

Getting the most out of AARNet

Cecil Goldstein
Ron Heard

Vax/VMS Version

Produced for AARNet
by
Computing Services
Queensland University of Technology
November 1991

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GETTING THE MOST OUT OF AARNet

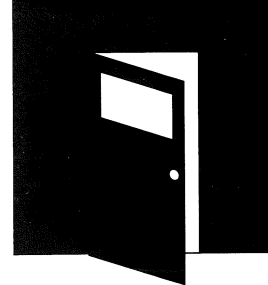
Imagine being able to exchange ideas and information with colleagues throughout the world almost instantaneously, to send manuscripts for comment and receive the reviewed manuscript back the next day, to have ready access to data held on many other campuses and institutions, to seek help on a problem from other professionals worldwide without even knowing them, and even to use computers located in another country from the comfort of your own office. Imagine this being possible without the expense of lengthy telephone calls, couriers, conferences and overtime, and you will begin to understand some of the benefits of AARNet—the Australian Academic and Research (Computer) Network.

A network is a tool. Like all tools, to use it effectively some effort must be made. But making that effort need not be daunting and it is the purpose of this guide to aid and facilitate that effort.

This booklet is intended as a guide to AARNet. It enables you to recognise the potential of services available through AARNet. It also provides you with the detail you need to access and use these services from your own computer systems.

The guide is divided into five sections

- AARNet in a nutshell — an overview of the network and computer communication,
- A guide to using AARNet services,
- How to obtain information — a guide to guides,
- How it all works, and
- Glossary.



What is a computer network?

Computers are said to communicate with each other when messages from one can be received by another and processed in an appropriate way.

For a message to pass from one computer to another there must be a medium through which data can pass. Possible media include copper wires, optical cable, telephone lines, microwaves, satellite channels, or a mixture of these.

When data arrives at a computer, it must be treated in an appropriate way. For this to happen there are agreed rules so that the receiving computer treats the data in the way intended by the transmitting computer. The rules determine, amongst other things, how the data is interpreted, what sort of message has been received, and what the contents of the message may be. Such a set of rules is called a "protocol". Protocols are implemented by programs running on each of the communicating computers.

Using one computer to communicate with another does not require you to know everything about the nature of the communication medium or the protocols. That is taken care of behind the scene by the network support staff who maintain the communication medium and programs.

When a number of computers can communicate successfully, they are said to constitute a communications network.

A computer connected to a network is called a node. Communications networks can vary greatly in size—linking together just two nodes or many thousands.

AARNet

AARNet is a physical network linking together Australian academic and research institutions (and some commercial organisations) by providing the platform for data communication through the use of multiple protocols.

Protocols are so important in determining the nature of the network that a network is often described by its protocol type. The most common protocol used on AARNet is called TCP/IP (for Transmission Control Protocol/Internet Protocol) and is implemented on all AARNet nodes. AARNet is therefore a TCP/IP network, or simply, an IP (Internet Protocol) network.

Through a link from Melbourne to California, AARNet becomes part of The Internet, a worldwide network originating in the US. The Internet connects many separate IP networks and computers using the TCP/IP protocols. These include North American educational, military, government, and research networks as well as numerous other national networks similar to AARNet. Many commercial and industrial organisations are also connected although usually only for electronic mail functions. Thus computers on AARNet are linked to some 100 000 other machines and millions of users throughout the world. Using AARNet as an IP Network is therefore the same as using Internet.

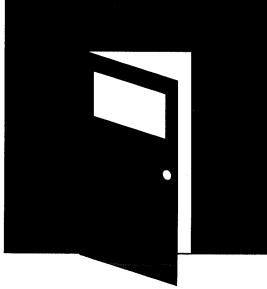
How AARNet is organised

AARNet was established in 1990 at the initiative of the Australian Vice-Chancellors Committee (AVCC). Its brief was to provide a computer based communication service to Australian academics and researchers to enable the dissemination of information and knowledge, encourage dialogue, debate, and the interchange of ideas, and to foster intellectual and cultural sharing, cooperation and understanding.

AARNet is administered for the AVCC by a special section of the AVCC secretariat working in conjunction with the computing services departments of constituent institutions. It is this section which is responsible for maintaining the connections between sites, ensuring standards and consistency, providing support and controlling functional matters such as name and address allocation.

Access

Because AARNet is funded by the AVCC and subscriptions from member institutions, no individual charges are made. Each member institution can access the network as often as required and it is then up to each organisation to decide which network services to provide and who can use these services. Non-educational institutions can apply for affiliate membership of AARNet and organisations (including commercial ones) with no direct links to AARNet can arrange to be connected to AARNet sites in order to receive email and news feeds.



Physical structure

While the exact physical structure (topology) of AARNet has little bearing on the use of the network, some understanding of its design can help in conceptualising what is happening when you invoke a network service.

AARNet comprises a two-tier star-like layout. A national hub, located at Melbourne University connects via leased Telecom data communication lines to six regional hubs located at a university in each of the five other state capitals and Darwin. In the second tier, each regional hub is connected via owned or leased lines to each of the participating organisations within that region.

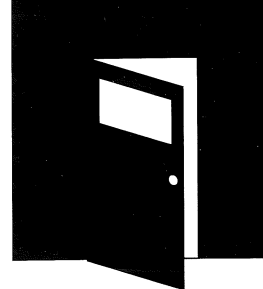
AARNet becomes part of Internet via a line from the national hub to California.

AARNet provides the medium (the lines) for carrying the data and the dedicated communication hardware (specialised computers) for routing data to the correct destination.

Each institution has the responsibility to provide and maintain the software on its own computers which implements the protocols for data communication on AARNet and which facilitates use of the services available over AARNet — for example email systems.

Each institution also maintains its own local networks and it is the responsibility of the institution, if it so wishes, to connect these local networks to the AARNet link. In this manner local networks or subnets in turn can become part of AARNet and Internet.

AARNet SERVICES



Networks are about sharing and distributing resources and information. While, at the lowest levels, all data is transferred in the same way, to the user networks provide different forms of data communications, each fulfilling a specific function and facilitating different ways in which information can be exchanged and resources accessed.

It is with the use of these functions, usually called network services, that you will be most concerned. This section will look at these services and discuss what they are, how to use them and how to get the most out of them.

The services most commonly available over AARNet and Internet provide for:

- the exchange of electronic mail messages (email),
- the transfer of files of any type from an account on one machine to an account on another machine (file transfer),

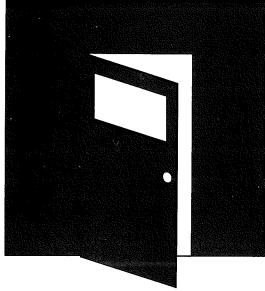
- a means of connecting to and directly using any machine on the network (remote interactive login), and
- conferencing and the open interchange of ideas and information via discussion groups and bulletin boards.

Other services are available over the network although not yet provided by all sites. These will be discussed further in this section.

Each of the main services listed above defines a specific form of network communication which can be used in a number of ways to achieve different purposes.

The following list is not definitive but is meant as a guide to what can be done over AARNet and to what is the appropriate service for doing this.

Contacting people worldwide on Internet and other networks such as Janet, the Academic network in the UK	email	Examining online library catalogues	remote login
Transferring data or research results for continued processing	email or file transfer	Searching online databases	remote login
Transferring text files	email or file transfer	Perusing online information systems	remote login
Transferring special binary or system-specific files such as compiled programs or wordprocessor and spreadsheet files	file transfer (standards are being developed to do this using email as well)	Connecting to a distant machine in order to use a special resource such as a supercomputer	remote login
Distributing agendas, minutes, notices to lists of people	email	Working on a project based elsewhere	remote login
Obtaining information and software from archiving sites	anonymous file transfer or email information servers	Writing a joint paper	email
Maintaining mailing lists	email	Seeking or providing information	conferencing
Participating in, and obtaining information from, special interest groups	email interest groups	Participating in discussion, debates, exchanges on a variety of topics	conferencing
		Voicing an opinion	conferencing
		Submitting a job application	email
		Requesting and receiving referee reports	email
		Upgrading software	file transfer or email for source code



Thus, not only can each service be used to accomplish a variety of tasks but it can also complement others. For example . . .

A research scientist, Joe, at a university in Australia, wishes to know whether anyone else has carried out research similar to that which he is doing. Exploration of the literature, and searches of online databases accessed via AARNet have, at this stage, revealed nothing, but he nevertheless believes there are some people working in the area. Not having any specific place to start his inquiries he posts his query as an item to an appropriate group (category) in the **Usenet news conferencing system**. This item is propagated via the news system over the entire network and is read by another scientist, Julia, working at a university in the US. She has carried out similar work and responds by posting a reply to the same newsgroup. In turn, this is read by our original researcher, Joe, who then continues the discussion directly with his new found colleague using **email**. Eventually, it transpires that Julia has developed a system to analyse experimental results in a way interesting to Joe and invites Joe to use this system. After getting an account on the relevant machine at Julia's university, Joe transfers his test results to this machine using **file transfer** and then, **remotely logs** in to the machine to run the test. The results show up some revolutionary facts about the subject which lead both Joe and Julia to valuable findings. Eventually, they decide to write a joint paper on their conclusions and use **email** to transfer drafts of this paper to each other for amendment and comment as they write it. Their paper is published in a prestigious journal and they are awarded a science prize for their work. Finally, they meet for the presentation, and . . .

It is predominantly and ultimately people who communicate over a network and as our example attempts to illustrate, this interaction can encompass a whole range of human experiences.

Using network services

Network services are available to you through programs running on the computers connected to AARNet. You interact with the relevant programs by providing the information and commands required for the task. Once you have completed your instructions, the program will interact with the network software effectively carrying out the functions for that service.

All network services imply a communication connection between two machines on the network. Obviously, then, it is necessary for the originating computer to be able to specify the machine it is trying reach. For this purpose each computer connected to the network, known as a **host**, is given a network name or hostname specified in a format known as **the Internet domainised format**.

An example of such a name is

`redgum.qut.edu.au`

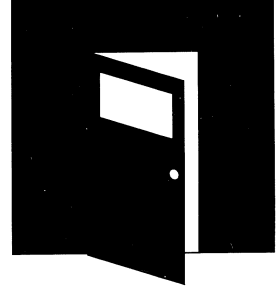
The leftmost component is usually the machine name for that host (redgum). The remainder is the domain name (qut.edu.au). Each of the components in the domain name represents a level or domain within a hierarchical structure where each domain describes or classifies an entity, either logical or physical, to which that host belongs. Each higher level domain "contains" the lower level or sub-domains beneath it. Thus, our example is the network name or hostname for QUT's Vax 6430 and can be defined as follows:

<code>redgum.</code>	the local machine name given to the 6430 Vax within the
<code>qut.</code>	domain, which is a physical organisation (Queensland University of Technology) within the
<code>edu.</code>	edu(cational) domain, a logical classification encompassing similar educational organisations and is within the
<code>au</code>	Au(stralian) domain, which is the top level country domain and includes all Australian sites.

Such hostnames are known as Fully Qualified Domain Names since they include a reference to all the domains in which the host is a member. Because the method for defining such hostnames is based on a distributed system of name allocation where there is an authority to ensure uniqueness at each domain level, each hostname is unique on the network. Such hostnames can therefore be used to address or reference the machine you wish to access and in this context the hostname is also known as the **address** of that machine.

Therefore, to use a network service you must:

- have the address of the remote computer you wish to reach,

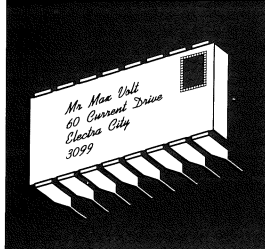


-
- have access to a machine at your site providing the service you want, and
 - be familiar with the commands necessary to use the program for that service.

Obviously, using a network service can differ from machine to machine depending on the operating system of the machine and the program implementing the service. This is particularly true of email, where there are a number of mail systems which interact with the user in quite different ways. On the other hand, the various programs implementing file transfer and remote login on AARNet and Internet use essentially similar commands.

Although differences in actual commands can occur, the logical process in using a network service is similar on all systems.

- *In the following sections each service is described more comprehensively and its use is discussed in generic terms. Annotated examples of the actual use of these services under a specific operating system are then given.*
-



EMAIL

What is email?

Email is the facility enabling you to send messages to other computer users. You can contact users on your local system or, via AARNet and Internet, users of networked computers in many parts of the world. Email is fast—messages to anywhere in the world are usually delivered within minutes. The computer system of the person you are contacting will accept and store the email message in a mail file, so the person does not have to be using the computer at time the message is sent. Since AARNet is financed “up front”, no individual charges currently apply.

You can exchange many sorts of information via email—including memos, letters, data and programs. People working together on a paper together can exchange drafts. You can send messages to multiple users, making email a suitable means of contacting all the students enrolled for a particular course, or any group of people needing the same information.

Currently, email will send only text messages. Thus you cannot directly send binary files or files that include special characters. These include files formatted by a word processor, spreadsheet files, and compiled programs. You can use “FTP” (file transfer) for these files, or you can encode them using an agreed standard method. Methods for integrating encoding standards into email are currently being developed.

How email works

You invoke the mail sub-system by entering the appropriate operating system command. This sub-system allows you to:

- send messages to other people, reply to a message, or forward a message,
- read messages sent to you,
- extract messages as text files,
- print messages,
- delete messages, and
- organise and manipulate the messages stored in your mail file.

Some mail sub-systems let you create “fo‘ders” so that you can keep track of your messages by storing related ones together.

All email messages consist of two parts. The first part is a header which contains details of the sender, details of the addressee, a subject line, the time and date the message was sent, and other information that the network needs to deliver the message correctly. The second part is the message itself, created by the sender.

As a simple guide to sending an email message, you can follow these basic steps.

1. If necessary, prepare or create a file containing the message to be sent.
2. At the operating system prompt, enter the command to invoke the mail system.
3. In the mail system, give the command to send a message followed by the name of the file containing the mail message if such a file has been prepared.
4. Enter the email address for the recipient and the subject line in response to the prompts. If the name of a message file was given at step three, the message will now be sent.
5. If a file containing the mail message has not been created, type in your message.
6. When you have completed your message, type the command to terminate the message input. The message will now be sent.
7. In the mail system you can give further commands to read and manipulate your email as detailed below.

The various facilities

Sending a message

To send email you need a message and someone to send it to.

You can create a message with a text editor, such as Edt or Vi. If you use a wordprocessor to create your message, save the file without the formatting information — using the “text out” or “export” ASCII option. Other information you may wish to send could include text already created as output from a program or a data logging device.

