

participating institutions in Brisbane, Sydney, Melbourne and Adelaide using the QUIPU Directory Service.

**Term** From January 1991 to December 1991

### **Deliverables to Digital**

- Access to all technical papers and materials relevant to the management and implementation of the project. Technical papers and publications will acknowledge Digital's contribution to the project.
- ISODE/QUIPU and any other relevant programs will be ported to Ultrix and distributed in the public domain. The software will be maintained and distributed in a timely fashion.
- ISODE/QUIPU testing in the DEC Windows environment.
- VMS/Ultrix interworking. For example User Agents will be tested for inter-working in both environments.
- Benchmark, timing, sizing and performance information for ISODE/QUIPU on Digital platforms.
- Interoperation of the directory service on Digital platforms with other systems in an OSI framework.

## Project Aims

It is proposed to implement a pilot, national, electronic directory service over AARNet, which will enable individuals within AARNet to access information about people, capabilities, organisations and resources using computer-based access tools. In its simplest sense it can be seen as analogous to an internal telephone directory (and indeed can be used as such), but it is also capable of providing access to an on-line distributed database of the individuals, resources and organisations which form Australia's academic and research community. With links to similar projects in many other countries this service will become a significant component of the global academic and research infrastructure.

The research intends to produce the following deliverables to the national AARNet community by the end of the first phase in 1991:

- A national electronic directory structure, populated initially with information from the participating institutions.
- Documentation of the costs and benefits experienced by the participating institutions in providing directory services. This will serve as a guide to other institution's entry into this national program.
- The acquisition of valuable experience within AARNet in the use of emerging open networking technologies in a research, service and production role.
- The fostering of participation of Australian network engineers and researchers in the ongoing development of global communications technologies, with the consequent strategic benefit that results from such active participation.
- Documentation of the experiences in the management of a national project within the AARNet program, as a guide to future activities of similar national significance to the Australian academic and research community.

The project will be managed by The University of Queensland and AARNet, with the participation of the University of Adelaide, the University of Sydney, Monash University and the CSIRO Division of Information Technology and a commercial partner.

The project aims to produce the following deliverables to the commercial partner:

- Access to all technical papers and materials relevant to the management and implementation of the project. Technical papers and publications will acknowledge Digital's contribution to the project.
- ISODE/QUIPU and any other relevant programs will be ported to Ultrix and distributed in the public domain. The software will be maintained and distributed in a timely fashion. QUIPU is public domain implementation of the CCITT X.500 Directory Services. It has been in development since 1987 and is intended for early development of standard DS and to provide an environment for experimentation and research. The QUIPU software is freely available and distributed with ISODE. Development is continuing on the QUIPU DSA and many Directory User Agents (DUA) in a number of countries. It will most likely be the defacto standard used by the tertiary and research institutions around the world.
- ISODE/QUIPU testing in the DEC Windows environment. User Agents operating in a Windows environment on both VMS and Ultrix systems will be developed and tested.

- VMS/Ultrix interworking. For example, User Agents will be tested for inter-working in both environments. These are OSI applications which will migrate to open networks and provide a valuable mechanism for testing in OSF1.
- Performance information about these applications on Digital platforms will be made available to Digital. In particular benchmarks will be established, which will include timing and sizing, for operation of the ISODE/QUIPU directory services.
- Interoperation of the directory service on Digital platforms with other systems in an OSI framework. The AARNet Directory is being developed in conjunction with a number of projects in other countries, including the USA and UK.

## Funding

This project is being funded jointly by the AVCC and the participating institutions. This proposal is requesting the inclusion of Digital as a commercial partner. The funding is as follows:

AVCC	\$80,000
Participating Institutions	\$300,000
Digital	\$100,000

The list price of suggested equipment from Digital is estimated at \$150,000

## Project Details

The project plans to research the problems of initiating, managing and maintaining an extensible national electronic directory service on AARNet and to foster these services so that they continue beyond the life of the project. The participating institutions will each undertake specific focussed research and development projects, which will reflect specific interest areas of the project partners, and exploit local skills. User Agents will need to be developed both for interactive use as well as for applications such as Message Handling Systems.

The directory will be fully populated, initially, with information from the participating institutions and a skeletal national electronic directory will be created. This directory will contain information on objects such as:

- The member institutions, and other relevant organisations.
- Internal structure such as faculties, schools, and departments.
- Staff members, organisational roles.
- Computer based services.

Information contained about these objects will consist of properties such as:

- Telephone, facsimile and telex numbers.
- Physical location.
- Postal and electronic addresses.
- Descriptive information.

This will be augmented with other data to reflect users needs including (but not limited to): areas of interest, bibliographic information, maps, images, abstracts, skills and research information. This will create a general information system of great power. The project will ensure data is held in a secure fashion, and is kept up-to-date. Users will be able to verify their information, and in many cases modify it directly.

The costs and benefits experienced by the participating institutions in providing directory services will be documented. This will serve as a guide to other institutions' entry into this national program. Services will be identified which exploit the features of the directory service, and quantify the benefits of their application. In addition, new opportunities are expected to emerge such as the use for publicising the universities' capabilities and resources to peer institutions, the community at large, and internationally. Australian researchers will be able to exploit the directory to promote their skills and capabilities, enhancing the national research profile.

