Theme 2: The start of the on-line network

- 1966: DAD: interactive access in building, including graphical displays
- Feb 1968 – branch in Griffith with PDP-9
- April 1968 – PDP-8 installed at Canberra – teletype access

New Equipment

A PDP-8 computer has now been installed in Canberra. It is currently being adapted to function as a controller to enable five teletypes to be connected to the Control Data 3600. The design and construction of the interface has been carried out as a research project within the Division. It is anticipated that eventually a number of new devices will be linked to the 3600 through the PDP-8 and the interface.

Teletypes

Theme 2: The start of the on-line network

- May 1968 – PDP-8/S installed in Perth – link to UWA

Perth Branch

Equipment for the Perth Branch of the Division has now arrived and is being
installed at the Floreat Park laboratories of C.S.I.R.O. The installation will use
a Digital Equipment Corporation PDP-8/S linked by telephone lines to the PDP-6
at the University of W.A. to enable full use to be made from Floreat Park of the
University computer. This remote station will be equipped with a Potter 800 lines

-2-   Newsletter No. 35.

per minute printer, a DEC 200 cards per minute card reader, a DEC paper tape
reader/punch and a teletype unit.

Theme 2: The start of the on-line network: 'remote' teletypes

- The 1967-68 annual report contained:

> The direct access capabilities previously available
> through six keyboard display consoles have been extended by the
> addition of five teleprinters, one of which is located in the
> Division of Land Research. The teleprinters are connected to
> the 3600 by means of a Digital Equipment PDP-8 computer and a
> special interface. The PDP-8 has also enabled the performance
> of off-line transcription from a picture scanner and an
> analogue-to-digital converter.

Theme 2: The start of the on-line network

- Peter Heweston (private communication February 2020) reported being a user of the terminal at Land Research.
- A request on CSIRO Yammer's provided information that there was a door at the lab, with a sign saying that the room being the site of the first computerised connection to the 'outside world' or something akin to that.
- Peter Hanlon (private communication February 2020) added:
  - There was a teletype (ASR33 probably) set up at the Division of Land Research on the Black Mountain campus which ran by cable along the Botanic Gardens fence into a DEC PDP8 thence into the CDC3600.
  - It operated for several weeks or months until lightning intervened, frying parts in the PDP8 before damaging the CDC3600.
  - Control Data generously fixed the machine out of spares, rumoured to be $80K-120K. DCR then considered optical isolators.

Theme 2: The start of the on-line network – PDP-8 front-end and 'phone lines

The 1967-68 annual report contained:

4.3   PDP-8 TELETYPE SYSTEM

(Dr. B.J. Austin and C.D. Gilbert)

In April, a Digital Equipment PDP-8 Computer was installed at Canberra to act as a controller for a small number of remote teleprinter stations. Remote can be taken to mean within a radius of about ten miles – i.e. within Canberra – but an experimental connection with a PDP-8/S and teleprinter in Sydney is being planned. Five teleprinters were purchased with the PDP-8 and of these two will remain in the D.C.R. building while the others will be lent to interested organisations. It is possible that further teleprinters will be added to the network, but the number of stations active at any time will be limited to five. The remote stations will, in general, be connected to the PDP-8 by private telegraph wires to be provided by the Post Office, and approval of the signalling methods by the Postmaster General's Department will be required. For this reason, while the technical details of operating remote stations are virtually completed, a delay of a few months is anticipated before operations outside the CSIRO site can begin.

Theme 2: The start of the on-line network: Post Office delays

The 1968-69 annual report contained:

> The PDP-8 computer and teleprinter system in Canberra has now been in operation for over a year, and with reasonable reliability. Hopes of using Post Office telephone lines to remote locations have not materialized this year owing to approval delays. However, these lines are expected to be available shortly. Three more teleprinters have been delivered to other Divisions to make a total of eight machines.

Theme 2: The start of the on-line network: in use in Canberra

The Oct 1969 Newsletter contained:

Remote Teleprinters in Canberra

The remote console Teletype system is at last operating over APO telephone lines to various locations in Canberra. While the equipment has been available for a year, the lines have only now been connected.

