

NATIONAL COLLABORATIVE RESEARCH INFRASTRUCTURE STRATEGY

**Final Investment Plan
for the Research Capability**

Platforms for Collaboration

PART TWO OVERVIEW

Modern research is increasingly powered by technological platforms that enhance the research community's ability to generate, collect, share, analyse, store and retrieve information. Some research can only be progressed because of the capabilities provided by these platforms.

Broadly speaking, this ground work has been recently and expertly covered by the e-Research Coordinating Committee (eRCC)¹, which says:

“Just as in other facets of life, information and communication technologies (ICT) are radically transforming the way research communities across the world are operating. Distributed high-performance computing, digital data resources and high speed communications are just some of the developments improving the capacity of researchers to interact with their colleagues and share data worldwide in ways previously un-heard of.

“These ‘e-Research’ capabilities are enabling researchers in fields as diverse as medicine, genetics, chemistry, education, linguistics and finance to achieve world class research outcomes and to disseminate knowledge gained from research through the use of advanced ICT. In fact, e-Research has the potential to increase the efficiency and effectiveness of research endeavours across all disciplines. Greater interactivity between researchers and an increased ability to access research outputs will benefit industry, governments and the Australian community as a whole.”

The rapid growth in the quantum of research data, and the need for better management of these assets, was recognised by the eRCC as an important issue to be addressed by the research community and governments alike. This issue has also been identified internationally by agencies, such as the US National Science Foundation and the UK's Office of Science and Innovation, and improved e-Research capabilities will be the key to finding a solution.

Consequently, the Platforms for Collaboration Investment Plan has been informed by the considerations of the eRCC; the needs of NCRIS investments; the recommendations of the PMSEIC working group on Data for Science; extensive consultations; and reviews and inputs from existing activities.

¹ An Australian e-Research Strategy and Implementation Framework, Final Report of the e-Research Coordinating Committee, DEST April 2006.

Investment Principles

Developments in e-Research and cyber-infrastructure, both technological and social, are rapid and likely to continue for the foreseeable future. Hence, we can expect an increasing pace of change and an ongoing flow of new opportunities to enhance the quantity, quality and productivity of research efforts; noting always that some research is otherwise impossible and that the improvement in infrastructure and the ability to ask more demanding questions go hand in hand.

Combined with this pace of change, the independent goals and decision making processes of a multitude of governments and institutions will ensure that any future Australian e-Research infrastructure will be a combination of many activities with a need for significant co-ordination.

Therefore: A foundation principle is to enhance, strengthen and build on co-operative arrangements so that an increasingly coherent level of support can be provided to researchers, and their collaborations and communities. (A)

The strengthening of e-Research activity and the pursuit of collaborative research within existing ICT intensive disciplines and more broadly within other disciplines hinges on the ease with which e-Research activities can be carried out.

Therefore: A foundation principle is to reduce barriers to adoption of e-Research by systematically supporting new e-Researchers as well as expert e-Researchers; by sourcing and supporting suitable tools and services. (B)

e-Research can most usefully be contemplated as a permanent change in the way researchers work; so that the capabilities needed to carry out e-Research must be robust and enduring, reliable, always on, and commoditised when practical.

Therefore: A foundation principle is to provide robust and enduring services delivered by providers where the delivery of the service is the mission. (C)

The funding available from the National Collaborative Research Infrastructure Strategy (NCRIS) for Platforms for Collaboration (PfC) is significantly less than would be required to support all the Australian research which could benefit from e-Research services, so a means of defining priority is required.

