Australian Academic and Research Network

Australian Vice-Chancellors Committee

Australian Committee of Directors and Principals

Commonwealth Scientific and Industrial Research Organisation

The objective of the network is to establish an Australian computer communications network to provide common set of networking services to member sites.

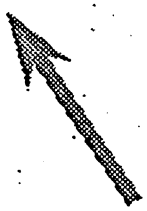
Network membership to include:

- Universities
- Colleges
- Government Research Organisations
- Other research and commercial organisations with common interests to the core member bodies

AARNet Network Objectives

Australian Academic and Research Network

Research and Communications	Distance Education and Open Learning	Information Services	Tertiary Administration
Large network of peer systems providing: • Mail Delivery • News Services • File Transfer • Remote Access • Remote job execution • Directory Lookup	Service provision for clients: • Student - Lecturer mail • Distance lectures • Study Centre support • Access to learning resources • Access to courses • Access to administration	Academic Support services: • Library Activities • Database Access	Administrative Access • Admissions Centres • DEET requirements • Executive services



Phase 1 AARN network

Phase 1 to be implemented by April 1990 using a mix of medium and high speed lines (48K, 2M)

Phase 2 to include line bandwidth upgrades and expansion of services to include information access services to be implemented in 1991 / 1992

Phase 3 to include other services and bandwidth upgrades. Services for other media (Fax, video) may be financially and technically feasible within this packet network in this timeframe

AARNet - Phase 1

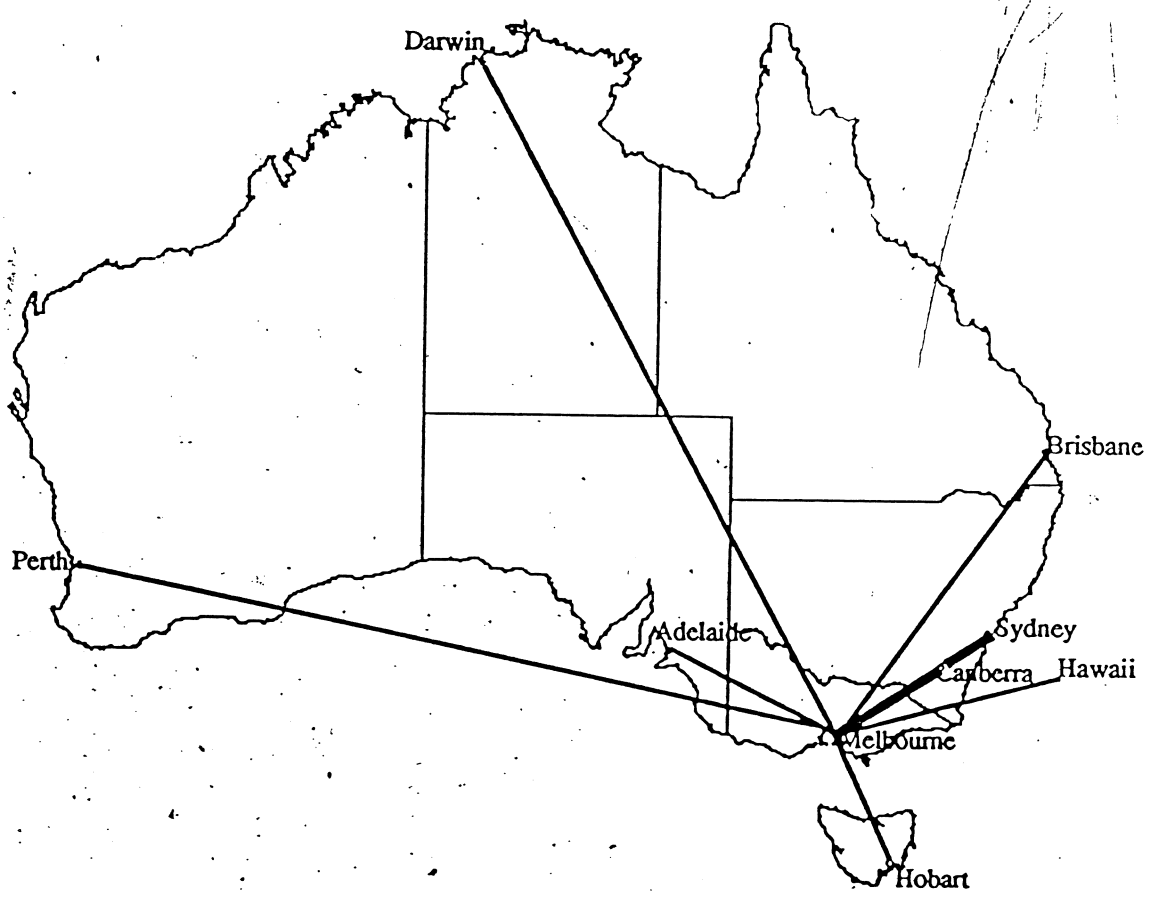
Phase 1 program encompasses:

- Installation of mid-speed (48K) and high speed (2Mbps) leased lines plus routers to form the trunk backbone.
- Installation of 48K leased lines for the tail-end links from each backbone interface to every member site.
- Support for national DECnet and national IPnet using multi-protocol routing units for both the backbone and the tail-end sites
- Support for ISO OSI (clns) anticipated mid 1990 - plus migration to DECnet Phase V routing
- Support for X.25 gateway access anticipated in late 1990

Service Issues

- Integration of ACSnet services with IP facilities
- IP management issues
- DECnet managment for Australian DECnet Phase IV
- Directory services
- Network management facilities
- IP / DECnet application gateways
- Introduction of ISO OSI support
- Gateways to other services (e.g. Library networks)

AARNet BACKBONE Network



National Research Network Backbone

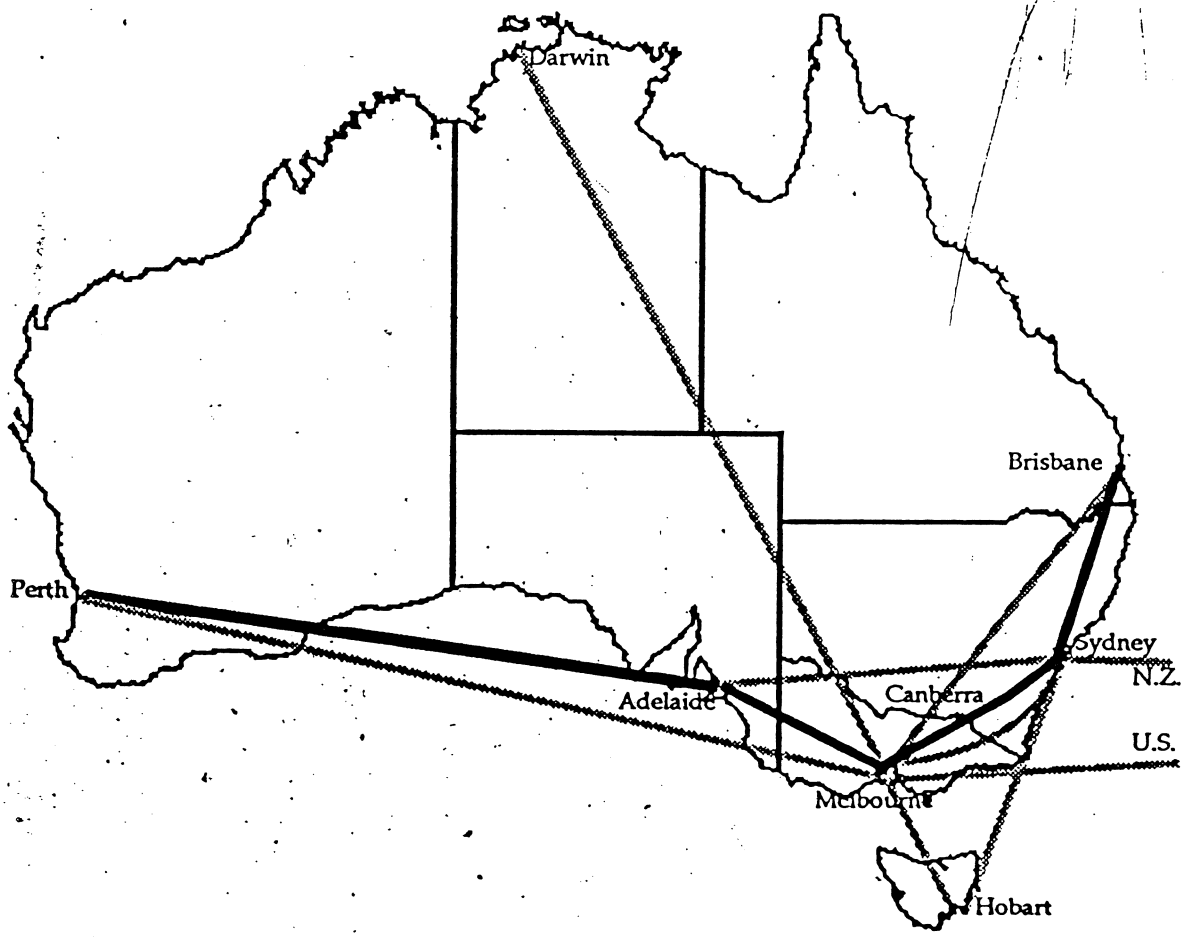
Phase 1 Topology

Backbone links will use midand high speed point-to-point digital lines for Phase 1 (e.g. 48K Digital Data Service or ISDN MicroLink mid speed and 2Mbps Megalink for high speed lines)

Backbone links are terminated at Regional Network Centres (hosted by a University within each State Capital)

Major mid-speed trunk lines will be upgraded to 2Mb leased lines. Additional ISDN channels will also be configured as required to form a mesh topology for increased reliability as well as increased bandwidth and performance.

Futures for the AARN Backbone



Increase bandwidth on trunk links - Megabit main trunk with additional 64K/144K ISDN links.

Major Regional Centres provided with dual paths, second hub located in Sydney for enhanced network throughput.

Link to Hawaii upgraded, and link to New Zealand established.

Potential use of dynamic ISDN connections for peak load servicing

OSI

- Sponsored by international standards bodies (ISO/IEC, CCITT)
- Development of the standards commenced in the mid-70's
- Development has not been focused. The standards bodies allowed local constraints and opinions to fragment the activity
- OSI is detached from practical reality within the standards world:

  "Democracy might be a fine way to run a government, but it is no way to produce rational technology."

- Osi contains bloated, fundamental inconsistencies within the protocols
- OSI exists today as "pilot" projects. There are no extensive full OSI networks in use.
- OSI standards are still changing and there is no confidence that the technology is well understood. Vendors are waiting for stability in the standards

  "I am here to put my hand on the OSI bible and implement everything. Except, of course, for the bits that aren't sensible!"

- Open Systems can be achieved only through implementation and experimentation - OSI is yet to persue this path.

