SPEARNET NEWS

Issue No. 1   **June, 1987**

COMMENT

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Committee, and
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It is with much pleasure that I introduce this first issue of *Spearnet News* which marks a significant epoch in the development of Spearnet. It represents the maturity of an idea which has been nurtured for many years by a group representing a number of universities. The concept of Spearnet is not new. We have watched the development of similar networks overseas. Many factors have hindered similar development in Australia including the relatively small population (15 million) spread over a country which has an area similar to that of mainland USA and, unlike most other countries, a lack of central funding.

Spearnet began in the Universities but is intended to incorporate all tertiary and research institutions in the South Pacific and indeed this is already happening.

It is interesting to note that Spearnet has received no direct funding to date. Development costs have been borne by those institutions who have believed in the vision. Digital Equipment Corporation however has supported the development by making available significant discounts for equipment and software directly involved in the connection to Spearnet. This agreement was negotiated to include all Universities and may be extended to include other institutions. DEC is to be commended for this far sighted view. Other manufacturers have yet to provide support of a similar nature.

The Vice-Chancellors Committee, Working Party on Networking Policy has recommended that the AVCC support the concept of Spearnet. The Working Party is now preparing recommendations about financial support to provide a secretariat. This will pave the way for a formal Spearnet Management Committee. A final decision by AVCC depends upon the report by an AVCC consultant.

The University of Queensland was pleased to host the first Spearnet Workshop early this year. This meeting was modelled on "Programmer Workshops" held some years ago with the view that bringing the programmers and engineers together improves personal communications and stimulates activity. On this basis the Workshop was enormously successful and I will be looking to providing as much support as possible to the next one to be held in Melbourne.

One of the most pleasing aspects of Spearnet to me is that we have begun a level of cooperation between tertiary institutions which has never occurred previously in Australia. Certainly, at this point of time, this cooperation has been between the Computer Centres and Computer Science Departments however it illustrates that the concept of Spearnet works and that we can fulfil the promise to all academics and researchers.

The most exciting part of Spearnet is the challenge yet to come.

The implementation of international communications standards and the provision of improved application layer services will be most interesting. However, we must not lose one of the most important aims of Spearnet - the provision of a network for researchers and not a network for research.

Spearnet Workshop at University of Queensland — 1987

An inaugural Spearnet Workshop was held at the University of Queensland from the 9th to the 12th of February 1987. The workshop was arranged at fairly short notice and so it was pleasing to see, for a country the size of Australia, attendance from 19 of the 21 Universities. In addition there was representation from New Zealand (Otago University), the CSIRO Division of Information Technology as well as IBM and DEC. DEC who have strongly supported Spearnet since its inception also made a presentation.

The workshop sessions were run mainly by the University of Queensland and CSIRO Division of Information Technology but also included site reports from all institutions. The major topics covered were the Coloured Book and OSI protocols. However there were several "educational" sessions, discussions about other networks such as ACSnet and BITNET as well as debate over contentious issues such as addressing and naming.

One of the most important aspects of any such meeting is the personal contact with ones' colleagues. Electronic communications can only ever be an adjunct to personal contact.

The most important and interesting outcome of this workshop, in spite of the debate, the disagreement, the diverse interest and backgrounds of the participants, was the solid resolve that the concept of Spearnet is paramount. This is reflected in the unanimous resolutions of the group:-

It was unanimously agreed:
This group will actively work on the establishment of a computer network to enhance connectivity of, and collaberation between, educational/research institutions and give ongoing commitment to its support.
This group supports the formation of a secretariat to coordinate activities in ares such as:
  1. Newsletter.
  2. Mail distribution lists to facilitate discussion.
  3. Regular workshops.
(The University of Queensland agreed to provide a secretariat for the time being. The University of Melbourne and CSIRO Division of Technology offered to arrange the next workshop — see details elsewhere in this Newsletter.)

SOUTH PACIFIC EDUCATIONAL AND RESEARCH NETWORK

SPEARNET — Some ISSUES

Graham Rees
University of Queensland

Spearnet is an initiative of the Universities in Australia and New Zealand to improve computer based communications within the teaching and research community. It is hoped that this effort will spread rapidly to other associated institutions in the South Pacific area.

The network is primarily intended for the teaching and research community including Universities, Institutes of Technology, Colleges of Advanced Education, and Colleges of Technical And Further Education, etc and extending to any individual or organisation related to or participating in the knowledge and education industry.

The major objectives of Spearnet are:
To create a computer based communications network for the education and research community in the South Pacific region which has access to similiar networks in other countries.

To enhance the quality of teaching and research by providing an economic and convenient method for the timely exchange of ideas and information.

The types of facilities expected to be available to the user would include:

* Virtual terminal access to remote systems and services.
* File transfer, access and manipulation.
* Electronic mail with features such as conferencing, bulletin boards and subscribed news.
* Remote job entry or remote process execution.

The idea of such communications is not new. The necessity for rapid and convenient communications is now well accepted. What is new about Spearnet is the concerted effort to promote common mechanisms which are readily available to all (in our community). There are a number of systems overseas which have been aimed at just these objectives such as Coloured Books in the UK and BITNET and EARN in the USA and Europe respectively which have achieved great success. ACSnet in Australia has gone part way in meeting these requirements but why have we not followed our overseas colleagues sooner? Perhaps we have held onto the parochial view for too long that our small population spread over a large geographic distance would not permit such a system. Fortunately those times are past!

Part of the concept of Spearnet is to promote the idea of electronic communications such that anyone obtaining access to a computer system will want to "connect to and use Spearnet". They may only have a vague idea of all the services available but know that the rapid exchange of ideas and information with colleagues around the world is essential in competing in today's market place. Just as everyone demands a telephone today , Spearnet and other forms of electronic text, voice and video information will become the norm in the not too distant future.

The objectives do not mention any particular network architecture. It is important that we do not cloud the absolute necessity of user level communications with how the technologists implement the network. Further, the objectives make clear that the network is intended for the whole community and not any particular group.

While we believe that the necessity for Spearnet is immutable it is natural for others in the community to ask about the reasons for such a system.