Therefore: A foundation principle is to prefer e-Research infrastructure services which are of value across multiple research communities; and are of value to those communities whose research needs led to the NCRIS capabilities. (D)

[VISION]

"Australian researchers will enhance their contribution to world-class research endeavours and outcomes, through the use of advanced and innovative information and communication technologies." [eRCC]

e-Research is the use of advanced and innovative information and communication technologies to support both traditional fields of research, as well as new fields of research made possible by those advanced technologies. e-Research embraces the increasingly team-based nature of successful research. It is vital because it allows research to take a quantum leap forward by enabling new research activities.

e-Research also challenges the notion of what we have traditionally thought of as comprises research infrastructure. As we move from a bricks and mortar environment to a digital environment, our view of infrastructure must change. e-Research infrastructure not only comprises hardware relating to computing, data storage and communications networks, it can be perceived as the complex models developed with considerable investments to examine large research challenges, such as climate change, water management and land use. Such models exist in a virtual environment, but may be regarded as research infrastructure nonetheless and increasingly will need to be recognised by funding agencies responsible for infrastructure investments.

A key reason for government investment in e-Research is that it increases the economic, social and environmental returns to Australia from its research funding. This is because it will:

- increase the return on the Government's substantial investments in both research and research infrastructure;
- ensure Australian researchers remain internationally competitive, including in the emerging fields of research; and
- increase benefits from researcher-industry collaboration.

As e-Research has evolved in the past, the Australian Government has made specific investments in the individual elements that underlie the vision for e-Research in Australia. These include:

- a robust high bandwidth telecommunications network, the Australian Research and Education Network (AREN);

- distributed high performance computing capacity, the Australian Partnership for Advanced Computing (APAC);
- accessible digital repositories (research databases, online libraries, etc);
- accessible research facilities and large instruments (telescopes, etc);
- agreed standards and specifications to maximise interoperability between networks, computer platforms and applications including middleware (the software 'glue' to assure accessibility, etc); and
- the Australian Access Federation (AAF).

However, the research infrastructure landscape in Australia will change in the coming years, principally through the Australian Government's investment in a new generation of research infrastructure. These investments in turn require further investment in e-Research if the vision is to be realistically addressed. These investments will be in the e-Research platforms that provide researchers with the ability to generate, collect, share, analyse, store and retrieve information.

The Platforms for Collaboration capability of the National Collaborative Research Infrastructure Strategy will provide many of the platforms for Australian researchers to engage in e-Research, both domestically and internationally. In doing so, it will support the vision proposed by the eRCC.

The following key investment areas are recommended for the PfC capability:

- National Data Management Infrastructure;
- National Computational Infrastructure; and
- Interoperation and Collaboration Infrastructure.

The investments are predicated on two key services that will provide a foundation for PfC investments. These foundation services are (1) AREN, and (2) the AAF. Given the importance of these foundation services, funding has been provided in each case to establish or equip them to support the PfC capability investments.

While the PfC capability will ensure major steps forward are made, much remains to be done to fully achieve the vision for e-Research in Australia. For example, issues that are beyond the scope of what PfC might address within its current funding envelope include broadband access for researchers to each relevant resource from their desktop/laptop computer; the need for a future upgrade of the AREN backbone, or its international linkages; and, most vitally, sustained funding for the long term storage and management of research data of enduring importance.

Overall Arrangement

On acceptance by the NCRIS Committee of this PfC Investment Plan, the Department of Education, Science and Training (DEST) will establish the Australian e-Research Infrastructure Council (AeRIC) to which direction will be given regarding policy and investments intentions from the NCRIS committee.

AeRIC will develop and sustain the forums in which co-operation can be achieved, thereby, over time, providing policy and standardisation frameworks that deliver a nationally coherent e-Research infrastructure.

AeRIC will recommend the manner in which funds will be provided to PfC components in accordance with the investment plan, and subject to annual re-assessment with DEST.

PfC components will report to, and be reviewed for progress by, AeRIC which will recommend variations to funding agreements to the NCRIS Committee when required.

