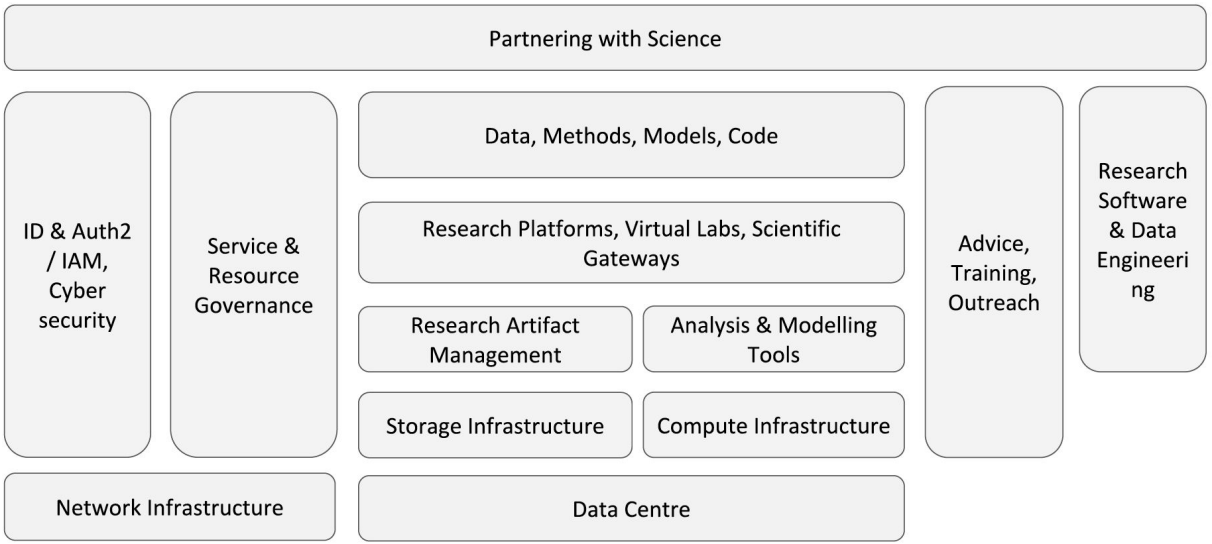
4:30 - 5:30 pm - Research Cloud NZ BoF

Wednesday 20 Feb

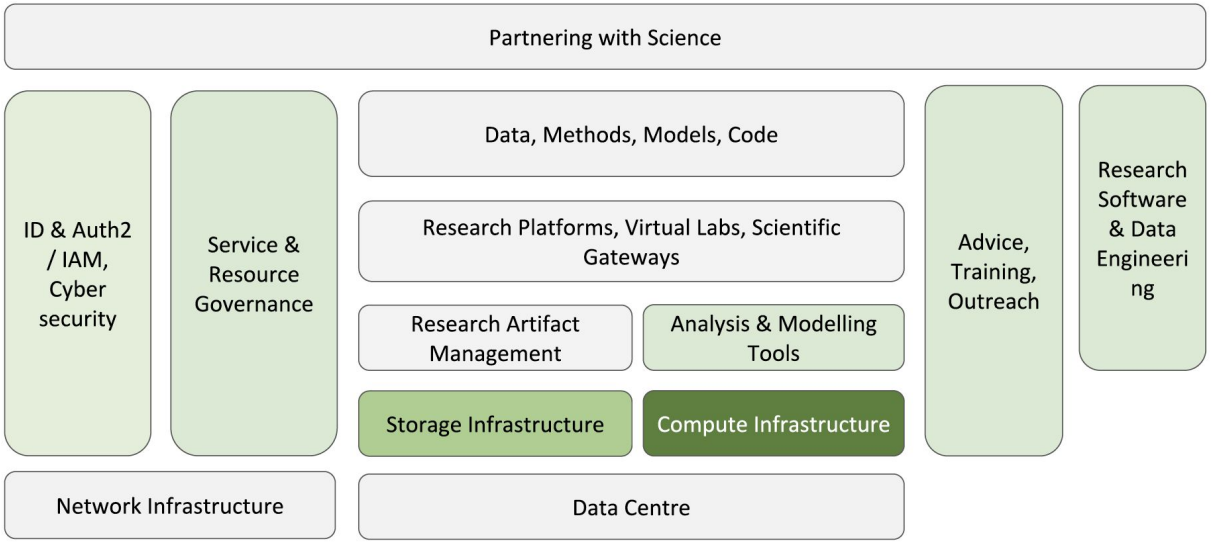
11:10 am - 4:00 pm - Hacky Hour / Bring Your Own Code Workshop