Benefits to Users

* Rapid exchange of ideas and information for research and teaching.
* Development of common resources (not only communications).
* Shared access to the resources of other institutions which would not otherwise be obtainable.
* Saving of time and money by the reduction of duplication of effort and the development of common communications procedures and interfaces.
* Easing of the constraints of multivendor environments.
* Improved communications for other sectors of the teaching and research community such as administrators and libraries.

Benefits to the nation

* Improved quality of education.
* Improved access to educational facilities.
* Improved access to research for commerce and industry.
* Improved access to ideas and information.

How do we implement Spearnet? For a network which will grow as large as Spearnet some type of management structure is essential. There are three important levels (I hesitate to say layers) to consider:

1. SPEARNET Objectives

This is regarded as the top most level of Spearnet where the objectives stated are sufficiently abstract as to be non-contentious and timeless.

2. Planning and Policy

This level involves the formation of plans, policies and strategies which will be conducive to Spearnet development in the present and near future. This requires a management and coordination function and vision about the future. How do we plan to meet the objectives of Spearnet over the foreseeable future? What policies are necessary?

3. Implementation

The implementation level is obviously the real thing. The functions, the services of Spearnet and how they are implemented. What software on what machines and what problems?

PLANNING AND POLICY

The formation of policy and planning the necessary infrastructure to encourage the favourable development of Spearnet must be coordinated by a Management Committee with appropriate representation from participating parties.

Generally, policies will need to be formulated to meet the requirements of Spearnet. For example the following are proposed as being some of the criteria to meet the stated objectives:

Reliability	Bandwidth
Convenience	Connectivity
Robustness	Standardisation
Economy	Stability

(Obviously these would need to be expanded in some detail.)

One can propose further policies (with the knowledge of present work in the international standards arena and the likely directions of the major vendors) such as

The promotion and use of internationally accepted standards is essential in removing the constraints of multivendor environments and geographic distance.

A recognised management body is important in dealing with other organisations, in gaining recognition and in convincing possible new members or contributors that Spearnet is indeed viable. It is more likely that an organised group will have more influence with vendors. We must also be cognisant in our policies of the likely direction of vendors as well as the international standards groups such as ISO.

The management group can also perform various administrative and secretariat functions such as the dissemination of information and educational material. Various working parties or sub-committees may be required to perform part of this work.

Present Management Structure

The first formal meeting of the "Interim Management Committee" was held on the 28 May 1986. The membership of the committee consisted of the original instigators of Spearnet with Alan Coulter (University of Queensland) as the chairman because of his efforts over many years. The committee was regarded as interim to allow for appropriate changes as the need for a more formal management structure emerged. The committee members are:

Mr Alan Coulter — Chairman (University of Queensland)
Mr Ian Hunter (James Cook University)
Mr Alex Reid (Western Australia University)
Dr Tommy Thomas (CSIRO Div of Info Technology)
Mr John Ashton (Digital Equipment Corp)
Dr Colin Boswell (Victoria University — New Zealand)

At that meeting an "Implementation Team" was also formed. The main purpose of which was to advise the Interim Management Committee on technical matters. The original membership of this team was G Rees (University of Queensland), R Erskine (Australian National University), R Freak (Digital Equipment Corporation) and I Richards (CSIRO Division of Information Technology). It was difficult for such a small and distributed team to be really effective. Fortunately this group rapidly expanded into the present Spearnet Interest Group with the University of Queensland providing a coordinating function. The main effort to come from this was a Spearnet Workshop held at the University of Queensland in February 1987.

Early in 1986 it was recommended that the Coloured Book Protocols developed by the JNT in the UK initially be adopted as the main protocols for the present. It was expected that a move would be made to appropriate implementations of the ISO OSI protocols as soon as practicable. The Colour Book Protocols provide an excellent adjunct to already existing services such as ACSnet and X.29. They are a working, stable and robust set of products, meeting is a major requirement of Spearnet. Also they are functionally rich providing virtual terminal, file transfer, electronic mail, and process to process communication if required. In addition the Red Book Job Transfer and Manipulation Protocol would be available between some sites if required. Of major importance is that implementation of these protocols are available for a wide variety of vendors machines so no sites would be precluded from joining Spearnet from the outset. There are now eleven sites in Australia (with a further three expected in the near future) and eight in New Zealand.

The recently formed AVCC (Australian Vice Chancellors Committee) Working Party on Networking Policy recommended in January 1987 that the AVCC actively support Spearnet by providing a full time Coordinator of Networking Development and establish a management committee with a wider membership.

Future Management Structure

The management requirements in the future will need to be more formal. A small permanent staff would provide continuity of various management functions. An elected committee with appropriate user representation would set policy and overall direction. Subscribers would receive Spearnet newsletters and other information (eg user directories) and have access to educational materials, an advisory service and any Spearnet products. Spearnet may also be able to negotiate discounts on software and hardware with vendors by virtue of its large user base. Also the group should have more influence on manufacturers directions and products.

The Management Committee would also need to bring into being various Working Parties for advice and recommendations as required. Projects involving significant work may need to be funded or handled on a royalty basis.

IMPLEMENTATION

The Implementation level is the "coal face". It is important that at this level people maintain a flow of information to the policy makers as well as a high level of cooperation and discussion between the technicians actually implementing the network.

There is no doubt that the most effective method of doing this is through continued workshops similar to that held at the University of Queensland in January 1987. This workshop was attended by 19 of the 21 Australian Universities and University Colleges as well as representatives from the New Zealand Universities, CSIRO Division of Information Technology, Digital Equipment Corp and IBM. The attendance illustrates the importance placed on Spearnet by the tertiary institutions. The committment of this Special Interest Group to the absolute necessity for Spearnet is consolidated in the resolutions passed by the group at the conclusion of the workshop.

This group will actively work on the establishment of a computer network to enhance connectivity of and collaboration between, educational/research institutions and give an ongoing committment to its support.

This group supports the formation of a secretariat to coordinate continuing activities such as newsletters, mail, regular workshops and other management functions.

This group recommends that each institution establish a directory of electronic mail addresses e.g. initially in their internal telephone directory.