The consoles are located at:-

Division of Computing Research, Black Mountain,
(Remote Console Room and Computer Room)
Division of Land Research, Black Mountain,
Division of Plant Industry, Black Mountain,
Pye Laboratory, Black Mountain,
Division of Wildlife, Gungahlin,
Public Service Board, Barton, and
Forest Research Institute, Yarralumla.

Five machines may be operated simultaneously but only four of these may be over telephone lines. For the next few months a timetable is in operation whereby each user has access to the 3600 for half the working day. Further development

Theme 2: The start of the on-line network

of the system in the near future will permit any of the present eight teletypes (plus perhaps a few more) to have automatic access to the 3600 on demand.

As data is transmitted using relays to switch a DC current in the telephone line, the present system is limited to a radius of seven or eight miles from the Canberra laboratory.

- So we can confirm a limited wide-area network was in operation in September 1969. How much this constitutes a network (in the sense of DARPANET) is open to examination.

Theme 2: The start of the on-line network

The 1969-70 annual
report contained:

Computer Link A Raytheon 706 computer in the Division of Entomology, Canberra, was linked to the 3600 (via the PDP-8) by a quartermile long underground cable providing an interactive link between the two computers. The Raytheon 706 computer with magnetic disc is used to acquire and reduce output data from a mass spectrometer, and the 3600 for data processing. The link was fully operational in July 1970.

Theme 2: The start of the on-line network

CoResearch April 1970 contained:

Cable will Carry Love Scent Clues

A quarter-mile coaxial cable laid recently between the Divisions of Entomology and Computing Research in Canberra could hasten the development of new control methods for some of Australia's insect pests.

The cable will connect the Division of Entomology's high resolution mass spectrometer through a small computer with the Division of Computing Research's powerful Control Data 3600 computer.

The computer link will speed up enormously examination of the output of the mass spectrometer.

Among the substances analysed in the spectrometer are pheromones, chemicals insects use to communicate with one another.

Pheromones enable insects to recognise their own kind, signal alarm, indicate where to go for food, attract the opposite sex, and regulate castes in the social orders.

If they were available synthetically, pheromones would have a potential use in insect control free from the risk of widespread chemical contamination of the environment.

One possibility could be the use of a synthetic scent-trail pheromone to disrupt termites in their foraging.

A mass spectrum, however, is likely to contain readings for several hundred ions. Determining precisely the mass of any one of them by manual methods can take about 20 minutes, and there is usually not time to make accurate measurements of the masses of more than a few of the ions.

The computer link will be able to record a complete high resolution mass spectrum in half a minute and give an accurate mass value for each ion in about five minutes. It will also be able to determine what combinations of atoms fit each mass value.

The problem of storing mass spectra will also be simplified. The Division of Computing Research will be able to store them in digital form on magnetic tape.

The link was devised by Mr. C. D. Gilbert of the Division of Computing Research and Mr. C. G. Macdonald, head of the Division of Entomology's mass spectrometry unit.

A small Raytheon 706 com-

Theme 2: The start of the on-line network

in their foraging.

However, before synthetic pheromones can be produced the chemical compositions of the natural pheromones have to be determined, and this problem is complicated by the fact that only very small quantities can be isolated for analysis.

Mass spectrometers, which are valuable tools in the analysis of complex organic compounds, use up the substances they analyse as they analyse them, so if only small quantities are available it is vital that the analysis be carried out quickly.

The computer link will enable analyses to be carried out hundreds of times faster than they can be now.

In the mass spectrometer, the substance to be analysed is vaporized and the molecules ionized. The ions pass in a beam through a magnetic field and are separated according to their masses.

The masses of the ionized molecules can be measured to accuracies of about three parts in a million, making it possible to work out what atoms make up each molecule.

Right: The cable trench is treated with insecticide.

Below: The cable layers pause for a photo break.

A small Raytheon 706 computer in the mass spectrometry unit will receive the output of the mass spectrometer and make preliminary calculations. Its output will be fed along the cable to the Control Data 3600 which will do the rest of the processing.