If you wish to send a quick message, most mailing systems will let you type the message at the keyboard. This process is fast, but does not allow you the chance to review your message before you send it. Many mail systems allow you to invoke a text editor to create a message.



Addresses

We have already discussed the need to be able to address the machine you are connecting to when using a network service. Email however not only requires that you specify a machine but that you also identify the user on the machine the mail is intended for. This is similar to giving the name of a person at a particular address on the envelope of a letter.

The most common way of distinguishing a user on a machine is by that users **username**. A username is a unique identifier given to every registered user of a multi-user computer system. Often the username is, or includes, the user's actual name but this need not be so. For email purposes, a user can also be given a mail alias. This is generally derived from the persons actual name. For example, MOZARTWA can have a mail alias or mailname W.Mozart.

Aliases allow all users at a site to be given mail addresses of a standard form. This standard form is usually chosen to resemble the person's actual name. These names can remain constant even if the person's username changes and can also be independent of any particular machine.

It follows then that a combination of a username or mail alias and hostname can identify a person effectively on a network machine and can therefore be used to address email to that person across the network.

Furthermore, in a similar way to aliasing users, network software enables an organisation to define a sitename or organisation name as a general address for email purposes. This sitename is often the domain name for that organisation, for example qut.edu.au. Again, this approach enables an organisation to retain a consistent and standard address.

Thus a combination of username or mail alias and hostname or sitename can in fact be given (where aliases and sitenames have been defined) and this is the formula used for addressing email. Such addresses are called **email addresses**. For example, to send email to a person at QUT with the username MOZARTWA on host redgum.qut.edu.au, we can use the email address

mozartwa@redgum.qut.edu.au or
W.Mozart@qut.edu.au

The @ symbol separates the name used to identify or address the individual user (the local part) from

the part which identifies or addresses the host or site (the network part). "@" is the commercial at character, usually shift-2 on keyboards. This is the standard form for email addresses used on AARNet and Internet. Even users on machines on other networks can be reached in this way. Thus an address on Janet, the UK academic network, given in the form

thomasd@multics.cf.ac.uk

or an address on the Bitnet network (another academic network originating in the US), given in the form

wolfgang@mitvma.bitnet

will be handled appropriately if your local email system has been set up to recognise such addresses. In these cases the mail is first sent by the communications software to a computer connected to both networks called a **gateway**, which will then use the appropriate protocol to forward the message to the actual destination machine. The gateway is invisible to you and you do not need to know what or where it is. There is therefore then no difference in addressing email to any network provided there is a gateway between the networks and you have a correct email address in the Internet format for a user on the other network.

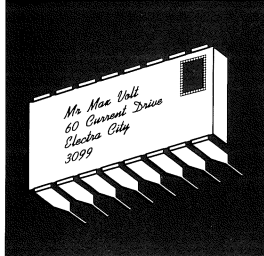
If your mail system is not set up to route to gateways automatically, you will have to specify the actual gateway in your address and should therefore first consult your local computing services.

Normally you find out a person's email address via personal contact such as the telephone or conventional mail. This is because complete directory services, though increasing, are not yet fully developed. (See the section on Guide to Guides for the sorts of information you can find out.) Most sites have a postmaster who will provide help with mail addresses — typically you can email queries to the username `postmaster` at the particular site.

You can always find the address of someone who has sent email to you because the address appears as part of the header of the message.

Subject line

Part of every email message is the subject line. In messages received it helps to decide reading priority. If you have a number of stored messages, the subject line can be used as an index.



When you are sending an email message the system will ask you to enter the subject line. To help the addressee, you should make it an accurate reflection of the message contents.

Reading a message

Within the mail sub-system you can obtain a listing of all the messages currently held showing the subject line and sender. You can then request the system to display the message.

Replying to a message

Mail systems provide a special reply command, so it is very easy to reply to an email message. The system takes the sender's name from the message header. This becomes the address for your reply. It takes the subject line from the header also, and puts "Re:" before it to form the subject line of a reply. Thus if the subject line of a message was *The Colour of the Sky* the subject line of the reply would be *Re: The Colour of the Sky*. Of course, you still need to provide the message. You can create the message in the ways described above.

Printing a message

It is often useful to have a copy of a message on paper. You can request the mail sub-system to print a message on a printer attached to your computer system.

Extracting a message as a file

If the message you receive contains information you wish to work on further—for example it may be a draft of a document you wish to amend, a program you wish to run, or data you wish to process—you can extract the message so that it becomes a computer file. You would use an editor to remove any extraneous information, and could then treat the file as you would any other computer file.

Deleting a message

When you no longer want an email message, you can and should delete it. Unwanted messages make the messages you do want harder to find, and waste valuable file space.

Organising mail messages

After you have read a mail message you can retain it for further reference. Many mail sub-systems give you the facility to create a number of "folders", and to move messages to a particular folder. You can thus keep related items together and so simplify the task of locating a particular message. It is up to you how you organise the folders. Some people like to store together all messages dealing with a subject,

others like to store together all messages from a particular correspondent.

Mail delivery

Generally there is no facility within AARNet and Internet for confirming successful delivery of mail. However, in most cases if mail fails, you will be sent a failed mail message. This normally occurs if:

- you have specified an incorrect username or alias,
- you have specified an incorrect or non-existent sitename or hostname, or
- the machine you are sending mail to or a gateway machine is not reachable (in which case some mail systems will continue at intervals to retry to deliver).

Even though mail is delivered very rapidly, a reply will ultimately depend on the response of a person. Always consider the time differences between locations. If you require an urgent response then it is useful to indicate this in the subject line.

Distribution lists and interest groups

A distribution list or mailing list allows the same email message to be sent to all the people whose addresses are contained in a defined list. This concept can provide several functions.

People who have a similar interest or who are part of a common group (for example, conference participants) can be placed on a list which is maintained at a coordinating site. Email can then be addressed to a special email name at that site which is associated with the list and the message will be redistributed to all the addresses in the list. This method can be used to disseminate information or carry on a discussion within a group. Furthermore, the coordinating site can archive information or resources relevant to the interest group which can be made available on request by email or by file transfer (see later).

The redistribution is often done automatically by software which processes the list when an email message to the list name is received.

Open distribution lists, that is, lists to which anyone can be added, are known as interest-groups since they are essentially established by people interested in a particular topic in order to communicate with others with the same interest. Numerous interest-groups exist covering a wide variety of



topics (see the section Guide to Guides). Many of these topics are also found in the NEWS system and, in fact, many interest-groups are fed into NEWS. The difference between a newsgroup and an interest group then is that an interest-group discussion is available only to those on the list and the items in the interest-group are distributed via email. Thus, interest-groups can exist across networks not directly accessible to each other for conferencing or file transfer. Also, because distribution is to interested people only, its circulation can be limited and the topics covered therefore can be more diverse than in News. However, in News you have access to the entire News database (see the section on News).

Distribution lists normally have two addresses associated with them

- a request address, to which you send requests in order to be added to the list as a subscriber, (or to be removed). This can be the address of a person coordinating the list or a special name if the list updating is performed automatically by software.
- the list address. Any email sent to this address is redistributed to all the subscribers.

You should ensure that when you use a distribution list, you mail to the appropriate address. Details of these are usually given in the various lists of interest-groups.

Many interest-groups exist on the BITNET network. These are usually called Listservers and are accessible from AARNet.

Before subscribing to an interest-group, you should ensure that it does not exist within the News system.

Info-servers

Often, information can be retrieved from an “archive” site by using email. You send email with a request command as the message to a nominated address, and receive the requested information back as email. Mail to the nominated address is processed by a program called an “info-server” which interprets and carries out the command sent.

The commands most useful are those which request a list of the files available, a specific file, or help information.

Directories of info-servers will usually specify the format of such commands.

Info-servers are useful for retrieving information across different networks or where file transfer is not available. By and large, on AARNet and Internet you will generally find it more convenient to use file transfer (FTP).



In the following dialogue, everything the user types is in **bold, fixed space font**, everything the system displays is in normal, fixed space font, explanations are in *italics*.

\$ mail

— *command to invoke the mail program*

You have 2 new messages.

MAIL> dir

— *list new mail messages*
NEWMAIL

#	From	Date	Subject
1	IN%"TRACE@qut.edu.au	31-OCT-1991	Overtime and Allowance Claims
2	IN%"julia@uvw.edu"	1-NOV-1991	Details of my current project

MAIL> 2

— *new messages include an urgent one, so it is selected by giving the number of the message*

#2 1-NOV-1991 16:22:08.14 NEWMAIL
From: IN%"julia@uvw.edu" "Julia Storm"
To: J.Merriwether@qut.edu.au
Subj: Details of my current project

Date: Fri, 1 Nov 91 16:18 -0600
From: Julia Storm
Subject: Details of my current project
To: J.Merriwether@qut.edu.au
Message-id: <F010E36E47FF201A11@qut.edu.au>

Dear Joe,

 thanks for your interesting mail. It appears
we are working in a similar area, and with somewhat
complementary aims. I am looking at making measurements
of storms in order to check my model, you appear to be
already making measurements and in need of a model.
Press RETURN for more...

— *rest of message can be read by pressing the return key*

MAIL> reply

— *using the REPLY function to generate a quick reply, typed at the terminal, and terminated with a control-Z*

To: IN%"Julia@uvw.edu"
Subj: RE: Details of my current project
Enter your message below. Press CTRL/Z when complete,
or CTRL/C to quit:
Dear Julia,

 This is really exciting. Many thanks. A quick
reply to let you know I received your posting, and to say
I have some processed data which I will send as a separate
file.

 I will read your posting and reply in more detail soon.

Regards

Joe.

^Z



MAIL> send thunder6.dat

— using the SEND function to send a file which already exists in the user's account

To: in%"julia@uvw.edu"
Subj: Thunderstorm analysis data

MAIL> help

— user was not sure of the next command so entered HELP

HELP

Allows you to obtain information about the Mail Utility.

To obtain information about all of the MAIL commands, enter the following command:

MAIL> HELP *

To obtain information about individual commands or topics, enter HELP followed by the command or topic name.

Format:

HELP [topic]

Additional information available:

/EDIT	/PERSONAL_NAME	/SELF	/SUBJECT	ANSWER	ATTACH
BACK	COMPRESS COPY	CURRENT	DEFINE	DELETE	DIRECTORY
EDIT	ERASE EXIT	EXTRACT	FILE	FIRST	Folders
FORWARD	GETTING_STARTED	HELP	KEYPAD	LAST	MAIL
MARK	MOVE NEXT	PRINT	PURGE	QUIT	READ
REMOVE	REPLY SEARCH	SELECT	SEND	SET-SHOW	SPAWN
V5_CHANGES					

Topic?

— exit from help by pressing return key

MAIL>

MAIL> move thunder

— now, create a new "folder" to store this and related messages. In Vax Mail a folder is created by moving an item to it

Folder THUNDER does not exist.
Do you want to create it (Y/N, default is N)? y
%MAIL-I-NEWFOLDER, folder THUNDER created

MAIL> select mail

— select the folder "MAIL", which is the default folder where items are stored after they have been read

%MAIL-I-SELECTED 5 messages selected



MAIL> dir

— list the items in this folder
MAIL

#	From	Date	Subject
1	R.HEARD	17-OCT-1991	AARNet document
2	IN%"W.Mozart@salzbur	19-OCT-1991	The Magic Flute
3	IN%"thomasd@multix.c	22-OCT-1991	Milkwood
4	IN%"julia@uvw.edu"	26-OCT-1991	Your posting on sci.geo.met
5	IN%"W.Mozart@salzbur	26-OCT-1991	Re: The Magic Flute

MAIL> 4

— select item 4

#4 26-OCT-1991 16:42:40.55 MAIL
From: IN%"julia@uvw.edu" "Julia Storm"
To: J.Merriwether@qut.edu.au
Subj: Your posting on sci.geo.met

Date: Fri, 1 Nov 91 16:18 -0600
From: Julia Storm
Subject: Your posting on sci.geo.met
To: J.Merriwether@qut.edu.au
Message-id: <F010E366ABF3F201B22@qut.edu.au>
Joe,

I would be very interested to hear more about your work
Press RETURN for more...

MAIL> move thunder

— move this newsitem to the folder
"THUNDER" also

MAIL> delete 2

— delete an unwanted item

MAIL> dir

MAIL

#	From	Date	Subject
1	R.HEARD	17-OCT-1991	AARNet document
2	(Deleted)		
3	IN%"thomasd@multix.c	22-OCT-1991	Milkwood
4	(Deleted)		
5	IN%"W.Mozart@salzbur	26-OCT-1991	Re: The Magic Flute

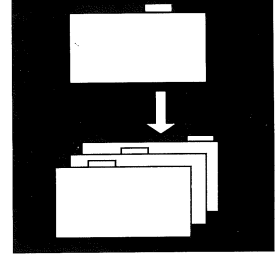
— directory listing now shows item
2 and item 4 as deleted because
they are no longer in this folder

MAIL> exit

— exit from the MAIL utility, back
to VMS

\$

FILE TRANSFER (FTP) AND ARCHIVES



File transfer services make it possible for you to move files from a directory on one computer to a directory on another, irrespective of any differences between the computers. Any type of file that can be stored on a computer can be transferred and there is no limit on the size — except, of course, the receiving machine must have sufficient file space or quota available to accommodate the incoming file.

On AARNet and Internet file transfer is carried out by using the File Transfer Protocol (FTP). The program which implements this is also known as FTP and to invoke it you use the FTP command. Similarly, the term FTP is commonly used to mean file transfer.

Because FTP moves files between directories and directories are normally “owned” by users, you require a valid username and password on the remote computer you are accessing. This is so that your authority to access files or create files in a directory on that remote system can be authenticated.

Obviously, unless you have been allocated usernames on both machines, this can imply getting or giving out password information. If you do find this necessary, then it is strongly recommended that you do this only with someone you trust, and if it is necessary to give out a password, that you change it immediately the transfer is complete. Again, it is often preferable to transfer files as email messages because this does not require access to a password.

FTP can be used in any circumstances where files need to be moved from one computer to another. Some examples:

- data collected at one site is transferred to be processed at another,
- you move to another organisation and transfer the files containing your work, research, email, and so on,
- information such as personnel records are transferred to a central authority, and
- programs are upgraded by transferring new versions from the originating site.

Anonymous FTP

Probably one of the most widespread uses of FTP is to obtain generally available information such as public domain software or shareware from a computer without the need to have a specific username or password. This is known as

anonymous FTP as it allows you to access the remote computer with the username `anonymous` and usually any string of characters as a password although some sites request your name or some other identification as a password (for record-keeping purposes).