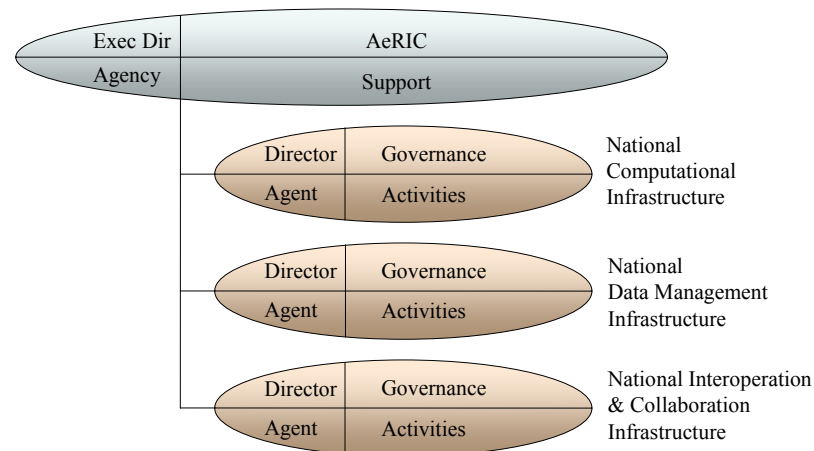
The overall mission of AeRIC will be to ensure that world class services and expertise are identified, developed and delivered nationwide in ways that support effective e-Research within and across all research disciplines. This will include services and expertise related to:

- data capture, management, retention, publication, discovery and re-use;
- data analysis;
- computational modelling;
- collaboration systems;
- grid inter-connectivity;
- trust and access management; and
- networking.

Governance

Because of the critical contribution ICT will make to future research, and because the research practice and landscape will continue to evolve in response to increasing ICT capabilities, the activities of AeRIC will have wide ranging ramifications. The

members of AeRIC will be determined by DEST in consultation with higher education and research institutions and other relevant agencies.



The Chair will be a person with a broad view of national e-Research requirements.

The Members of AeRIC (about ten members are envisaged) will be drawn from the stakeholders and participants in e-Research infrastructure; including providers and users of AeRIC e-Research services and capabilities.

To ensure the widest possible input, AeRIC will host a broadly inclusive e-Research forum to gather strategic input in refining its business plan and activities.

An Executive Director will be appointed to lead the identification of integrative services of value across NCRIS capabilities and the development of an annual business plan for approval by AeRIC and the NCRIS Committee.

The Executive Director will also be responsible for monitoring implementation arrangements and activities, identifying and managing risks, and measuring the key performance indicators of implementation activities.

A small secretariat will be established to assist the Executive Director. The secretariat will be able to support grant management through DEST.

The PfC components will be the primary means through which a coherent suite of services is developed and delivered to the users of the infrastructure.

National Data Management Infrastructure

The effective re-use of research data on a national basis is the primary goal of the investment into national data infrastructure. The investment will deliver research data registration, location and access services, and outreach services for researchers and institutions that can enhance the effective use of data within a federated research data management system (as recommended to PMSEIC). The investment also meets some key requirements of the NCRIS capabilities:

- 5.1 Evolving Biomolecular Platforms and Informatics
- 5.2 Integrated Biological Systems
- 5.3 Characterisation
- 5.8 Networked Biosecurity Framework
- 5.10 Optical and Radio Astronomy
- 5.12 Integrated Marine Observing System
- 5.13 Structure and Evolution of the Australian Continent

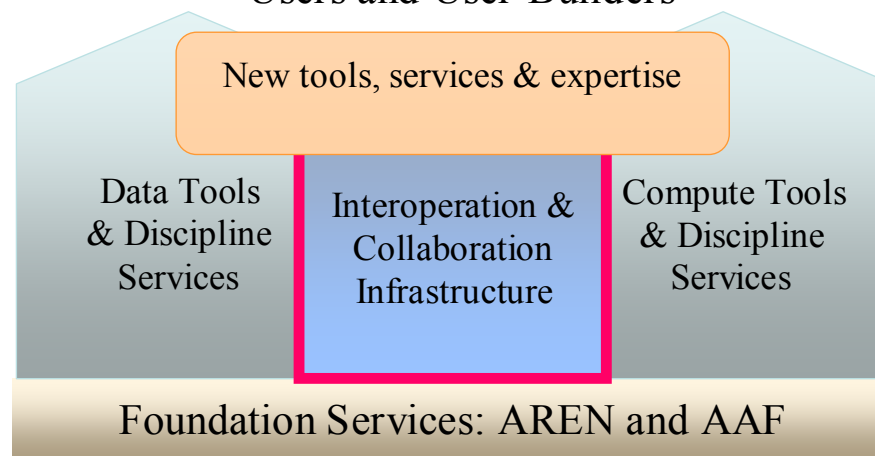
The outcome will be the ability for all researchers to identify, locate, access and analyse any available research data, regardless of origin or scale.