Taking a wider view

eResearch ecosystem



NeSI.1: 2011-2014



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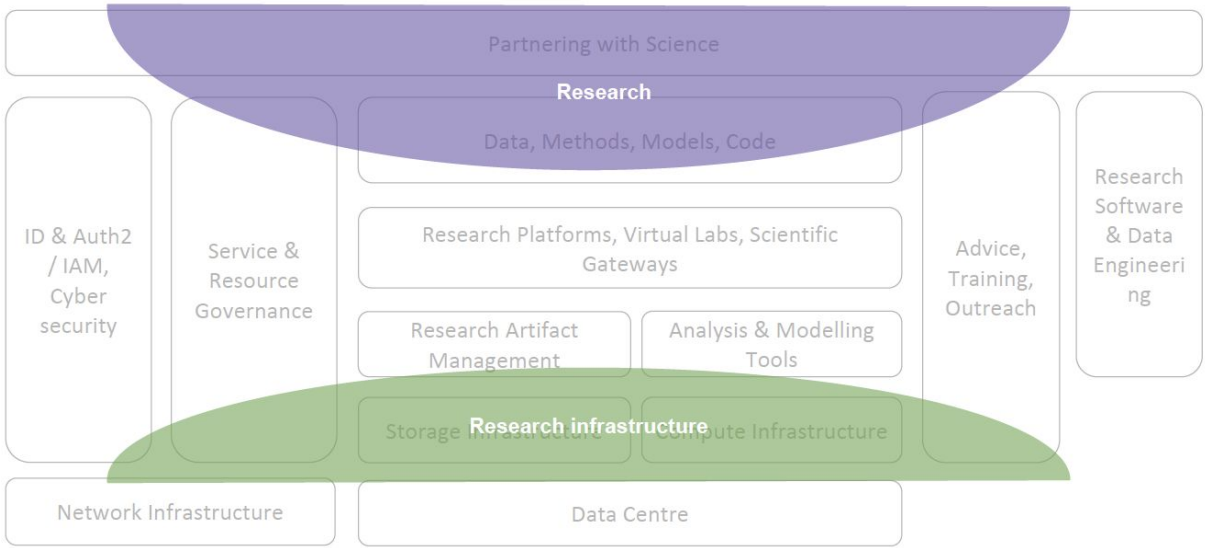
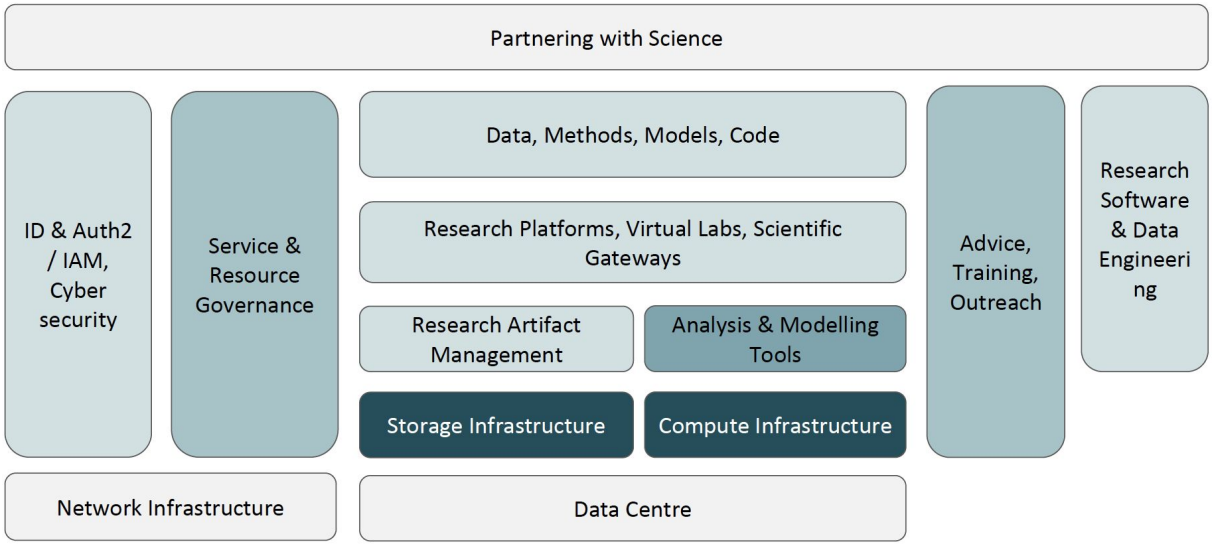
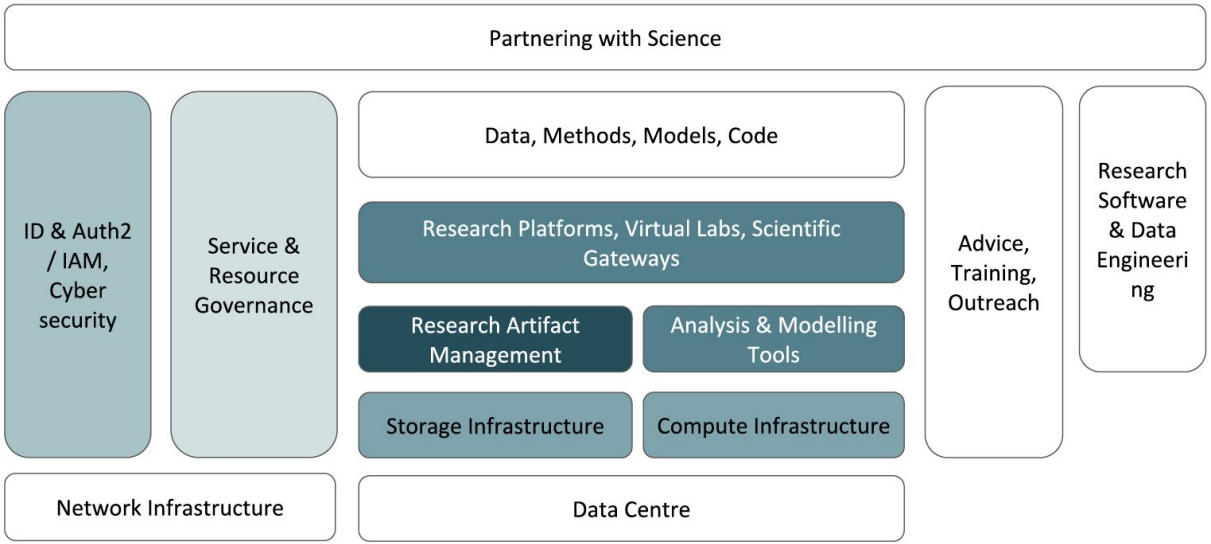