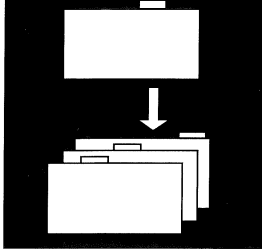
In such a scheme, an organisation will place files that it wishes to make openly accessible in a special directory under the username “anonymous”. Any network user can then invoke FTP to access this directory and retrieve the files it contains. Not all sites provide such an anonymous FTP service: it is relevant only if the site has information of interest to others or if the site maintains archives. (See the section on archives below.)

Using FTP

As with all network services you need the address of the machine you wish to connect to, and if you are not using anonymous FTP, a valid username and password. Using FTP essentially establishes an open connection between the local machine you invoke FTP on and the remote machine you are accessing. For this to occur, the remote machine must be running an FTP server (most AARNet and Internet computers do), since it is the FTP program on your end and the FTP server at the remote end which communicate.

1. At the operating system prompt enter the **FTP** command and optionally, the address of the destination computer.
2. If you provided the remote machine address FTP will attempt to access the FTP server on that machine and, if this is successful, you will be asked to login by giving a username and password in response to the appropriate prompts.

If the address was not given, then you will receive the FTP prompt and at this stage will need to provide the address. Again, if the connection is successful you will be prompted to login.
3. The login process is used by the remote computer to check and authenticate your access. Under anonymous FTP this is basically meaningless although still required. Even though FTP establishes an open connection and the login process is similar to actually logging in to a machine interactively (see the section on interactive connection), FTP as such is not an



interactive process because you do not enter commands directly on the remote computer. You interact with FTP on your computer issuing commands to the FTP process. Some FTP commands allow you a limited capability to manipulate files and directories on the remote machine by transferring these commands to the remote machine and receiving the responses.

4. Once you have successfully established an FTP connection and logged in to the remote machine, you can give commands to
 - transfer files,
 - change directories,
 - list the contents of directories,
 - close the FTP connection, or
 - terminate the FTP session.

Other facilities and options can exist depending on your local implementation of FTP.

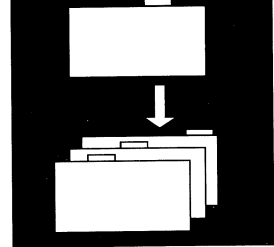
The list below gives the main commands usually available under FTP. The examples use specific file names such as `mumble.dat`. In an actual case you should replace these with the names of the files you wish to transfer.

put mumble.dat transfers the file `mumble.dat` from your computer to a remote computer. There is usually the option to specify a different name for the file to be given on the remote machine.

get burble.txt transfers the file `burble.txt` from the remote computer to your own computer. Again you can optionally give the file a different name on your machine.

Note that when transferring and renaming files you should bear in mind case sensitivity and the file naming conventions of each machine. For example, VMS permits only one full stop in a filename, while Unix accepts more than one. Thus, when transferring a file from a Unix to a VMS system, the file should be renamed so that the name it will get on the VMS system will be valid.

cd foo	changes directory on the remote machine to <code>foo</code> .
lcd bar	changes directory on your own machine to <code>bar</code> .
dir	provides a listing of the names of the files in the current directory on the remote machine.
ldir	provides a listing of the names of the files in the current directory on your computer.
mget and mput	as get and put above but you can transfer multiple files using wildcard (*) notation. There is usually no option here to give transferred files different names.
type binary or type ascii	FTP permits the transfer of different file types. In most cases you will be concerned with one of two types. Files which are text — that is contain standard printable characters defined in the ASCII encoding scheme are called ASCII, files which are executable program files or system specific files (for example spreadsheet, wordprocessor, databases) are called binary. The ASCII type is the default, so if the file you need to transfer is a binary file you must set the file type to binary and when necessary back to ASCII.
disconnect	disconnects from the remote computer.
quit or exit	terminates FTP.



Archives

Computer archives are collections of files related to a particular subject, (for example, the AARNet resource guide) which are stored on a computer and made available via anonymous FTP. Often this is public domain software or shareware (computer programs made freely available or for a small “pay if you use” charge) for a particular computer system, for example, MS-DOS. Certain sites assume responsibility for maintaining such archives, say, where that organisation has an established expertise in a particular field.

Often sites are set up as “shadow” archives. These sites hold complete copies of other, usually very popular, archives existing elsewhere in the world. Thus, the information they hold can be retrieved more “locally” reducing the load on the overall network. For example, Deakin University provides a shadow archive for the SIMTEL-20 software archives maintained by US Army Information Systems Command in New Mexico. This archive contains publicly available programs for numerous systems including MS-DOS and UNIX. Users on AARNet can then retrieve files from the archive held at Deakin over AARNet links only and consequently the link to the US does not have to carry numerous individual retrieval requests to SIMTEL-20 for the same information.

It is considered good network practice (see the section on Net etiquette) to first check if information is available at an AARNet site before connecting to an archive overseas. See the companion booklet “The Concise AARNet Guide”.

Because files available for anonymous FTP can be large, they are often stored in special formats requiring less storage space. These methods enable a number of files to be grouped together into a single file (called file archiving) or “squeeze” the contents of a file up (called file compression). Such files, must be transferred using the **binary file** mode. Once they have been received they must be de-compressed and de-archived before they can be used.

A common form of file-archiving on AARNet and Internet is the Unix **tar** format (from tape archive as this format was and is used to back up files to tape). File-archives of this type usually have the suffix “tar”. For example, `aarnet_info.tar` can be a file containing a number of separate files about AARNet. This file can also be compressed. Using

the common Unix compress utility to compress a file will give that file a further extension .Z. Our file, after compression will be called `aarnet_info.tar.Z` (Note that the character “_” used in the file name is the underscore character, usually shift hyphen on keyboards. This is a character frequently used in filenames to improve readability.)

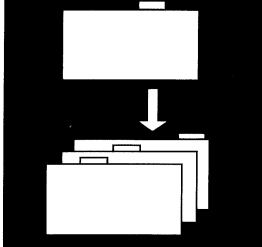
Again, to FTP such a file you will have to set the file mode to binary in the FTP system. Furthermore, if it is to be transferred to a VMS machine, you will need to give it a VMS filename with only one full stop. For example, `aarnet_info.tar.Z` can become `aarnet_info.tar_Z`

In addition, you will have to ensure that your computer has programs available to decompress and de-tar such a file. Utilities to de-tar and de-compress files of this sort exist for VMS as well as Unix systems.

Thus when transferring a file you should:

- note the file type and set the transfer mode accordingly,
- ensure that, if the file is a file-archive or is compressed, you have the appropriate programs to extract the files from the archive and decompress it, and
- ensure that the transferred file will have a name appropriate to the system it is being transferred to.

The flexibility of FTP in allowing files and directories to be manipulated on both the remote and local computers, makes FTP a very powerful yet easy-to-use tool for facilitating the distribution and sharing of information across AARNet.



In the following dialogue, everything the user types is in **bold, fixed space font**, everything the system displays is in normal, fixed space font, explanations are in *italics*.

\$ **ftp**

— *command to invoke File Transfer on Vax*

REDGUM.QUIT.EDU.AU MultiNet FTP user process 3.0(102)
FTP>**nimbus.boulder.edu**

— *request to connect to remote machine*

Connection opened (Assuming 8-bit connections)
<nimbus.boulder.edu FTP server (Version 6.9 Sun Oct 27 1991) ready.
Username: **anonymous**

— *login with the username "anonymous"*

Password:

— *mail name was given as password (typed but not echoed)*

<Welcome, archive user! This is an experimental FTP server. If have any
<unusual problems, please report them via e-mail to datta@vanimbus.boulder.edu
<
<Please read the file README
< it was last modified on Sat Oct 26 21:18:18 1991 - 6 days ago
<Guest login ok, access restrictions apply.
nimbus.boulder.edu>**cd /pub**

— *some explanatory messages, then the machine name as prompt*

<CWD command successful.
nimbus.boulder.edu>**dir**

— *request to list file and directory names*

<Opening ASCII mode data connection for /bin/ls.
NEW.FILES 5122 Files added/changed in the last 15 days
README 365 Informational messages about the system
incoming/ = (dir) put your donations here
records/ = (dir) Weather FTP archives
readme.first 928 Directory tree for this site
tmp/ = (dir) Temporary stuff that may disappear
wp/ = WordPerfect related files
<Transfer complete.
nimbus.boulder.edu>**cd /records**
</records: No such file or directory.

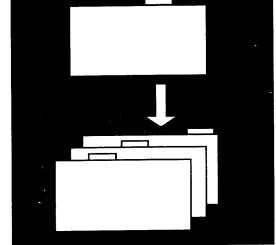
— *wrong command typed: '/' should not be typed for a sub-directory, the system responded with a message*

nimbus.boulder.edu>**cd records**

— *correct command this time*

nimbus.boulder.edu>**dir**

— *request names of files in sub-directory*



```
<Opening ASCII mode data connection for /bin/ls.
README          3514  Intro and description of weather archives
temperature/    - (dir) Temperature records
precipitation/  - (dir) Precipitation records
wind/          - (dir) Wind direction and speed records
thunder/        - (dir) Thunder days records
misc/          - (dir) Misc files that don't fit anywhere else
<Transfer complete.
nimbus.boulder.edu>cd thunder
```

— move to sub-sub-directory

```
<CWD command successful.
nimbus.boulder.edu>cd brisbane
```

— and one level more

```
<CWD command successful.
nimbus.boulder.edu>dir
<Opening ASCII mode data connection for /bin/ls.
t1960-1969.tar.Z    7510
t1970-1979.tar.Z    7450
t1980-1989.tar.Z    7500
t1990.tar.Z         500
<Transfer complete.
nimbus.boulder.edu>type binary
```

— set appropriate mode for a compressed file

```
Type: Image, Structure: File, Mode: Stream
nimbus.boulder.edu>get t1980-1989.tar.Z
```

— now request the file, changing its name so it will contain only one full stop, and end with the characters "underscore,z" which are assumed by the most common Vax VMS uncompress program

```
To local file: t1980_1989.tar_z
<Opening ASCII mode data connection for t1980-1989 (7500 bytes).
<Transfer complete.
nimbus.boulder.edu>cd /pub
```

— change back to pub directory (immediately below the root directory, as shown by the slash)

```
<CWD command successful.
nimbus.boulder.edu>cd incoming
<CWD command successful
nimbus.boulder.edu>put 1991.dat
```

— copy a contributed file to the archive (will also send email to the manager of the archive to inform her or him)

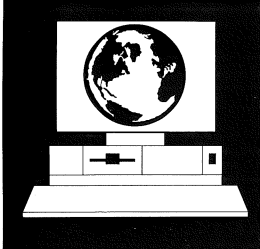
To remote file: t1991

— give the contributed file a standard name

```
<Opening ASCII mode data connection for 1991.dat.
<Transfer complete.
nimbus.boulder.edu>exit
```

— and exit

```
<Goodbye.
$
```



INTERACTIVE CONNECTION (TELNET)

Perhaps the network service that most dramatically conveys the sense of network connectivity is that which enables you to connect to a machine, possibly many thousands of kilometres away, and to use it interactively by giving commands and instructions directly to that machine.

In using email or file transfer (FTP), you essentially interact only with your local system, with messages or data then being transmitted as a result of these locally given commands. In an interactive session however, once the connection has been made, the local system becomes transparent and commands typed in by you are directly transmitted to the remote machine with the response from the remote computer being displayed on the your monitor screen. Interactive connection is also known as **remote login**.

On AARNet and Internet this service is provided by the **Telnet** protocol and the program which implements it is called Telnet.

Remote login makes available two major functions

1. You can login remotely to any machine you have access to — that is, have a username and password — and use it as you would at the local site. This is particularly useful if you are engaged in a project or research based at an institution some distance from where you are located. For example, in distance education or postgraduate studies.

Additionally you can use computers directly providing computational resources such as supercomputing facilities and specialised packages which might not be available at your local institution. This enables much greater access to these facilities and therefore makes them more cost efficient and widely available. Usually, sites providing such resources have procedures by which you can apply for access to a specific facility, and the sites will also provide documentation and assistance. However, use of the facilities may be charged for. You can often apply for access by emailing the relevant person.

2. One of the most common uses of remote login is to connect to and then examine databases such as library online public access catalogues (OPACs), and online information services providing, say, information on a university's course timetable, recreational and cultural activities, and so on. These are usually set up in

such a manner that once you have connected you are not able to carry out any function other than to look at the database available. Accordingly, access to these databases often does not require you to have any special permission or username to login and the login procedure is therefore automatic. Some, however, might require you to enter a password before allowing you to use certain features.

Once you have accessed the remote machine, what you enter at your keyboard are commands to that remote system. These commands will either be commands for the operating system (1 above) or for the program running the catalogue or database you are searching (2 above). Accordingly, after the initial connection, the commands you use during a remote login session will depend on the machine you have logged in to.

Using Telnet

The Telnet utility enables you to access any AARNet or Internet system in an interactive session provided the remote system supports a Telnet server — most sites do. Again, you need to have the address (domainised hostname) for the machine you are trying to reach.

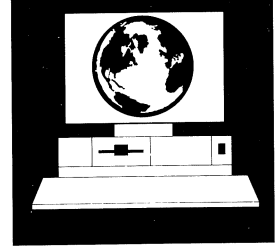
To make a Telnet or remote login connection you then need:

- access to a local machine providing the Telnet service,
- the address of the machine you wish to connect to, and
- a valid username and password if you are not logging into a publicly available information service.

Once you are logged into your local machine most Telnet connections will follow these basic steps

1. At your local system prompt enter the Telnet command followed, optionally, by the remote computer address. Telnet will then attempt to access the remote machine.
 - 1a. If you did not give an address, you will receive the prompt **TELNET** and at this point can enter the address. In some implementations you would need to precede this with the Telnet command "open" or "connect". For example

```
TELNET> open redgum.qut.edu.au
```



Telnet will now at this point try to access the remote computer.

2. Once the connection has been made successfully, indicated by a message displayed on the screen, Telnet becomes transparent and you will be prompted by the remote system to log in. (Often special instructions on how to terminate are displayed when you first connect. You should take careful note of these.) You use the username and password you have for that computer. If it is a publicly available information system or catalogue, which does not require a username, you will be prompted by that system for the next command or instruction you need to give to start accessing the database.
3. At this point you are interacting completely with the remote system. To end your session therefore you give the logout or end session command as required by that system. This will terminate the connection and you are then able to issue commands directly to your local system. If you are back at the `TELNET` prompt, you could exit from Telnet or open another connection.