The next workshop is planned for late 1987. Some of the problem areas being addressed by the Group are:

> Directory Services
> Cbook/ACSnet Gateway
> Addressing Issues
> Accounting
> OSI X.400 Development
> BITNET
> Higher level mail systems

Spearnet Services

The services offered by the Coloured Book Protocol set are:

- The network service is provided by X.25 hence potentially any X.25 site can participate.
- Yellow Book is the Transport Service which provides a process to process communications mechanism and is the basis for the following applications services.
- Green Book Virtual Terminal service provides for remote interactive sessions.
- Blue Book is the File Transfer Protocol.
- Grey Book provides Electronic Mail (which uses the Blue Book file transfer protocol).

The addressing information required to access a remote site is:
- The X.121 site address (a string of up to 15 digits) — for ease, a symbolic representation of the address is usually used, and
- Appropriate accounting information (user name, password) to allow access to the site or address a particular user.

ACSnet is based on Unix systems and provides file transfer and mail facilities. There are now in excess of 300 hosts in Australia. A gateway located at Melbourne University provides access to networks in the USA including UUCP, CSnet, ARPAnet and BITNET. There is also a gateway between ACSnet and Coloured Book mail at the University of Queensland.

Additionally X.25 PAD facilitates access to many Value Added services both public and private. For example the public electronic mail systems of Telecom Australia and the Overseas Telecommunications Commission which also have access to the Telex network. There are many private data base and information retrieval systems accessible such as Lockheed's DIALOG and the Australian Bibliographic Network.

Concluding Remarks

The main purpose of this paper is to present a concise introduction to Spearnet and put some of the issues in perspective. There is a tremendous enthusiasm for Spearnet simply because of the realisation of the urgent need for this type of communications network. Hopefully we will look back in a few years time when Spearnet consists of hundreds of sites and has adopted international standards and wonder what we did before.

THE COLOURED BOOK PROTOCOLS — A BRIEF OVERVIEW

The Coloured Book protocols were developed by the UK academic and research community and implementations have been produced for a number of different operating systems as a result of grants and contracts from the UK Joint Network Team. JANET, the UK Joint Academic NETwork uses the Coloured Book protocols. The coloured book protocols make use of the international standard protocol X.25 for connection to a packet mode data network. Consequently most implementations include implementations of the international standards X.3/X.28/X.29 for character mode terminal access to public packet data networks. These standards provide for a terminal access service to other systems on the network.

Yellow Book Transport Service

This protocol provides a process to process communications mechanism allowing two programs on different hosts to exchange blocks of data.

Blue Book File Transfer

This protocol provides a mechanism for transferring files between machines on the network. Text, binary and executable files can generally be transferred between two similar operating systems. Generally only text files can be transferred between two dissimilar operating systems.

Grey Book Mail Protocol

This protocol uses the Blue Book file transfer protocol to transfer electronic mail messages (as files) between two systems.

UQ X.25 PACKET SWITCH

Software is available from the Prentice Computer Centre for running an X.25 packet switch on a micro—VAX computer. The software uses KXT11—CA boards for the serial lines. Each board is capable of supporting two lines at speeds up to 28kbps in either RS—422 or RS—423 mode or a single line at speeds up to 56kbps. The switch software is currently capable of supporting up to four KXT11—CA boards, but this can be easily extended to supporting the maximum number of boards that may be used within the backplane and power supply capacity of the CPU box. On a micro—VAX I the software is capable of a throughput of over 400 packets per second. On the newly available rtVAX (KA620) CPUs a throughput of over 1,000 packets per second may be reasonably expected.

Switch Configuration

A minimum switch configuration would be:

- A micro—VAX CPU with VAXELN run—time licence: currently the rtVAX (KA620) which includes 1Mbyte of memory is probably the best buy.
- A CPU and option mounting box — a BA23 would be suitable for 3 KXT11—CAs, a BA123 would allow for at least 8 KXT11—CAs.
- A disk controller and disk drives for loading KXT11 microcode and storing statistics and event information. The RQDX—3 and RX50 floppy disks would be suitable.
- A DEQNA Ethernet controller if it is desired to down—line load the switch from a DECnet host, or to access the call statistics and event log from a DECnet host.

Uses Of The Switch

The switch may be used wherever there is a requirement for a number of systems to share a single line to a public X.25 network. The greater the number of systems the sooner the cost of the switch is recovered compared with the cost of individual lines for each system. At the Prentice Computer Centre the switch is used to connect AUSTPAC to an ANF—10 network with DEC—10 host computer, a VAX/VMS system and a MICOM circuit switch. In the near future additional VAX/VMS systems may be connected as well as departmental systems. The call statistics recorded by the switch make it possible to back bill the operators of any individual system connected to the switch and records can be produced of all calls to or from any individual system. Further information is available from:

Arthur Hartwig
Prentice Computer Centre
University of Queensland

Connecting a VAX to Spearnet

Hardware —

Unibus: DMF, KMS, (DUP)
BIBus: DMB
Q.Bus: KMV, (DPV)
      ( ) non-DMA devices — not preferred.
Austpac Connection

Software —

VMS/DECnet
PSI (Packet Switch Interface)
Coloured Books. (non DEC product — enquire University of Queensland)

List of known Australasian Coloured Book sites

This following list comprises the known sites that are running an implementation of the United Kingdom's Coloured Book protocols. The protocols implemented are Yellow Book (Network Independant Transport Service), Blue Book (Network Independant File Transfer Protocol), and Grey Book (Network Independant Mail Protocol).

Listed with each site is the X.121 address to access the site, and the Yellow Book Transport String to access the Coloured Book facilities.