The mass spectrometry unit provides a mass spectral service to the Division of Plant Industry as well as the Division of Entomology.

One of the main users of the service is the Division of Plant Industry's plant chemotherapy group which produces compounds that it hopes will be biologically active and useful, for example, as herbicides or fungicides.

Theme 2: The start of the on-line network

CoResearch April 1970 contained:
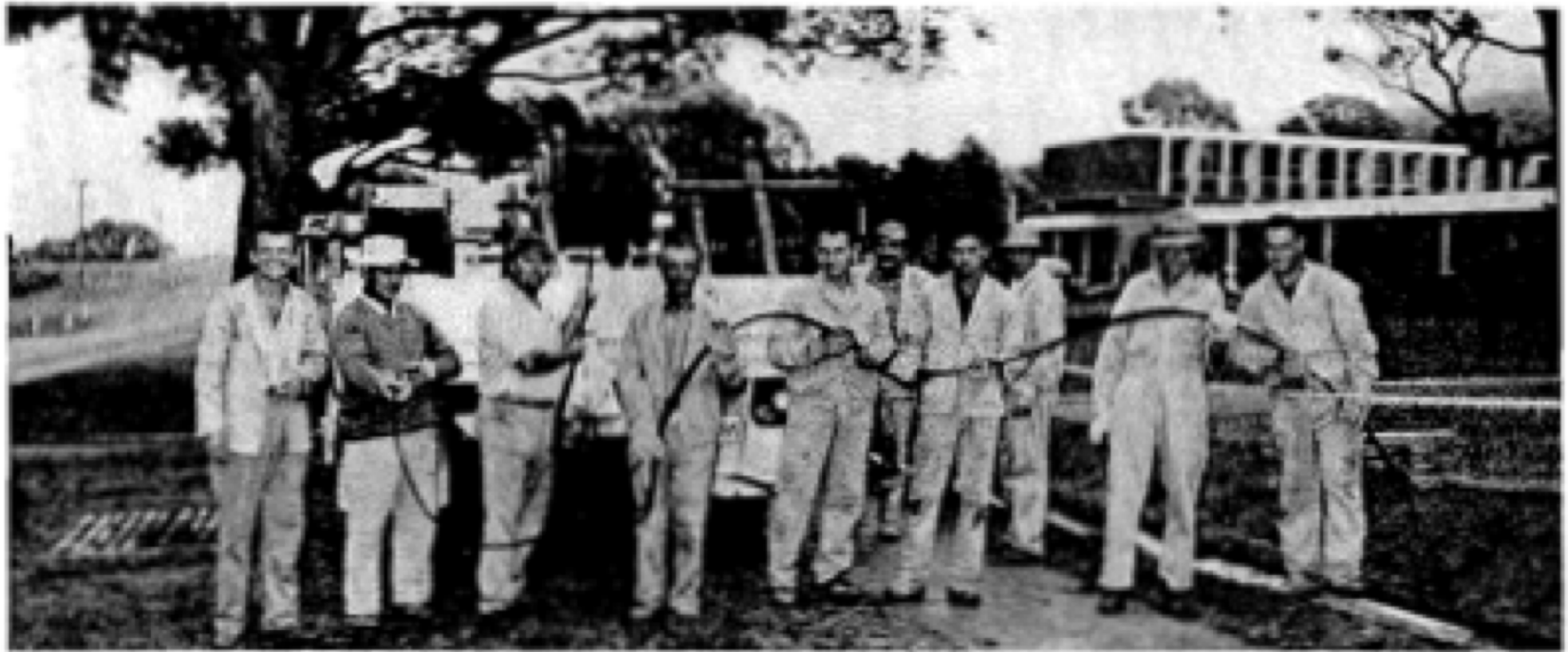
Theme 2: The start of the on-line network – linked computers

The 1970-71 annual
report contained an announcement of a project to link computers
in state capitals to Canberra:

Network
Project

T.S. Holden

The largest single system project since the development of the DAD monitor for the Control Data 3600, to link computers in other Branches of the Division in Adelaide, Brisbane, Melbourne and Sydney to the 3600 via interstate telephone lines, was started during the year.

