

# CENTRAL COMPUTING FACILITY





There are a set of publicity leaflets which describe the facilities available at the Atlas Centre and the work of Central Computing Division of Rutherford Appleton Laboratory.

The following leaflets are available:

- Introductory Information
- Central Computing Division Organisation and Contacts
- Central Computing Mainframe Equipment
- Software
- Communications
- Development of Central Computing at RAL
- Computer Graphics Devices
- Computer Graphics Systems
- Office Automation
- Database
- Computer Graphics Applications
- Scientific Database Applications
- Office Automation Examples using PROFS
- Joint Academic Network (JANET)
- Development Projects

Copies of the leaflets and further information can be obtained from:

Head of User Support and Marketing,  
Atlas Centre,  
Rutherford Appleton Laboratory,  
Chilton, DIDCOT,  
Oxon, OX11 0QX.

or ☎ Abingdon (0235) 446623.

## Introduction

The Central Computing Division at RAL provides the Science and Engineering Research Council (SERC) mainframe computing service to establishments throughout the UK. It is equipped with a large computer complex, specialised peripherals and a large amount of communications equipment. Over 2000 users from most UK Universities and many Polytechnics make use of the facilities and new users are always welcome.

The facilities are intended primarily for SERC supported researchers in the universities and polytechnics and employees in the SERC establishments. Sometimes resources can be sold to other government establishments and commercial users.

The other leaflets in this series give some idea of the scale and diversity of the services available.

## Use of the Central Computing Service

All use of any SERC Computing Facility must be authorised. For SERC-sponsored users there are three possible ways:

- as part of a **Research Grant** - when applying for an SERC Research Grant you can ask for computing time at RAL for work on the project;
- as part of an **approved Research Programme** - some SERC Research Programmes (for example Nuclear Physics projects) have an annual allocation of computing facilities;
- as a **'Pump Priming'** allocation - a small allocation may be made for a new user to carry out an appraisal or feasibility

study prior to submitting a Research Grant Application.

Arrangements for non-SERC users must be discussed individually.

## Application for Resources

If you are a potential user wishing to discuss the facilities available and how they can meet your long term requirements you should initially contact the Head of User Support and Marketing, or, for administrative users, the Head of Information Management.

Formal application is made by completing SERC form AL54 obtainable from:

- Resource Management Section at the Rutherford Appleton Laboratory.
- University Computing Centres,
- University Offices.

The notes with the form give more details.

## The Service

The Central Mainframe System is run 24 hours a day, 7 days a week. There are two mainframes; an IBM 3081K is closely coupled with an Amdahl Atlas 10 providing considerable computing power. In an average week 4500 jobs are run and there are about 300 simultaneous logged-on users. Vast amounts of data are generated by the many scientific applications and are stored on more than 50000 magnetic tapes; a bank of magnetic tape drives provide access to these data. Disk drives, a mass storage unit and a range of high quality output devices complete the range of peripherals.

Both batch and interactive services are provided through a variety of operating systems. Interactive access is available mainly through CMS and UTS (a UNIX



system)<sup>1</sup> while most batch jobs are run in either CMS or MVS. An Office Automation System (PROFS) is available to anyone with access to an appropriate terminal.

Users not located at RAL have access to the machines in a variety of ways using the Joint Academic NETwork (JANET). This provides remote login access, and message and file transfer facilities.

## Documentation

A number of documents have been written at RAL, including introductions to the operating systems CMS and MVS, and these are issued to newly registered users. A variety of more specialised documents is available in machine readable format; these can be browsed at the terminal or printed on one of the high quality laser printers. Advice can be given on the availability of manufacturers' manuals and these can be ordered on behalf of users.

## Getting Started

To help a new user become acquainted with the system, an introductory course is held regularly at RAL and is offered to external establishments. This course introduces most aspects of both CMS and MVS, and a great emphasis is placed on supervised practical tutorial sessions. A separate course introducing the concepts and facilities of PROFS is also held at RAL.

## Applications Software

In line with any other mainframe complex, a wide variety of programs, packages and libraries is available. Most of those on our system are of specific interest to scientific programmers. Databases, graphical packages, statistical packages and a number of compilers complete a list too extensive to detail here.

Many packages from specific scientific areas have been acquired by users and mounted on the system with help from RAL computing staff, who are always willing to discuss new requirements.

## Providing HELP and Information

All telephone queries about the service are taken by the Service Line. Any questions which cannot be answered immediately are logged and passed on for action by an appropriate expert.

Programming problems are handled by the Program Advisory Office (PAO), which can also be contacted directly through electronic mail.

As well as the printed and machine readable documentation there is an on-line HELP system. It provides instant information to interactive users on commands available in the system. It also gives details of options and parameters and restrictions.

We keep in touch with users in a number of ways.

- Immediate news is provided at login for interactive users.
- There is an extensive set of NEWS files giving details of changes and information covering a period of months.
- Bulletins are issued when required to all workstations and remote users, and are added to the set of NEWS files.
- FORUM is a bi-monthly Computer Newsletter which is distributed to users. It contains articles of more general interest and users are encouraged to use FORUM to air their views on the service and facilities provided.

## Other Information

This leaflet is one of a set of publicity leaflets which give further details of the services available from the Central Computing Division of the Rutherford Appleton Laboratory. If you require more information please contact the Head of User Support and Marketing at

Atlas Centre,  
Rutherford Appleton Laboratory,  
Chilton, DIDCOT,  
Oxon, OX11 0QX.

or ☎ Abingdon (0235) 446623.

<sup>1</sup> UNIX is a trademark of the Bell Laboratories

## Overview

Central Computing Division is responsible for the RAL mainframe services, for communications and other computing infrastructure, and for the basic support of Office Automation and other administrative computing.

This note gives details of the structure of the division and the main contacts.

## Divisional Organisation

Under the Division Head, who is also SERC Director, Computing (Dr Brian Davies) there are three main areas of responsibility as follows.

- **Computer Services**  
(Mr Doug House)

Provision of the central computer service, all computer operations, hardware purchases, handling user telephone queries, telecommunications, control of software changes.

- **User Support and Marketing**  
(Mr Paul Thompson)

Support and marketing of the mainframe services for scientific users, assessing future requirements, training and public relations, resource management and accounting.

- **Software and Development**  
(Dr Trevor Daniels)

This is subdivided into:

### Systems

(Dr Tim Pett)

Support and development of operating systems.

### Information Management

(Dr Keith Jeffery)

Support and development of RAL office automation, RAL administrative computing, support of electronic mail services; this group also supports the central database requirements of administrative and scientific users.

### Development

(Dr Paul Bryant)

Development of RAL site communications, networking, assessment of new products and work with the IBM PC.

### Graphics

(Mr Chris Osland)

Support and development of graphics devices and software.

## Contacts in Central Computing Division

If you are a user or potential user wishing to discuss the facilities available and how they can meet your long term requirements you should initially contact the Head of User Support and Marketing, or, for administrative users, the Head of Information Management. Existing users are encouraged to use the normal contacts:

- **Program Advisory Office (PAO)** will answer technical queries about supported software and will give general programming advice.
- **Service Line** will help with operational problems (loss of contact with the system, bad performance, lost output etc.) and is the main telephone contact with the Division; all calls are logged and PAO or other experts are contacted if required.

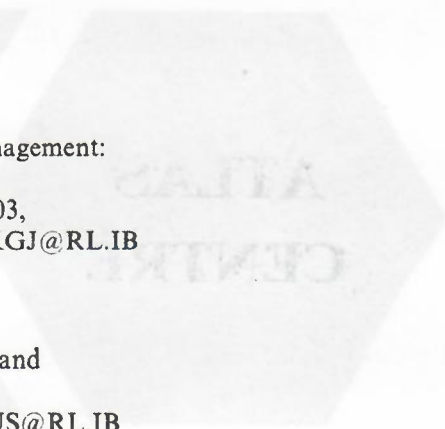
**Details:**

**Head of User Support and Marketing:**  
 Mr P C Thompson,  
 ☎ Abingdon (0235) 446623,  
 Electronic mail address: PCT@RL.IB

**Head of Information Management:**  
 Dr K G Jeffery,  
 ☎ Abingdon (0235) 446103,  
 Electronic mail address: KGJ@RL.IB

**Program Advisory Office**  
 staffed from:  
 1400 - 1630 Mon - Thurs and  
 1400 - 1530 on Friday  
 Electronic mail address: US@RL.IB

**Service Line**  
 staffed during normal office hours  
 ☎ Abingdon (0235) 446389  
 Electronic mail address: SERVICE@RL.IB





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## The Central Processors

The Central Mainframe complex consists of linked IBM 3081K and AMDAHL Atlas10 processors which share peripheral devices. The complex is shown schematically overleaf.

The **IBM 3081K** is a dual processor, 16 MIPS (Million Instructions Per Second) machine with 32 Mbytes of memory and 24 I/O channels. It is linked via Channel To Channel adaptors (CTCs) to an **Atlas10** 15 MIPS uniprocessor with 24 Mbytes of memory and 32 I/O channels.

Under normal circumstances the IBM 3081K is run as a front-end handling interactive users, network control programs and a small amount of batch work. The Atlas10 is run as a back-end handling most of the batch work. These roles can be reversed if necessary.

## Data Storage Devices

There is approximately 38 Gbytes of fixed disk storage (encompassing a variety of manufacturers and equipment types); this is used for spooling, system and user datasets and temporary space.

Also connected is a **Masstor M860 cartridge store**. This has a capacity of 110 Gbytes and consists of a honeycomb of storage cells, each holding one cartridge of wide magnetic tape. The device automatically loads cartridges into read/write stations.

Magnetic tape access is provided by 16 **Memorex 3227/8 drives**.

A **Memorex 3864** solid state paging device with 96 Mbytes of storage is used as the primary paging device.

## Communications and Switching Units

All remote access to the Central Computing Mainframes takes place through an **AMDAHL 4705 Communications Controller**. Local direct connections are made through IBM 3274 screen controllers or through the AMDAHL 4705.

The Communications Controller, Screen Controllers and Output Devices are not connected to both mainframes at the same time (in the way that data storage devices are), but are routed through a **T-BAR switching unit**. This enables all these units to be switched from one processor to another if their roles are altered.

## Output Devices

An **IBM 3203** provides conventional lineprinter output.