1 AUSTRALIAN SITES

1.1 University Of Queensland. (Prentice Computer Centre).

Contact Person: Arthur Hartwig (07)377 4079.
Mailbox Name: ARTHUR
Postal Address: St Lucia, Brisbane. Queensland, 4067.
X.121 Address: 5052-737-20000
Blue Book Transport String: 1.FTP
Grey Book Transport String: 1.FTP.MAIL

Contact Person: Arthur Hartwig (07)377 4079.
Mailbox Name: ARTHUR
Postal Address: St Lucia, Brisbane. Queensland, 4067.
X.121 Address: 5052-737-20000-90
Blue Book Transport String: .FTP
Grey Book Transport String: .FTP.MAIL

Contact Person: Arthur Hartwig (07)377 4079.
Mailbox Name: ARTHUR
Postal Address: St Lucia, Brisbane. Queensland, 4067.
X.121 Address: 5052-737-20000-94
Blue Book Transport String: .FTP
Grey Book Transport String: .FTP.MAIL

1.2 University College Of Northern Territory.

Contact Person: Tery Anstey
Mailbox Name: POSTMASTER
Postal Address: G.P.O. Box 1341
Darwin, Northern Territory.
X.121 Address: 5052-898-30021
Blue Book Transport String: .FTP
Grey Book Transport String: .FTP.MAIL

1.3 University Of New England. (Computer Centre).

Contact Person: Gordon Smith.
Mailbox Name: GORDON
Postal Address: Armidale, N.S.W. 2351.
X.121 Address: 5052-677-22006
Blue Book Transport String: .FTP
Grey Book Transport String: .FTP.MAIL

1.4 James Cook University.

Contact Person: Brad Cooper
Mailbox Name: B__COOPER
Postal Address: Townsville, Queensland. 4811.
X.121 Address: 5052-777-21002
Blue Book Transport String: .FTP
Grey Book Transport String: .FTP.MAIL

1.5 Flinders University.

Contact Person: Mark Legg.
Mailbox Name: MLEGG
Postal Address: Bedford Park, Adelaide, South Australia. 5042.
X.121 Address: 5052-827-20012
Blue Book Transport String: .SPCP.FTP
Grey Book Transport String: .SPCP.FTP.MAIL

1.6 University Of Tasmania. (Department Of Information Science).

Contact Person: Rod Bilson.
Mailbox Name: ROD
Postal Address: G.P.O. Box 252C
Hobart, Tasmania. 7001.
X.121 Address: 5052-022-30003
Blue Book Transport String: .SPCP.FTP
Grey Book Transport String: .SPCP.FTP.MAIL

1.7 South Australia Institute Of Technology. (Computer Centre).

Contact Person: Rollo Ross.
Mailbox Name: CCAJR
Postal Address: P.O. Box 1, Ingle Farm
South Australia. 5098.
X.121 Address: 5052-826-22004
Blue Book Transport String: .FTP
Grey Book Transport String: .FTP.MAIL

1.8 Division Of Information Technology (CSIRO). (Computing Networking Group).

Contact Person: Trevor Hales
Mailbox Name: TREVOR
Postal Address: 55 Barry Street, Carlton
Melbourne, VIC. 3053.
X.121 Address: 5052-334-30001
Blue Book Transport String: .FTP
Grey Book Transport String: .FTP.MAIL

1.9 Division Of Radio Physics (CSIRO).

Contact Person: Paul Rayner
Mailbox Name: PAUL
Postal Address: P.O. Box 76, Epping. N.S.W. 2121.
X.121 Address: 5052-286-21001
Blue Book Transport String: .FTP
Grey Book Transport String: .FTP.MAIL

1.10 AUSTEK.

Contact Person: Richard Sharpe
Mailbox Name: RSHARPE
Postal Address: Innovation House, Technology Park
The Levels. S.A. 5095
X.121 Address: 5052-826-20000
Blue Book Transport String: .FTP
Grey Book Transport String: .FTP.MAIL

1.11 Australian Anglo Observatory.

Contact Person: Helen Davies
Mailbox Name: POSTMASTER
Postal Address: P.O. Box 296, Epping. N.S.W. 2121.
X.121 Address: 5052-286-21000
Blue Book Transport String: .FTP
Grey Book Transport String: .FTP.MAIL

2 NEW ZEALAND SITES

2.1 University Of Waikato.

Preferred Site Name: NZ.AC.WAIKATO
Contact Person: John Houlker
Mailbox Name: CBOOK
Postal Address: Waikato somewhere!
X.121 Address: 5301-710-00004
Blue Book Transport String: .FTP
Grey Book Transport String: .FTP.MAIL

2.2 Massey University. (Massey University Computer Centre).

Preferred Site Name: NZ.AC.MASSEY
Contact Person: Bob Lambourne
Mailbox Name: BOB
Postal Address: Palmerston North, N.Z.
X.121 Address: 5301-630-00005
Blue Book Transport String: .SPCP.FTP
Grey Book Transport String: .SPCP.FTP.MAIL

2.3 Victoria University Of Wellington. (Computing Services Centre).

Preferred Site Name: NZ.AC.VUW
Contact Person: Michael Newbery
Mailbox Name: JNET%"NEWBERY@VUW4341"
Postal Address: Private Bag, Wellington. N.Z.
X.121 Address: 5301-470-00049
Blue Book Transport String: .FTP
Grey Book Transport String: .FTP.MAIL

2.4 Lincoln College.

Preferred Site Name: NZ.AC.LINCOLN
Contact Person: Cliff Collister
Mailbox Name: POSTMASTER
Postal Address: Private Bag, Canterbury. N.Z.
X.121 Address: 5301-300-00047
Blue Book Transport String: .FTP
Grey Book Transport String: .FTP.MAIL

2.5 University Of Otago. (Computing Services Centre).

Preferred Site Name: NZ.AC.OTAGO
Contact Person: Ian Greig.
Mailbox Name: COMPIG
Postal Address: Box 56, Dunedin, N.Z.
X.121 Address: 5301-240-00016
Blue Book Transport String: .FTP
Grey Book Transport String: .FTP.MAIL

2.6 University Of Auckland.

Preferred Site Name: NZ.AC.AUCKLAND
Contact Person: Alistair Blennerhassett
Mailbox Name: CCC—ALISTAIR
Mailbox Name: JNET%"CCCALISTAIR@AUCCVAXB"
@NZ.AC.VUW
Postal Address: Private Bag, Auckland. N.Z.
X.121 Address: 5301-970-00073
Blue Book Transport String: .FTP
Grey Book Transport String: .FTP.MAIL

2.7 Canterbury University.

Preferred Site Name: NZ.AC.CANTERBURY
Contact Person: Robin Harrington
Mailbox Name: HARRINGTON@NZ.AC.VUW
Postal Address: Private Bag, Christchurch. N.Z.
X.121 Address: 5301-300-00034
Blue Book Transport String: .FTP
Grey Book Transport String: .FTP.MAIL