Theme 2: The start of the on-line network

Linked computers – Remote job entry and printing to be provided
The 1970-71 annual
 report contained:

The project, a collaborative one involving officers in most of the Division's Branches under direction from Canberra, will result in big savings in turnaround time for jobs submitted to the 3600 computer from Branch areas. (At the moment these jobs are sent by air express between the Branches and Canberra). A job submitted through a card reader at a Branch will be accepted and processed by the 3600 in the same way as a job submitted to the 3600 by the computer operators in Canberra. Output from the job will be directed back to the Branch or to any appropriate output device anywhere in the Network if so desired.

Theme 2: The start of the on-line network
 Linked computers – remote interactive to be available.

The 1970-71 annual
 report contained:

Not only will job turnaround be greatly improved, but the advantages of interactive computing will be extended to all programmers in the Network and not limited to the Canberra area only. Fast response from the 3600 may be expected by a user anywhere in the Network. A programmer in Adelaide, for example, will be able to make corrections to a program; direct the 3600 to run the modified program immediately; and have his program results displayed on the console he is using.

CSIRO

Theme 2: The start of the on-line network

Linked PDP-11 computers

The 1970-71 annual

report contained:

A Digital Equipment PDP-11 computer at each Branch will perform the message switching operations between the incoming and out - going lines, the local peripheral equipment, and the local Control Data 3200 computer (in Adelaide, Melbourne and Sydney). The software and interface units for these 'nodes' are currently being developed by the Division. Operation is expected to commence at the end of 1971 when the interstate lines become available.

Theme 2: The start of the on-line network

CoResearch April 1972 contained:

- Start of operation of SIRONET
- Links to Adelaide, Melbourne, Brisbane, Sydney and Canberra

SIRONET

Completion of an Adelaide-Melbourne link last month marked the start of operations of SIRONET (CSIRO Computing Network), with the CSIRO computers in Adelaide, Melbourne, Brisbane, Sydney, and Canberra linked by voice-grade telephone lines.

Providing scientists working in these cities with immediate access to the major machine of the Network in Canberra, SIRONET will extend the interactive computing facilities enjoyed in Canberra to users at laboratory locations.

Access by telephone is also available from other locations in Australia through Subscriber Trunk Dialling.

