

**AUSTRALIAN RESEARCH COUNCIL
FUNDING FOR RESEARCH INFRASTRUCTURE - MECHANISM C
SUMMARY OF APPLICATION FOR 1992 FUNDING**

Title of Proposal:

The Australian Academic and Research Network (AARNet).

Names of Institutions involved in Cooperative Proposal:

The Australian Vice-Chancellors' Committee, as the peak body representing all institutions in the Unified National System of Higher Education. It is acknowledged that funds need to be paid direct to an institution.

Relationship with other institutions through amalgamation or sponsorship:

Not applicable, as all UNS institutions are actively involved in the AARNet program.

Contact person / telephone:

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BUDGET SUMMARY

AMOUNT OF MECHANISM C GRANT SOUGHT:

	1992	(figures are quoted using 1992 dollar values)	
	\$	1993 (Indicative)	1994 (Indicative)
		\$	\$
ARC	<u>1,070,023</u>	1,334,307	1,591,848

AMOUNT OF OTHER SUPPORT

Source	1992	(figures are quoted using 1992 dollar values)	
	\$	1993 (Indicative)	1994 (Indicative)
		\$	\$
Institutions	1,197,570	1,493,357	1,781,596
CSIRO ¹	255,187	318,216	379,636
Other ARC funding	-	-	-
Other Commonwealth competitive research schemes	-	-	-
Private Sector ² :	195,000	245,000	295,000
Government Sector ² :	105,000	105,000	105,000
TOTAL (Other Support)	<u>1,752,757</u>	2,161,573	2,561,232

¹ CSIRO's contribution over this period subject to agreement between the AVCC and CSIRO.

² Contributions made as part of the AARNet Affiliate Membership Program

1. INTRODUCTION

The Australian Academic and Research Network (AARNet) is a joint program being undertaken by all member institutions of the Australian Unified National System of Higher Education and CSIRO. AARNet is managed and operated by the peak body for higher education, the Australian Vice-Chancellors' Committee (AVCC). There is also active involvement of operational, technical, research and academic staff drawn from across the higher education sector.

The AARNet program is directed toward servicing the national and international data communications requirements of the Australian higher education and research sector. The program is a significant component of the common infrastructure requirements of these institutions.

The overall project leadership and direction is provided by the AVCC through its Standing Committee on AARNet, the AARNet Advisory Board. The Board comprises 4 nominees of the AVCC, 2 nominees of CSIRO and an ARC nominee.

The prime objective of AARNet is to provide leading data communications technologies and associated network services to the desktops and laboratories of researchers, academics and relevant support staff within the higher education institutions and CSIRO. This service provides vital support to other national and regional programs operating within universities and CSIRO including the provision of specialist high performance computing systems to the research sector, access to national and international information databases, and similar programs where access to a specialised research tool or resource is required.

In addition this program provides an essential tool to assist researchers in Australia to effectively collaborate with their peers in regional, national and international organisations.

This proposal seeks the support of the Australian Research Council (ARC) for the operation and continued development of this program in the period 1992-1994. This support is required to build on the significant progress made in 1990 and 1991 in establishing AARNet. In planning for the 1992-1994 triennium the AVCC has taken into account the anticipated increase in the usage of networking services and set this against the possible decrease in the unit cost of these services due to a more deregulated environment. The net result of these trends is a forecast program of total annual expenditure of \$2.8m in 1992, rising to \$4.1m in 1994.

In 1990 and 1991 the ARC provided 38% of the total funding required over this period. This submission seeks a similar commitment from the ARC in 1992, and indicates a desire for the continuation of this funding commitment in 1993 and 1994 as a consolidated three year funding program. The amount requested from the ARC under the Mechanism C funding for 1992 is \$1,070,023.

2. SIGNIFICANCE AND IMPORTANCE OF THE INITIATIVE

AARNet is important, both from a national and international perspective, in its contribution to the provision of infrastructure support for the national research effort. Increasingly data communications facilities are playing a major role in the provision of a complete range of communications services to the individual researcher.

The data network services include the provision of access to reference material and similar information sources in a huge variety of formats, the support of both individual and group communications requirements, and access to specialised tools and equipment. AARNet provides a mechanism for the dissemination of information, ideas and techniques and serves as an access to specialised resources located in Australia and overseas.