2.8 DSIR. (Division Of Information Technonolgy).

Preferred Site Name: NZ.GOVT.DSIR
Contact Person: David Couch
Mailbox Name: SRGHDAC
Mailbox Name: JNET%"SRGHDAC@GRV"
@NZ.AC.VUW
Postal Address: Private Bag, Lower Hutt. N.Z.
X.121 Address: 5301-460-00000
Blue Book transport String: .FTP
Grey Book Transport String: .FTP.MAIL

DIRECTORY SERVICES

The University of Queensland has available copies of the latest JANET directory issued by the Rutherford Appleton Laboratories in the UK. This directory exists as a VAX/VMS command file for updating the site tables used by the UWIST coloured book implementation under VAX/VMS. It may be of use to non VAX/VMS sites for reference information such as finding the X.121 address of JANET sites and determining what services a site provides. It is available as the ASCII file [.NRS]IPSS018.COM on the UQ micro VAX II WOMBAT (AUSTPAC address 050527372000090) and may be file transferred from other SPEARNET sites by quoting the user name GUEST and password GUEST.

Brad Cooper of James Cook University is planning to keep a directory of overseas information providers accessible through the international X.25 network. Please direct enquiries or suggestions directly to Brad.

(See section on SPEARNET sites for Brad's address.)

HOW MUCH DOES SPEARNET COST TO USE?

The actual data transmission costs of using SPEARNET are quite low compared with other means of sending information. The costs quoted here are taken from statistics of actual transfers over SPEARNET by the DECsystem10 in the Prentice Computer Centre, University of Queensland. These statistics should be used as an indication only, since actual costs will depend on a variety of factors (eg line speeds between the two sites and the packet switch network, load on the two systems involved in the transfer etc). A message of 24 lines (this would fill a typical display terminal screen) would probably be between 1.5 and 1.8 kbytes long (depending on the length of each line). The costs are proportionally higher for small transfers because the fixed overhead of starting up the transfer is shared across fewer characters.

Transfers in Australia:

1.2kbytes, 16 secs transfer time, 5c
5.8kbytes, 25 secs transfer time, 14c
12.6kbytes, 46 secs transfer time, 26c

Transfers overseas:
0.8kbytes, 24 secs transfer time, 39c
5.8kbytes, 37 secs transfer time, 131c
12.6kbytes, 62 secs transfer time, 257c

NEXT SPEARNET WORKSHOP

The next Spearnet Workshop is being held in Melbourne late in 1987. The date has not been fixed yet. Enquiries should be directed to:

Chris Chaundy
University of Melbourne
ACSnet: cha@murdu.oz
VAX/VMS PSI mail: PSI%233430003::chris

Trevor Hales
CSIRO Div. of Information Technology
ACSnet: hales@ditmela.oz
SPEARnet: trevor@ditmelb

PSI SECURITY FEATURES

Abstract
This document attempts to take the mystery out of setting up the PSI security database to do what you want it to. My experience is that the documentation is cryptic and, at times, incorrect. After a lot of trial and error, I have come up with the following explanation of how to configure the PSI security databases using PSIAUTHORIZE.

Introduction

The VAX PSI Management Guide has several sections used to describe the PSI security features which is used to restrict the use of PSI on your VAX/VMS system. The manual has a description of the databases that are used, the checking procedure used by the security system, a description of the Access Control Lists and the matching algorithm used, and a summary of the commands used to modify and display the contents of the various databases.

Many examples are provided in the manual of how to set up some specific types of access for incoming and outgoing calls. Whilst they cover a large range of options here, the selection of examples is by no means exhaustive, and some adaptation and interpretation must be done.

Once you understand the "basics" of the security system, the security databases can then be configured with a fair degree of reliability. The file that stores the security setup is SYS$MANAGER:PSI_SECURITY.COM. This command procedure is executed every time the PSI system is started up. Note that some of the commands necessary to create a suitable database are only required at the initial setup phase. These commands will cause an error to be generated each time the command file is executed. Whilst this does not cause any problems, it is an undesirable feature.

Note: All commands illustrated in this document are PSIAUTHORIZE commands. To invoke PSIAUTHORIZE you issue the

        RUN SYS$SYSTEM:PSIAUTHORIZE
command to DCL.

Our Security Philosophy

At the University of Queensland, we are currently running five X.25 connections, and will be installing a sixth in the very near future. Access to our systems from the rest of the campus is made as open as possible, and therefore, we need a mechanism to limit the general populace to the "free call" environment. The next level up is the chargeable call to anywhere in Australia. We are not providing any facilities that Telecom Australia does not, so therefore we don't limit the calls in this range to specific DTEs. The last level is chargeable calls to anywhere in the world. Once again, this is treated as a single entity.

Users will be granted access to PSI only as required. In this way it will be easier to track down people misusing the network. Rights are granted to users after they make appropriate representations to our accounting section.

A Brief Overview

The first stage involves telling the system that you want an identifier that you can use to allocate security features to.

The second stage involves defining the types of access that each identifier will allow.

The third stage involves the actual granting of these access modes to each machine that wishes to call you and each user that wishes to make calls.

Creating Identifiers

Firstly you need to create identifiers that will carry the appropriate security features that you want. These identifiers can be an arbitrary string, but because some rights show up in the users rights list, some thought should be given to the names. The ones we chose are:
* PSI$MAIL_USE — remote system can send us PSI mail
* PSI$NO_CALLS_IN — prevent remote system from calling us
* PSI$NOREV_CALLS_IN — prevent remote system from calling us reverse charge
* PSI$NATIONAL — allow user to make chargeable calls within Australia
* PSI$INTERNATIONAL — allow user to make chargeable calls to anywhere in the world
* PSI$MINERVA — allow user to call Minerva. This is special because Minerva do their own accounting.
* PSI$FREE_CALL — allow user to make any free calls. These include all calls local to the campus and any reverse charge calls off—campus.