Directory systems have both start up and ongoing costs, which will be quantified by the project. Start up costs include hardware and software acquisition, and installation labour. Ongoing requirements are mainly for data entry and management, and the modification of existing procedures to exploit the directory.

Project Management will make extensive use of AARNet facilities, avoiding more costly and inefficient methods of communication where possible. Aside from cost savings by the reduction of paper exchange and phone usage, technical reports and other material will be co-authored online and will be readily available over the network. Day-to-day communication between project partners will be through electronic mail and other AARNet services.

## **Implementation**

In order to meet the project objectives it is proposed to site suitable computer systems in Brisbane, Sydney, Melbourne and Adelaide to support the development of the pilot directory systems. These computers will remain the property of AARNet and, after completion of the project, would support the directory service function on a regional basis. It is envisaged that all AARNet institutions would want to operate their own directory on their own equipment (although such a service could be contracted).

Broadly activities for each participating institution are:

- Directory Initialisation. The directory services must be installed and populated with information (some sites are already well advanced in this).
- Management and maintenance of the directory.
- Focussed Research Projects. There are a number of specific research and development areas which will be undertaken as part of the project.

## **Focussed Research Projects**

The participating institutions will each undertake specific focussed research and development projects, which will reflect specific interest areas of the project partners, and exploit local skills. There is much work to be in the DUA area and in management of the directory. These focussed projects are yet to be detailed but will include:

- VMS support. Simple interfacing into the Unix world is already available from The University of Queensland using Ultrix-DECnet services or SUNos DNI. This is of limited functionality, and merely provides the unix interfaces already available over a network link into a VT100 tty. Native VMS support for at least one DAU is highly desirable. Should it be possible to produce a PCSA supported tool for IBM/PC usage this would also have substantial rewards. Finally, support for VMS email services is totally lacking. There would be clear benefits for both the third party mail package providers and the academic community in the development of a VMS mail interface to the directory for use at message submission and delivery stages.
  - Native User Agent support
  - PCSA and LAN Works support
  - Third party MHS support at submission and delivery processing stages
  - VMS callable mail interface support.
- PC and Macintosh support. It is hoped a MS-Windows supporting DUA will be coming within the life of the project from JANET funded research work. This will make use of an OSI stack on the PC, or some kind of lightweight emulation. There is also a Hypercard (Macintosh) stack based DUA which could undergo some refinement, CSIRO has access to the source (from SICS in Sweden). Other than these, no native PC/Mac interfaces are known to exist.
- Unix mailsystem support. Arbitrary index file lookup can be exploited to provide name->address lookup using dumped tables generated from the Directory Information Tress (DIT). At the next level of sophistication the Message Transfer System (MTS) can be interfaced directly to the DIT in some way, to provide deliver-time lookups. Finally user-agents can be modified to perform DUA access in a variety of ways. Some of these activities are already underway across the network-at-large but should at least be tracked within AARNet and probably attacked directly where relevant. MHSnet support is clearly desirable.
- Yellow pages support. Current DIT structures do not lend themselves to "interest areas" forms of searching. Collaboration is underway with projects at Griffith University, The University of Queensland and the Australian National University into Management Information Systems and other databases of capabilities within AARNet would lead to the creation of new data types, and their population into the DIT. This would permit the same interface (the DUAs) to be offered for accessing non-email information such as:
  - Research Grant status
  - Skills databases
  - Research Interest searches
- Interoperability. There is ample opportunity for interworking with other Australian X.500 DS systems including Telecom, ACUS (Australian Centre for Unisys Software) and the GIRD (Australian Government) funded project. Details will be published of profiles adopted, and any non-standard data types supported. As well as demonstrating the ability to connect to other systems it is desirable to ensure consistency of the DIT with any other DS that are in service.
- User Directory Access. User Agents permitting users to directly access and modify the information in the directory. There are many questions to be investigated in this

area, such as, how do users "view" and use an information structure which is widely dispersed geographically?

- Data Security. Currently the DIT is treated as a global read access data structure. Some of the more interesting uses of the DIT would require some controls of access to sensitive data. Therefore the project must ensure a consistent access control profile is implemented.
- Replication. Few guidelines exist to structure appropriate levels of data replication.
- Data Structuring. Initially the "well known" profiles will be used, in line with MHS based usage of the DS as a primary target. As new information types are identified these will be instantiated in the DIT and guidelines for usage drawn up.
- Usage Statistics. Statistics on availability, DIT size and end-user usage of the services will be produced.

## Project Schedule

The project is scheduled to run from January to December 1991. An indicative schedule of activities is:

### 1Q91

Detailed development of project management structure and reporting procedures.  
Hardware acquisition program.  
Overall and focussed project design details and implementation schedule.

### 2Q91

Population of directories.  
Management procedures for maintaining the directory, user education.  
Focussed projects.

### 3Q91

Profiling and sizing directory requirements, registration procedures, expansion planning.  
Focussed projects.

### 4Q91

Appraisal of the project.  
Cost/benefit studies of the site directory activities.  
Publication of all research and development activities.