AARNet interfaces with the United States' research network environment, the Internet, and through international agreements, AARNet users also have direct access to the research community in North and South America, Europe, the Asia/Pacific region and parts of Africa. This matrix of connectivity forms a global entity populated by about 2 million members of the academic and research

community. As a consequence of the rapid and widescale adoption of communications technologies, data communications networks are now a crucial factor in international collaborative activity in research. Data communications facilities are now being used as a major component of infrastructure support for research. Investment in such infrastructure is being seen as a high priority within the strategic programs being undertaken by Australia's peer nations.

3. AARNet

This proposal calls for continued financial support for AARNet from the ARC. The AARNet program was commenced in 1990, with the actual network being installed nationally over a three week period in May 1990. Over the ensuing 12 months, usage of AARNet has increased by a factor of four over the July 1990 levels, and the current growth trends indicate continued exponential growth over the medium term future. The attached usage figures provide an indication of the rate of this growth (Attachment C). These trends indicate significant further growth over the 1992-1994 period, and will require a complete upgrading of internal capacity of internal bearer services from kilobit transmissions speeds to megabit transmission speeds over this period.

This growth in usage levels of AARNet serves as a useful indicator of AARNet's performance over the past twelve months. The actual traffic levels within the network as well as a large collection of individual case studies about the usage of AARNet across the research community are testimony to the vital role that AARNet now plays in the conduct of research in Australia.

In addition to the supply of data communications transport services, AARNet is also actively involved in making this technology both more accessible and more effective to the research user population. To this end, AARNet has produced material which is of assistance to those who are learning how network facilities can assist them in their work. It has produced a resource guide of AARNet services and resources which are on line to AARNet users.

AARNet has taken an active role in assisting universities and CSIRO to undertake developmental activities to enhance the quality of the services available across AARNet. Some eight projects have been funded by AARNet to date including the production of introductory material, the provision of Directory Services on the network and the implementation of intelligent information and archival servers on AARNet. It is hoped that such efforts will be of assistance in making the services of the network accessible to all members of the Australian academic and research community over the coming years.

4. RELEVANCE TO IDENTIFIED NEEDS AND PRIORITIES

In relating this to the specific objectives of ARC funding, AARNet provides support for high quality research on a national basis. It underpins and enhances the effectiveness of many of the established research programs including the Cooperative Research Centres Program. Projects such as the Australian Genome Information Service, the External Users program of the Australian National University's Supercomputer Facilities, and similar national undertakings are now effectively reliant on AARNet to provide the lower layer of infrastructure support.

In addition the international connectivity offered through AARNet ensures that Australian researchers can be peer participants in key international research programs. Within the past twelve months a number of international collaborative research agreements have been undertaken by Australian universities, where the viability of the joint program is critically dependant on access to AARNet. In this way, AARNet plays a central role in supporting the continued viability and excellence of Australia's overall research effort, and it anticipated that this critical role of the common communications infrastructure will extend through the coming decade and beyond.

5. SPECIFIC ARC FUNDING CRITERIA

In terms of the specific assessment criteria nominated by the ARC the following comments are provided:

The relationship of the proposal to the research directions of the institutions involved:

AARNet is seen as being highly complementary to the programs being conducted in higher education institutions. There is a common strategic direction being pursued by all institutions to provide access to computing facilities to researchers in all disciplines. Access is provided through the use of desktop facilities, shared computing facilities and specialized resources, linked at an institutional level by a high speed local area network. All institutions currently have high speed local networks and the AARNet program provides a compatible extension to these local facilities on a national and international basis. The result is that the tools and techniques used to access resources within institutions are exactly the same as the tools and techniques used to access remote resources across AARNet. Programs which fund information technology tools within institutions currently run at about \$3m per annum and the total investment in facilities is conservatively valued at over \$500m. Through the operation of AARNet this substantial investment in technology is enhanced providing "value added" national and international resource.

Other sources of support and funding involved:

Of the \$2.8m AARNet budget proposed for 1992, the AVCC member institutions will contribute some 43% of the required funding, which is a continuation of their original commitment. For the balance, CSIRO is expected to provide 9% of the required funds (again a continuation of their commitment of 1990 and 1991) (this is subject to agreement between the AVCC and CSIRO) and other bodies (both governmental and commercial organisations) are expected to contribute 10% of the required funds by becoming Affiliate Members of AARNet. The amount requested from the ARC is 38% of the total expenditure for the program for 1991.

This it is anticipated that some \$555,187 will be provided to assist funding AARNet from sources other than the ARC and higher education institutions for 1992.

A four year budget for AARNet, covering actual expenditure in the current 1991 budget, and the proposed 1992-94 triennium budget, is attached to this submission (Attachment A).