Telnet provides numerous other facilities which can vary from implementation to implementation and you should refer to your local computing services for details. However, three valuable features generally available on most implementations will be described here.

Escape-character

It is often useful and sometimes necessary to give commands to the Telnet program running on your local system when in the middle of remote login session. For example, if you cannot end an interactive session on the remote system or if the connection appears to have hung (be stuck), you need to be able to terminate that connection from the local end. Similarly, you might want to use a Telnet option, for example, to check the status of the connection, while in the middle of an interactive session. To this end Telnet allows a special character to be defined, sometimes `Ctrl-^`, or `Ctrl-]` which, when typed is not simply passed through to the remote system by Telnet but is recognised by Telnet as meaning that the connection to the remote host must temporarily be suspended. Depending on the implementation, this will either put you back at the Telnet prompt where you can

enter any Telnet command, or execute the Telnet command given immediately after the escape-character. For example, if it is necessary you can use the escape-character to get back to Telnet and then issue the command to end the connection.

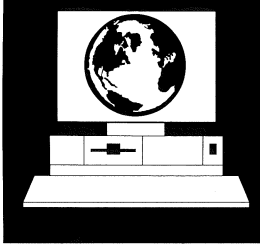
IBM systems—TN3270 emulation

When you are remotely logged in to a computer, the computer assumes that you are using a certain type of terminal and formats its responses for display on your monitor screen accordingly. If, however, your terminal, as set up for your local system, does not match the terminal type which the remote system assumes, the output on your screen will be incorrectly or even illegibly displayed. Most machines on AARNet and Internet use a terminal type called VT100 or one based on this and therefore there are no difficulties when such machines connect to each other. However, if you are accessing an IBM machine which requires a non-VT100 compatible terminal type, problems can occur. To deal with this, Telnet supports a mode which allows the IBM type terminal to be emulated. That is, incoming data in the IBM format will be converted by Telnet to a VT100 compatible format and thus displayed correctly. On some implementations of Telnet this mode will automatically be set when Telnet senses that the remote machine is using an IBM format. On others, you invoke the mode by using the command `tn3270` to run Telnet. Your local computing services will be able to provide more detail.

Logging a remote session

If your implementation supports this, logging can provide a very useful feature. When logging is set it will create a file on your local machine which contains a transcript of your Telnet session. This is very useful, for example, when searching a remote database. You can specify your search, then simply allow the information to be displayed on your screen without reading it in detail. Then when finished, you can examine this information at leisure on your own machine. In this way you do not need to remain connected longer than is necessary and will have a record of your search as well.

Remote login opens the world to computer users in a direct and immediate fashion, making a computer, library catalogue or information system thousands of kilometres away as accessible as one on your desk.



In the following dialogue, everything the user types is in **bold, fixed space font**, everything the system displays is in normal, fixed space font, explanations are in *italics*.

\$ telnet

— *command to invoke telnet program*

REDGUM.QUT.EDU.AU MultiNet TELNET-32 3.0(81)
TELNET>**library.anu.edu.au**

— *request to connect to a library*

Trying... Connected to LIBRARY.ANU.EDU.AU, a (MENZIES)ENCORE_MULTIMAX running UNIX.

System V.R2.4 UNIX (madmax)

```
+-----+
|                                     |
|      =====                     |
|      Welcome to the Australian National University Library                 |
|      =====                     |
|                                     |
|      How to Login to our Online Public Access Catalog (OPAC):             |
|      -----                     |
|               * Terminal Emulation: VT100 required. *                     |
|                                     |
|               Type "library" at the login prompt.                         |
|                                     |
|      How to Exit:  "Ctrl ]" will take you back to your machine             |
|      -----                     |
|                       <or>                                                  |
|               Use the "EX" option from the top menu screen.               |
|                                     |
|      Problems can be sent via e-mail to "helpdesk@library.anu.edu.au"      |
|               or phone (06) 249-2009                                       |
|                                     |
+-----+
```

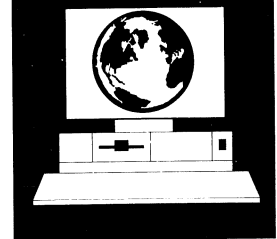
— *a "welcome" screen: note carefully the how to proceed and how to exit messages which are given here*

login: **library**

— *obeying instruction from the welcome screen*

UNIX System V Release R2.4 ns32532
madmax
Copyright (c) 1984 AT&T
All Rights Reserved
Login last used: Mon Nov 4 16:53:55 1991

```
*****
***      McDonnell Douglas Computer Systems Company.      ***
***      17:16:08 RealityX 2.01 Rev 06 04 NOV 1991        ***
***      Australian National University Library.          ***
***                                                         ***
*-----*
```



17:16 04 NOV 91

WELCOME TO THE ANU LIBRARY <START>

413 OPAC87-TI

THE CATALOGUES

1. URICA on-line catalogue
2. Serials receipt enquiry

NEW BOOKS

3. Books received this week
4. Library Opening Hours

Exit

EX. To logoff

Enter selection 1

— proceed with normal library search
... until

Enter selection **ex**

— give command to disconnect

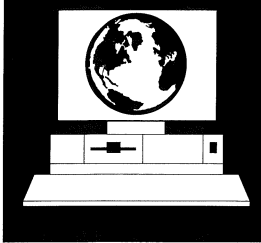
```
*****
***      CONNECT TIME AT 17:19:21 = 3 MINUTES      ***
***      CPU MS. = 13000                          ***
*****
*** LOGGED OFF AT 17:19:21   ON 04 NOV 1991        ***
***
```

Disconnected

Connection closed by Foreign Host

— connection is closed, user is back
to telnet prompt, and can exit

TELNET>**exit**
\$



\$ telnet

— command to invoke telnet program

REDGUM.QUT.EDU.AU MultiNet TELNET-32 3.0(81)
TELNET>cirrus.uvw.edu

— command to telnet to connect to remote machine

Trying... Connected to CIRRUS.UVW.EDU, a VAX-6430 running VMS.

This is the UVW VaxCluster.

Username: MERRIWETHER

— connection has been made, user can log on and use machine as any other user

Password:

Welcome to VAX/VMS version V5.4-2 on node CIRRUS
Last interactive login on Monday, 4-NOV-1991 17:09

\$ dir

Directory DSKZ:[MERRIWETHER]

A.LIS;1	11	29-OCT-1991 15:15:04.95	(RWED,RWED,,)
JULIA.TXT;1	2	27-SEP-1991 16:56:34.46	(RWED,RWED,,)
THUNDER6.DAT;1	37	8-OCT-1991 13:54:13.39	(RWED,RWED,,)
THUNDER9.DAT;4	35	8-OCT-1991 16:27:48.53	(RWED,RWED,,)

Total of 4 files, 92 blocks.

\$ run [storm]sumul1.exe

Input data: thunder6.dat

Output will be b.lis.

Successful termination.

\$ log

— end of session, user logs out as normal

MERRIWETHER logged out at 4-NOV-1991 17:15:11.65

Accounting information:

Buffered I/O count:	1509	Peak working set size:	2573
Direct I/O count:	274	Peak page file size:	11604
Charged CPU time:	0 00:00:27.12	Elapsed time:	0 00:02:46.95

Connection closed by Foreign Host

— connection is broken by remote system, and the telnet prompt shows user is connected to local machine again

TELNET>exit

— user exits from telnet program

\$



One of the most exciting aspects made possible by networks is the ability to seek or exchange information, opinions and ideas in discussions with other users throughout the world on a variety of subjects — computer science, mathematics, physics, astronomy, chemistry, biology, language, culture, religion, music, arts, crafts, current affairs, and sport.

Such an open forum between strangers, often in different countries and from different cultures, not only provides a platform for dialogue and the dissemination of knowledge, but can truly make the world seem a smaller place and people more real in one another's eyes.

On AARnet such a forum is made possible through News or Netnews, which is a network-wide distributed bulletin board and conferencing system linked to the Usenet News System in the US.

A bulletin board and conferencing system can be likened to an open email system such that, in principle, all messages sent to such a system can be read by all users of the system, and all users can send messages to the system.

News consists of some 800 ongoing discussions called newsgroups. Each newsgroup refers to a particular topic and contains articles or postings (called newsitems) related to that topic and posted or sent to the newsgroup by individual users.

Newsgroups are structured hierarchically by category, with a newsgroup name made up of components showing all the categories and subcategories it is in—very much like a computer hostname. For example, the newsgroup `comp.os.msdos` is a newsgroup containing newsitems about the PC operating system, MS-DOS. The name clearly indicates this as it defines a newsgroup about the computer (comp), operating system (os) MS-DOS (msdos).

Newsitems posted to a newsgroup can either be original items or follow-ups to existing items, thus creating a discussion. They can contain any text information, so besides information and discussion newsgroups often make available software in either source code or text encoded binary format.

News can be used in many ways. For example:

- to seek information, advice or help on technical, professional, personal or even trivial matters, you can post a question or problem to a relevant newsgroup,
- to elicit comment from professional counterparts you can post your ideas to an appropriate newsgroup,
- to share ideas in areas of specialisation or interest by actively participating in a newsgroup,
- to advertise — there are newsgroups where you can advertise things for sale or look for jobs,
- to pass an opinion or see what others think — there are newsgroups on current affairs and contentious issues,
- to communicate with others of similar ethnic, cultural or religious backgrounds throughout the world,
- to find out what is happening around the world — for example, there are numerous newsgroups related to sport, music, cinema, and so on,
- to simply engage in a dialogue with others having the same interests, hobbies or profession as you,
- to find a new recipe or read a good joke — there are many recreational newsgroups . . . computers are not just technical jargon!

How News works

Unlike most other network services where data is sent across the network as a direct result of a user instruction, News is essentially used on a local system with data transfers being initiated by the News system itself.

All newsitems available to you on a particular system are stored in a database on that local system. When you invoke News, you use a part of the News system known as a newsreader. The newsreader enables you to interact with News by reading, sending or replying to newsitems. There are many newsreaders available, for example News for VMS systems. While the newsgroups and newsitems available will be the same using any newsreader, each newsreader can provide you with different commands and displays (see examples) although their functions will be similar.

When you post a newsitem it is immediately added to the appropriate newsgroup in the local News database and is available to all other News users on that local system. It is also stored, together with other similarly posted newsitems, in a file which is then transferred by the News system to other, usually adjoining News sites. These adjoining sites will in turn add the received newsitems to their



database and then forward them, together with any newsitems posted there, to News sites similarly adjoining them. In this way newsitems are propagated throughout the entire network usually within twenty-four hours. Sites not on Internet can be reached when messages are propagated through an appropriate gateway to a corresponding News service on another network.

Some newsgroups are moderated. A newsitem sent to such a moderated newsgroup is not immediately propagated and added to the database but is in fact sent via email to a person defined as the moderator of that newsgroup. That person can then modify the newsitem if required before posting to the newsgroup or can reject it altogether. Consequently, if you post to newsgroup and the item does not appear immediately, it is probably a moderated newsgroup.

New newsgroups can be created by authorised people at any site participating in News. The scope of a created newsgroup can also be specified. A newsgroup defined as local will exist only on the News system it was created on and postings to it will not be propagated. In this way sites can establish newsgroups covering matters of local interest, for example, information about course timetables, which is of relevance to that local site only. Newsgroups defined as network-wide, however, are created at all sites through the propagation of special messages called control messages that pass information from site to site instructing the News system to create a newsgroup, or, for that matter, to delete one.

The News system at each site is under the control of that site and can be configured as is appropriate to local needs. This includes determining:

- who can post to News,
- who can read News and which newsgroups,
- how long items in each newsgroup will be retained before being deleted,
- which newsgroups the site will accept,
- which newsgroups are local and will not be propagated further,
- who the moderator of created newsgroups is, and
- how frequently News feeds will be received and provided.

Using News

The way you read News and post to a newsgroup will vary depending on the News reader program you have on your machine. The functions provided by each newsreader will essentially be the same. The following provides some indication of these functions. You should refer to your computing services department for details of actual commands. The accompanying tutorials provide examples of actual usage on popular systems.

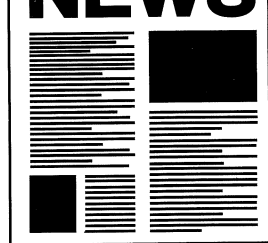
When using News you can:

- display the list of newsgroups available at your site,
- select a subset of only those newsgroups you are interested in and only list these,
- add or remove newsgroups from this subset,
- select a newsgroup and list the newsitems in it,
- read a newsitem,
- select for reading only new newsitems,
- post a new newsitem or followup to a newsitem (followup newsitems are “chained” to the item they refer to and carry the same subject line thus creating an ongoing discussion),
- print a newsitem,
- extract a newsitem to a file,
- skim through the newsitems on a group, and
- resume reading News at the point you were at when you last used News.

Many newsgroups are archived by various sites and the information they contain then made available for retrieval via anonymous FTP. The newsgroup `aus.archives` in fact contains information on which newsgroups are archived and at which site.

It is important when using News to conduct yourself acceptably in what you say and how you say it. The section on Net Etiquette makes some suggestions on what is a suitable way to act on News.

Sites have access to News by virtue of being on AARNet. All that is required is sufficient filespace on a computer to store the database, News software, and an arrangement with an appropriate site to obtain a News feed. This is indeed a very small price to pay for the resources, information, and contacts News can provide.



In the following dialogue, everything the user types is in **bold, fixed space font**, everything the system displays is in normal, fixed space font, explanations are in *italics*.

