



# NCI AUSTRALIA

*THE HOME OF GADI*

1 September 2020

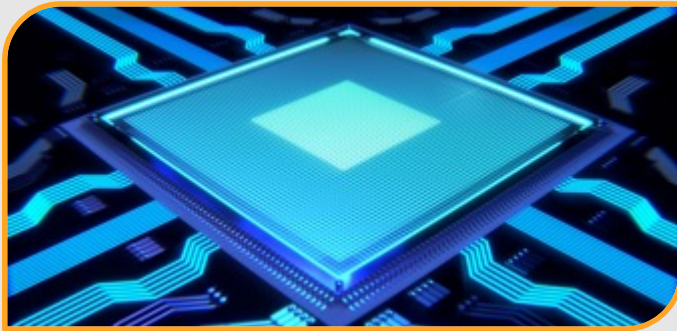
**HPC·AI**  
ADVISORY COUNCIL  
NETWORK OF EXPERTISE

 **NCI**  
AUSTRALIA

# WHO WE ARE

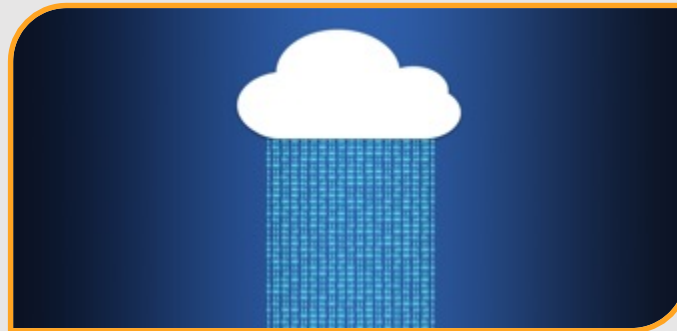
**WE ENABLE AUSTRALIAN RESEARCH WITH WORLD-CLASS...**

## HIGH PERFORMANCE COMPUTING



The fastest research supercomputer  
in the Southern Hemisphere

## DATA SERVICES



Integrating our computing and data  
platforms with smart software to  
enable new kinds of data-intensive  
research

## DATA STORAGE AND MANAGEMENT



The fastest file systems in the  
Southern Hemisphere

# OUR MISSION STATEMENT:

*To provide world-class, high-performance advanced computing services for Australian research and innovation*

## IN DETAIL:

*We are research and outcome driven*

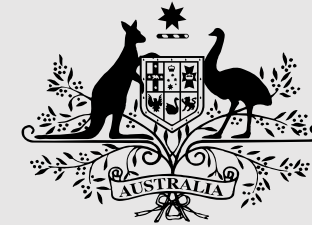
*We enable research that informs policy*

*We deliver outcomes with national benefits*

NCI is funded directly by the Australian Government, through the Department of Education's **National Collaborative Research Infrastructure Strategy** (NCRIS).

NCRIS is a national network of world-class research infrastructure projects that support high-quality research that drives greater innovation in the Australian research sector and the economy more broadly.

NCI is truly national and accessible from anywhere in Australia.