NeSI.2: 2014-2019



NeSI.2: changes from new infrastructure



MBIE Evaluation of NeSI (2017)

Finding	Evaluation
Effectiveness	Met expectations
Impact	Met expectations
Relevance	Met expectations
Sustainability	Below expectations
Value for money	Met expectations
Appropriateness of business model	Below expectations

Framing the future

Researcher Consultation

- The future needs for advanced research computing of national research communities are often unstated and invisible to those outside any community.
- Posing a question of longer term needs is often required before they're given proper consideration.
- Specialised investments in advanced research computing should be driven by and co-designed with research communities.

Insights on researcher expectations

Collaboration and **interdisciplinarity** are becoming more common, enabled by shared computational and analytical skills and language. As **interdependencies** develop across research investments and activities the sector needs to enhance coordination and networks.

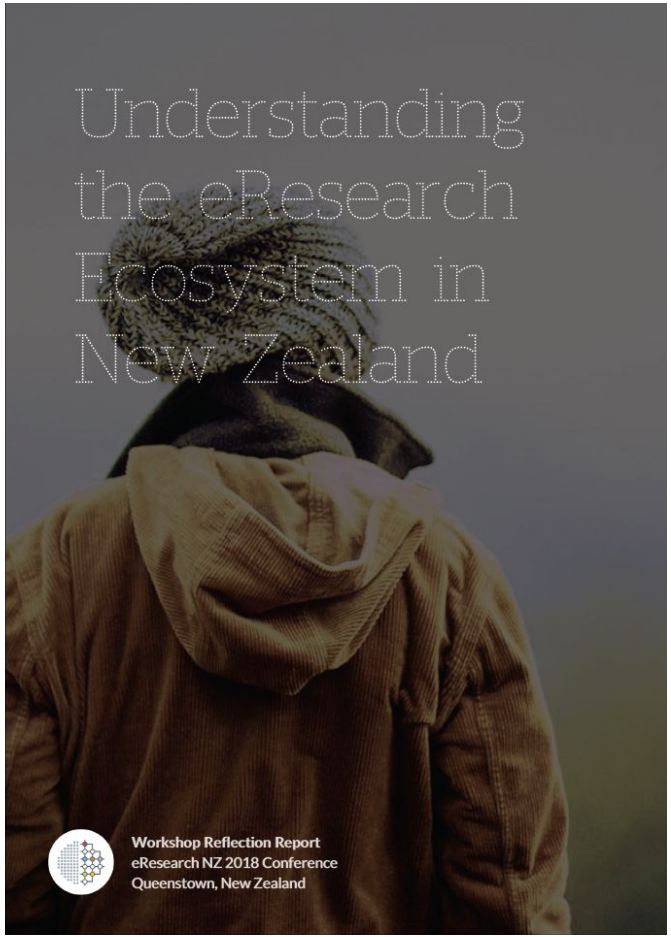
Programming and **analytical skills** are becoming core to many research disciplines, with needs for support, training, and advice becoming critical as software becomes a common form of scientific models and methods.

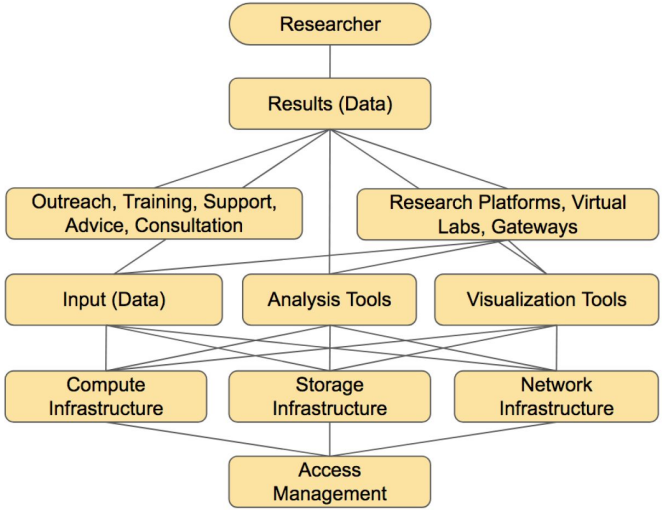
Growth in data, increasing **complexity** of models, increasing **diversity** of research drivers, and a **spread** of maturity suggest increasing needs for advanced research computing and for broadening support. Service experiences need to meet a range of researcher profiles, from those **needing support** through to those most **self-sufficient**.