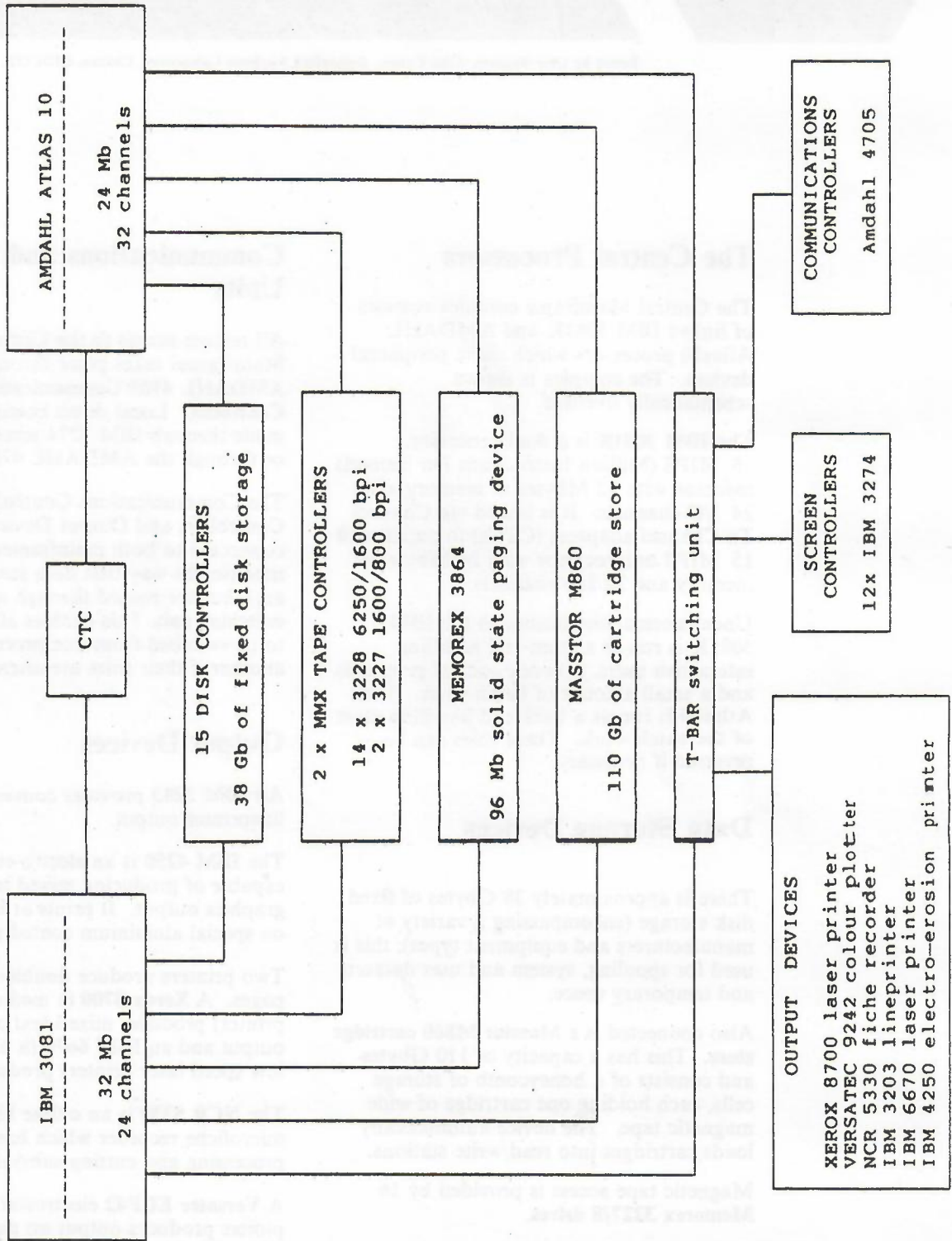
The **IBM 4250** is an electro-erosion printer capable of producing mixed text and graphics output. It prints at high resolution on special aluminium coated paper.

Two printers produce double-sided A4 pages. A **Xerox 8700** (a medium speed laser printer) produces mixed text and graphics output and an **IBM 6670** (a high quality, low speed laser printer) produces text only.

The **NCR 5330** is an online high speed text microfiche recorder which has full chemical processing and cutting subsystems built in.

A **Versatec ECP42** electrostatic colour plotter produces output on paper or mylar film 42 inches wide. It is perfectly suited to the output of large engineering and design drawings.

# RAL MAINFRAME CONFIGURATION





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## Operating Systems

The Central Computing Division runs three operating systems on its mainframe complex.

**VM/CMS** This is the main interactive service. CMS has a powerful editor (XEDIT) and an interpretive command processor (REXX). It supports a relational database system (SQL/DS) with its associated sequel-like query language SQL. Programs can be run interactively or in a CMS batch system.

**MVS** This is the main batch operating system. The subsystem JES3 controls the scheduling of jobs and the processing of output.

**UTS** This is a System V UNIX<sup>1</sup> operating system. UTS supports C, PASCAL and Fortran 77. It has a number of tools including a text processing facility, a symbolic debugger, a desk calculator, and a computer program and document maintenance system.

## Languages

Many programming languages are used at RAL. The most widely used is:

**Fortran** Traditionally Fortran was used by the scientific and engineering community, but it is now used for many types of general programming. IBM's VS Fortran compiler (ANSI

1966 and 1977 standard levels) is available. This compiler has many extensions to the ANSI standard.

Other languages available are:

**COBOL** Mainly used by the business world, COBOL is used at RAL for some of the administrative computing but can be used by the general user too.

**PL/1** This is a language of IBM's that allows many data types and more language constructs than Fortran, as well as allowing close interaction with the operating system. We have an optimising version of the compiler which allows efficient code to be produced.

**Pascal** This is a suitable language for applying structured programming techniques and it has constructs for defining data structures. The strictness of its semantics mean that many programming errors can be detected at compilation time.

**BCPL** This is a language designed primarily for non-numerical applications such as compiler writing, interpreters, text editors, text layout systems and general systems programming.

**Prolog** This is a language developed by the Artificial Intelligence community to use logic as a means of solving problems. Prolog consists of logical axioms and statements that are to be proven or disproven.

<sup>1</sup> UNIX is a trademark of the Bell Laboratories

The compiler for Prolog was obtained from the University of Waterloo.

**Assembler** The IBM assembler for 370 Assembler language is mainly used by systems programmers but is available to all.

## Libraries

When using a computer to solve a problem, remember that someone has probably done it already. We have a number of libraries containing subroutines to perform many common operations; from moving data around to complicated mathematical functions, from sorting to making numeric approximations to physical systems. The most popular of these are:

**RHELIB** This library is named after RHEL (Rutherford High Energy Laboratory) the former name of RAL. It contains a mixture of routines for data manipulation, mathematics, input/output and interfacing to the operating system.

**HARLIB** Mainly used for numeric calculations, this library originates from our neighbouring site AERE Harwell.

**NAG** This is a well-tested and widely-used library from the Numerical Algorithms Group. It contains mainly numeric and analytic solutions to problems like integration. We have the double-precision version for greater accuracy.

**CPC** A collection of programs that have been published in Computer Physics Communications.

**CERNLIB** Several libraries originating at the European Centre for Nuclear Research (CERN) in Geneva. The libraries contain both subroutines for data manipulation, physical calculations and mathematical functions, and a number of packages (usually libraries of subroutines) for topics like

function minimisation, fast input/output, memory management and histogramming.

## Packages

Central Computing Division supports a number of more specialised packages. Some examples are:

**GENSTAT** A General Statistical program developed at the Agricultural and Food Research Council's Rothamstead Experimental Station.

**SAS** Statistical Analysis System. This allows easy statistical analyses of data samples in either character or binary form. SAS has procedures for tabulation, histogramming and many different statistical parametrisations. It also has an associated graphics package **SASGRAPH** which allows simple presentation of data.

**HISTORIAN** Provided for the High Energy Physics community, Historian is a program maintenance tool which allows software to be easily updated and multiple versions of source code to be kept, thus allowing parallel developments.

**CAPSTAN** A critical path analysis program.

**Mortran** A Fortran pre-processor which allows a lot of powerful programming constructs to be used in a program but which generates standard Fortran which can be passed to one of the usual compilers.

There are also many packages supported by other Divisions at RAL. These include the Finite Element and Circuit design packages supported by Technology Division.

## Further information

For further information about software contact User Support and Marketing.



## Introduction

Users of the computing facilities at RAL include administrators, engineers and scientists on the RAL site and researchers in UK universities. Their requirements for data communications range from a low speed connection for a hardcopy unit to a high speed megabit per second link for inter computer working; from local to international connections. The data communication equipment and transmission media needed to satisfy all these requirements is extensive.

The two main areas in data communications are **terminal access** and **networks**.

## Terminal access

The access methods used at RAL are:

- Direct connections
- Via a terminal switching system (PACX)
- Via a network
- Via a dial-up connection

### Direct connections

Here terminals, or special peripheral devices, are connected directly into the required system. Examples of these are the 'screen' devices used on the central system and the CAD/CAM workstations used on the minicomputers. There are over 400 connections of this type on the site.

### Terminal switching system (PACX)

In this system a user's terminal is connected on one side and a number of computer systems on the other. The user selects the computer system of his choice and if this system has the available resources then the connection is made; otherwise the user is queued. This system supports over 500 terminals and 250 computer ports on some 20 computer systems.

## Networks

The number of terminals making use of this type of connection is high, in excess of 1000.

### Dial-up

This allows users to connect from anywhere that a telephone line is available by use of dial-up modems.

## Networks

'Networks' mean different things to different people; here we mean the ability to connect computers, their peripherals and terminals, to other computers. The devices may be connected on the same site, in which case it is a **Local Area Network (LAN)**, or the devices may be in different locations and even in different countries, in which case it is a **Wide Area Network (WAN)**. Types of services offered by a network include:

- Use of the remote computer as if it were at the local site (interactive access)
- Transfer of files between computers; useful for collaborative projects
- Submission of jobs to a remote computer and receiving back results
- Electronic mail.

## Networks at RAL

At RAL the following networks are used.

### The local area X.25 network

X.25 is the CCITT standard for packet switch networks and is widely supported in the academic community and by the national carrier British Telecom (BT).

The network is based on a number of **Packet Switching Exchanges (PSEs)** supporting both host and JNT PAD (**Packet Assembler Disassembler**)

connections. Currently there are 40 host connections and 30 JNT PAD connections at RAL. (A PAD is a device that allows a number of terminals to be multiplexed through one line onto an X.25 network.)