**Australian Government**  
**Department of Education**



# HOW WE ARE FUNDED



## FOUNDATION COLLABORATORS



## COLLABORATORS



## OTHER CONTRACTS

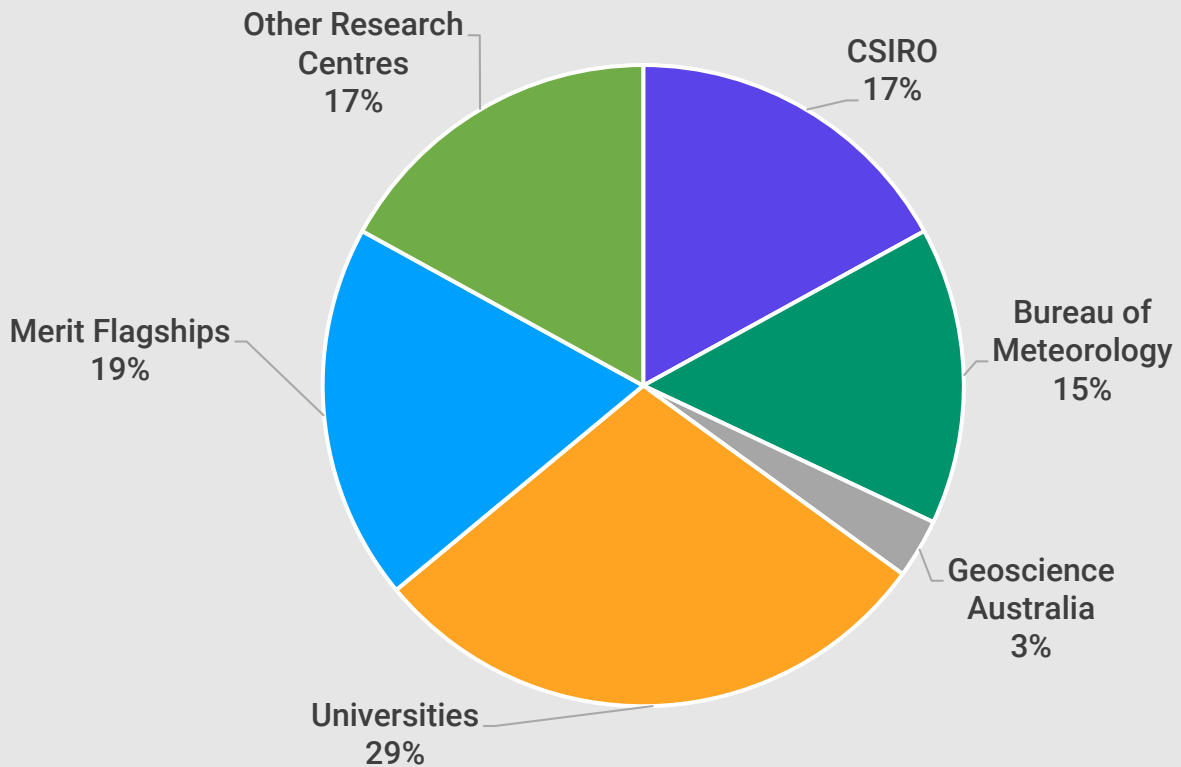


## COMMERCIAL PARTNERS

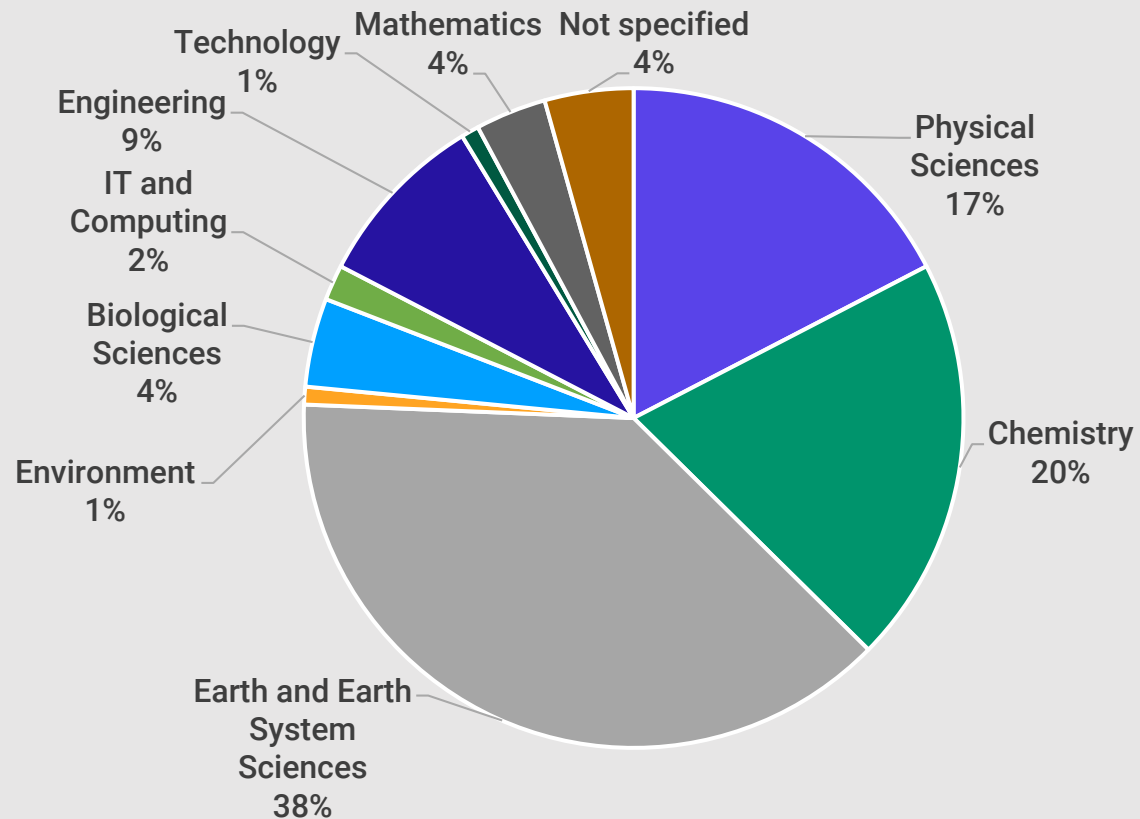


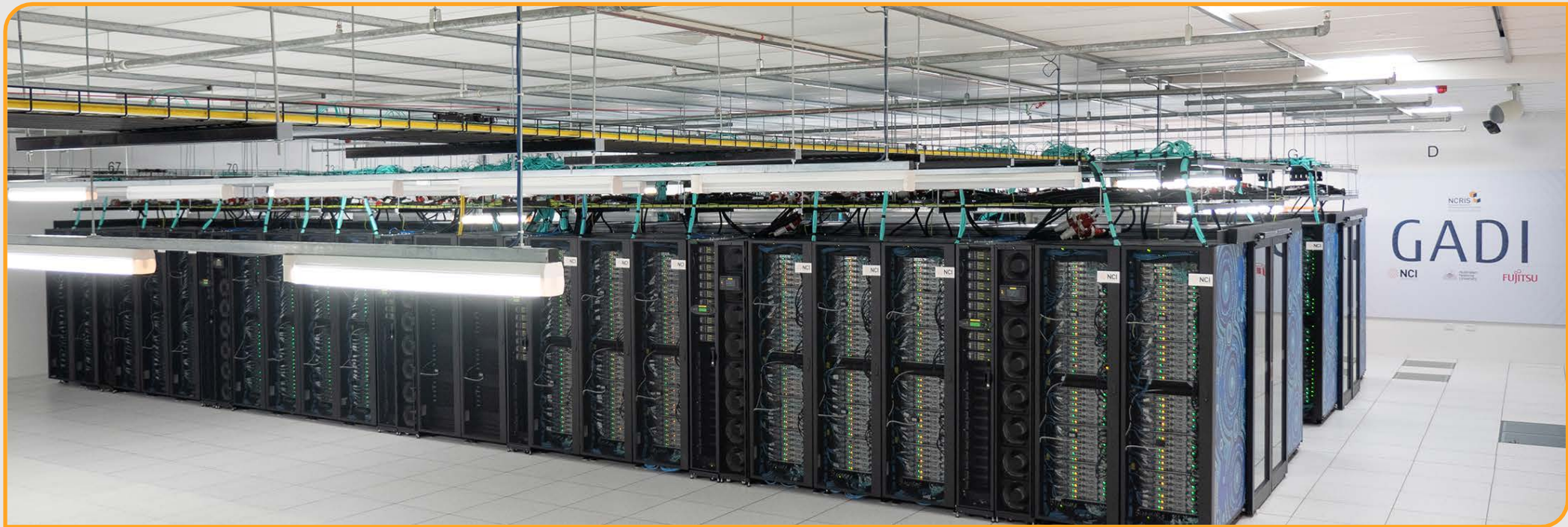
# HPC RESOURCE USAGE AT NCI

## Distribution by Research Organisation



## Distribution by field of research





## **GADI — AUSTRALIA'S FASTEST RESEARCH SUPERCOMPUTER**

- 145,152 CPU cores (Intel Xeon Cascade Lake) across 3,200 nodes
- 580 terabytes of memory
- 640 GPUs (Nvidia V1000 across 160 nodes)
- Infiniband HDR interconnect up to 200 GB/sec (gigabytes per second)

# GADI TEST SCHEME

NCI set up an invitation-only scheme for Gadi in 2020 Q1, STRESS2020, to test the capabilities of the new system. These projects – at this scale and this level of ambition – would not have been possible without Gadi.

Project Description	Compute (KSU)
Computationally intensive CFD for gas turbine design (CPUs and GPUs)	6,000
High-resolution galaxy modelling	10,000
Scaling CFD for high-resolution combustion simulations	12,000
Enhancing Australian climate model simulations	6,000