\$ news

*— command to invoke news system.
System responds with display of
news items, at the point where
the user exited the previous time*

```
rec.sport.rugby: 88 Items (#1384 - #1471) Prot:RW
-<Discussion about the game of rugby.>-
  Title                                From                                Lines Date
1453 Re: Some thoughts on the Aust v NZ se harsant@headplant.t 21 2-Nov
1454 Re: Some thoughts on the Aust v NZ se andrew@DINO.QCI.BIO 1 2-Nov
1455 Australia wins the Rugby World Cup johnb@cs.uq.oz.au ( 32 3-Nov
1456 Re: Australia wins the Rugby World Cu andrew@DINO.QCI.BIO 18 3-Nov
->1457 CONGRATULATIONS AUSTRALIA WC CHAMPS 1 milton@ac.dal.ca 24 3-Nov
1458 WORLD CUP: the final placings. wft@math.canterbury 31 3-Nov
1459 Re: The World Cup Final cjp@cs.aber.ac.uk ( 25 3-Nov
1460 1991 Rugby World Cup andy@comp.vuw.ac.nz 103 3-Nov
1461 Re: CONGRATULATIONS AUSTRALIA WC CHAM mwebb@maths.tcd.ie 20 4-Nov
1462 North vs South wft@math.canterbury 26 4-Nov
1463 Antipodean Thoughts russell@coco.cchs.s 46 4-Nov
1464 Re: Final update. STESMITH@ESOC.BITNE 25 4-Nov
NEWS> dir/all
```

*— request to give a listing of the
names of the newsgroups. System
lists one screen full.*

```
-----
NEWSGROUPS [ALL, 822 Newsgroups]

  Newsgroup                                Count    Unread
669 rec.sport.football.misc 2 2
670 rec.sport.football.pro 191 191
671 rec.sport.golf 18 18
672 rec.sport.hockey 118 118
673 rec.sport.misc 11 11
674 rec.sport.pro-wrestling 114 114
-> 675 rec.sport.rugby 88 74
676 rec.sport.soccer 184 184
677 rec.sport.tennis 36 36
678 rec.sport.triathlon 16 15
679 rec.sport.volleyball 57 57
680 rec.travel 120 120
NEWS>
```

*— user selects the required
newsgroup using arrow keys and
“pageup” or “pagedown” keys*



NEWSGROUPS [ALL, 822 Newsgroups]

	Newsgroup	Count	Unread
696	sci.electronics	252	252
697	sci.energy	111	111
698	sci.engr	22	22
699	sci.environment	429	429
700	sci.geo.fluids	4	4
701	sci.geo.geology	20	20
-> 702	sci.geo.meteorology	20	12
703	sci.lang	70	70
704	sci.lang.japan	62	62
705	sci.logic	57	57
706	sci.math	148	148
707	sci.math.num-analysis	63	63

NEWS>

— presses return to select
newsgroup and display its entries

sci.geo.meteorology: 20 Items (#1136 - #1155) Prot:RW

	Title	From	Lines	Date
1142	Scientist & Programmer Positions, NC	southern@neit.cgd.u	68	1-Nov
1143	Re: Hot air chimney over Texas (&Miam	millier@rcf.rsmas.mi	30	1-Nov
1144	Re: Kuwait well fires almost gone	cgilbert@igc.org (C	4	2-Nov
1145	Re: Hot air chimney over Texas (&Miam	stumpf@nsslsun.nssl	43	2-Nov
1146	Grace remnant	sailor@cellar.org (17	2-Nov
1147	Re: Grace remnant/Henri (?)	anash@kukui.soest.h	28	2-Nov
->1148	Re: Modelling thunderstorms	julia@uvw.edu	36	2-Nov
1149	Re: Hot air chimney over Texas (&Miam	millier@rcf.rsmas.mi	36	2-Nov
1150	weather reports available on net?	Steven.Maker@dartmo	10	2-Nov
1151	RE: Grace remnant/Henri (?)	hall@orion.jsc.nasa	13	2-Nov
1152	ex-Grace question	sailor@cellar.org (18	2-Nov
1153	Re: Hot air chimney over Texas (&Miam	blanchard@nsslc.gcn	41	3-Nov

NEWS>

— uses arrow keys to select item,
then presses the return key to
display that item

Group: sci.geo.meteorology, Item 1148 (Current Item Range #1136 - #1155)
Subject: Re: Modelling thunderstorms
From: julia@uvw.edu (Julia Storm)
Date: 3 Nov 91 21:13:53 GMT

In an interesting article merriwether@qut.edu.au
(Joe Merriwether) writes:

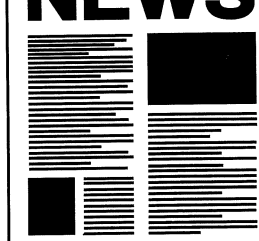
>I am engaged in a research project where I am using a
>number of dispersed video cameras to take time lapse
>photos of thunderclouds, digitising the results, and
>correlating them to form a 3 dimensional picture
>of air currents in a storm cloud. I wonder if anyone is

I am currently developing a 3-D computer model of air currents
in clouds, and would be interested in seeing if there is a way
where actual data can be matched with theoretical values from

NEWS>

<RETURN for more - 16/27 Lines (67%)>

— rest of the item can be read by
pressing the return key



NEWS>help

— user was not sure of the next command, so entered help

NEWS Help DISPLAY

Information available:

ADD	ANSWER	ATTACH	BACK	BOTTOM	CANCEL	CLEAR
CLOSE	COMPRESS	COPY	CREATE	DEFINE	DELETE	
DEREGISTER	DIRECTORY	DISPLAY	DOWN	EDIT	EXIT	EXTRACT
FOLLOWUP	FORWARD	HELP	Keypad	KILL	LAST	MAIL
MARK	MODIFY	MOVE	NEWS	NEWSGROUPS	NEWS_settings	
NEXT	NOSCREEN	OPEN	POST	PRINT	PURGE	QUIT
READ	REFRESH	REGISTER	REPLY	REPOST	SAVE	SCREEN
SEARCH	SELECT	SEND	SET	SHOW	SKIM	SKIP
SPAWN	TOP	TOPIC	UNMARK	UNREAD	UNSKIP	UP
UPDATE	VERSION	WRITE				

NEWS>post

— request to post a newsitem. The system invokes the standard editor so the user can create the newsitem.

newsgroup: sci.geo.meteorology

*c

I believe the discussions on thunderstorm modelling are becoming very technical, and as such are not of sufficient general interest to continue in this group. I will continue discussions via email. In the meantime, I thank the group for helping me to find someone engaged in similar research. We will post any findings here.

Regards

Joe M

^Z

*EX

— user types control-Z then EX to exit from the editor. Is then prompted for subject line, and whether to post the item or not.

Subject: Further discussion of thunderstorm modelling

Post to sci.geo.meteorology? [y] y

NEWS>exit

— exit to leave the news system



OTHER SERVICES

Information services

Some of the most important questions people ask about AARNet are how to find out which resources exist on the network and where these are held, and how to ascertain a user's email address. Being part of a network as large as the Internet, and with an evolving technology, this information is both vast and changing. Lists, books, and resource guides have been produced and there are similarly a number of computer-based information systems available. However, there is as yet no single uniform network-wide service providing these details.

Two major projects are currently being undertaken by AARNet sites to develop mechanisms for the provision of network-wide information services to answer these needs.

The AARNet Directory Working Group is developing a network directory service based on the X.500 protocols. X.500 is the name given to a set of protocols which define the standards to be used for the interchange of information about individual users. This information will be held in separate databases across the network. Thus you will be able to find the email address of a person at an AARNet site by accessing that site's information database through the directory service software on your local machine. This is being coordinated at the University of Queensland and, to some extent, is already in place at a number of organisations on AARNet. However, its adoption as a network-wide standard will depend on the findings of the working group. Further details of X.500 directory services are given below.

The AARNet Archive Working Group is establishing a major archive server to store popular archives by shadowing these, and to maintain lists of other available archives and the information they contain. By centralising this information and providing a uniform method for obtaining details, duplication and can be avoided, information can be kept current, and, most importantly, there will be a single point of reference. Thus you will not need to expend effort and energy to determine and investigate which resources are available to get information about resources! This Group is being co-ordinated by Peter Elford of the AARNet Administration and an initial archive service is

already in place at Deakin University. See the section on Archie below.

Network information services are essentially online databases. They differ from general online information services primarily in the way they gather and make available the information they contain. Because the essence here is on a network service, the information must be network wide and current. This is achieved in one of two ways

- The information is maintained in distributed but similarly structured databases at individual sites and linked together via software into a logical whole, as is the case with directory services, or,
- The information is held on a central machine, as is the case of the archive server, and is constantly updated by automated mechanisms.

Access to network information services, like all network services, can be through a number of different user interfaces — those programs you interact with on your own machine to accomplish your task. In directory services as well as in email and other services, these interfaces are increasingly referred to as “user agents”. User agents for network information services, in a similar fashion to FTP, are application programs which run on your local machine and which set up the network data transfer to query the relevant database and retrieve the information. If you do not have a user agent locally, the design of the network information system may allow you to Telnet to server machines and use the information services from these.

The following provides a fuller description of the network information services currently available on AARNet and how to use these. It should be noted that, while we are primarily concerned here with use over AARNet, these services extend to the Internet as well.

A later section in this booklet is “Guide to Guides” which will, we hope, provide some guidance on what information about resources is currently available and how to access this. The “Concise AARNet Guide” which accompanies this booklet provides more specific details of actual resources available on AARNet.

Directory services (network “white pages”)

This service will essentially establish a distributed global directory of information about individual people contained in separate directories maintained



at each individual site. It is based on the Quipu implementation of the X.500 protocols.

The global directory is logically structured as an inverted tree-like hierarchy, with the root or top level world directory containing references to secondary level directories for all countries and major organisations included under the world directory. Each of these second level directories in turn contains references to directories for all the organisations in that country or major organisation. Eventually, each organisation maintains a local database directory containing references to departments within that organisation and the actual details of the people in these departments, including their email address. Other types of information can also be stored.

The directory is accessible via directory service software. You can traverse the global directory until the local database is reached and the required information retrieved. For example, to find the email address of W.A.Mozart in the Department of Music at Salzburg University, you would invoke the directory service interface or user agent, and then “move” to the directory database at Salzburg University via the top or world level of the global directory, through the country level for Austria, to the directory for Salzburg University. At this point you would actually be accessing the database at Salzburg University and consequently be able to search for the information required. Some directories may be chained, in which cases a search will be automatically carried out on all the chained directory databases for the requested information.

Because actual data is held only in a local directory database, any changes need only be made locally. The information is therefore dynamic and always current. It will even be possible to store a digitised photograph of an individual which could be displayed on an appropriate monitor in response to a request for information about that person.

There are a number of programs available to provide access to directory services, such as **pod**, **dish**, **sd**. Each of these will allow you to:

- access a specific directory database by specifying the path to that directory. (for example; To reach the Queensland University of Technology’s directory you would first choose AU (Australia) from the top level global directory listing, and then within the Australian

country listing choose the organisation Queensland University of Technology.

- list entries. This will list records for all entries contained by that directory — so at the country level it will list all organisations in that country.
- move through the directory hierarchy by specifying levels above or below the one you are at, or by giving a full path. (for example, if you are accessing QUT’s directory you can list all entries at the first level which will show records for individuals and for departments which are at a secondary level. You can then move to a department at the secondary level and access information about a person in that department.
- search for an entry for a given person.

Because directory services are not fully developed or implemented, your local computing services would be best suited to advise you regarding availability and access from your site.

Whois

Whois is a program developed by the Network Information Centre (NIC) in the US to enable the interrogation of online information databases across the network. A site can make a database accessible to whois by providing a whois server. If your site supports the whois program, you can use this service to search for information by using a single line command. Your whois program connects to the whois server at the specified site, which then carries out your search request and returns the result.

For example, if you are using a Unix machine and you wish to obtain information about a user called Smith at a site called `uvw.edu` which provides a whois server to their directory database, you would use the command

```
$ whois -h wp.uvw.edu smith
```

Under VMS the command would be

```
$ whois/host=wp.uvw.edu smith
```

Some sites which maintain X.500 directory services also provide a whois interface to these services.



Archie

Finding out what information is held in archives across the network or where to find a particular item of information (say a specific program) is of vital importance if AARNet is to achieve its potential. There are currently some effective methods for getting archive information (See the section Guide of Guides). However, as we have mentioned, the establishment of a archive server is designed to consolidate all these into a single point of reference. Currently such a service is available on AARNet by using Archie.

Archie is a system developed at McGill University in Canada, which maintains a list of about 600 archive sites on Internet. These provide an anonymous FTP service. Archie is designed to access each of these sites periodically to obtain a listing of the files currently stored in that site's archives. In this way the listing held by Archie for each site is updated approximately once a month. Access to the list is via the Archie program. By using Telnet to connect to a specified Archie server machine, you automatically invoke the Archie program on the remote Archie server machine and use this to search for information.

Naturally, you should choose the most local Archie server in order to limit network congestion. (On AARNet this is `archie.au`)

You connect to an Archie server by using telnet.

```
telnet archie.au
```

You will then be prompted to login. Use the username "archie" (lowercase) to do so. A password is not required.

```
login: archie
```

When have connected to the Archie machine you will receive the Archie prompt. At this prompt you can:

- set the level of your search to define how general or specific your search should be.

```
archie> set search sub
```

when searching will select names of files and directories in the archive listings which contain

(partially match) the string of characters specified by you.

```
archie> set search exact
```

when searching will select names of files and directories in the archive listings which exactly match the string of characters specified by you.

The default setting is partial matching

- search the listings using the `prog` command.

```
archie> prog editor
```

will search the archive listings for files and directories whose names match the search criterion defined by the `set search` command (if given). By default it is a partial match, so the above command will search for all names containing the string of characters `editor`.

The information given lists the archive machine name and the files and the directories found by the search. **Note that searches will often produce copious results.**

- request that the results of your search be sent to you via email to the email address specified. For example:

```
archie> mail WA.Mozart@qut.edu.au
```

will send the results of the search to the user Mozart at the address given.

- leave Archie.

```
archie> bye (or quit or exit)
```

- On some Archie sites you can obtain information and descriptions about software by using the `whatis` command. For example

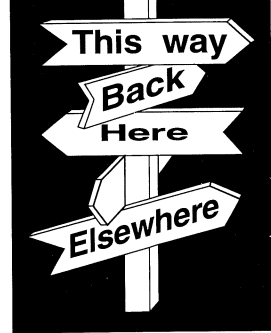
```
archie> whatis kermit
```

will provide a description of the Kermit programs held in the archives.

Although other sources also exist to list archives, Archie is dynamic and provides effective computer-based search facilities.

Finger

This is a minor network service, not enabled on all machines, which sends information in response to a single line command. It is commonly used to obtain information about a user on a particular machine, or to check whether a particular user is currently logged in to a machine on the network. It can also be used to return information held in a file and thus can provide a basic form of directory service. To use



finger you would generally give the finger command followed by the hostname of a remote site.

Ping

Again a minor, but useful network service.

“Pinging” a machine is basically used to check whether it is available. Test data packets are sent to the specified machine and the time and success of these transfers checked. If the success rate is zero, then the machine is not available.

The command to use is generally

ping brolga.cc.uq.oz.au

where `brolga.cc.uq.oz.au` is the hostname of the machine you are trying to reach.