These identifiers are created by the ADD/IDENTIFIER command. This command is only needed to create the identifier initially. It will give a "DUPLICATE IDENTIFIER" error if issued again,
e.g., ADD/IDENTIFIER PSI$FREE_CALL

Setting Up The Access Control Lists

Next, the access control lists must be set up to define what type of access these identifiers will be allowing to which DTEs or users. This is done with either the SET DTE or SET DESTINATION command. The access features allowed are
* INCOMING — allow incoming calls from a remote DTE
* INCOMING + REVERSE_CHARGE — allow incoming reverse charge calls from a remote DTE
* OUTGOING — allow outgoing calls REVERSE CHARGE ONLY
* OUTGOING + CHARGE — allow both chargeable and reverse charge calls out

Some examples of our ACLs are listed here with an explanation.

        SET DESTINATION PSI_MAIL/ACL = (ID = -
        PSI$MAIL_USE,ACCESS = INCOMING)/NEW
Create an ACL for the PSI—MAIL object that only allows Incoming calls that are NOT reverse charge. PSI mail destined for a remote system is treated the same as an interactive call from the user.

        SET DTE 9/NET = AUSTPAC/ACL = (ID = -
        PSI$FREE_CALL,-
        ACCESS = OUTGOING + CHARGE)/NEW
This is a call made locally to our campus. The PSI$FREE_CALL identifier will allow calls to any DTE starting with "9" which are either reverse charge calls or normal calls.

        SET DTE 05052/NET = AUSTPAC/ACL = (ID = -
        PSI$NOREV_CALLS_IN, ACCESS = -
        INCOMING + OUTGOING + CHARGE)/NEW
        SET DTE 2/NET = AUSTPAC/ACL = (ID = -
        PSI$NOREV_CALLS_IN, ACCESS = -
        INCOMING + OUTGOING + CHARGE)/NEW
This ACL will allow any type of call to go out from us, but will not allow any reverse charge calls from within Australia. Note, there are two ACLs set up here. The addresses 273720000 and 0505273720000 are functionally equivalent, so we need to account for both.

        SET DTE 2/NET = AUSTPAC/ACL = (ID = -
        PSI$NATIONAL,-

```
ACCESS = INCOMING + REVERSE__CHARGE + -
OUTGOING + CHARGE)/NEW-
SET DTE 2/NET = AUSTPAC/ACL = (ID = -
PSI$FREE__CALL,-
ACCESS = INCOMING + REVERSE__CHARGE + -
OUTGOING)
```

These commands will set up two entries in the ACL for any DTE starting with "2". They both will allow the remote DTE to call in reverse charge and non—reverse charge. The difference is that the first will allow a person on our system to make chargeable calls out, and the second will only allow them to make reverse charge calls out, hence they can only make "free" calls. We shall see a little later on how the user gains these privileges to make the calls.

```
SET DTE ALL/NET = AUSTPAC/ACL = (ID = *,-
ACCESS = NONE)/NEW
```

The last line in setting up your ACLs should be this command. The PSI security system has some interesting features. When a lookup is done on the data bases, if a match is found for the DTE address, but no clear access is specified, then the call will be refused. If however, no match can be found for the DTE address, then the call will be allowed. This line is a "catch—all" to disallow any calls that we have not specified explicitly.

Note: the command SET DTE * etc., modifies ALL existing entries in the data base with the new features that you specify in the command. The SET DTE ALL etc., command sets up a last gasp entry that will match everything.

Any DTE number specified is considered to be a range of a DTE addresses. That is, if 05052 is specified, then any number that starts with (or is) 05052 will match the entry.

The /NEW qualifier specifies that this ACL entry goes at the front of the Access Control List, and all previous ACL entries should no longer have effect. ACLs are scanned in order until a match or the end of the list is found. To add extra entries to the Access Control List, you **don't** use the /NEW qualifier. By using more than one entry in the ACL, you can include a single DTE into a number of access groups, giving more flexibility in granting access to users.

Granting Rights To DTEs And Users

Once you have defined what types of access you wish to allow, you must then grant these "rights" to the users and the remote DTEs. The commands to do this are GRANT/ID, REVOKE/ID, SHOW/RIGHTS, and SHOW/ID.

GRANT/ID PSI$FREE__CALL 9/DTE/NET = AUSTPAC

Grant to any DTE starting with 9 access as a "free" call. Note that any DTE starting with 9 is local to our campus, and hence, a free call. In our setup, we could easily have granted another access right such as PSI$NATIONAL with the same effect. This way just distinguishes free calls from chargeable ones.

GRANT/ID PSI$MAIL__USE 05052/DTE/NET = AUSTPAC
GRANT/ID PSI$NATIONAL 05052/DTE/NET = AUSTPAC
GRANT/ID PSI$MAIL__USE 2/DTE/NET = AUSTPAC
GRANT/ID PSI$NATIONAL 2/DTE/NET = AUSTPAC

These commands will grant access to PSI mail to any remote DTE starting with 2 or 05052 (Note as before).

Note: You MUST allow the remote DTE to make the call in so that it can connect to the mail system. If you don't, then the call will fail prior to checking for access to the PSI mail system.

GRANT/ID PSI$INTERNATIONAL SYSTEM
GRANT/ID PSI$NATIONAL SYSTEM
GRANT/ID PSI$FREE__CALL SYSTEM

Allow user SYSTEM to make calls to local (free) DTEs, any DTE in Australia, and any DTE in the world.

Note: If we didn't grant PSI$FREE__CALL using our ACL setup, then SYSTEM could make chargeable calls to anywhere in the world, but would fail trying to access our own local machines which are free calls (not all that useful).

REVOKE/ID PSI$NATIONAL SYSTEM

Don't allow SYSTEM to make any calls in Australia.

SHOW/RIGHTS SYSTEM

Examine the SYSTEM account, and see what modes of access we have allowed to it.

SHOW/ID PSI$INTERNATIONAL/FULL

Examine all the security records and list who has the ability to make international calls.

If you set up the data base to have a catch-all entry, then nobody will be able to call in or out until the rights have been granted to the remote DTE or the user respectively.

Some "gotchas"

When testing the system, you will need to logout your test process and then login again to pick up any new rights. They are only allocated at process creation time (as for process privileges).