Developing a low-latency weather forecasting view of atmospheric conditions over Australia	3,000
Extreme scale reprocessing of genome samples from the Medical Genome Reference Bank	4,000
Multi-day 400m resolution atmospheric model simulation of Australian continent	6,000
<b>TOTAL</b>	<b>47000 KSU</b>



# AUSTRALIAN LEADERSHIP COMPUTING GRANTS

The increased capacity and performance of Gadi allowed us to offer highly competitive grants at an unprecedented scale for Australian researchers. A second round, focused solely on COVID-19 research, offered further extremely large grants.

Project Description	Compute (KSU)
Towards more realistic modelling of supermassive black hole jets in galaxy formation simulations	45,000
A large ensemble of decadal climate forecasts to make Australia more climate resilient	45,000
Extreme scale simulations of combustion for low-emissions gas turbine systems	50,000
Global climate modelling with the Australian Community Climate and Earth System Simulator	37,000
Using large-scale molecular dynamics for rational drug design	15,000
Targeting structural transitions in the COVID fusion protein	12,000
Structure-based drug discovery	15,000
<b>TOTAL</b>	<b>219,000 KSU</b>

# WORLD-CLASS COMPUTATIONAL RESEARCH

- Computational modelling and simulations at extreme scales: more atoms, much better resolution, leveraging the newest technologies (V100 GPUs, Infiniband HDR network, Cascade Lake CPUs).
- Significant science impact: COVID-19 rapid response research, major improvements to climate and weather models, next generation combustion and turbine systems.

# RESEARCH DATASETS ARE GROWING MASSIVELY

In the domain that NCI deals with—data for research—the recent growth in scale is huge. And the rate at which data sets are getting bigger is also increasing.



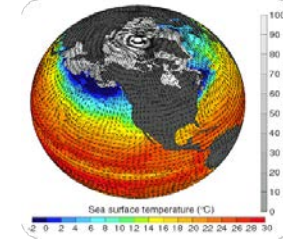
## Earth-Observation Data

- Copernicus-Sentinel (EU) and Landsat (US) satellite imagery
- Current size of collections: 5 PB
- Growth rate of 2 PB/year



## Genomic Data

- Illumina HiSeq X Ten at Garvan is first in Australia
- 18,000 whole genomes per year for <US\$1,000 each.
- >4PB in under one year, moved to NCI.



## Climate Model Data

- 4.5 PB at NCI
- Includes 1PB of CMIP5 data (global total 3.3PB)
- CMIP6 – 30+ PB, with 5 PB at NCI

# SCIENTIFIC VISUALISATION