Each of the PSEs has a connection into the **Joint Academic Network (JANET)** to allow access to and from Universities and other Research Council sites. JANET has connections to the BT's Packet Switchstream Service (PSS). Therefore calls can be made to commercial systems and to international networks.

**Ethernet**

This is now becoming popular and the number of products available commercially is growing.

**RSCS**

This is an IBM product for use on IBM or IBM lookalike systems for workstation communications. It is used for a number of workstations and

for the **European Academic Research Network (EARN)**.

**PRIMENET**

This is used for 8 PRIMEs at RAL all located in the same area. The connection is made by a ring passing through each of the systems. It is however restricted to the PRIME systems.

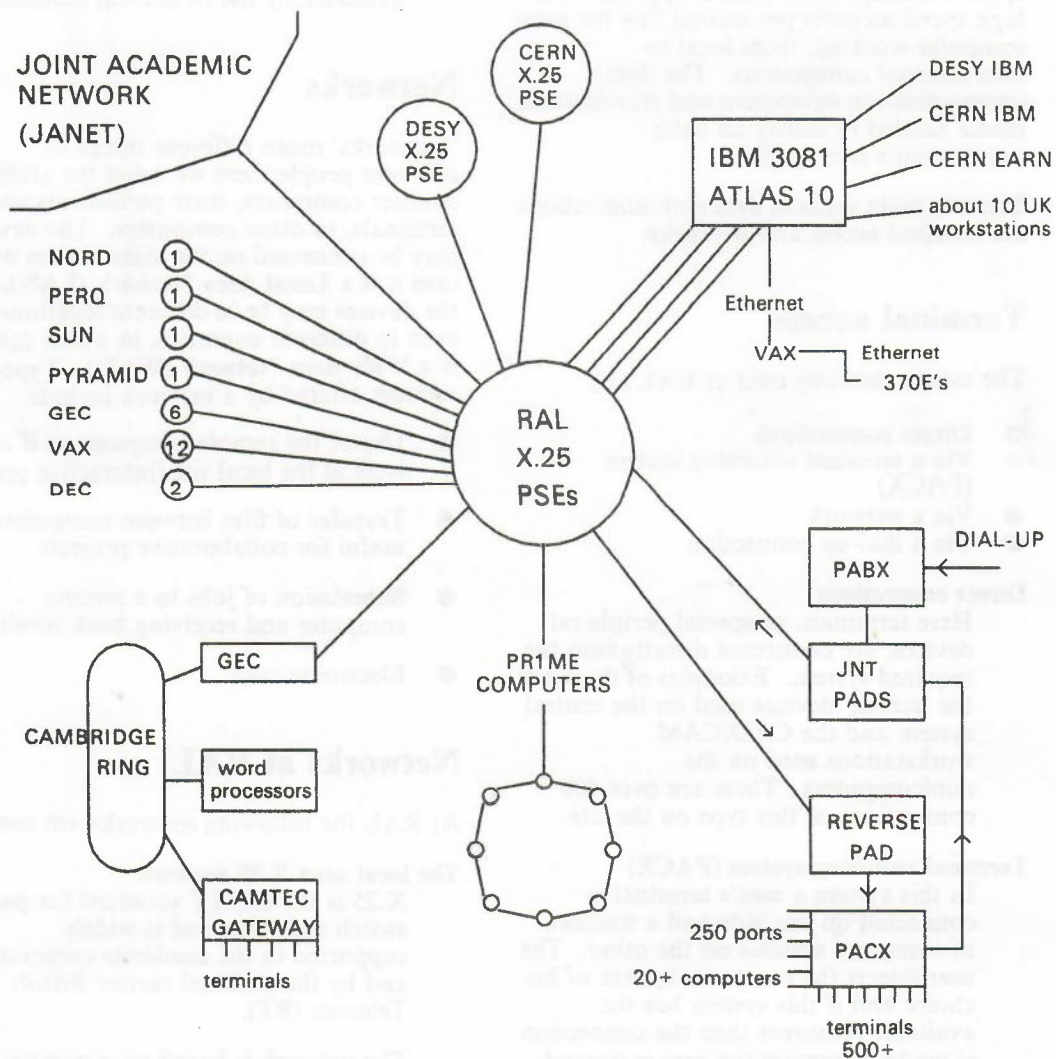
**Cambridge Ring**

The Cambridge Ring at RAL connects a number of word processors, GEC computers and PADs as an experimental network, and is approximately 3000 metres in length.

**Technology**

Over the years the technology used has changed. At any one time there is a mixture of current and old technology in use. Fibre optic cables are used extensively around the site.

**RAL LOCAL NETWORK CONNECTIONS**





# ATLAS CENTRE

# Development of Central Computing at RAL

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## Historical Background

An **IBM System/360 Model 75** computer was brought into service at the Rutherford High Energy Laboratory (RHEL) in 1967. Before that, a **Ferranti ORION** computer had been in service since 1962.

The IBM 360/75 computer assisted physicists engaged in research in particle physics, a branch of physics supported by the Nuclear Physics Board of SERC (then SRC). The computer enabled them to undertake the analysis and interpretation of the large quantities of data collected from experiments undertaken on particle accelerators, such as NIMROD at RHEL and the synchrotron at CERN in Geneva.

The name of the Laboratory has itself changed with time from RHEL to Rutherford Laboratory around 1972. The Rutherford and Appleton Laboratories merged in 1979, and the name now adopted for the combined laboratories is the Rutherford Appleton Laboratory (RAL).

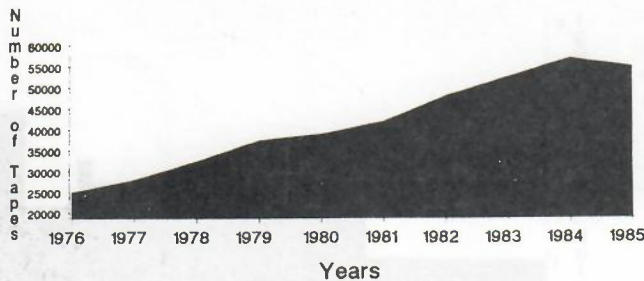
By 1971 the 360/75 computer had become overloaded with work and in December of that year an **IBM 360/195** computer was

brought into service as a replacement. The 360/195 was about 6 or 7 times more powerful than the 360/75 and SRC decided that about 20% of its capacity should be used to support branches of science and engineering funded by the other Boards of SRC.

Up to that time these users had obtained some of their computing resources from the facilities of the Atlas Computer Laboratory (ACL) which housed an ICL, formerly Ferranti, **Atlas 1** computer installed there in 1964. Plans to replace the Atlas 1 with twin **ICL 1908A** computers were not implemented because ICL decided to abandon the construction of the 1908A computer. Nevertheless, the first step of the plan was put into effect with the delivery in 1971 of an **ICL 1906A** computer to ACL. It was about twice as powerful as the Atlas 1 computer, while the IBM 360/195 represented about 20 times the power of the Atlas 1, which was closed to service in March 1973. In 1975, the Atlas Computer Laboratory was merged into the Rutherford Laboratory, and the ICL 1906A computer was closed down in 1978 to achieve savings in running costs.

## The Growth of Data Storage

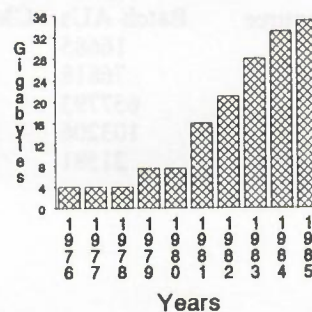
Tape Volumes



Note that many obsolete tapes were destroyed in 1984-85

## The Growth of Data Storage

Online Disk Storage Space



The continuing growth in demand for computer resources led to the installation of a second **IBM 360/195** processor in 1976. The opportunity was taken to install both computers in the Atlas Centre, the premises of the former Atlas Computer Laboratory, a move completed early in 1977. The two computers were coupled together to provide a unified service from April 1977.

In order to provide a transition to a replacement computer system an **IBM 3032** computer was installed in 1979. Later in 1979 the system was reconfigured to make the **IBM 3032** the front-end machine, scheduling the batch work for the **360/195s** and controlling the terminals and workstations.

A Computer Review Working Party (CRWP) recommended in 1981 substantial modernisation of the RAL computing facilities. Council agreed in May 1982 to purchase an **IBM 3081D** computer with 16 Mbytes of storage, and this was delivered in July 1982 when one of the two **360/195** computers was shut down. Following the introduction of the **3081D** to service, the other **360/195** computer was closed down in October 1982 after providing a continuous service for nearly eleven years at RAL.

At the same meeting in May 1982, Council agreed in principle to purchase an **ICL Atlas-10** computer (basically a Fujitsu M380) for installation in May 1983 providing certain funding and other issues could be satisfactorily resolved. The **Atlas-10** was delivered and accepted in April 1983. Its installation completed the CRWP modernisation and replacement plans which more than doubled the available CPU power. Since 1983 the **Atlas-10** has been used mainly as the batch processing machine. It is particularly suited to the scientific workload. The support arrangements for the **Atlas-10** in the UK have been transferred by **ICL** to the **Amdahl** company.

In October 1983, the 16 Mbyte **IBM 3081D** was exchanged for another **IBM 3081D** with 32 Mbytes of storage.

The Growth of Data Storage

## Central Computer Usage in 1985

Funding source	Batch AUs	CMS AUs
ASR	16685	1140
Engineering	76818	2729
Nuclear Physics	657793	9824
Science	103206	2608
External	21581	645

A **Memorex 3864** solid state paging unit and a cartridge storage device (a **Masstor 860**) were delivered in October 1983.

1984 and 1985 saw further enhancement of the hardware of the computer mainframe systems. Extra memory was added to the **Atlas-10** increasing its storage to 24 Mbytes. The increasing number of interactive users placed heavy demands on paging space and the **Memorex 3864** was increased to a total of 72 Mbytes. Communication between systems running on the two mainframes and access to the data storage devices was improved by the addition of more equipment.

In 1986 the **IBM 3081D** was upgraded to an **IBM 3081K** with a faster instruction rate.