A user sitting at any console may now enter his program and data directly through the keyboard and have the results returned promptly.
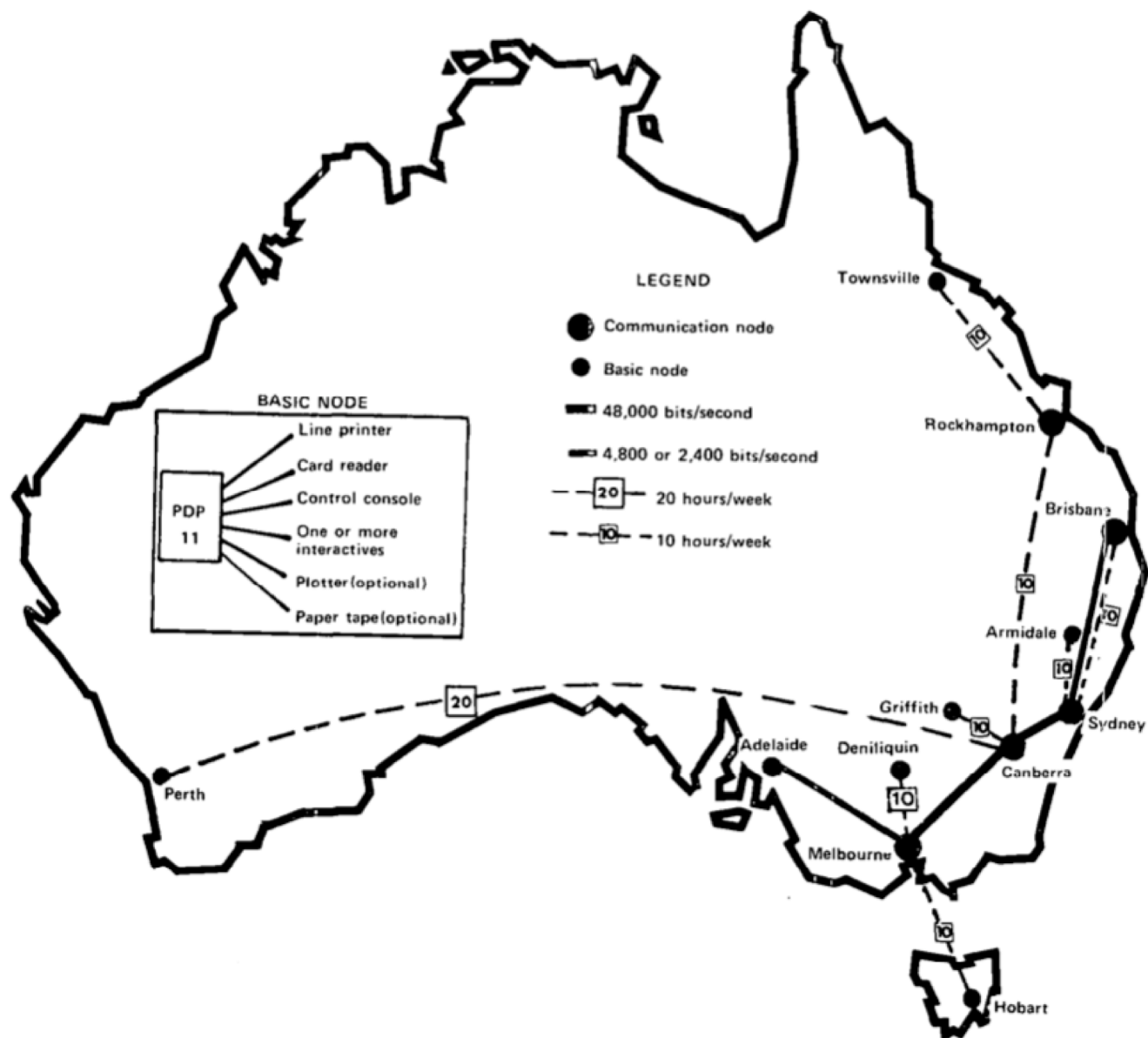
He may also request computer jobs to be run at a later time, after which volume output will be transmitted to his local branch site and printed there.