Achieving effective re-use is particularly difficult for collections that are not clearly within the responsibility of any of the organisations which collect and preserve data sets. Therefore the investment will also provide stewardship of some nationally significant data collections, using capability around selected existing research data retention facilities, and aiming at a leadership example of research data management.

In summary, the investment in the national data infrastructure will help users, builder-users and experts improve community data management practice, by providing:

- outreach advisory and support services to assist establish data curation practices;
- outreach advisory and support services to assist institutions establish research data management infrastructure and practice in a nationally coherent manner;
- data management brokering to help match needs to providers;
- federation level services, including data location, access and data mining;
- stewardship services hosting some categories of collections; and
- a merit scheme for prioritising the best use of the limited resources.

Researchers and research communities
Resource owners and operators
Users and User-Builders



National Computational Infrastructure (NCI)

High performance computing (HPC) requirements are explicitly identified in 5.1, 5.10, 5.12, 5.13 and are generally required within the discipline demands related to all NCRIS capabilities. The investments will deliver an internationally significant computing capability which can be assigned on a merit and priority basis, and build essential expertise in HPC needed to support NCRIS-supported and other priority research.

The outcome will be computational modelling beyond the reach of normal project, department and institution investment.

The spread of e-Research is also expected to be accelerated by the propagation of tools and analysis systems (via portals and similar encapsulations). The investment will also develop a computing fabric that supports the migration of tools and systems towards users.

The outcome will be a national computing environment in which computing power can be configured to match the tools and analyses required by priority research.

In summary, the national computing infrastructure will provide those computational services which can best be funded and justified at the national level, by providing:

- an Australian capability system commensurate with international practice;
- advisory and support expertise to assist computationalists;
- oversight and direction setting for the national computing fabric; and
- a community based merit allocation scheme for funded resources.

Interoperation and Collaboration Infrastructure

For e-Research to become easier for new e-Researchers, the complexity of the underpinning ICT systems needs to be hidden; fast, correct and expert help needs to be provided and the co-ordinating systems need to be managed in an expert way.

This investment creates an Australia-wide inter-operation platform linking expertise and compute and data support systems across regional and national service providers into a day-to-day operational activity.

The functions will include:

- a first point of contact and the management of effective user support;
- robust implementation of nominated middleware, tools and portals;
- robust implementation of collaboration services;
- a job submission fabric across all accessible and significant compute resources;
- a data movement fabric between all major data and compute resources; and
- the day-to-day operations management of the above services.

e-Research is in a formative state and yet the investment strategy calls for more commoditised solutions to simplify and therefore broaden adoption. Hence, progress will depend on new infrastructure that meets common and simple needs, as well more complex solutions for priority research communities and advanced users.

Australian Access Federation (AAF)

Easier, faster and simpler collaboration depends on the inter-working of multiple enterprise infrastructures. The AAF provides services critical to this inter-operation.

The AAF will support verifiable researcher identification, home based log-in (so-called Single Sign On), and community wide authorities and rights. The outcome will be simpler, more secure operation of all research community services.

The AAF is expected to support a wide range of research and higher education activities and therefore to be largely funded operationally on a user subscription model. Support is provided to assist uptake and develop services in (2008-2011).