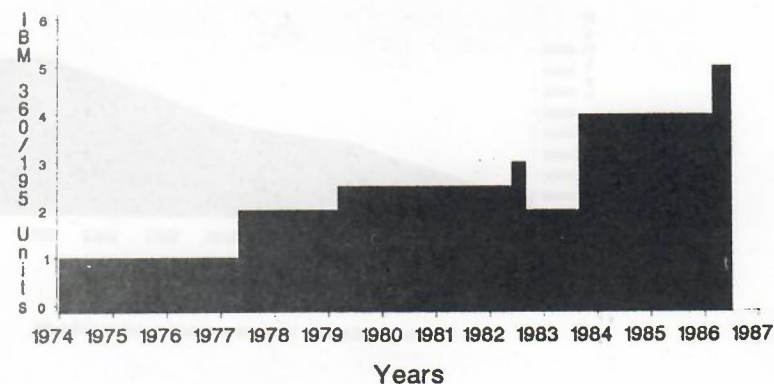
## Present system

The central mainframe complex now consists of linked **IBM 3081** and **Amdahl Atlas-10** processors which share peripheral devices. The capability and flexibility of the system make it one of the most powerful complexes in Europe. The CPU power has been increased 6 fold since 1975. Perhaps more important have been the changes made to keep pace with expanding data storage and terminal response requirements of the user community.

The online disk storage is 38 thousand million bytes (38 Gigabytes). This is used both by the system and users. The number of tape volumes registered in the system is 55000.

There are about 2000 users working on 434 separate projects. They are located not only on the Chilton site but also at almost every university and polytechnic in Britain. They gain access to the complex through terminals or workstations connected to the Chilton site by data communication lines provided by British Telecom. The provision of networks means that there are several thousand terminals which can gain access in this way.

Growth of Installed Cpu Power in terms of IBM 360/195s





## Introduction

For pictures to be produced by computers, special devices are required. The devices available to RAL users fall into a number of groups:

- display terminals, which may offer just one colour (effectively black and white), a number of shades of one colour (effectively greyscale) or a range of colours;
- printers attached to display terminals, which allow the picture on the screen to be printed;
- film recorders, which allow the picture to be recorded onto slide film (for projection) or photographic paper;
- pen plotters, often with several pens of different colours or line thicknesses;
- high resolution image printers on which output suitable for publications can be produced.

Because some programmers want to see the results of their program as it runs while others want to be free to browse through their output at their leisure, different methods of working are needed.

## Methods of Working

The mainframe computers provide both interactive service (via CMS) and batch service (via MVS and CMSBATCH). The graphics systems provide three ways of working, appropriate to these different systems.

### Output to User Terminal

CMS users may specify that their program is to produce its picture output on their terminal; this is the default option.

### Output to Hardcopy Devices

All users may specify that their output is to be sent to the Xerox 8700 laser printer (300 dots/inch) or the IBM 4250 electro-erosion printer (600 dots/inch). A similar facility is being implemented

for the Versatec 42 inch colour plotter (200 dots/inch, 4 toner colours). These devices are located in the Atlas Centre; external users then receive their output by post.

### Output to Graphics Filestore

Since users need to view pictures produced by batch programs, a graphics filestore is available and output may be routed to this and then viewed under CMS.

## Graphics Devices

Between 300 and 400 graphics terminals have direct access or access via JANET to the mainframe systems. The following types of graphics terminal are supported on the mainframe systems; lists of the terminals supported by each of the basic graphics systems are given in the **Computer Graphics Systems** leaflet.

### Tektronix 4000 series terminals

These are 'storage tube' displays of medium and high resolution but just one colour. Hardcopy of the picture on the screen may be produced with Tektronix 4631 devices.



Figure 1. Pegasus



### **Sigmex 5000 series terminals**

These are 'raster' terminals that have a comprehensive set of instructions, including area fill and multiple text sizes and line styles. They are also capable of operating as emulators for Tektronix 4000 series terminals. Grey scale hardcopy of the picture on the screen may be produced on a Tektronix 4632 device.

### **CalComp 81 pen plotters**

These desk-top A3 plotters provide for 8 pens and have a number of useful features such as curve drawing. With ink pens, output on paper is suitable for pasting into good quality documents; with spirit-based felt-tip pens, high quality foils may be obtained.

### **Cifer 2634 terminals with graphics option**

These are low resolution raster terminals which contain a Tektronix 4010 emulator. Hardcopy of the picture on the screen may be sent to an Epson dot matrix printer.

In addition to these user terminals, some more specialized equipment is located in the graphics terminal pool at the Atlas Centre.

### **Dunn Camera Film Recorder**

One of the colour Sigmex terminals, the 5688, has a Dunn Instruments film recorder attached to it. This can produce 35mm or 10" x 8" Polaroid (B/W or colour) output and so is most suitable for producing slides.

### **Seiko CH-5201 Colour Printer**

Another Sigmex terminal, a model 6160 that may be used as a model 5484, has a Seiko CH-5201 colour hardcopy device attached. This device produces high resolution (1024 x 1280 dots) colour output on A4 paper or foil, at a fraction of the corresponding cost for Polaroid material. It is therefore highly suitable for producing foils and illustrations for documents.

At RAL there are three specialized output devices attached to the mainframe systems and accessible from CMS, MVS and the network.

### **Xerox 8700 Laser Printer**

This high speed laser printer can produce single-sided and double-sided A4 output. As well as possessing a wide range of text output capabilities, it is used by all the graphics systems for good quality hardcopy. Its addressability is 300 dots/inch; each dot is either 'on' or 'off'; at present no facilities for grey-scale output have been implemented. Because of its speed (70

pages/minute) it is the most suitable device for high volume output.

### **IBM 4250 electro-erosion printers**

Two of these printers are installed; one in the Atlas Centre and one in R1. They produce text and graphics output on 11.8 inch wide continuous silver paper; their resolution (600 dots/inch) ensures typeset quality for both text and graphics. They are intended for production of reprographics originals and for high quality archival graphics output. Their speed (90 seconds/A4 page) makes them appropriate for final versions of output and not for high volume output.

### **Versatec ECP42 electrostatic colour plotter**

This device produces colour output on paper or mylar film 42 inches wide. Its resolution is 200 dots/inch and it plots at about 1 inch/second for each of four colour passes (black, yellow, magenta, cyan). It is perfectly suited to the output of large engineering and design drawings and for the production of overhead projection foils.

Output on these devices produced in the Atlas Centre is distributed by the Central Computer operators.

## **Documentation**

The graphics devices are supported by a number of different graphics software systems and, in general, cannot be used without one of these systems. Documentation of the devices - and the features of the devices that are used by the software - are given in the documentation of each software system.

*The RAL Graphics User's Guide* provides information on SMOG and its related packages and *The RAL GKS Guide* provides information on the GKS system. GINO-F is described in manuals supplied by the CAD Centre, Cambridge, specifically *The GINO-F User Manual* and *The GINOGRAPH User Manual*.

## **Further information**

For further information contact Chris Osland, Head of Graphics.

## **Figure**

Pegasus: after Delahaye, *Geometric and Artistic Graphics*, MacMillan (1986).



## Introduction

In many cases, pictures are a more convenient way of displaying results than numbers or text. Computer graphics systems allow programs to 'draw' pictures on suitable devices, such as computer terminals and plotters. Different 'graphics devices' are driven in different ways, so a **basic graphics package** is normally used to simplify the task, providing facilities for drawing simple objects (like lines, characters or coloured areas).

Most scientific users require facilities for presentation of data, such as graphs, histograms and contour maps. These are termed **high level routines** since they need to use a general purpose package.

For some applications it can be convenient for all the facilities to be contained in an **application program** that can be driven by appropriate commands.

This leaflet covers the **basic graphics packages supported at RAL**; the **high level routines, applications programs and devices** are described in other leaflets.

## Standards

Members of Graphics Section have been active in developing and promoting international standards for graphics. It is our policy to base all future development of graphics systems on such standards, including GKS (Graphical Kernel System) and CGM (Computer Graphics Metafile), where these are appropriate.

## Basic Graphics Packages

Three basic graphics packages are provided: GKS, GINO-F and SMOG. Of these, GKS is recommended for the vast majority of new applications, since the level of support we can provide for GKS is better than that for the other systems and the range of

facilities available from GKS is large and growing rapidly.

## GKS (Graphical Kernel System)

RAL have developed and distributed a comprehensive implementation of this international standard for computer graphics. GKS contains a powerful range of **output** facilities:

**POLYLINE  
POLYMARKER  
TEXT  
FILL AREA  
CELL ARRAY  
GENERALIZED DRAWING  
PRIMITIVES**

The **input** facilities in GKS provide standardized access to the many different types of input device available on modern graphics devices:

**LOCATOR  
STROKE  
VALUATOR  
CHOICE  
STRING  
PICK**

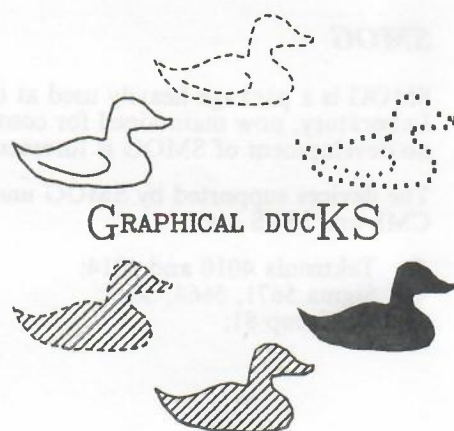


Figure 1. Example of various GKS output facilities.

GKS provides a comprehensive set of *control* functions that allow the use of several graphics devices simultaneously and selectively.

There are *segment* facilities that allow the user to store elements of the pictures in segments and subsequently manipulate the segments on the output device. Permanent storage of picture sequences is provided by the GKS *metafile* functions.

The RAL system currently matches version 7.2 of the standard, although it is planned to update the system to version 7.4.

The devices supported by RAL GKS are:

- Tektronix 4010 and 4014 displays;
- Cifer 2634 graphics display;
- Sigma 5000 series (except 5688);
- CalComp 81 desk-top plotter;
- Benson 1302 and 1332 1 metre plotters;
- Xerox 8700 laser printer;
- IBM 4250 electro-erosion printer;
- GKS annex E (character encoded) metafile;
- Versatec ECP42 42 inch colour plotter.

Further device handlers are being developed for other graphics devices recommended for SERC users.

### GINO-F

This package is widely available within the UK and is extensively used as the basis for application programs that require graphics; Mark 2.6 is installed on the mainframe systems. GINO-F provides both 2-D and 3-D functions to the user although no facilities for shading areas or suppressing hidden lines or surfaces are included.