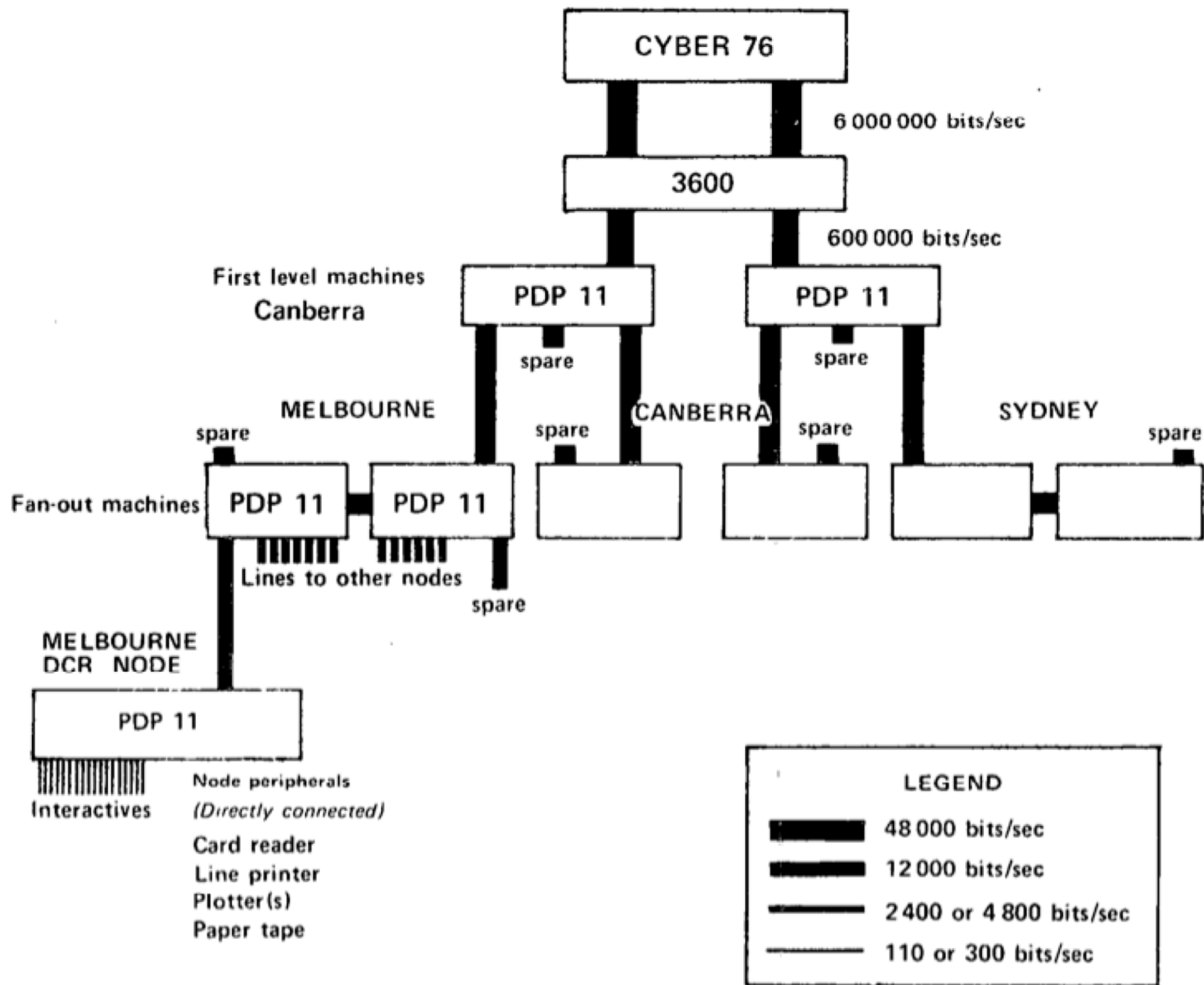
Small Digital Equipment computers installed at each branch site by the Division of Computing Research handle information transfers in the network and provide files to the larger Control Data computers owned and operated by the Division.