The arrangements proposed for the purchase of the facility, day-to-day management and operation, maintenance and access to the facility:

The attached budget indicates, in 1992 that 76% of the funding is to be used to purchase communications facilities for AARNet. The majority of this expenditure is currently committed to Telecom Australia and OTC for the lease of communications capacity to support the network. The equipment budget is to maintain the installed base of communications equipment used by AARNet. The supply of services by the telecommunications carriers is a standard customer arrangement, and the supply of equipment to AARNet is covered by specific sales and maintenance contracts undertaken by the AVCC and relevant suppliers.

The day-to-day management and operation of the facility is undertaken by the AVCC. In addition to this central operations group seven universities are subcontracted by the AVCC to provide daily operational management services to all other connected sites within their State. This arrangement

has proved effective in ensuring that the total service has remained available at levels of better than 98.7% in the 14 months of seven day, 24 hour operations.

Access to AARNet is via the institution's local networking facilities. As the usage figures demonstrate, AARNet has proved to be a very effective mechanism which enables disparate groups to work together at a national and institutional level to achieve the total objectives of the program.

The nature and degree of cooperation involved between the institutions:

AARNet is one of the major common cooperative programs undertaken in the higher education sector. All institutions contribute to the funding of AARNet, through contributing a percentage of the operating grant of each institutions, and all institutions are served by AARNet in a uniform and consistent fashion. All institutions have been active participants in the development of informational services on the network, and in actively promoting the benefits and potential uses of this facility within their institution.

The potential of the proposal to enhance research in the area concerned, and in the institutions involved:

The AARNet program is intended to address broad-based issues associated with the support of the communications requirements across the entire research system. It offers substantial benefits to researchers and research programs through access to valuable information and resources. It also enables researchers within smaller institutions to enjoy the same levels of access to national resources as those in the larger institutions. Thus, from this perspective, AARNet offers the potential to enhance the quality, effectiveness and timeliness of the overall national research endeavour.

This significant investment in the purchase and deployment of leading communications technology also provides a focused catalyst to research and development being undertaken in aspects of data communications technology itself. There are active research programs underway in Queensland (notably the Centre for Information Technology Research, CITR), and a joint CSIRO, University of Melbourne and Royal Melbourne Institute of Technology research institute in Melbourne (the Collaborative Information Technology Research Institute, CITRI), which are specifically involved in this area of research into aspects data communications, and these research endeavours, and many other related research programs in this area undertaken within other institutions, are assisted in various ways through their access to AARNet.

The extent to which the proposal supports high quality research:

AARNet supports the interaction and collaboration of high quality researchers on a national and international basis. Researchers gain effective and productive access to high quality research tools, techniques and resources.

Whether the proposal is appropriate in terms of the mission, size and resources concerned:

The first 14 months of operation has indicated the viability of the approach adopted by the institutions in supporting the common AARNet program. The institutional support structures, and the operational management undertaken by the AVCC have proved effective in ensuring that the AARNet program has met the ambitious expectations associated with the project. The challenge now is to ensure that AARNet can continue to meet the growing requirements as expressed by the

client research population. This is seen in 1992 as an issue of funding for the necessary facilities to be leased and purchased from the appropriate suppliers.

The need for, and level of demand for, the proposed equipment or facility in Australia, its relevance to identified national needs and priorities and the availability of comparable infrastructure elsewhere in the country:

In terms of the program's relevance to identified national needs and priorities, AARNet is a vital component of common infrastructure in the Australian research sector. A network which spans both the academic and commercial research environment plays a critical role in bringing researchers together, and acts as a significant catalyst in the process of application of research results. It is also noted that research is an international activity, and Australia is both a significant contributor to basic research output, and a client of overseas research output. Our geographic isolation makes interaction with researchers in similar fields overseas, of critical importance. Data communications is one of the few tools which can reduce this distance significantly. Through AARNet, Australian researchers are within fractions of a second from information sources published elsewhere in the world, and networks offer a mechanism whereby a large travel budget is not a prerequisite for effective collaboration in mainstream high quality international research programs.

In terms of the availability of comparable infrastructure elsewhere in the country, there is still no other viable mechanism available to the research sector other than to run a dedicated private network. Commercial telecommunications carriers do not wish to invest in this area of communications technology, and at present offer a technically more conservative (and in this case, inapplicable) method of data communications using virtual circuit-based packet switched networks. If and when there are commercial offerings of the type used within AARNet, and if at that stage such communications technology is as relevant to the needs of the sector as it is today, then alternatives to a dedicated private network will be seriously considered. At this stage the approach adopted by institutions has proved to be unique, and also very effective in addressing current needs and requirements.