The devices supported by GINO-F under CMS and MVS are:

- Tektronix 4010 and 4014;
- Sigma 5671, 5664, 5684;
- CalComp 81;
- Xerox 8700 laser printer (as an emulator for a film recorder);
- IBM 4250 electro-erosion printer (as an emulator for a film recorder).

### SMOG

SMOG is a package heavily used at the Laboratory, now maintained for continuity; no development of SMOG is foreseen.

The devices supported by SMOG under CMS and MVS are:

- Tektronix 4010 and 4014;
- Sigma 5671, 5664, 5684;
- CalComp 81;

- Xerox 8700 laser printer (as an emulator for a film recorder);
- IBM 4250 electro-erosion printer (as an emulator for a film recorder).

### Other Basic Graphics Packages

In addition to these packages, the IBM GDDM package is used within the system to drive IBM graphics devices. A previous package in use at the Laboratory, MUGWUMP, is maintained for continuity although its use in new applications is discouraged.

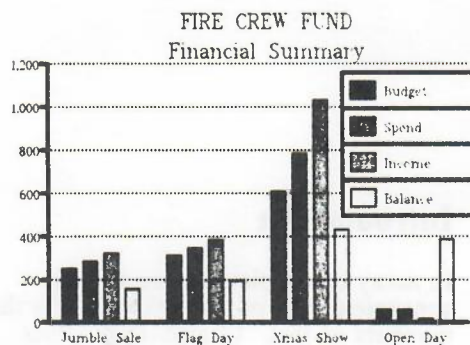


Figure 2. Business Graph

### Documentation

The graphics systems available on the mainframe systems are described in two main RAL manuals: *The RAL Graphics User's Guide* provides information on SMOG and its related packages and *The RAL GKS Guide* provides information on the GKS system. GINO-F is described in manuals supplied by the CAD Centre, Cambridge, specifically *The GINO-F User Manual*. MUGWUMP was described in *The Electric User's Manual: Part III*.

A large number of CMS HELP files exist for the graphics systems; a graphical HELP facility, using GKS as a basic graphics package, is currently being developed.

### Further information

For further information contact Chris Osland, Head of Graphics.

### Figures

- 1 After Hopgood, Duce, Gallop and Sutcliffe, *An Introduction to the Graphical Kernel System (GKS)*, Academic Press (1986) 2nd edition.



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October 1986

## What Is It?

Office Automation (OA) is the application of a collection of hardware and software components to the everyday office business of an organisation. It allows end-users to do office jobs more efficiently. It can be regarded as automation of the desk.

A service using IBM's PROFS system was introduced on a trial basis at the Laboratory in 1983 and now has more than 450 users. The system serves most of the senior managers and their secretaries plus a representative cross-section of other administrative users drawn from Finance, Personnel and General Administration.

The RAL PROFS installation offers:

- the sort of computer mail already in routine use by scientists;
- document preparation (word processing) and distribution;
- electronic aids for booking meetings and conference rooms;
- a database containing RAL personnel and accommodation data;
- an Information Retrieval system containing SERC's conditions of employment, laboratory notices, circulars, etc.;
- a full screen spreadsheet package.

The PROFS service at RAL means that staff who have no previous computing experience are now using a computer as one of the tools of their trade.

## Why Is It Important?

The survey by Booz, Allen and Hamilton, shows that a major economy in office work can be made by the introduction of word

processors. Having introduced word processors the next major economy is achieved by automating some of the functions of middle management; in particular the production, handling and filing of documents; manager/staff and manager/manager communication. It is these areas which office automation addresses in the widest sense; not only does it provide the functions given as examples above but it also provides a framework from which to access other services such as corporate administrative information systems.

An important feature of 'integrated' OA Systems is that these functions are organised under a common user interface, and provision is made for a high degree of interconnection between individual office functions. Some functions may be available outside an OA system (eg word processing) but increased efficiency in the performance of office tasks is only likely to arise when maximum use is made of the natural interconnection of these tasks.

## PROFS

**PROFS (PROfessional OFFice System)**, is an IBM Strategic Product which provides the basic facilities of office automation. The system is powerful, flexible and easy to use. The documentation is excellent and Central Computing Division provides extensive training and support services. PROFS is continually being developed and improved by IBM. Central Computing Division feeds back to IBM user experience with the system so helping to shape its future development.

PROFS is a menu based system, although it is possible for experienced users to control it by commands when more appropriate. The menus take the user in easy steps from one major facility to another using the PF

(Program Function) keys on an IBM terminal or any other full screen terminal emulating an IBM terminal. PROFS is now widely used at the Rutherford Appleton Laboratory and is attracting interest from external organisations concerned with OA.

The use of an Office Automation system should benefit many projects because it allows information to be shared easily and quickly. Documents can be circulated with added explanatory text and changes made and reviewed instantly by the originator and his or her colleagues.

## Add On Services

From PROFS it is possible to access decision support systems based on the use of INFO (a relational database system) and STAIRS (a full text retrieval system). INFO provides the basic facilities on which SERC has built an administrative database describing staff, organisational position, room and telephone numbers, etc. STAIRS provides full text retrieval for a range of

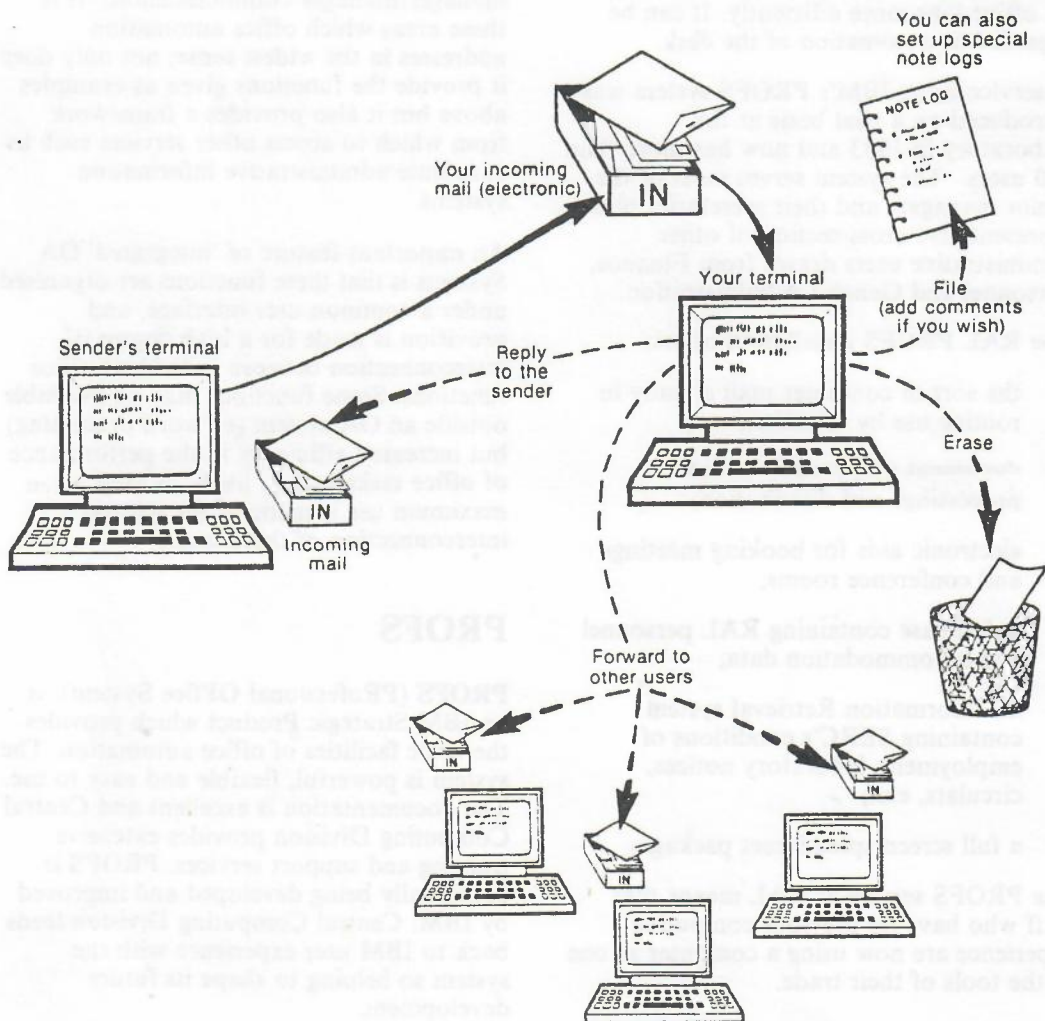
operational documents including CEMs (Conditions of Employment Memoranda) and General Notices.

It is possible to add other services on to PROFS quite easily; for example a spread-sheet calculation facility - ExecuCalc - is available to allow rapid handling of tables of figures. This has proved particularly useful for requirements such as the Five Year Forward Look (financial planning).

PROFS is seen as the principal entry point to these and other services provided by Information Management Group.

## Further Information

For further information please contact either Keith Jeffery, Head of Information Management or Jed Brown, Head of Office Automation in Information Management Group.



The diagram above shows what a PROFS user can do after receiving a note (SH20-5604-1. IBM Professional Office System. Using the Professional Office System).



## What Do We Offer

Information Management Group offers a full service in database system support, ranging from the support, documentation and training associated with a given package, leaving the user to do the applications project, through to a full service where the customer requirement is analysed, agreed and implemented by Information Management Group.

## What Is It?

'Database' is a term describing a collection of techniques related to the efficient storage and retrieval of data. A database is 'an integrated collection of data of interest to the organisation or enterprise'. A database is accessed and controlled through a database management system (DBMS). The efficient design and implementation of databases has been shown to have a marked effect on the profitability of a commercial enterprise and so can have a marked effect on the efficiency of an organisation like SERC. The main point about databases is that the system surrounding the data in the database provides the facilities to update or retrieve the database information by one or more users, more or less simultaneously and with appropriate security and authorisation procedures.

## Database Packages

The standard database packages supported at RAL are:

- **STATUS:** this is a free text information storage and retrieval system. STATUS has an easy to use user-friendly query language and amending data is

possible. It is not suitable for a highly dynamic database and has no Fortran or other high-level programming language interface. STATUS is available on PRIME and on IBM CMS.