This next one was curly and caused us some bother. I had a section of a command file that looked like this:

```
! International calls. (No reverse charge calls — of course)
SET DTE 0/NET = AUSTPAC/ACL = (IDENTIFIER = -
PSI$INTERNATIONAL,-
ACCESS = INCOMING + OUTGOING + CHARGE)/NEW
! To allow incoming calls —
GRANT/IDENTIFIER PSI$INTERNATIONAL 0/DTE/-
NET = AUSTPAC
```

The second last line has a "-" at the end and even though this is a comment, it was treated as a continuation character, and the last line was not executed. Examination of the log files did not indicate any error, but the security system would clear calls that we thought we had granted access to. Note DCL will not treat a "-" as a continuation character if it is in a comment line.

When configuring your database for the first time, leave "bread crumbs" along your trail so that you can work your way backwards if something doesn't work. Always keep a note of what commands are currently in force. If you "undo" an action in the wrong order, it is possible to so mess up your PSI security databases, that nothing short of reinstalling PSI will fix it.

CSIRO Networking Review

The CSIRO Division of Information Technology has recently completed a review of networking within academic and research organisations in Australia. Copies of the report may be obtained from:

CSIRO Division of Information Technology
55 Barry Street
CARLTON VIC 3053

Telephone: (03) 347 8644

(See section on SPEARNET sites for Trevor's address.)

VAX/VMS SPECIFIC INFORMATION

Some Information on Accounting in VAX/VMS PSI and UWIST Coloured Books

CBS and PSI Accounting under VAX/VMS

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Introduction

Each month we produce accounts for usage of the VAX cluster which forms the central computing resource at the University of Otago. We use locally written software to directly process the accounting files produced by VMS in order to get the monthly bills and statistics which we need.

When we bought VAX PSI we decided to pass the communication costs which each user incurred back to the user. We decided to do the same thing for the Coloured Book Software when it arrived. This is an account of what we learned while modifying our software for these purposes.

The PSI Accounting File

The PSI accounting file has the same sort of structure as the usual accounting file produced by VMS. The PSI information could have been incorporated into the existing accounting file but this is not the case.

A PSI accounting record contains the following information:

Username:	UIC:
Account:	Finish time:
Process ID:	Start time:
Owner ID:	Elapsed time:
Terminal name:	Processor time:
Remote node addr:	Priority:
Remote node name:	Privilege :
Remote ID:	Privilege :
Queue entry:	Final status code:
Queue name:	Job name:
Final status text:	
Bytes sent:	Bytes received:
Segments sent:	Segments received:
Packets sent:	Packets received:
Messages sent:	Messages received:
Remote DTE:	CUG number:
Local DTE:	Network:
Destination:	Network device:
Protocol ID:	LCN:
Circuit type:	PSI—access
Facilities:	
Clearing reason:	
Clearing cause:	Diagnostic:
Inc thruput class:	Out thruput class:
Inc packet size:	Out packet size:
Inc window size:	Out window size:
Clearing facilities:	
Calling facilities:	
Accept facilities:	

PSI Access and PSI Accounting

PSI Access is the software which provides X.25 access on a VAX which does not have a direct X.25 connection but which is connected to a VAX which does have an X.25 connection.

A VAX running PSI Access produces a PSI accounting file just as a VAX running PSI would. There are two points to note about the PSI Access accounting file:

- All data transferred shows in the 'sent:' fields. The 'received:' fields always contain zero.
- The PSI accounting file for the VAX which actually has the X.25 connection also has a record for each call made through PSI Access. This record has the 'sent:' and 'received:' fields correctly filled out but has a username of SYSTEM, rather than that of the actual user.

We identify records as being duplicates of calls recorded in other PSI accounting files when they have a user name of SYSTEM and a Remote ID which is not an empty string. We ignore such records and leave the version with the correct username which appears in the PSI accounting file for a VAX running PSI Access to be used to calculate charges.

The CBS Log File

The Coloured Book Software produces a file of its own which logs calls made to and from CBS sites. This file does not have the same structure as the accounting and PSI accounting files. The CBS log file is an indexed file of variable length records, indexed with two keys. Each record represents an attempt at a CBS transfer. The primary key is the finish time of the CBS transfer and the secondary key is the Username of the user making the transfer.

I do not know if a formal description of the layout of this file exists, but I have deduced the following Pascal-like description by inspection of log files.

CBSRecType (this maps onto the first 69 bytes of the cbs log records) Record

FinishTime	:	$UQuad;
RecordType	:	$UWord; { 0 → Q, 1 → P , 3 → P with retry }
RetryCount	:	$UByte;
Status1	:	Unsigned;
Status2	:	Unsigned;
TransferId	:	Unsigned;
TransType	:	Unsigned; { ??? }
FileSize	:	Unsigned; { in bytes }
NotSure	:	$UWord;
LengthInd	:	$UWord; { length of record minus length of info item }
InfoLength	:	$UWord; { length of info item }
StartTime	:	$UQuad;
Member	:	$UWord;
Group	:	$UWord;
UserName	:	Packed Array][1..12] of Char;
Account	:	Packed Array [1..8] of Char

{ The rest of the cbs log record is variable data as follows:

RemoteAddrLen	:	$UByte;
RemoteAddr	:	Packed Array [1..RemoteAddresslen] of Char;
FileNameLen	:	$UByte;
FileName	:	Packed Array [1..FileNameLen] of Char;
FTPVersion	:	Packed Array of Char; — to end of record

} End;

Some points to note about the CBS log records are:

- The records do not show segments sent and received and thus can not be used to accurately calculate the charge for a CBS call.
- The 'StartTime' on a record does not indicate the time at which that attempt to transfer started. The start time remains the same on all retries of a transfer as it is on the initial attempt to transfer. It is, consequently, of no

value in determining the elapsed time of an X.25 call.
- The 'FinishTime' shows when the CBS transfer attempt terminated, not when the X.25 call it made to effect the transfer terminated.
- The 'FileSize' does not reflect the amount of data transferred. For example, a file transfer which fails part way through will have moved less data than the file size indicates. It is not a reliable indicator of the number of segments sent and received.
- The 'RemoteAddr' is the text supplied by a user as the address of the remote site for outgoing transfers. For example, it might be AUCKLAND or NZ.AC.AUCKLAND for transfers from me to the University of Auckland, depending on what I specify within VMS Mail. It is NOT the X.25 number for Auckland and it is not necessarily the full specification of the remote site.