6. ADDITIONAL MATERIAL

Attached to this submission are the following documents:

Attachment A	AARNet - 90-94 Budget Summary
Attachment B	AARNet Affiliate Network Members
Attachment C	AARNet Weekly Traffic Levels - June 90 to July 1991
Attachment D	AARNet Quarterly Report, Second Quarter 1991

Attachment A

AARNet - 1990-1994 Budget Summary

	Actual		Proposed		
	1990	1991	(92-94 figures in 92 Dollars)		
			1992	1993	1994
<u>AARNET EXPENDITURE</u>					
1. Data Transmission Charges	750,502	1,433,388	1,876,200	2,459,200	3,095,200
2. Equipment	747,101	294,362	265,000	307,400	344,500
3. AARNet Management	344,000	441,250	556,500	620,100	620,100
4. Education Promotion and Development	32,000	230,000	106,000	84,800	63,600
5. Other	10,000	13,000	19,080	24,380	29,680
TOTAL Expenditure	1,883,603	2,412,000	2,822,780	3,495,880	4,153,080
<u>AARNET FUNDING</u>					
1. Higher Education Institutions	1,161,865	703,112	1,197,570	1,493,357	1,781,596
2. CSIRO	204,613	204,613	255,187	318,216	379,636
3. Australian Research Council	854,400	917,000	1,070,023	1,334,307	1,591,848
4. Affiliate Membership Program		250,000	300,000	350,000	400,000
TOTAL Funding	2,220,878	2,074,725	2,822,780	3,495,880	4,153,080

Attachment B

AARNet Affiliate Network Members

The following organisations and companies are connected to the Australian Academic and research Network, and pay an annual fee to AARNet for the provision of networking services. The organisations have signed a formal undertaking to use AARNet for the purposes of support for joint collaborative research activity with an Australian higher educational institution and/or CSIRO, or to support the supply of goods and services to Australian higher education services and/or CSIRO.

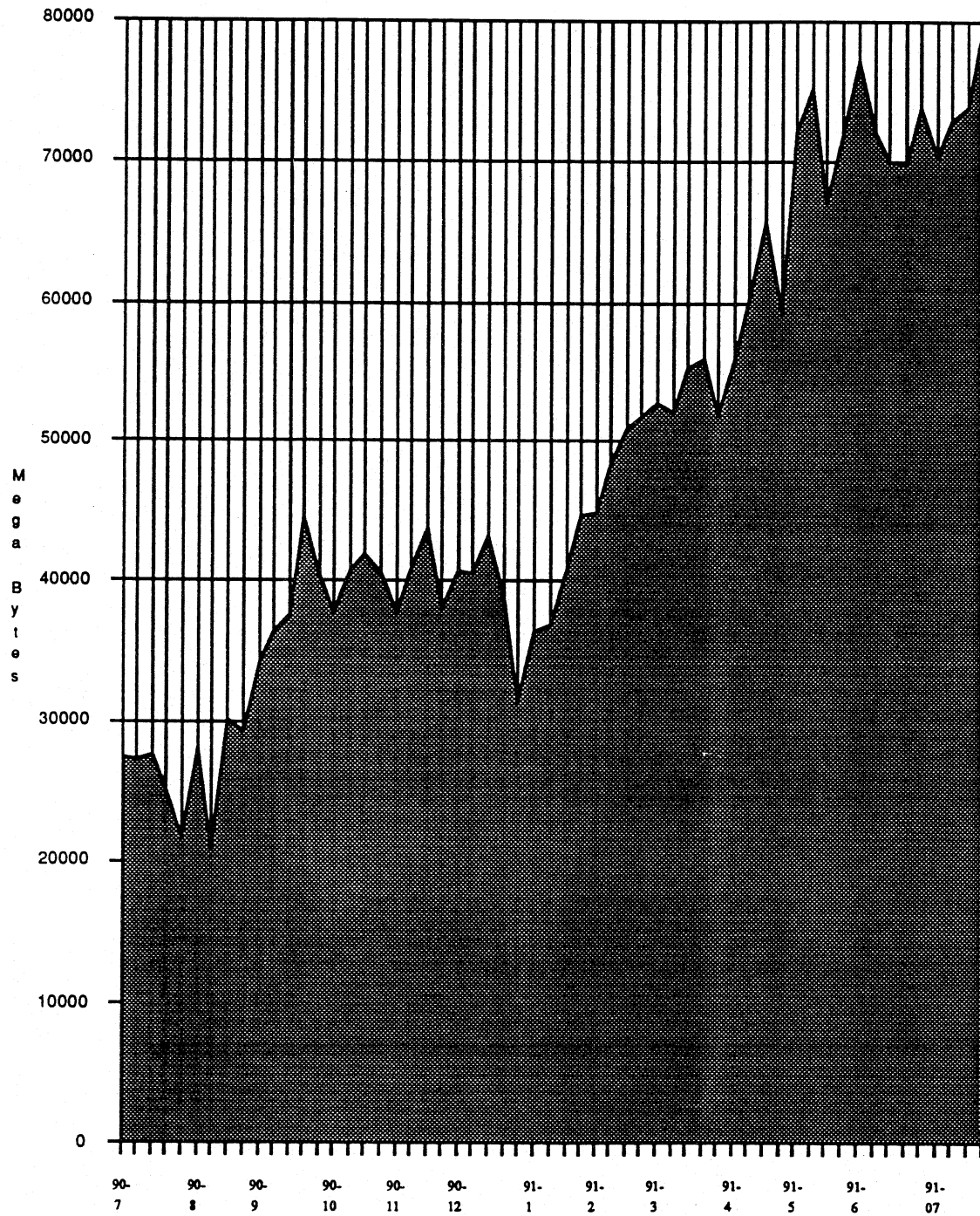
The networking service supplied by AARNet is either the delivery of electronic mail across AARNet (Mail Only) or as a peer network connection (Network).