- **SQL/DS:** this is an IBM supplied package providing a relational database system in the VM/CMS environment. The user interface is SQL (structured query language, rapidly becoming the standard for query languages) and the system provides for multiple user read and write to data structured as relations. This system is particularly powerful in the decision support environment and in scientific databases.
- **INFO:** for small administrative databases where the data are structured. This is a relational system which handles tables consisting of columns and rows, where each row is a record or a group of items related to a particular entity. INFO is a self-contained system with its own user language and its own programming language. At present it has no interfaces to Fortran or any other high-level language. INFO is not very efficient at update, particularly for large databases. It is available on PRIME and IBM CMS.
- **R-EXEC:** this is a portable relational database system developed for scientific databases, although it has been used successfully in administrative applications as well. It consists not only of database facilities for update, retrieval and enquiry, but also has graphics and report writing facilities. The system has both a command language and a structured Fortran programming environment.

- **STAIRS:** this is an IBM supplied package providing free text retrieval in an analogous way to STATUS. It is used with PROFS (Professional Office System).

scientific databases, and decision support and transaction processing databases.

For detailed information on these topics the contacts are:

Document databases . . . . . Jed Brown  
 Decision support databases . . . . . Judy Lay  
 Scientific databases . . . . . Brian Read

## Contacts

The supported database packages offer facilities for administrative databases,

For general information on database contact Keith Jeffery, Head of Information Management.

## An application of STATUS at RAL

The STATUS package has been used to store information about books and reports in the library and provides an online search and display facility. The example below shows a simple search for the phrase 'relational database'.

```
> books
> q relational database?
Question is satisfied by 5 articles
> t all
* 1.
   #ISBN (0 471 27612 X)
   A relational database management system.
  2.
   #ISBN (0 85012 397 6)
   Introducing relational database
  3.
   #ISBN (3 540 12032 7)
   Relational database systems.Analysis and comparison
  4.
   #ISBN (0 444 87718 5)
   Relational database systems.
  5.
   #ISBN (0 201 07185 1)
   The INGRES papers. Anatomy of a relational database system.
> d 2
  2.
   #ISBN (0 85012 397 6)
   Introducing relational database
AUTHOR  MAYNE A * WOOD MB
LOANS   ON-LOAN-1
LOCATION Shelf position (519.683.5 MAY)
        Copy 1 R27
SUBJECT #UDC (519.683.5 MAY)
        COMP
PUBLISH #PUBYEAR 1983
        National Computing Centre
OTHERINF #DATE83 (19:09:83) #AUT (MAYNE A)
> end
```



## Introduction

RAL provides a number of high level graphics packages that greatly simplify production of common forms of data display. These use the basic graphics systems to drive the supported graphics devices: the user rarely needs to know anything about his device apart from its type. RAL supports three high level graphics packages, but recommends that new applications use the NAG Graphical Supplement unless the required facility is not available.

In addition to the high level packages, RAL provides a program for plotting data via user commands. This saves the casual user knowing anything about the graphics packages or programming languages and can be used to produce output on any device supported by GKS, including the Xerox 8700 laser printer and IBM 4250 electro-erosion printer.

## High Level Graphics Packages

### *The NAG Graphical Supplement*

This provides a wide range of facilities and may be used independently of the main NAG library:

- Plotting Scientific Data**
- Fitting Curves to Data**
- Plotting Mathematical Functions**
- Drawing Contours**
- Displaying Three Dimensional Data**
- Business Graphics**

For all these routines, extra routines are available to allow user control of:

- axes** both linear and log;
- tick marks** chosen automatically or supplied by the user;
- background grid** with any form of graticule;
- titles** above the plot or along the main axes;
- keys** in many different forms.

The NAG Graphical Supplement is now provided as a Fortran 77 package, making handling of text strings simpler and safer than with the previous Fortran 66 version. It is installed at RAL with the GKS interface, so that all devices accessible via GKS are supported, as listed in the **Computer Graphics Systems** leaflet.



Figure 1. Mercator Projection

### *RAL's own high level routines*

These routines, which cover many but not all of the facilities available in the NAG package, are provided for continuity but it is not recommended that new applications use them, with one exception. The RAL routines for map drawing have no counterpart in either NAG or GINO-GRAF and so should be used for all map drawing. For the other routines (data plotting, histograms, curve fitting and contour drawing), the NAG routines are more rugged, better documented and make better use of the graphics devices.

Versions of the library are available with interfaces to both the SMOG and GKS basic graphics packages; it is recommended

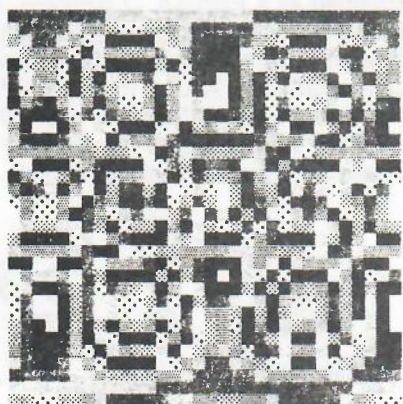


that the GKS interface is used wherever possible since this provides access to a wider range of devices than the SMOG interface.

The devices supported by the GKS version are listed in the **Computer Graphics Devices** leaflet.

### **Image Processing**

Work is currently in hand to provide general user facilities for processing and output of images. This will include facilities for continuous tone and screened output on the IBM 4250 and screened output on the Xerox 8700. At present, the CELL ARRAY function (Fortran 77 routine GCA) in the GKS basic graphics package should be used for output of image data. This provides grey-scale output on monochrome Sigma displays and colour output on colour Sigma displays. Simple support on the Xerox 8700 and IBM 4250 is also provided.



**Figure 2. Wollastonite Electron Micrograph**

### **GINO-GRAF**

This package, available only with the GINO-F basic graphics package, and installed in the same library as GINO-F, contains facilities for producing

- graphs,
- histograms,
- bar charts,
- pie charts.

There are both 'easy-to-use' versions and versions where the user can control the different aspects of the final plot - axes, border, labelling, titling - independently.

The range of facilities is much smaller than for the NAG Graphical Supplement, so GINO-GRAF should only be considered if the program is already using GINO-F.

The devices accessible to GINO-F and hence GINO-GRAF are listed in the **Computer Graphics Devices** leaflet.

## **Graphics Application Programs**

### **EZIPLLOT - data plotting**

This program uses commands to drive RAL's own high level graphics routines (see above) and produce graphs, histograms, contour plots and fitted curves. The latest version of EZIPLLOT uses GKS as the basic graphics package and so has access to the devices supported by GKS.

### **DRAFT - presentation graphics**

DRAFT takes commands typed by the user, or stored in a file, and produces diagrams suitable for use as slides, overhead projection foils or diagrams in publications. In addition to simple commands for drawing lines and text, DRAFT has a full repertoire of flowchart symbols and provides a large number of mathematical, musical, astrological, meteorological and other symbols.

The current version of DRAFT uses the SMOG basic graphics system and so is restricted to the devices supported by SMOG. DRAFT is being rewritten to use GKS so that the full range of RAL graphics devices can be supported.

## **Documentation**

The NAG Graphical Supplement is documented in its own manual: *Nag Graphical Supplement* which may be ordered from the Documentation Officer.

*The RAL Graphics User's Guide* provides information about RAL's own high level routines, including the map drawing routines.

Documentation of EZIPLLOT and DRAFT is primarily online, but small user guides are available from the Documentation Officer.

A large number of CMS HELP files exist for the graphics systems; a graphical HELP facility, using GKS as a basic graphics package, is currently being developed.

## **Further information**

For further information contact Chris Osland, Head of Graphics.

## **Figures**

- 1 GKS MAPS package, RAL 1986.
- 2 Wollastonite Electron Micrograph Simulation, after Oxford University (1983).



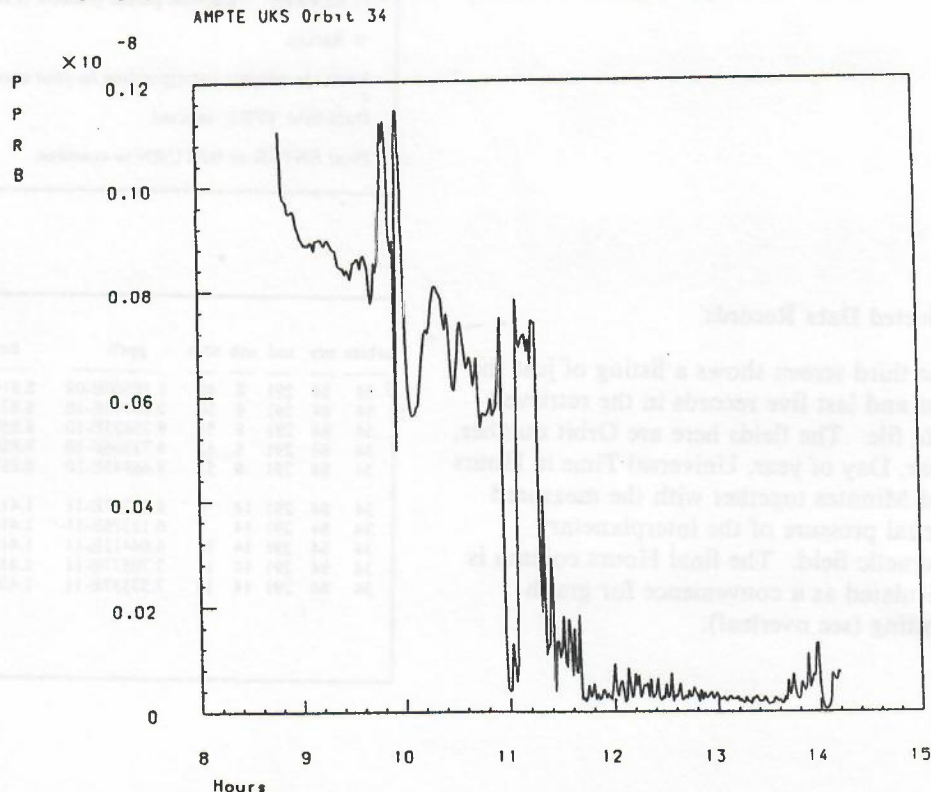
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The importance of establishing data archives is increasingly recognised. Scientific data now tend to come from large and expensive experiments and in great quantities. They must be organised and stored safely. More than that, a Data Centre must make its holdings easily available. Support for such initiatives is provided by Scientific Database Section in two ways: it is involved in establishing databases and also in ensuring the necessary software infrastructure.