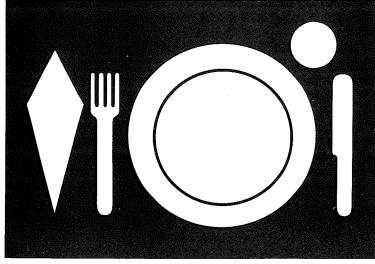
Talk

Talk, when enabled, allows two users, on separate network machines, to engage in an interactive dialogue by splitting each users screen in two and allowing each to use one half of the screen to type in their messages. Because what appears on both screens is identical, each user can see what the other is saying and respond immediately.

The usual command format is

talk mozartwa@redgum.qut.edu.au

where `mozartwa` is the user on machine `redgum.qut.edu.au` you wish to talk to.



NET ETIQUETTE

The network offers a new medium of communication. In using this medium you are ultimately dealing with people, and so standard rules of respect and fairness apply. In suggesting the guidelines below we are not changing these rules but applying them to the new situation of network communications.

Writing for email

Email is just another form of mail and so you should use similar courtesies. With people you know, address them as you would in a normal letter. With strangers you should probably be briefer and more formal, though still friendly. Beginning with a salutation and ending with good wishes are simple good manners and emphasise that you are talking to a real person and not just a machine.

Normal academic courtesies apply also. If you quote information received by email or otherwise via the network, it should be acknowledged, just as if you found the information in a published paper.

Email is a very fast service and its speed and ease of use can change user behaviour and expectations. If you receive an email message and cannot send a complete reply at the time, it is helpful to send a quick acknowledgment, so that the sender knows the message has not gone astray. If you receive a request for information which you will be collecting over time, it is a simple matter to post the information as it comes to hand rather than wait to collect it all. That way the correspondent has something to work with, and can perhaps enter into a dialogue with you about his or her exact needs.

Address problems and queries

If you have an address but are not sure that it is valid, you can send a trial message to that address. The message may be delivered to someone different to the person you are seeking, so the message should state that it is a trial, and indicate clearly whom you are trying to contact. Many sites have a person who will help with contacting users at that site. You can usually contact such people at the username `postmaster`.

Writing messages for the network

It is very easy to generate a quick letter using email, or a quick item for a network conference, but it pays to think a little before sending it. Review your message and consider whether what you are saying is:

- clear — for example, if you are asking a question there should be no doubt about exactly what you want to know,
- complete, so that your correspondent does not have to contact you for clarification,
- indicative of the level at which you require an answer — for example, you should indicate whether you are seeking a general introduction to a subject or the latest research findings, and
- indicative of the detail you require — for example, don't ask for everything a correspondent knows about thunderstorms when you want to know the average number of thunder days in the Brisbane area.

Try to be a good communicator. Write simply and clearly. Remember that many of the people you contact may not have English as their first language. So make an effort to:

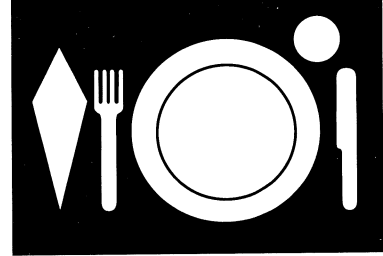
- avoid slang and unusual idioms,
- keep sentences short and their structure simple,
- be careful with new words and acronyms which may not be in a dictionary (if you need to use them, explain them before use),
- be sparing of humour, sarcasm, and irony which may not be self-evident.

You can also use lay-out to help with communication. You can help readers to comprehend your message if you confine one idea to a paragraph, leave a line between paragraphs, and give appropriate headings where they are needed. If you are listing a number of items, consider setting them out on successive lines.

Using netnews conferencing

Netnews conferencing gives you a method of easily reaching numbers of people with interests in a particular field. It is a good way of requesting information from a wide range of experts. You make the best use of the conferencing system if you post to the newsgroup which most closely matches your field of interest and supply a subject line which accurately describes the contents. You should read the articles already posted in the group to get an idea of the range and conventions of the group.

In asking for information you may be putting a number of people to a considerable amount of work. It is in the cooperative spirit of the network to offer to do something in return. For example, many people include in their requests for information an



offer to collate the answers and re-post them to the network so that everyone can benefit.

Also in the spirit of cooperation, if someone in a newsgroup makes a request in an area where you can help, do so. A small amount of assistance from you can make an enormous amount of difference to the person seeking help. Giving help adds to the spirit of cooperation in the network, and the person you help might be able to assist you on another occasion.

Postings on netnews sometimes receive abusive replies, commonly called “flames”. You can minimise your chances of being flamed by following the advice given above. If you are flamed, don’t worry — you are not alone. Ignoring this sort of undesirable behaviour may be the best way of stopping it. You may wish to take the advice from Proverbs: “Answer not a fool according to his folly, lest thou also be like unto him”. However if you wish to defend yourself, remain courteous. And do not expect to have the last word—there seem to be people with much more time to spend than you could ever manage.

File transfer

AARNet is a high capacity communications medium, but it is not unlimited. If you are going to make heavy use of AARNet, a little forethought may save resources considerably. One of the heaviest demands made on the network comes from the transferring of large files. If you plan to transfer a large file check first to see if it is held locally. There are a number of “archiving” sites, holding various classes of information, so check to see if the information is held on your site, in your state, or within Australia before requesting a file transfer from overseas.

It is best also to transfer files in off peak hours. Within Australia, off peak is between 6pm and 7am Eastern Australian time. Off peak hours in Australia and the US overlap between 6pm and midnight, Eastern Australian time.

Remote logins

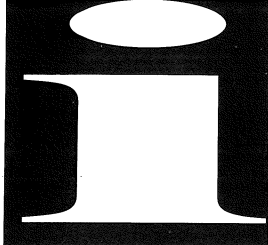
You should never attempt to use a system you are not authorised to use. To attempt to do so is more than a breach of etiquette — unauthorised use of computer systems is stealing, and is no less stealing because what is stolen is a resource rather than an object. Furthermore, AARNet is funded by Australian Universities, primarily for academic

purposes. It is outside the spirit of AARNet to use its resources to play computer games.

Remote logins can demand heavy resources from the network. You will get a better response, and will help to spread the network load, if you work in the off peak times as outlined above.

More information

There are a number of articles in the newsgroup `news.announce.newusers` giving further advice for network use, and giving answers to questions frequently asked by new users.



GUIDE TO GUIDES

This section suggests strategies you can use to find out about the various resources available on AARNet. In the section on Information Services we discussed network facilities which are being developed to provide information about resources, and how to use them. Because these facilities are not yet fully implemented, the emphasis here will be on alternative methods for obtaining resource information.

Resource information refers not only to tangible resources available on the network, such as archives and supercomputers, but also to the resources, such as machine and email addresses, you need to be able to use a service.

As such, we can consider resource information as providing details for:

- ascertaining a machine address,
- ascertaining an email address,
- locating a particular archive or shadow archive,
- looking for a particular type of information, for example, a program to do fast backup under MS-DOS called fback,
- looking for general information, for example, what programs are there to do fast backup under MS-DOS? or what kind of educational programs are there?
- locating a computing resource, for example a vector processor,
- locating online library catalogues,
- locating general online information services,
- locating interest groups. For example, you wish to communicate with people having a similar interest in kite making.

By the nature of this document we will consider only what is accessible on AARNet and not on the entire Internet, although much of what follows is of relevance to Internet as well.

Major guides

Firstly we need to be aware of the major resource guides presently available.

The AARNet Resource Guide

This document, currently maintained by AARNet, is available both as *The Concise AARNet Resource Guide* produced as a companion to this booklet, and as a computer file.

The guide contains information about:

- all AARNet sites,
- all online library catalogues available on AARNet,
- archives available on AARNet,
- computing resources available on AARNet,
- directory services currently available on AARNet,
- network gateways.

Copies of the printed booklet should be available from your Computing Services Department. If not, you can obtain the online version by FTP.

- FTP to `aarnet.edu.au`
- Change to the `pub/resource-guide` directory,
- Each section of the guide is stored as a separate file, in Postscript and in plain text.

Archie

There is an Archie archive server available on AARNet. This maintains lists of files available by anonymous FTP and enables searching of these lists. To access this server on AARNet:

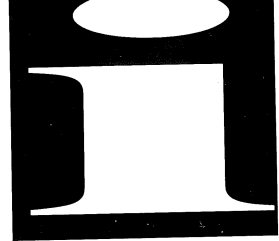
- telnet to `archie.au`
- login using the username `archie` (lowercase),
- use the Archie commands described in the section on Information Services to search for the information you require.

News

By its very nature News is an extremely important source for information. Name changes, availability of machines, services offered, OPAC access and details of available software are often announced in newsgroups. A number of newsgroups specifically carry update information about archives and interest groups (see later in this section). Postings to news can often be an effective means for locating information. For example, asking if anyone knows of the availability of a particular program, but this should be done after the other avenues have first been checked.

Newsgroups of particular relevance in providing information are

`aus.aarnet`
`aus.archives`



aus.general
comp.archives
comp.sources
news.lists

Obviously, you would also look for information on a particular topic in the appropriate newsgroup. For example, to locate information about storm cloud modelling you could enquire in the newsgroup `sci.geo.meteorology`.

Looking for information

Locating a machine or site name

The best place to look for this is in The AARNet Resource Guide which will not only give details of the organisation but will usually also list the email address of a contact person there. Failing this, you could try a posting to `aus.aarnet`.

Locating an email address

Since directory services have not yet been implemented at all sites on AARNet, there is no single method for obtaining an email address. However, there are a number of steps you can take.

- Check in the Resource Guide if the organisation you are trying to contact maintains a white pages directory. You can try accessing this directory by:
 - using directory services from your site (if available),
 - using whois if it is available at your site, and the remote machine supports a whois server,
 - telnetting to a machine which does provide directory services.

The entry in the Resource Guide will indicate which methods are possible.

- Simple and straightforward — try contacting your prospective addressee by other methods (phone, Australia post) to ascertain her or his email address,
- Check the organisation entry in The AARNet Resource Guide. If email addresses to that site appear to be of a standard form, try using that with a polite test message. For example, the sitename for QUT is `qut.edu.au` and the usual standard email alias is of the form `initial.surname`; thus to send mail to Wolfgang Mozart at QUT you would try `W.Mozart@qut.edu.au`,

- Try sending email to the contact person or postmaster at that organisation asking for assistance.
- Post to an appropriate newsgroup asking for assistance. For example to `aus.aarnet` or the soc groups. Note that this should be used only as a last resort.

Locating archive information

You might want to check archives for a particular item or to see what is generally available on a specific topic. Much of the information stored in archives is in fact computer software. So

- check the various newsgroups. If, for example, you are looking for a program to run under MS-DOS, look in the newsgroup `comp.sources.msdos`
- check the Archie server by searching for an exact name if you know what you are looking for, or by searching for possible keywords if you are browsing. For example, a keyword like “calc” could be used to list programs providing a calculator function.
- consult the AARNet Resource Guide for lists of archive sites and the categories of information they store.
- check the newsgroup `aus.archives` for updates on AARNet archive sites. (The lists posted are usually the work of energetic and public minded users who go to considerable effort to compile and consolidate listings. Thanks and appreciation are certainly due to them.)
- post to an appropriate newsgroup such as `comp.sources.wanted`. Again, only as a last resort.

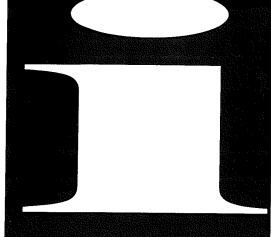
Locating online library catalogues

The best source for this would be The AARNet Resource Guide or `aus.aarnet` for any new information.

An excellent source, providing details of OPACs across the world and maintained by Deidre Stanton, can be obtained from Murdoch University by anonymous FTP.

- FTP to `csuvax1.csu.murdoch.edu.au`
- change to the subdirectory `pub/library`

The information is contained in five files



■ `opacs.list`

This is a copy of the document *UNT's Accessing On-line Bibliographic Databases* by Billy Barron at the University of North Texas. It contains a list of OPACs in alphabetical order by university and also has a very useful appendix describing the use of a number of library systems.

■ `ozlibraries.list`

extracted from The AARNet Resource Guide

■ `ozopacs.list`

A list of OPACs in Australia and New Zealand maintained by Deidre Stanton (This is written for users at Murdoch, but can be adapted.)

■ `internet.library.list`

Lists OPACs and comprehensive information about them from the University of Maryland.

■ `JANET.OPACs.list`

lists OPACs available on the JANET (UK) network. Access to these is via a gateway at `sun.nsf.ac.uk`, so in effect you make two remote connections; once to the gateway and once to the OPAC site.

■ `canadian.opacs.list`

a list of Canadian OPAC sites.

There are programs which enable the user to select an OPAC from a menu, and connect to it automatically. They use a list of OPACs maintained in a database. Examples of these programs are Hytelnet and Catalist. Contact your local Computing Services Department to see if this is available at your site.

Most of these files are long. Before retrieving them, check whether they are locally available from your library or computing services. If not we suggest that you recommend that a copy be obtained and held somewhere central for reference.

Locating computational resources

Again, the best source for this would be the AARNet Resource Guide. You could refer to the listings for "Institution Details" and "Computational Resources".

Interest groups or listservers

Interest groups are mailing lists used to redistribute messages via email among a group of people with a common interest. Listservers is the term used for these on the Bitnet network. In this sense interest

groups are very similar to newsgroups and indeed a number of interest groups exist also as newsgroups. The main differences are that an interest group discussion reaches only the people who are "subscribing" to it, items are distributed via email and so can be sent to different networks, and often the topic of the interest group is of a more esoteric or specific nature. A list of interest groups can be found in the newsgroup `news.lists` or can be retrieved via FTP

■ FTP to `aarnet.edu.au`

■ change directory to `pub/netinfo`

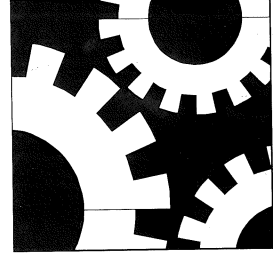
■ the relevant files are `mailing-lists1`,
`mailing-lists2`, `mailing-lists3`

You join a list by sending a request to subscribe command in an email message. This should then elicit a return message giving further details on how to proceed.

You should check whether an interest group exists as a newsgroup before subscribing to it. See the section on Email for additional information.

Internet

Many additional resources are available on the Internet by using the same network services that have been described here. There are also many more sources of information available — something which can make matters even more confusing! It is beyond the scope of this booklet to describe all of these and the interested reader is referred to *The Internet Resource Guide*. This can be retrieved by FTP from a number of AARNet sites (see archive lists), among them `archive.su.oz.au`, where it is held in the directory `pub/netinfo`. However, the document is lengthy so you should first check whether there is a copy available at your site.