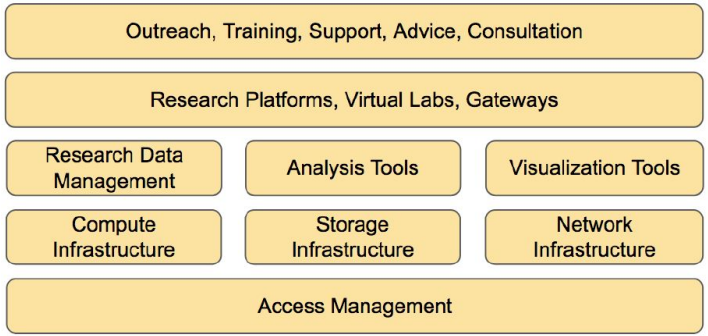
Emergence of research teams working with **Māori data**, needing to support sovereignty and Vision Mātauranga, as with other forms of **sensitive data** such as in biomedical research and in working with population and administrative data.

International Benchmarking Study

- Research exists within a global context, with each nation having a unique ecosystem of advanced research computing investments, providers, and capabilities.
- There is much for any nation to learn from reviewing these strategies, outcomes, and lessons learnt.
- In countries which recognise eResearch capabilities as competitive, capabilities are being consolidated and integrated to achieve greater effectiveness and scale


Understanding the eResearch Ecosystem in New Zealand
Workshop Reflection Report
eResearch NZ 2018 Conference
Queenstown, New Zealand


Researcher
Results (Data)
Outreach, Training, Support, Advice, Consultation
Research Platforms, Virtual Labs, Gateways
Input (Data)
Analysis Tools
Visualization Tools
Compute Infrastructure
Storage Infrastructure
Network Infrastructure
Access Management


Outreach, Training, Support, Advice, Consultation
Research Platforms, Virtual Labs, Gateways
Research Data Management
Analysis Tools
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Compute Infrastructure
Storage Infrastructure
Network Infrastructure
Access Management

Stakeholder interests & incentives

- Often, a network of stakeholders and investors underpins national advanced research computing capabilities.
- Institutional objectives and incentives often operate in a fine balance with national aspiration and shared intent.
- Investment incentives need to be aligned in order to realise shared goals.

Investment & return on

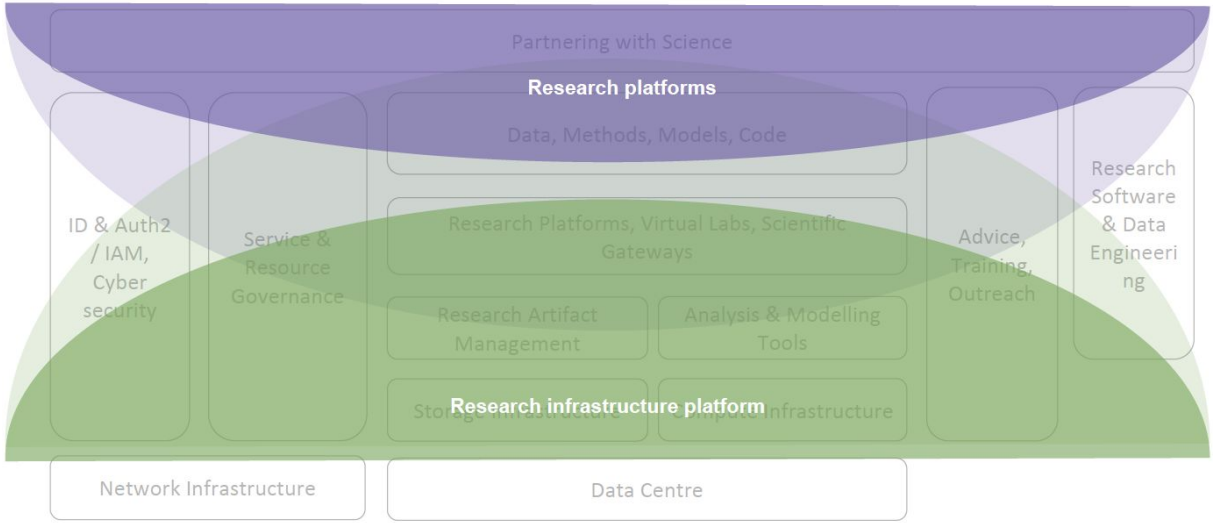
	Collaborators	Crown	Comment
Investment contribution	49.59%	50.41%	Crown view this as a 50:50 partnership with Collaborators.
Share of platform resources	60%	40%	40% resources provided to the wider sector.
Sector % payment of platform resources costs	83% *Collaborator share of cost*	0% *Merit user share of cost*	Collaborators pay most of own costs, while losing autonomy & control. Wider sector gains access fully subsidised.