Collaboration with scientists covers several areas of SERC research such as high energy physics and astronomy. However the major growth is in geophysics, as evidenced by the

work for the World Data Centre for Solar Terrestrial Physics, the NIMBUS remote sensing satellite archive and the AMPTE (Active Magnetospheric Particle Tracer Explorers) database.

Infrastructure support means the implementation and support of database management software, with original development where necessary. For example, the Section runs the IBM relational system SQL/DS on the central mainframe, while the creation of the R-EXEC data handling package offers a common environment for the Geophysical Data Facility component databases.



This graph from the AMPTE database shows how at around 11am the magnetic field partial pressure suddenly fell as the UK spacecraft crossed the magnetopause boundary.

Here are illustrated three examples of screen output from the MENU program which provides on-line access to the AMPTE database. A command driven interface may alternatively be used.

### UKS Summary Data Records

The first screen on the right shows options for selecting what data are to be retrieved and what is to be done with the result. The data may be listed, printed, plotted, or transferred (FTP) to a remote computer.

```

UKS Summary Data Records

1 Help/Information
2 Choose an orbit
3 Choose a measured data field
4 Retrieve records from the database
5 List first and last 5 records of retrieved data
6 Plot the retrieved data
7 Put the retrieved data in the file TEMP LISTING
8 List/Browse/Print/FTP the file TEMP LISTING

0 Return

Enter the number corresponding to your choice:
2

CHOOSE AN ORBIT

Enter orbit number (3 to 82):
34
    
```

### Choosing a Measured Data Field

The second screen offers a choice of the major data fields. (The complete summary data records have 159 fields altogether.)

```

Choose a measured data field

These quantities are measured at one minute intervals.

1 Help/Information
2 BT      Magnetic field strength (nT)
3 BEZ    Z component of magnetic field (nT)
4 PPRB   Magnetic field partial pressure (Pascals)
5 IDEN   Ion bulk density (cm**-3)
6 ITEMP  Ion bulk temperature (keV)
7 IPRES  Ion bulk pressure (Pascals)
8 IVEL   Ion bulk velocity (m/s)
9 ELDENM Electron number density (cm**-3)
10 ELTEMP Electron temperature (keV)
11 ELPRES Electron partial pressure (Pascals)

0 Return

Enter the number corresponding to your choice:
4
Data field 'PPRB' selected.

Press ENTER or RETURN to continue.
    
```

### Selected Data Records

The third screen shows a listing of just the first and last five records in the retrieved data file. The fields here are Orbit number, Year, Day of year, Universal Time in Hours and Minutes together with the measured partial pressure of the interplanetary magnetic field. The final Hours column is calculated as a convenience for graph plotting (see overleaf).

orbitn	uty	utd	uth	utm	pprb	hours
34	84	291	8	49	1.10560E-09	8.81667E+00
34	84	291	8	50	9.88993E-10	8.83333E+00
34	84	291	8	51	9.75825E-10	8.85000E+00
34	84	291	8	52	9.73306E-10	8.86667E+00
34	84	291	8	53	9.66945E-10	8.88333E+00
34	84	291	14	8	6.82327E-11	1.41333E+01
34	84	291	14	9	6.12376E-11	1.41500E+01
34	84	291	14	10	6.04411E-11	1.41667E+01
34	84	291	14	11	7.70577E-11	1.41833E+01
34	84	291	14	12	7.33337E-11	1.42000E+01



# ATLAS CENTRE

# Office Automation Examples using PROFS

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Office Automation is provided at RAL by IBM's Professional Office System (PROFS) running on the central computer.

## The PROFS Main Menu

The starting point for every PROFS user is the PROFS main menu. It shows a clock, monthly calendar, up to 8 functions which can be tailored to individual requirements and a typing area for commands. The blank space in the middle is for messages and reminders. There is a message showing that there is electronic **mail waiting** to be opened. There are 2 further main menus allowing 16 additional function choices. Shown below are examples of two of the most important OA functions.

```

RAL PROFS SYSTEM - MAIN MENU                                A00
Press one of the following PF keys.
PF1 Process schedules                                     Time: 11:53
PF2 Open the mail
PF3 Search for documents                                1986 JANUARY 1986
PF4 Process notes and messages                          S M T W T F S
PF5 Prepare documents                                  5 6 7 8 9 10 11
PF6 Process documents from other sources                12 13 14 15 16 17 18
PF7 Process the mail log                               19 20 21 22 23 24 25
PF8 Check the outgoing mail                            26 27 28 29 30 31
PF10 Main menu number 2                                Day of Year: 014
PF11 Add an automatic reminder                          PF9 Help PF12 End
----- Any problems, phone Service Line ext 6389 -----
=>
MAIL WAITING
  
```

## The PROFS Scheduling Facility

The PROFS scheduling facility provides every user with a personal diary and access to those of colleagues. This example shows the range of functions available. These include access to schedules for conference rooms, printing schedules and scheduling meetings between individuals. An example of this last function is shown overleaf.

```

PROCESS CALENDARS                                          W00
Calendar for: K. G. Jeffery
Calendar date: 25/07/86
Time: 10:34
Press one of the following PF keys.
PF1 Work with the day's schedule
PF2 Look at 7 days of the calendar
PF3 Look at the conference room schedules
PF4 Work with the next day's schedule
PF5 Work with the previous day's schedule
PF6 Look at the month
PF7 Schedule a meeting
PF8 Print 7 days of the calendar
PF10 Look at calendar main menu number 2
PF9 Help PF12 Return
  
```

## PROFS Mail

The PROFS Open-the-Mail facility provides a brief summary of each item of electronic mail that has been sent to the user. New items are highlighted and the subject descriptions if well chosen help to guide the user to the most important items. Formal documents have the registry or 'CRON' number attached. Notes (informal messages) have a date and time. The example over shows a typical note.

```

OPEN THE MAIL                                             C00
Press the PF key for the document you want.
-----FROM-----TO-----TYPE DUE DATE DOCUMENT NO.
PF1 Brown, J. NO DISTRIBUTION Draft 85350PRO0091
Subject: Attendance List for EPUG Meeting on 30 January
PF2 Nesta Jones JB --RLVM370 Note 14/01/86 11:13
Subject: ACCOMMODATION
PF3 Susan J. Mitchell, J.Brown Note 14/01/86 10:46
Subject: Nesta re EPUG visit
PF4 D. F. Parker Jed Brown Forward 14/01/86 11:11
Subject: Userid

Screen 1 of 1
To look at all of these documents, type ALL here and press ENTER====>
PF9 Help PF10 Next Screen PF11 Previous Screen PF12 Return
  
```

LOOK AT THE NOTE E01

From: ADM1 --RLVM370 Date and time 14/01/86 11:13:29  
 To: JB --RLVM370

From: Nesta Jones  
 Subject: ACCOMMODATION  
 Jed  
 Is accommodation being arranged in Amsterdam by the organisers? Or is everyone making their own arrangements independently? Where are you staying?

Nesta

cc: NJL --RLVM370

E N D O F N O T E

PF1 Alternate PFs PF2 File NOTE PF3 Keep PF4 Erase PF5 Forward Note  
 PF6 Reply PF7 Resend PFB Print PF9 Help PF10 Next PF11 Previous PF12 Return

### Reading a Note

The note about ACCOMMODATION was selected and displayed occupying the whole screen. A long note can be scrolled with PF10/PF11 and the other actions that can be taken are displayed at the foot of the note. The most usual practice at RAL is to Forward-the-Note to the sender with additional text at the beginning in the form of a reply. The next example shows this.

LOOK AT THE NOTE E12

From: ADM1 --RLVM370 Date and time 14/01/86 11:13:29  
 To: JB --RLVM370

From: Nesta Jones  
 Subject: ACCOMMODATION  
 Jed  
 Is accommodation being arranged in Amsterdam by the organisers? Or is everyone making their own arrangements independently? Where are you

PF1 Up PF2 Down PF9 Help PF10 Next Screen PF11 Previous Screen  
 FORWARD THE NOTE E11

Forward to: nl  
 From: Jed Brown PROFS System Manager  
 SERC PROFS name = JED F12/13, R27, x6609

-----  
 Subject: ACCOMMODATION  
 I expect to be able to finalise accomodation this afternoon! I will forward the details to you and the others then!

PF1 Top PF2 Bottom PF3 Erase line PF4 Add line PF5 Nulls Off PF6 Format  
 PF7 Send PF9 Help PF10 Next Screen PF11 Previous Screen PF12 Cancel

### Forwarding a Reply

Note that the original note is displayed in the top half of the screen which has been split into two independent halves. The top half can be scrolled up and down and the bottom half has other simple editing and formatting functions as well. The reply is sent by pressing PF7.

SCHEDULE A MEETING W06

Type the information below. Then press PF1, PF2, or PF3.  
 Starting date: 25/07/86  
 Ending date: 30/08/86  
 Amount of time needed: Hours 1 Minutes 0  
 Requested starting time: 10:00

Type one user name, conference room name, or distribution list name per space. To look at a schedule, place the cursor under the name and press PF4.

USER NAME	USER NAME
KGJ K. G. Jeffery	JB Jed Brown
_____	_____

PF1 Check calendars  
 PF2 Send a notice of the meeting without checking calendars  
 PF3 Schedule a recurring meeting without checking calendars

Screen 1 of 4  
 PF9 Help PF10 Next user names PF11 Previous user names PF12 Return

### Scheduling a Meeting

The meeting schedule facility can save a large amount of time and effort if a significant number of the participants keep PROFS schedules up to date. This example shows a meeting requiring 1 hour to be scheduled between 25 July and 30 August for two members of staff. A conference room could also be on the list. This would be appropriate where large numbers of staff are concerned or where a seminar was being arranged.

TIMES FOUND FOR A MEETING W07

Starting date: 25/07/86  
 Ending date: 30/08/86  
 Amount of time needed: Hours 1 Minutes 0

Choose a day and time by typing an X next to your choice below.  
 Change the starting and ending times as required and press ENTER.

CHOICE	DAY	DATE	STARTING	ENDING
-	Tuesday	29/07/86	12:00	17:10
-	Tuesday	19/08/86	10:00	17:10
x	Wednesday	20/08/86	10am	11am
-	Thursday	21/08/86	10:00	12:00
-	Thursday	21/08/86	14:00	17:10

Screen 1 of 1  
 PF1 Try another PF9 Help PF10 Next Screen PF11 Previous Screen PF12 Return

### Choosing a suitable time

The next screen shows all of the dates and times during which the two members of staff were free. One of these has been chosen and the exact times specified. A note (not shown) is then generated and sent to all those involved.