What is a network?

Computers are said to **communicate** with each other when data in the form of messages, files, commands or requests is transferred from one to the other. To make such communication possible, two major components are necessary.

- The machines must be connected to each other by any physical medium able to carry computer data (lines). This connectivity is achieved by “networking” the lines in that machines do not need to be directly connected but are linked if there is a path to them via other machines or communications equipment.
- They must also both be able to “understand” the data and the nature of the transfer and so ensure that information sent is correct, complete and handled appropriately. For example, data sent as a mail message must be recognised as such by the receiving computer and processed accordingly, that is, delivered to the addressed user.

This understanding is achieved by establishing a set of rules defining how the data to be sent must be formatted, what further information must be added to the data to facilitate the transfer and what commands must be exchanged between communicating machines to carry out the transfer successfully.

These rules are implemented on communicating machines by special programs. Thus, a receiving computer knows what to expect and interprets the transmission correctly because its program for processing incoming data communications follows the same rules that the sending machine used to set up and transmit the data.

In this way it is analogous to any other form of communication. Vocal communication for example, involves the physical transmission of sound across airwaves. However, it is only meaningful when these sounds are recognised as words in an agreed upon language spoken at an acceptable speed and volume.

Such rules for defining communication standards are known as **protocols**. Computers connected together using the same protocols are said to form a **communications network**.

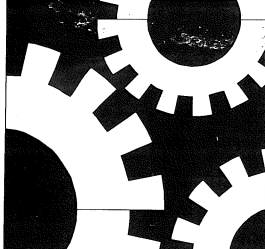
Computers connected to a communications network are known as **nodes**.

It is possible to use different protocols to define data communications over the same physical network (similar to using the same vocal medium, sound, but speaking in different languages). Machines thus can be on the same network, that is connected to each other, but can communicate only if the protocols they use are compatible. Also, if machines support multiple protocols they can communicate with each other using any of these protocols, but cannot mix the protocols. So, if machines A and B both implement protocols xx and yy, they can “talk” to each other using an xx to xx connection or a yy to yy connection but not an xx to yy one. In this example, we could describe our physical network as being both an xx communications network **and** a yy communications network.

Some physical networks, because of their design and structure do not allow the use of multiple protocols.

Furthermore, some types of data transfer, notably electronic mail, are possible between different communication networks, that is between different protocols, by using a machine connected to both networks as a **gateway**. Such a machine, gatewaying say between xx and yy, would receive a mail message sent using protocol xx, determine that it is destined for an address on network yy, convert the message to protocol yy and pass it on to network yy.

Often, computers within a particular organisation are linked in a local area network (LAN) which can be considered as physically limited to that organisation only. Similarly LANs may be divided into even smaller networks known as subnets encompassing say a particular building or department. Such subdivisions are implemented in order to provide greater flexibility, security, and efficiency. Networks of any size can be connected to each other by dedicated communications computers. When LANs are connected together they can be said to form a Wider Area Network (WAN) and when WANs are connected, they form an internetwork with all machines on all component networks accessible to each other in the same way. Since these machines would use the same protocols to communicate with each other, this would ensure that the data will be routed through all intermediate links until the destination is reached. The section on addressing and routing deals with this in greater detail.



If we then contend that each organisation, irrespective of its actual network structure, constitutes a LAN, we can define AARNet as a WAN and the Internet as a internetwork of WANs.

The TCP/IP protocols stack

Although it is possible to use a number of different protocols over AARNet, our discussion will focus on the TCP/IP Protocols because this is the most prevalent one, and the only one used on the link to the rest of the world.

The Internet (and AARNet as an IP Network forming part of the Internet) is characterised by the protocols it uses to implement its data communications. These protocols are called the Internet Protocol Stack or Suite, of which two, TCP and IP, are the best known. Because they are very often used together, the term TCP/IP has come to refer to the entire suite and to be the generally accepted term when talking of Internet protocols.

The TCP/IP protocol stack defines standards or rules for the transfer of data from one connected node to another. It is made up of separate “layers” with each layer responsible for a particular function or stage of the data communication. A layer interacts with the layer above and below it and those functions carried by the lower layers are transparent to the higher layers. The functions defined for each layer are implemented by software (programs) running on each networked machine.

This concept of a layered protocol or protocol stack is best illustrated with an example.

Let us say Julia, who is a user on computer VAXB, wishes to send a mail message to Joe who is a user on another node, UNIX1. Note that even though these are different machines, they can communicate with each other as each implements its own version of the same protocol stack.

Julia invokes the mail system on her machine, VAXB, enters her message and provides the electronic mail address for Joe. (Exact procedures for sending electronic mail are described elsewhere.) The address for Joe includes Joe’s mailname and the name of the machine where Joe receives his mail, UNIX1. The mail system on VAXB processes Julia’s input, ascertains that the message needs to be sent across the network to another node, and then passes the information (the message, address, and other details) to the top level or “application layer” of the protocol stack.

The application level is a layer in the protocol stack which defines the way data must be formatted and interchanged between communicating nodes in order to carry out a specific task such as email, file transfer, remote login or conferencing. These tasks are the **network services** this booklet describes.

In our example, the application layer is a network mail protocol. (On AARNet this protocol is SMTP). It could similarly be a protocol to facilitate another network service such as file transfer or remote login.

This application layer is responsible for formatting the mail information according to the rules defined by the mail protocol into a series of statements specifying who the message is from, to whom it is being sent, the date, subject and the text of the message.

These statements are intended for the corresponding mail application layer running on the receiving machine (UNIX1), which, when it receives the data, is able to understand and respond to each statement and, on completion, to pass the details to the mail system on UNIX1 for delivery to Joe.

In this sense, the application protocol only “connects” or communicates with a similar application protocol at its destination. That is, the statements it produces are only understood by a corresponding protocol layer.

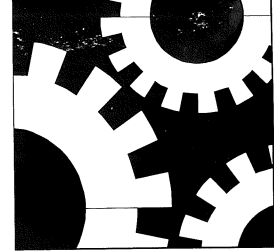
The data as formatted by the application layer must now be transmitted to the destination machine in such a manner so as to ensure that it reaches the correct machine intact. These functions are carried out by the TCP/IP protocol stack which effectively lies beneath the application layer.

To TCP/IP all data appears the same when passed to it by the application layer. Thus data for an email message transfer or a file transfer is handled identically by TCP/IP. The data only becomes meaningful in terms of the function or service they are intended for when processed by the appropriate application layer.

This structure enables different applications or services to use the same means to send data.

When the application layer passes the data to TCP/IP, it does so to the TCP layer of the protocol.

TCP or Transmission Control Protocol is known as the transport layer. It is responsible for ensuring that the data as set up by the application layer protocol



gets through to its destination. To do this, it splits the data into smaller segments called datagrams and adds protocol information of its own to each datagram.

If we imagine the data received from the application layer as a letter, then TCP could be said to split this letter into pages, place each page in an envelope, and write its own protocol information on the envelope. This protocol information comprises, among other items, destination and source port numbers (used to identify the connection uniquely), the segment or datagram sequence number and other information needed to verify that the data is complete and correct.

When the corresponding TCP layer on the receiving machine (UNIX1) receives each such envelope, it uses the information on the envelope to check that the page it contains has been correctly received and then, after removing the envelope, passes the page, in its correct order to the (mail) application layer. TCP also communicates with its peer TCP layer acknowledging successful receipt of each page (datagram) and asking for retransmission where necessary. Note that the information added by the TCP layer is meaningful only to another TCP layer.

Having set up its control mechanisms, TCP now needs a way to actually get its envelopes to the destination. This is provided by the network or IP (Internet Protocol) layer.

In turn then, TCP passes its envelope or datagram to IP. It also passes the address of the destination machine to IP (the address of UNIX1). IP adds this address to the datagram as well as the address of the source machine (VAXB) and other details that it requires, including a code to indicate that it received the datagram from TCP. This is analogous to IP placing the TCP envelope in another envelope on which IP has written its own protocol information. IP also takes the address of the destination machine given to it by TCP and, using a dynamic routing process (see the section on routing), determines the route each envelope or datagram must take to reach that address. It then passes this “larger” envelope to the physical layer which implements the physical or actual transmission of the data along the route specified by IP. IP transmits each datagram as it receives it along the route it currently determines as best. Thus, each datagram or envelope is transmitted independently, possibly even on different routes,

and datagrams can therefore arrive in a different order to that in which they were sent.

IP itself is not concerned with reliability and, when it receives data at the receiving end, merely “removes” its envelope and passes the inner envelope up to the indicated transport layer (in our case TCP). It is then TCP which checks each datagram and resequences them.

Thus while data is passed up or down through a protocol stack, each layer only looks at and “understands” that information which was added to the data segment by its corresponding layer.

Review

Perhaps to summarise the function of the protocol stack, we can draw an analogy with an everyday example.

Let us assume that a business needs to transfer a piece of machinery to another location. It decides that the best way to do this would be to dismantle the machine and send the components as a number of separate parcels.

The machine is dismantled by its operators using standard instructions (the application layer).

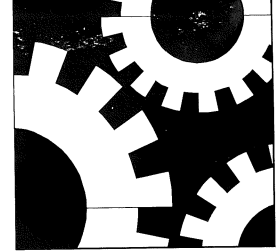
Each part is then boxed, addressed, measured, labelled by packers and delivered to the transport company (the TCP layer).

Each box is now assigned to a consignment according to its size and availability of space by checking its destination address, and dimensions and details of the consignment added to the label. Dispatchers then load each parcel according to its consignment details — some might go by truck, some by van, some by plane (the IP layer).

Each parcel is then transported to the destination location (the physical layer).

On the receiving end, as each parcel arrives it is delivered to the appropriate location for unpacking (the IP layer).

The “unpackers” check that each parcel has arrived in good order and that all the parcels sent are there. If a box is damaged or missing they institute action to check and rectify this (the TCP layer). (Suing the delivery company might work here but does not really under TCP/IP!)



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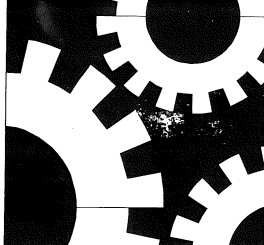
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Once all the boxes have been checked and unpacked each part is delivered in the correct order to the operators, who, using a set of instructions reassemble the machine. If, however, the instructions they use are a different set to the original ones, the machine will not function! (The application using a different protocol!)

Addressing

We have referred earlier to addresses as used by the protocols to determine a destination and source machine. In previous sections we have described addresses required by users when accessing a network service.

A network, comprising numerous interconnected machines, needs a way of being able to identify an individual machine in order to determine the location and what path through the network a data transmission would have to take in order to reach that machine.

This is achieved on AARNet through a system of addressing, domain name server functions, and routing mechanisms employed by the communication protocols.

Our discussion here will again focus on the way TCP/IP achieves this on AARNet and Internet.

Addresses

We have previously described the way computers can be addressed using their hostnames as defined in the Internet domainised format

(redgum.qut.edu.au). While this is functionally correct as it is what you generally would provide when specifying a machine for a network service, it is not the address the communication software or the IP layer of the protocol actually uses to route data to that destination machine.

Each computer connected to AARNet is in fact also given a unique Internet address comprising a series of four numbers separated by full stops. For example

131.181.1.2

These numbers not only identify the machine, but are constructed in a manner which enables the IP layer to determine a path to the machine for the actual transmission of data. Essentially, the number is divided into two parts — one identifying the IP network the machine is on, and the other to identify the machine itself on that local IP network. Thus

131.181 is the network address for QUT and identifies redgum on the local QUT network. Often the local network part can be further divided so that one number refers to a local subnet and the other to the actual machine. That is, **1** is a subnet at QUT and **2** is redgum's number on that subnet.

While numbers as addresses are best for communication programs to use because computers can manipulate numbers more efficiently and extensively than letters making up a hostname, they are more difficult for people to relate to. There is no obvious connection between a machine in a particular organisation and the number that is its network address. It is not clear from the network address where or what the machine is, and numbers are more awkward for users to use, understand and remember.

Therefore, even at the cost of some redundancy, the Internet has provided users with the more friendly and functional way of referring to computers connected to it by using hostnames in the Internet domainised format.

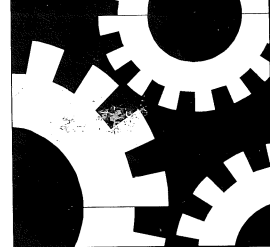
What is an address then?

Several different forms of addresses have been discussed, all of them correct in that they fulfil similar functions but at different levels of usage. There are, however, differences in the terminology used for referring to each of these forms.

Generally taken a hostname, domain address, domainised address or simply address can all be understood as referring to a computer by its name in the Internet domainised format and it is this which you would most commonly use.

The number address given to a machine is called the IP address and, while it is vital to the communications software, you will seldom, if ever, need to use it.

Finally, as we have seen, addresses used for email differ slightly as they include a part to identify the person on a machine and can contain a sitename rather than a hostname for the network part. Such addresses are called email addresses. Locally, on the same machine or site, an email address can simply be the local part, that is, the username or mail alias.



The Domain Name System (DNS)

Naming authorities

A number of questions now arise. How can it be guaranteed that every hostname, sitename, and IP address on the network is unique? And how, if people use names and computers use numbers, can these two different address formats be tied together? That is, if you provide a network service with a hostname, how do the protocols convert this to the IP address for actual transmission of the data.

Hostnames are ensured of being unique through a hierarchical system of distributed **naming authorities** acting together to form the Domain Name System

Every domain has its naming authority which is responsible for the management of names within that domain. The naming authority is therefore able to guarantee the uniqueness of each sub-domain or simple machine name that is contained in its domain. Using this structured approach means there is no need for a single authority to ensure uniqueness over the entire network.

In our example then, the top level country domain name `au` was assigned by NIC—the Network Information Centre situated in California. By being the naming authority for the top level domain, NIC ensures that `au` represents Australia and not, say, Austria. Thus, if there was a `redgum.qut.edu` in Austria, this machine would differ from our example because the top level domains would differ.

The naming authority for the `au` domain is AARNet, that is, the AARNet administration manages the naming of domains within the `au` domain and guarantees that there is only one `edu` sub-domain and within that only one `qut` sub-domain (organisation). QUT is then responsible for the supervision and allocation of names for its machines.

Similarly, every separate network on AARnet and Internet is assigned a network number by NIC (this is usually the first, or first and second numbers of the four-part IP address format). The network number assigned to QUT is 131.181. The last two numbers therefore become the address “space” available locally to QUT to assign as it requires. QUT uses subnetting, thus the third number is used to address subnets (up to 255) and the fourth to address individual machines on each subnet (again, up to 255 on each subnet). Once a network number

has been given to an organisation, it is the responsibility of that organisation to ensure the uniqueness in the numbering of its address space.