Australian Research and Education Network (AREN)

Research activities lead to highly variable communication loads, often with high peak demands, distributed to unusual locations and with sporadic usage patterns. The AREN is configured to share basic capacity and relieve research projects from costs that might be associated with commercial supply of bandwidth for rare requirements.

AARNet operates the AREN and uses the core network infrastructure to provide commodity Internet access for its members. Revenue from these sources is expected to meet AARNet's operational costs. While discussion have included a second circuit to Perth or subsidising operational expenses, no new investment is in this plan.

The funds that have been allocated are expected to meet commitments from Government to fund the recurrent costs of links to Darwin from 2008.

AeRIC

The national e-Research infrastructure will face continual fragmentation due to urgency and independence. AeRIC will work to articulate a strategic view; to identify generic tools, practices and services; and match needs to available services.

The outcome will be a focus across the total investment on common needs and the ability to focus effort systematically on priority infrastructure development.

AeRIC will establish the National e-Research Architecture Taskforce (NEAT) to focus expertise and resources into teams targeting selected communities or new core services. The benefits will be the evaluation of systems, middleware and tools leading to the deployment of new services, and a more sustainable evolving e-Research fabric leading to increased e-Research adoption.

NEAT will identify, scope and support activities that include:

- projects to 'adopt, adapt and influence' global standards, components and middleware to create tools and services that meet identified discipline needs;
- the strengthening of key expertise groups associated with important existing or selected future middleware, user tools and global standards; and
- the hardening of new services in preparation for their on-going operation.

INDICATIVE FUNDING SUMMARY

Component	Arrangements and relationship to foundation principles	NCRIS	Others ²
AeRIC	AeRIC will sustain the strategic motivation and promotion of e-Research. It will also provide the essential framework in which additional funding could be applied, through which additional parties could participate and by which the community can influence the direction of national e-Research infrastructure (A,D). The Executive Director will lead component cohesion, undertake component reviews, and develop an annual business plan.	2	0
NEAT	AeRIC will establish NEAT to advise on the services and components that need to be made operational as part of the evolving national e-Research infrastructure. Activities sponsored by NEAT will build services that can better meet needs from discipline and NCRIS capabilities. The expenditure is included in the Australian National Data Service and Interoperation & Collaboration Infrastructure (B,D).	(11)	(22)
National Data Management Infrastructure	A specific aim of the overall investment is to improve the management and use of research data and, in doing so, address the needs raised in the PMSEIC report on Data for Science. This component will implement federated meta-services to support cross-disciplinary data re-use (A,B,C,D); provide custodial and analysis services for some data collections (C, D); and assist researchers and institutions and develop towards best practice (A).	21 ³	24
National Computational Infrastructure	Capability computing is a national imperative and this component continues previous support in that area continuing the ANU hosted national merit capability computing services which operate with an internationally recognised quality of service (C,D). Other investments will support specialist computing where such additional resource can be identified as a critical need to leverage the impact of NCRIS investments (A,B,C,D).	26	32
Interoperation & Collaboration Infrastructure	Regional service providers are a key ingredient in e-Research infrastructure. This component builds a platform of inter-working national services across those regional providers and develops their outreach so that an increasing set of research resources can be connected. The arrangement will allow flexibility over time so that new resources can be targeted (A,C).	20	12
AREN	AARNet provides Australia's national research backbone and the Australian Research and Education Network (AREN) service (B,C,D). New significant investments have not been afforded priority for funding in this plan. NCRIS will, however, meet existing commitments to the AARNet infrastructure to sustain the Darwin services.	3	N/A
AAF	An organisational structure will be established to house the Australian Access Federation (AAF) and operate PKI and shibboleth services required for collaboration (C,D). The use of those services is expected to include non-research applications and so a subsidised subscription model is proposed.	3	N/A
		75	68

² The contribution under "Others" would rise if other NCRIS funded capability investments and other research organisations co-fund PfC services or the states significantly co-invest.

³ An implementation plan for ANDS has yet to emerge, these estimates are approximations only.