Organisation	Type of Network Service
ACT Electricity and Water	Mail Only
Anglo Australian Observatory	Network
Antarctic Division	Network
Australian Artificial Intelligence Institute	Network
Australian Bureau of Agricultural & Resource Economics	Network
Australian Bureau of Meteorology	Network
Australian Centre for Unisys Software	Mail Only
Australian Computing and Communications Institute	Network
Australian Council for Educational Research	Mail Only
Australian Electoral Commission	Network
Australian Institute of Marine Science	Network
Australian Nuclear Science and Technology Organisation	Network
Australian Oceanographic Data Centre	Network
Australian Seismological Centre, BMR	Network
Australian Unix Users Group	Mail Only
BHP Research Laboratories	Network
Boral Elevators	Mail Only
Canon Information Systems Research Australia	Mail Only
Comperex Pty Ltd	Mail Only
Computer Education Centre	Network
Computer Power Software	Mail Only
Datacraft Limited	Mail Only
Defence Science and Technology Organisation	Network
Department of Agriculture and Rural Affairs (Victoria)	Mail Only
Department of Transport and Communications	Network
Dialix	Mail Only
Earth Resource Mapping	Network
Elizabeth Computer Centre	Mail Only
ESRI Australia	Mail Only
Exicom Pty Ltd	Network
Geelong and District Water Board	Network
Gemco (Incorporating Aldetec)	Mail Only
Gestetner Pty Ltd	Mail Only
Graphics Computer Systems	Mail Only
Great Barrier Reef Marine Park Authority	Network
IPS Radio and Space Services	Network
Labtam Pty Ltd	Mail Only
Megadata Pty Ltd	Mail Only
Melbourne Information Technology Services	Mail Only
Message Handling Systems	Mail Only
Miden Pacific	Network
MINCOM Pty Ltd	Mail Only

NEC Information Systems	Mail Only
NorTel Technology Centre	Mail Only
Pyramid Technology Corporation	Network
QPSX Communications Ltd.	Mail Only
Queensland Department of Primary Industry	Mail Only
Silicon Graphics Pty Ltd	Mail Only
Softway Pty Ltd	Mail Only
South Australian Department of Employment and TAFE	Network
South East Queensland Electricity Board	Mail Only
State Electricity Commission of Victoria	Mail Only
Sugar Research Institute	Network
Technology Development Corporation	Network
Telecom - Network Management Systems Development	Mail Only
Telecom Australia (WA)	Mail Only
Telecom Australia - Integrated Network Products Unit	Mail Only
Telecom Australia Research Laboratories	Network
Telecom Australia, Customer Network Management Branch	Mail Only
Telecom Network Engineering and Support Services	Mail Only
Telecom Network Management and Protocol Development	Mail Only
Teletronics Pty Ltd	Mail Only
Toshiba International	Mail Only
Webster Computer Corporation	Mail Only
Wesley College	Mail Only

Attachment C

AARNet Weekly Traffic Levels - June 90 to July 1991



Attachment D

AARNet Quarterly Report, Second Quarter 1991