Nameservers

Even though naming authorities provide a means for distributing the responsibility of naming hosts, and the use of hostnames provides a more comprehensible way of addressing a machine, it is the actual IP address (numbers) which is used by the IP protocol to reach a machine. There must therefore be a way of both making the names of hosts available throughout the network and associating these hostnames with actual IP addresses.

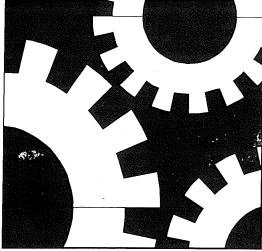
One way of achieving this is through the use of lookup tables — files containing the hostname and IP address of network machines. But this is static, implies that each host must have its own file, and that files must be updated on individual machines. Considering the size of the Internet, such files would be extremely large. Also, hosts not in the file would not be automatically contactable by hostname.

The use of the **Domain Name System (DNS)** resolves this by providing dynamic address resolution and updating.

In this system each domain naming authority is responsible for maintaining information about the domains and machines it contains. This information is held in files on machines connected to the network and controlled by the naming authority. It is made available through name server software — programs which transfer information in response to a request. Machines performing this function are called **nameservers** and the information held by them match hostnames to actual IP addresses and also provide the addresses of other nameservers which can be queried to resolve addresses not known in that domain.

When an application layer protocol gets a hostname to connect to (as in an email address) it invokes a program known as a resolver to find an IP address for that hostname. The resolver queries its local nameserver but if the address cannot be provided by that local nameserver then the query is passed on to other nameservers in the network until the information is found.

The top level nameservers for a top level domain are known as root servers. They know about other root servers and can pass queries from one top level



domain to another, effectively allowing the entire Internet to be queried for a particular address.

In addition, nameservers can be used to store other information besides simple hostname to address tables. For example, details of the actual machine itself (type, model, operating system), services provided and contact names can be stored. Furthermore, in cases where a machine can be known by another hostname (perhaps an old name), this name can be entered as a synonym of the real hostname. The machine can then be addressed by either name.

Nameservers also provide a class of information known as MX (Mail eXchange) records. Use of MX records allows non-Internet machines to be addressed and enables sitenames, as already discussed, to be defined. The information stored in these records is used exclusively for email transfers. MX records map names which can be used in email addresses to actual hostnames with IP addresses to which email can be physically delivered. Thus, a record can exist for a computer not directly connected to an IP network or for one which is part of another network. The record contains entries which “point” to one or more genuinely connected hosts (those with IP addresses).

When mail software encounters an email address it looks for an MX record for the hostname or sitename part of that address. If one is found, it then delivers the mail to the machine whose address is pointed to in the MX record. If the email addressed a non-Internet machine, then the Internet machine pointed to in the MX record acts as a “gateway” to the network that the addressed machine is on. In this way, non-Internet computers can be directly addressed for sending mail. The user does not need to know how the mail will reach that machine or whether machine is even on the network. The MX record will provide any gateway details needed.

In a similar vein, it is possible to provide a sitename rather than a hostname as a general address for email to a particular organisation. The sitename is often a domain name. For example `qut.edu.au`

Again such a name is put into an MX record which points to one or more specific machines at that site acting as mail server machines. Several advantages become apparent. An organisation can retain a consistent mail address irrespective of which machine in that organisation actually receives the mail and, furthermore, several machines in order of

preference can be pointed to so that if the first preference is unavailable, the mail will be sent to the second and so on, ensuring that the mail delivery to the user is not delayed. Once mail is received on the mail server, it can be forwarded locally to a machine of the user’s choice.

Routing

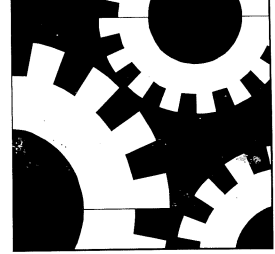
We have seen that it is the responsibility of the IP layer of the protocols, using the IP address of the destination machine, to determine the path a data segment or datagram must take to reach that destination computer.

Each computer connected to the network and using the TCP/IP protocols maintains lists called routing tables. These tables map IP network addresses (the network part of an IP address) to addresses of special computers known as routers. Routers are effectively physical gateways used to relay the data to the separate IP network that contains the destination machine. To do this, routers are therefore connected to two or more physical networks through connector ports.

When the IP protocol layer receives a data segment from the TCP layer, it extracts the network part from the IP address given for the destination and checks this. If the destination network is the same IP network or subnet as that of the machine that IP is running on, the data is delivered direct. If, however, it is not, IP consults its routing tables and the data is delivered to the router whose address is mapped to the network address extracted. If there is no direct mapping for the destination network address, then there is usually a default router defined. The delivery of the data segment to the addressed router is then just as to another node on the same network.

The router that now receives the data would be connected to several other networks and it, in turn, determines whether the destination machine is on a network to which it is directly connected. If it is, the data is delivered. If it is not, the router similarly consults its routing tables for the address of another router to which to forward the data. This router will again be connected to further networks. The process is repeated until eventually a router is reached which is directly connected to the destination network and the data delivered.

There can be a number of different paths to a destination network and there exist dynamic routing protocols which enable routers to talk to each other



and to update their routing tables so that routing is done in the optimum manner.

A last word

Network communication can be a very complex matter. The details provided here then do not attempt to be totally inclusive or comprehensive but, rather, are intended to provide the interested user with some background information as to how it all works. Knowledge of routing or nameservers are not really necessary to use AARNet, but it is hoped that seeing a more complete picture will make working with AARNet more comfortable, more familiar and enable you to gain the greatest possible benefit from it.

GLOSSARY

AARNet

Australian Academic and Research Network—the computer network connecting universities, research and other organisations throughout Australia.

account

When you are registered to use a particular computer system, you are given an account. Associated with the account are a unique user name and a password. You must enter these to show that you are authorised to use the computer system.

addresses

A unique name (or number) identifying a computer user or computer is called an address. Addresses are used in network communications in transmitting messages to a particular person or machine.

Archie

A database and related programs giving the user information about the contents of various archives.

archive

Collections of files related to a particular subject, which are stored on a computer and made available to the network community, usually via anonymous FTP.

ASCII

A standard method for encoding characters — text files are usually ASCII files. ASCII has codes representing upper case and lower case letters, the numerals, and punctuation. It also includes non-printing characters which can have special effects on the communications medium. ASCII is an acronym for American Standard Code for Information Interchange.

au

The top level (country) domain for Australia. All mail addresses and machine addresses within Australia end with these characters.

AVCC

The Australia 'Vice-Chancellors' Committee, the body responsible for funding and overseeing AARNet.

binary file

All files which are not text files are considered binary files. Any combination of bits is possible with a binary file. Some of these may correspond with special characters, and may have unexpected effects if transmitted without special encoding.

Bitnet

A computer communications network.

BTW

A common bulletin board abbreviation for "by the way".

bulletin board

A conferencing system where a number of people with similar interests can post information which can then be read by any member of the group.

communication

Two things are necessary for people (or computers) to communicate successfully — a medium through which data can pass, and an agreed set of rules about how the data is to be interpreted.

conferencing

A communications method which brings together groups with common interests, so that an item contributed by one person can be read by all members of the group. Bulletin boards are the most common examples of conferencing systems.

data

Information, facts, and figures. In Latin "data" is plural, the plural of "datum". In English it was originally considered plural, but in recent years has become naturalised as a singular noun.

datagram

A properly formatted set of data used in communication between computer systems. The datagram consists of two parts: the data proper which may be part of a longer message, and the header which indicates the destination computer, the type of data, a sequence number, and check digits.

directory

Files on a computer system are grouped together in directories. There is usually a directory for each user, holding the files owned by that user, and also directories holding public files. Related files are often organised into separate directories or sub-directories.

directory service

A service on a network giving information about sites, computers, or registered users on the network. Such services are being developed and introduced currently.

domain

A classification to which a computer in a network belongs. The names of successive domains are used in forming a unique name by which the computer is known to the network.

domainised name

A structured name for a computer in a network, in the form redgum.qut.edu.au. Uniqueness is ensured by having a hierarchy of naming authorities, each one responsible for approving the names in its immediate domain.

editor

A computer program designed for creating or modifying text files.

edu

The standard letters used to identify the educational domain within Australia. Many sites on AARNet will therefore have their addresses ending in .edu.au.

electronic mail

A system which allows you to send messages to other computer users.

email

Another way of referring to electronic mail.

escape-character

When you are connected to a remote computer system there is usually a character reserved so that you can break that communication (temporarily or permanently) and communicate with your local host. That character is the escape character. It is often a control character such as control-P or control square bracket.

etiquette

Considerate and responsible behaviour between members of a community—on computer networks often called “netiquette”.

FAQ

“Frequently Asked Questions” — many newsgroups have a designated person who regularly posts a file with answers to questions which are frequently asked on that group.

file

A collection of data held on a computer system, capable of being handled as a single entity and referred to by a single name.

file transfer protocol

The standard method for transferring files between different computer systems on AARNet or Internet.

filename

A name (made up of letters or digits or both, and perhaps some punctuation characters) uniquely identifying a computer file.

finger

A simple network service which will report if a particular user is currently logged in on a particular node of the network.

flames

Abusive or otherwise objectionable replies to messages posted on a conferencing system.

folder

After you receive an electronic mail message, it is stored until you specifically delete it. Most electronic mail systems allow you to keep related messages together in folders.

FTP

An acronym for file transfer protocol, the standard method for transferring files between different computer systems on AARNet or Internet.

gateway

A computer which connects two communications networks, possibly converting protocols where these differ between the networks.

hardware

The physical parts of computer systems or communications equipment. (If you can kick it, it's hardware.)

host

A computer system on which you can hold an interactive session.

IMHO

A common bulletin board abbreviation for “in my humble opinion”.

interactive session

A session where you interact with a computer system, usually by logging in, then typing operating system commands (or selecting them from a menu), observing the responses, and finally logging out.

Internet

A very large network consisting of interconnected computer systems able to communicate because they use a common protocol (TCP/IP). AARNet is effectively part of Internet.

IP address

A unique set of digits identifying a computer connected to a network and used by the communications programs. (For example 123.123.12.1.) Human users can use the more friendly domainised names. IP stands for Internet Protocol.

Janet

The academic and research communications network in the United Kingdom. It is an acronym for Joint Academic Network.

Kawaihiko

The academic and research network in New Zealand. Pronounced approximately: "Ka-wai-hi-ko". Maori for "branching electricity".

LAN

A Local Area Network. A network of computers communicating over short distances in a restricted area, such as one campus of a university. Many LANs have connections to larger networks.

log a session

While connected to a remote computer, you can have your local computer record in a file all the commands typed by you and all the remote computer's responses. This is called "logging a session".

login

To identify yourself correctly to a computer system as an authorised user and begin an interactive session. Normally to login you need to give a valid user name and password. The word "logon" is also used.

logoff

Used interchangeably with "logout".

logon

Used interchangeably with "login".

logout

To formally end an interactive session with a computer system, so that both you and the system know the session is closed. Breaking a communications connection will not necessarily result in logging you out. The word "logoff" is also used.

nameserver

A computer in a network responsible for keeping name and address tables, and providing that information on request.

national hub

A central controlling and routing site for a national network. The national hub for Australia is located in Melbourne.

netiquette

Network etiquette. Considerate and responsible behaviour between members of the network community.

network

A group of computers able to communicate because there is a communications link between them, and because they each obey a set of rules to correctly interpret any data sent between them.

news

A large conferencing system, comprising a wide range of newsgroups covering various areas of interest, to which interested individuals can post information. News is often called Netnews or Usenet.

newsgroup

A subdivision of network news where items covering a particular field of interest are posted.

newsitem

An individual item in a newsgroup within network news.

nodes

Single computer systems within a network are called nodes.

online databases

A typical online database stores information from a particular discipline so that you can connect to it and search for the information they need. For example, many online databases contain reviews and abstracts of journal articles in a particular field.

OSI

An abbreviation for Open Systems Interconnect, an internationally agreed set of standards for computer connection currently being introduced.

password

A set of characters used to verify that a person using a resource is authorised to do so. You should keep your password secret.

ping

A simple network service which will report on whether a particular node on the network is alive, and on the current reliability of the line to that node.

postmaster

Most sites to which you can direct electronic mail have a postmaster who is a contact person at that site. The postmaster will handle addressing queries, attempt to deliver mail where there are addressing problems, and otherwise intervene where there are problems with automated mail delivery.

protocol

An agreed set of rules by which messages passed from one computer system to another are encoded and interpreted.

regional hub

A computer site in a network responsible for routing of messages within a region. AARNet has regional hubs in Darwin and all state capitals (except Melbourne, the national hub).

remote login

When you use local computing equipment to connect to a distant computer, and initiate a session on that computer, you are said to make a remote login.

RTFM

An angry bulletin board abbreviation for "read the manual". A frequent reply when someone posts a query where the answer is easily found in commonly available documentation.

routing

Finding an appropriate path through a network to a computer which has been addressed is called routing. The problem of routing is usually handled for you by the communications hardware and software.

session

See "interactive session".

smiley

The characters :-) or similar ones which look like a smiling face when viewed from the side. Some people use them in news postings to indicate they are using humour or irony, and that what they are saying may not be literally true.

software

The programs and stored information used to make a computer system operate effectively.

SO

A common bulletin board abbreviation for "significant other". A non-gender-specific term for spouse, boyfriend, girlfriend or similar.

special character

A non-printing character with a special meaning to the computer or communications equipment. For example, causing transmission to pause, or ringing a bell on a terminal.

TCP/IP

Transmission Control Protocol/Internet Protocol. These together represent the two most important protocols used on AARNet and Internet. They ensure that messages passed from one computer to another are interpreted correctly.

Telnet

A program on a computer which enables you to connect from that computer to another one on AARNet or Internet.

Unix

An operating system common across a range of computers. Unix is a registered trade mark.

user agent

An application program which the user interacts with in order to use network services.

username

A name by which a user is registered to use a computer.

VMS

The operating system used by Digital Equipment Corporation's Vax Computers. Both "Vax" and "VMS" are registered trade marks.

VT100

A standard terminal type, supported by many computer systems, and emulated by many terminals or personal computers which are not themselves VT100 terminals.

WAN

A Wide Area Network: a network of computers not limited to systems in close proximity. A WAN often links a number of LANs together. AARNet and Internet are WANs.

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Cecil Goldstein
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