Theme 2: The start of the on-line network

- By 1975, Csironet was well established. A paper by Colin D. Gilbert, The Evolution of Csironet, noted that:

The CSIRO computing network, CSIRONET has evolved from a few interactive terminals in Canberra, to over 250 interactive terminals and about 50 PDP-11 nodal computers scattered throughout Australia.

LEGEND

● Communication node

● Basic node

▬ 48,000 bits/second

▬ 4,800 or 2,400 bits/second

--20-- 20 hours/week

--10-- 10 hours/week

BASIC NODE

PDP 11
- Line printer
- Card reader
- Control console
- One or more interactives
- Plotter (optional)
- Paper tape (optional)

Townsville

Rockhampton

Brisbane

Armidale

Griffith

Sydney

Canberra

Adelaide

Deniliquin

Perth

Melbourne

Hobart

CYBER 76

6 000 000 bits/sec

3600

600 000 bits/sec

First level machines
Canberra

PDP 11   PDP 11

spare   spare

MELBOURNE   CANBERRA   SYDNEY

spare   spare   spare   spare

Fan-out machines   PDP 11   PDP 11

Lines to other nodes

spare

MELBOURNE
DCR NODE

PDP 11

Interactives

Node peripherals
(Directly connected)

Card reader
Line printer
Plotter(s)
Paper tape

LEGEND

████ 48 000 bits/sec

▬▬▬ 12 000 bits/sec

▬▬▬ 2 400 or 4 800 bits/sec

─── 110 or 300 bits/sec

CSIRONET NODES

Canberra

CBR	DCR, Black Mountain
CD•	Bureau of Agricultural Economics, Braddon
CF•	Forestry Research, Yarralumla
CG•	Wildlife Research, Gungahlin
CH•	DCR, AMP Building, Canberra City
CK•	Industries Assistance Commission, Barton
CL•	Land Use Research, Black Mountain
CN•	Entomology, Black Mountain
CP•	Bureau of Mineral Resources, Parkes
CQ•	RAO/Head Office, Canberra City
CT•	Plant Industry, Black Mountain
CW•	Environment & Conservation, Canberra City
CX•	DCR, Black Mountain ‡

Adelaide

ADL	DCR, Adelaide

Armidale

EA•	DCR, Armidale

Brisbane

BNE	DCR, St Lucia
BL•	Long Pocket Laboratory, Indooroopilly †
BP•	Department of Primary Industry, Brisbane
BQ•	RAO, Brisbane

Deniliquin

ON•	Land Resources Management †

Griffith

GR•	DCR, Griffith

Hobart

HH•	Tasmanian Regional Laboratory

Melbourne

MA•	Atmospheric Physics, Aspendale
MD•	Mineral Chemistry, Port Melbourne
MEB	DCR, East Melbourne
MF•	Applied Organic Chemistry, Fishermen's Bend
MH•	Building Research, Highett
MI•	Mechanical Engineering, Highett
MN•	Chemical Physics, Clayton
MP•	Protein Chemistry, Parkville
MQ•	RAO, East Melbourne
MS•	Applied Geomechanics, Syndal
MU•	Tribophysics, Parkville

Perth

PER	DCR, Floreat Park

Rockhampton

ROK	DCR, Rockhampton

SYDNEY
Sydney

SC•	Fisheries & Oceanography
SE•	Radiophysics, Epping
SM•	Mineral Physics, North Ryde
SP•	Animal Physiology, Prospect
SQ•	RAO, Sydney
SR•	Animal Genetics, North Ryde
SYD	DCR, Chippendale

Townsville

TW•	DCR, Townsville

† Not yet operational   ‡ Developmental purposes only

Theme 2: The start of the on-line network

- So, 1969 or 1970 marks the beginning of CSIRO's packet-switched network
  - Within a year after DARPANET started
- Spread to all capitals, many regional towns, most CSIRO sites.
- Later developments
  - Micronodes based on Motorola 68000
  - Multi-host/multi-service capabilities
  - Unix workstation
  - X.25 support
  - Commercial users, e.g. SA Justice Department
  - E-mail in early 1980s

CSIRO

*Mail — 'Australia's best bargain'

by Sue Choquenot

Users of CSIRONET are finding the Electronic Mail System, now known as *Mail, a quick and economical way of passing messages and information between individuals within a building, town, state, country or even overseas at a fraction of the cost of a telephone call, telegram or telex.

Currently, no extra charge is made for *Mail above the standard network transmission fee, although this will change in the near future (see the March edition of *CSIRONET News*).

At the moment users enjoy Australia's best bargain and a 'letter' sent from one end of the country to the other costs just a few cents. Even with the proposed charges, *Mail will be considerably more economical than commercial electronic mail systems now available.

The system has several interesting features including easy to read on-screen documentation that helps you to use the system if you get lost, automatic notification of any new mail when you log-on to CSIRONET and a number of other features that you can order and change depending on your requirements.

Two researchers who are successfully using *Mail to assist in their work are Dr Robert Bell in the Division of Atmospheric Research in Melbourne and Dr Carsten Frederiksen at the South Australian Institute of Technology in Adelaide.

Dr Bell is involved in developing computer models of how the weather operates to help in prediction and understanding of the climate, while Dr Frederiksen is enhancing the modelling programs used on the CSIRONET supercomputer (a Control Data Cyber 205) to process and analyse the massive amounts of data obtained in the study. The researchers use *Mail to notify each other of the status of their work and files stored on CSIRONET. Last year Dr Bell sent and received more than 500 *Mail messages.