  "I don't know what the computer-communications protocols of the 90's will consist of, but they <u>will</u> be called OSI"

OSI does have a long term future: however, simply stated, there are *no* workable implementations in 1989, and *no* certainty when this will change.

The pragmatic approach to Open Systems from the service provider perspective is to adopt TCP/IP for immediate requirements, and follow the migratory technology into OSI as it stabilises at the marketing level.

Network Protocols

A network protocol is the connectivity tool which allows user level applications to interoperate over a network.

There are many network protocols in use today:

- Basic data connectivity protocols (no application interface) e.g. X.25
- Vendor-specific protocols allowing application interoperability within a homogenous network e.g. SNA (IBM), DECnet (Digital)
- "Open" protocols which are not vendor-specific e.g. OSI, TCP/IP

A network provider may either adopt a single protocol as the only means of access to the network, or adopt a basic data connectivity protocol, or provide a multi-protocol network.

Single protocol networks are inappropriate for a heterogenous user population - the network should not dictate protocols to user organisations.

Basic data connectivity networks cannot adequately service large networks as they lack the required protocol-specific tools for data to transit the network, and do not provide common application interfaces. Such networks are suited to Local Area and small scale networks.

Multi-protocol networks are neutral with respect to the networking solution used within each connected site, while still providing interconnectivity and protocol-specific networking facilities.

A Soap Box on Open Network Protocols

There are two major open protocols under active development today:

- The Internet suite of protocols (TCP/IP)
- The Open Systems Interconnect suite of protocols

TCP/IP

- sponsored by the U.S. Department of Defense
- development commenced mid 70's
- In use by late 70's
- Full implemetation of the network protocol stack including implementation of common applications for interoperability
- Supports both local and wide area network connections over a diverse physical connection environment.
- In active use today on close to 1,000,000 systems and is the major protocol within the global academic and research networking environment. The protocol has been implemented on a wide range of computing equipment.
- Developed through an engineering focus on interconnectability issues
- Continued engineering effort based on response to technology changes as well as the requirements of supporting a massive production set of networks.
- Long term future uncertain.