PSI Accounting Records for CBS Calls

CBS file transfers are done by the FTP—Manager on a user's behalf. Consequently the PSI record which is produced as a result of the CBS call does not have the user's username on it.

It is possible to recognise PSI accounting records which have resulted from CBS calls — they are written by a SYSTEM sub-process That is, the PSI records which have a username of SYSTEM and an Owner ID which is not zero are presumed to be records of CBS calls.

The PSI accounting records contain enough information to determine which of them correspond to CBS transfers and what the cost of those transfers is — presuming that you can determine the algorithm which your X.25 supplier uses and presuming that they apply it correctly. By isolating the PSI records belonging to CBS calls it is possible to calculate the actual total charge for CBS calls but it not possible to determine what part of that charge each CBS user is responsible for.

Accounting For CBS Transfers

There are several schemes which could be used to charge for CBS transfers. For example, one could:

- Not charge for them at all by ignoring the appropriate PSI records
- Determine a charge for CBS calls which is independent of the actual charge but which recovers approximately the right sum of money.
- Divide the actual cost determined from the PSI records amongst the CBS users either evenly or weighted by file size and destination.
- Attempt to determine which PSI records belong to which CBS records and charge users for their actual communication costs

We attempted to implement the last of these options.

Matching PSI and CBS Records

The algorithm which we use to match PSI and CBS records relies on the start and finish times on the records. It works on each VAX as follows:

1. Using the CBS log file build a list of the outgoing calls, in order of increasing finish time. Since the file is indexed with finish time as the primary key, the file can be read sequentially to get this list.
2. Read the PSI accounting file in increasing finish time order. This is the order which the file was written, so it can be read sequentially also.
3. For each PSI record which is for a CBS transfer and for which we are paying, find the FIRST record in the CBS list which has a start time before the start time of the PSI record and a finish time after the start time of the PSI record. This is the matched record. Remove it from the CBS list.

advancing time →

CBS	PSI	CBS
start time	*start time*	*finish time*
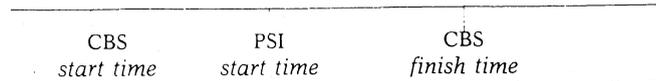
This algorithm can only work if there is only ever ONE CBS transfer in progress at any one time. If there were several CBS transfers taking place, there would be several PSI records and matching one to the other would become very hard, if not impossible.

Even when there is only one CBS call in progress at any one time, there may still be several CBS calls which match a PSI call when using this scheme. If a CBS call (CBS 1) retries just after another CBS call (CBS 2) has finished its first attempt, the following sequence of times can result:

advancing time →

CBS 1	CBS 2	CBS 2	CBS 1
start time	*start time*	*finish time*	*finish time*
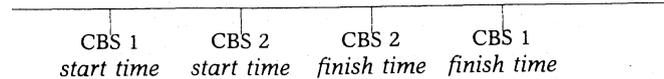
This happens because the recorded start time for CBS 1 is the start time of the FIRST attempt at that transfer. The start time which actually corresponds to the CBS 1 finish time shown above is after the CBS 2 finish time but is not recorded in the log files. Although the CBS 1 attempt occurred after the CBS 2 attempt, the log shows the CBS 2 attempt contained within the CBS 1 attempt.

If a PSI start time appears between the CBS 2 start time and the CBS 2 finish time, it is not clear which CBS transfer it actually belongs to. The algorithm above will match it to CBS 2 since that occurs first in a list ordered by finish time.

There is another fault with the algorithm which stems from the fact that CBS will put several transfers across one PSI circuit where appropriate. Suppose that two users have file transfers to the same site sitting together in the transfer queue. The first transfer sets up the PSI call to the remote site and makes the transfer. If the second transfer starts shortly after the first has finished, the PSI circuit will still apparently be open so the second transfer will make use of it. This results in there being ONE PSI record for two or more CBS transfers.

Our algorithm will match the PSI record for these calls to the first CBS transfer and charge that user for all the data moved. The user making the second CBS call never gets a PSI record which matches their transfer and is thus gets a free transfer.

This situation would appear, at first, to be quite uncommon. It requires that two different users have transfers to the same place ready to go at about the same time. In fact, the situation is relatively common for transfers from Australian and New Zealand sites to the U.K. All traffic to JANET goes through a gateway which has one X.25 address for us. This makes ALL the U.K. university sites appear to be the same place when PSI sets up the circuit for a transfer. Any two transfers to the U.K. occurring closely together will thus share a call and hence produce only one PSI record.

Summary
Reconciling PSI and CBS records for accurate charging appears to be impossible to do accurately. The only truely adequate solution appears to be to demand that the VMS CBS writers put enough information to charge on into the CBS log files. No other approach ensures that users are correctly charged for their CBS usage.

JCU Accounting Package
James Cook University also have available an accounting package for PSI and Coloured Book usage. Details are available from Brad Cooper.
(See section on Spearnet sites for Brad's address.)

Research at Rutherford Laboratories

Mr Danny Smith of the Prentice Computer Centre, University of Queensland has been offered a 1 year appointment as a Research Assistant at Rutherford Laboratories in the UK. Danny will be working on electronic messaging systems including X.400 which has been a particular area of interest for him since he began working with the communications group at the Prentice Computer Centre about 2 years ago.

The University has granted leave of absence and financial support to visit other sites. Mr Alan Coulter, Director of the Prentice Computer Centre said:

> Supporting staff in this type of personal development is paramount in maintaining our leading edge in the data communications field in Australia. This gives us the opportunity of participating in the implementation of international standards as well as opening personal lines of communication with expertise all over the world.
>
> While Danny is in the UK we also want him to visit other sites which have a reputation for work in communications.
>
> Danny is planning to visit Edinburgh Regional Computing Centre to investigate a network wide mail system which has an innovative directory and name registration service. He also plans to visit sites in Europe and Scandinavia.