Issued by User Support, Atlas Centre, Rutherford Appleton Laboratory, Chilton, DIDCOT, Oxon, OX11 0QX  
October 1986

## Introduction

The **Joint Academic Network (JANET)** was established by the Computer Board and the Research Councils to provide a single network with common standards which is accessible to any member of the academic community. The activity is now funded primarily by the Computer Board. The Atlas Centre provides accommodation and support. The intention of the activity is that the provision of a single network shall allow academics to use distant computing resources and to share information easily.

JANET now covers all Universities, most Research Council Establishments and many Polytechnics.

Before JANET was set up individual sites used different methods of connecting computers to networks and different software to do so. It was seen to be important to coordinate the evolution of networking in the academic community and to encourage the development of common standards. To help achieve this, the Computer Board and Research Councils' **Joint Network Team (JNT)** was set up in 1979.

The main activities of the JNT are to:

- ensure the adoption of common standards for data communications throughout the academic community;
- identify requirements for products conforming to these standards and to instigate development projects to provide them, where necessary;
- assist sites in planning the installation of equipment, particularly local area networks, to the new standards and in procurements to ensure that new computer systems can be connected;

- stimulate moves towards general interconnectivity and unified communications throughout the community.

The **Network Executive** was established in 1983 with the task of integrating **wide-area communications** to provide the single X.25 packet switched network which is now called JANET. The Network Executive is responsible for the planning and overall management of JANET. Both JNT and the Network Executive are responsible to the Director of Networking. The Director reports to the Network Advisory Committee, a body set up by the Computer Board to monitor these activities.

## Protocols

A set of protocols has been developed known as the 'Coloured Books'. These define the way in which terminals or computers must communicate with each other. The functions supported are terminal access, file or mail transfer and job shipment. These are a UK interim set of protocols. The intention is to migrate as soon as possible to the Open Systems Interconnection (OSI) standards defined by the International Standards Organisation (ISO).

## Layout of JANET

The links of JANET are telecommunication lines provided by British Telecom. Some work at 9.6 Kilobits per second (Kbps) and some work at 48 Kbps. The trunk lines link packet switching exchange computers (PSEs) at 10 sites. These PSEs are supplied by GEC and run manufacturer-supported software. Host computers at academic sites are connected to the JANET PSEs either through local networks or directly. A user with a terminal connected to a local host or

a network PAD can therefore gain access to any other host connected to JANET.

The diagram below shows the main PSEs and trunk lines of JANET.

### Management structure of JANET

A number of user groups have been set up which meet regularly. These are based partly on region and partly on subject. These groups then nominate representatives to a National User Group, whose Chairman is ex officio a member of the Network Advisory Committee.

Each JANET switch is housed at a Network Operations Centre (NOC) which is responsible for the operation of the switch, for fault tracking/fixing and for other routine matters. Each site which is connected to JANET is responsible for

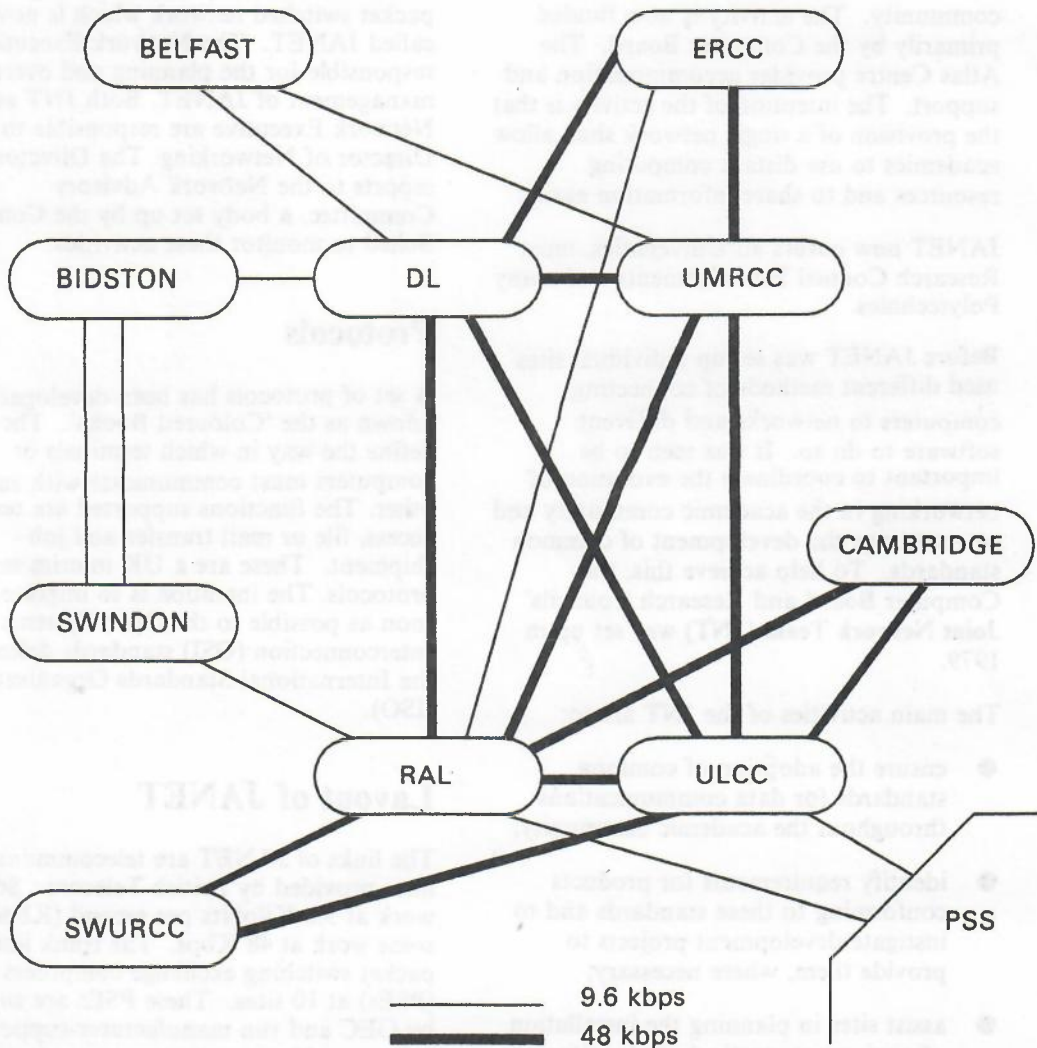
connecting the JANET link to its own local network.

### Sites outside JANET

Access to sites outside the scope of JANET is achieved by use of the public data networks both within the UK and internationally. There are two gateway computers, at RAL and ULCC, which allow access to British Telecom's **Packet Switched Service (PSS)**. Use of the public data networks costs money and the use of these services from JANET therefore has to be controlled.

There are also gateways between JANET and EARN (at the Atlas Centre), ARPANET (at UCL), and EUNET (at University of Kent). These allow communication between computers connected to JANET and those connected to many other networks both in Europe and America.

## JANET TRUNK CONNECTIONS





## Introduction

There are 3 main development projects being carried out by the Development Group of Central Computing Division:

- the support of IBM Personal Computers;
- the development of network products;
- the undertaking of small hardware projects.

## IBM Personal Computers

The **IBM Personal Computer (IBM PC)** has become popular mainly as a result of the very large amount of software which is available for it. To allow advantage to be taken of the PC as conveniently as possible the Development Group provides a service which includes:-

- providing pre purchase advice;
- organizing discount arrangements with suppliers and ordering equipment;
- assembling PCs, delivering them to users and giving some tuition;
- arranging maintenance and responding to requests for help.

To aid this work the group has investigated a large number of software products and can demonstrate them to clients. In addition various PC 'look alike' machines have been evaluated as well as hardware additions from various sources. A number of software developments have been undertaken mostly to provide utilities of common interest.

The development of products from manufacturers has been very rapid and it has not been wise to develop any applications packages as it would be difficult to match the quality of

manufacturer supplied items and would demand a continuing maintenance activity. The one exception has been the development of code to allow the PC to emulate the 3270/CIFER.

A few presentations have been arranged for suppliers to demonstrate their wares. These have been popular and led to a number of orders. Nevertheless the group provides services rather than actively attempting to advocate their use.

## The Development of Network Products

Currently the main activities are:

- development of the IBM 'Coloured Book' communications products;
- support of the EARN to JANET gateway;
- local area network development;
- support of RSCS communications.

The '**Coloured Book**' communications products provide one of the main access routes to the IBM computers. There are many desirable enhancements still to be done and also a demand for better quality services. One major activity just completed is the introduction of the Amdahl 4705 Communications Controller. Another activity, the introduction of the Name Registration Scheme, is currently being carried out. Shortly Job Transfer and Manipulation Protocol will need to be provided to match developments elsewhere in the JANET network. In the future the migration of JANET to use ISO protocols will demand effort.

Rutherford provides a gateway between the **European Academic Research Network (EARN)** and the **Joint Academic Network**

(JANET). This provides cheap access from UK academic institutes to similar ones in Europe, the USA, and many other parts of the world. The group is developing this gateway and taking an active part in the administration of EARN. EARN is committed to migrating to using ISO protocols and the group expect to take a similar part in this work which is closely associated with the migration activities of JANET.

High speed local area networks are still in an immature state and the group is engaged in small scale projects to provide special services and to maintain expertise. There are two principle projects. The first is to connect the IBM computer to the HEP VAX via an Ethernet to allow data from magnetic tapes on the IBM machine to be used by the 370/E processors on the VAX. The second project is to investigate Ethernet connections into IBM PCs and a number of products are being evaluated. An additional activity is investigating maintenance aspects of Ethernets and evaluating various monitoring tools.

Support of the RSCS communications is needed as there are many such connections needed to provide services to remote IBM equipment. In addition EARN uses these protocols.

## Hardware Development

An electronics workshop has recently been set up to undertake small projects mainly in the communications area. Current projects include a monitoring system for high speed communications lines. A system for allowing a teacher to interact with a class sitting at terminals has been completed recently. The group has a strong interest in hardware standards, and projects in the future will attempt to use standards advocated by CERN in their PRIAM project. It is hoped to make available the PRIAM software on one of the computers with a view to making it available SERC wide and so encourage hardware standardization.