One of the biggest problems facing collaborative researchers located in two different laboratories (let alone different States) is returning telephone calls. 'It often takes two or three phone calls before you catch whoever you are after,' said Dr Bell. 'With the *Mail system you can leave the message and know that the people you want will get it when they next log on the CSIRONET system.'

According to Ms Sally Record, senior technical officer in the Division of Human Nutrition in Adelaide, using *Mail has made her life a lot 'cleaner'. The Division has developed 'food tables' which give the constituents of commonly eaten food in Australia.

'More than 26 groups around Australia have used these food tables. When any user wants to run a program to use these tables they just notify me by *Mail. If they used the telephone I would have the problem of the telephone ringing all day and interrupting me'.
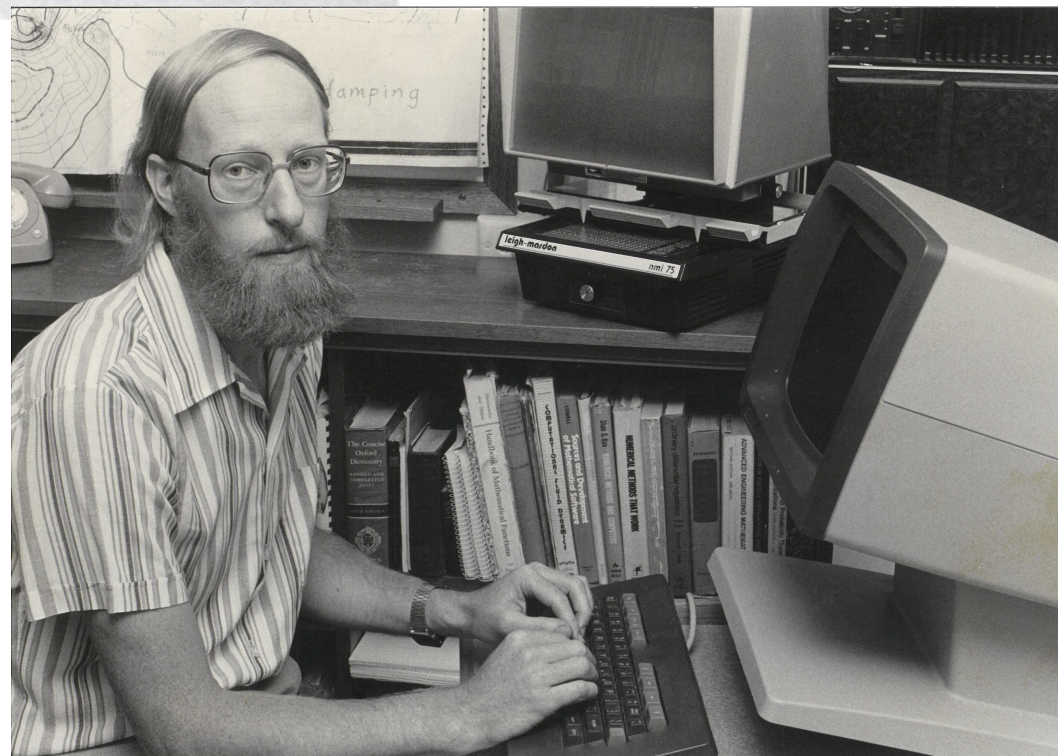
Since *Mail was introduced, clients seeking assistance have increasingly used it to contact CSIRONET in Canberra. Jan Bubb, manager of technical support, explained — 'before we started using *Mail most users reached us by telephone and left recorded messages. We found it was difficult to reach our customers by telephone to discuss their problems. Now we can leave messages on *Mail and give them updates about the steps being taken to help them'.

Jan said one of the advantages of the system was that it provided a printed rather than audio copy of all messages. In the future the section hopes to introduce a database for all requests so that they can analyse problems clients are experiencing and hopefully take action to alleviate the problems before they occur.

For information on *Mail, contact: Sue Choquenot (062-43 3381, CSIRONET mail address JOURNO) or Peter Milne (062-43 3330, CSIRONET mail address MILNE)

CoResearch Feb. 1986