Key challenges on the road ahead

incentives: competitive differentiation and collaboration to achieve critical mass, leveraging and sharing to build national capabilities

services: adaptability and flexibility to meet increasingly diverse needs at the risk of reduction in focus of value to founding big communities

skills: ability to absorb and translate new technologies, challenges in upskilling a highly fragmented and diverse science workforce, ceding responsibility to institutions



NeSI New Zealand eScience Infrastructure

Collaborating with:

MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT HĪKINA WHAKATUTUKI

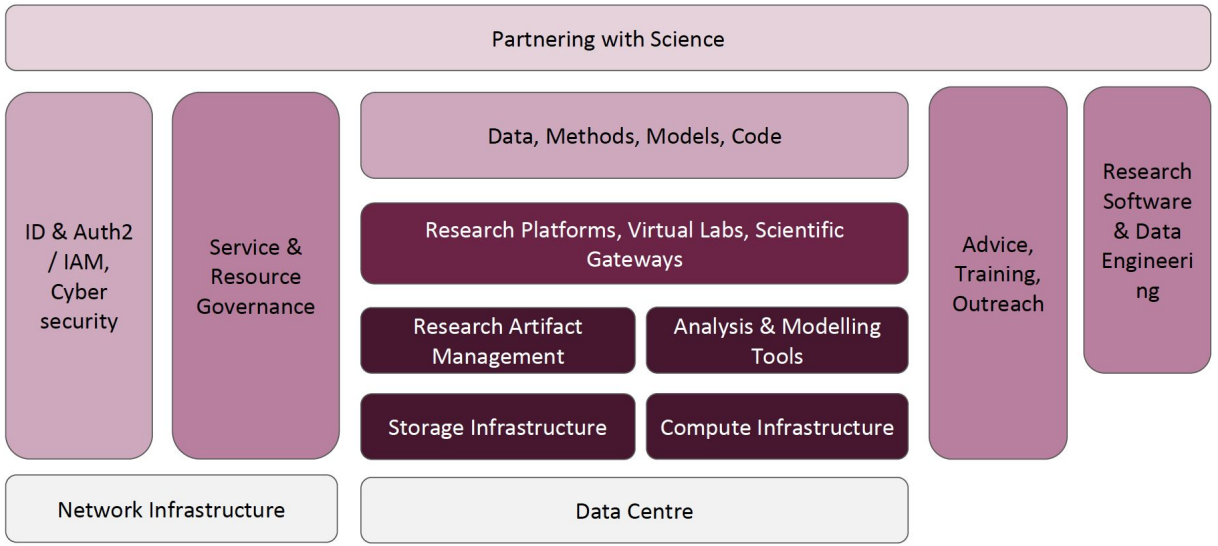
THE UNIVERSITY OF AUCKLAND

NIWA Taihoro Nukurangi

University of Otago Te Whare Wānanga o Otāgo New Zealand

Landcare Research Manaaki Whenua

A national eResearch infrastructure platform



NeSI contributions across the ecosystem

Contributing national capabilities in	Enabling others through
• Compute Infrastructure • Storage Infrastructure • Research Artifact Management • Analysis & Modelling Tools • Research Platforms, Virtual Labs, Scientific Gateways	• Partnering with Science • Service & Resource Governance • Data, Methods, Models, Code • Research Software & Data Engineering • Advice, Training, Outreach • Cyber security

Thoughts on the future

- Capability gaps in the NZ eResearch ecosystem of risk to our science excellence and impact?
- Emerging capabilities that could be better supported / made available nationally?
- Are there people you know (of) we should talk with?

support@nesi.org.nz

https://www.nesi.org.nz/apply

www.nesi.org.nz

@NeSI_NZ

nick.jones@nesi.org.nz