

## Newsletter of the SERC Central Computing Facility

No. 28 October 1982

### 1. REPORT ON THE SYMPOSIUM ON 3D-COMPUTER GRAPHICS RUTHERFORD APPLETON LABORATORY - 29 JUNE 1982

200 people made their way to RAL on 29 June for the Symposium on 3D-Computer Graphics in spite of the National Rail Strike on that day. The Symposium was jointly organised by the recently formed UK Chapter of the European Association for Computer Graphics (EUROGRAPHICS) and RAL. The author of this report has to declare an interest in that he is Secretary of the UK Chapter!

The Symposium consisted of 6 talks, commencing with an excellent overview paper by Mr Kilgour of Glasgow University. Almost every major application of computers, and computer graphics is no exception, requires the construction and manipulation within the computer of a model representing some entity or artefact in the outside world which is being designed or analysed. One of the major contributions of the graphics standards movement has been to make a clear distinction between viewing and modelling. The former is concerned with the generation of a picture from an internal model and the latter with construction of the model itself. However, many of the techniques and transformations needed for viewing are equally useful in modelling.

Mr Kilgour then considered the various types of picture format which depend on the kind of output device to be used. For a refreshed cathode-ray display (or raster display accepting vector commands) the output format is expressed in terms of vectors. The stages in the graphical output pipeline include transformation of the geometric model to 3D edge format, application of the viewing transformation to generate normalized 2D vector format, then transformation to device specific 2D vector format. Much of the 3D graphics is concerned with the specification and implementation of the viewing transformation.

There is a major alternative picture format to be considered, namely in terms of polygonal faces or facets. This kind of format is essential if realistic, solid-looking images of 3D objects are to be generated, (eg the recent Horizon Programme on Computer Graphics), with proper hidden-surface removal. Display of such images is effectively limited to raster-scan type devices.

The graphical output pipeline in this case includes transformation of the geometric model to 3D facet format, application of a viewing transformation to produce a sorted 2D facet format, and raster conversion to raster (frame store) format. Several

Board	MT	ELECTRIC	CMS
	195hrs	AUS	AUS
ASR	220	225	281
Engineering	395	160	331
Nuclear Physics	3561	1369	1520
Science	472	384	507
Central Funding	126	264	3729 *
MERC	80	54	170
External	64	65	151
Overheads	-	-	339
TOTAL	4918	2521	7028

\* These entries include some usage due to "service" functions which are strictly an overhead and should be accounted separately.

### ICF SYSTEMS

#### AU USAGE BY BOARD - periods 8204-8210

Board	Pr-time	GEC	DEC-10	TOTAL
ASR	129	155	35	320
Engineering	6761	2273	4378	13413
Nuclear Physics	109	121	0	231
Science	365	401	662	1429
Central Funding	4334	934	779	6049
System Overheads	8081	208	1406	9696
External	265	177	111	554
TOTAL	20044	4269	7371	31692

### 11. DIARY

#### USER MEETING

10 Nov 1982 - Decsystem-10 Users Committee meeting at 10.30 am  
James Clerk Maxwell Building  
King's Buildings  
Edinburgh

#### IBM PREVENTATIVE MAINTENANCE DATES

Routine Preventative Maintenance will take place on the following days from 1800 - 2200 hours. Login messages on the ELECTRIC and CMS services will be issued prior to each maintenance session.

18 Nov 16 Dec

#### FORTHCOMING EVENT - SERC Computing Summer School

An intensive two-week residential Summer School will be held at The Cosener's House, Abingdon, from 11 - 22 April 1983, on the theme "Good Practices in the Production and Testing of Software". It is restricted to SERC staff, SO/HSO, who have a science degree or equivalent and who spend more than half their time computing. Application forms will be available through the Establishment later this year, but if you are interested please contact R E Thomas, Computing Division, Rutherford Appleton Laboratory and you will receive a form direct. Places are limited to 20.

### 10. COMPUTER STATISTICS

IBM SYSTEMS 9/8/82 - 5/9/82 (1)  
6/9/82 - 3/10/82 (2)

Weekly availability is uptime/168.

SYSTEM AVAILABILITY - % of 672 hrs available

MT - 94.7%, CMS - 98.5%, ELECTRIC - 92.5% (1)  
MT - 91.3%, CMS - 98.6%, ELECTRIC - 90.1% (2)

#### MT THROUGHPUT

Average jobs/week 10475 (1) 10734 (2)  
Average CPU hrs/week 227 (1) 207 (2)

#### TERMINAL SYSTEM USERS

CMS ELECTRIC  
Registered users 844 1236 (1)  
Active users 338 415 (1)

Registered users 869 1226 (2)  
Active users 412 424 (2)

#### SERVICE LEVELS

Percentage of prime shift short jobs not turned round inside guideline:

MT Batch (1) Core size P12 P10 P8

0 - 210k 4.0 20.0 3.7  
212k - 350k - 2.3 1.3  
352k - 560k - 4.5 1.3

MT Batch (2) 0 - 210k 5.9 11.9 3.1  
212k - 350k - 6.2 3.2  
352k - 560k - 1.5 1.2

#### TERMINAL SYSTEMS

Response to trivial command during peak period:

CMS Week 1 Week 2 Week 3 Week 4 (1)  
% < 1 sec 92.1 98.8 96.5 97.0  
% < 3 secs 99.7 99.9 99.8 99.8

ELECTRIC (1)  
% < 2 secs 89.8 97.7 98.1 97.9  
% < 5 secs 95.6 99.0 99.5 99.0

CMS Week 1 Week 2 Week 3 Week 4 (2)  
% < 1 sec 96.4 95.6 95.0 97.9  
% < 3 secs 99.6 99.7 99.2 99.4

ELECTRIC (2)  
% < 2 secs 97.3 98.7 95.5 97.7  
% < 5 secs 98.7 99.5 97.9 99.0

#### USAGE

Cumulative totals are for current financial year - 26 weeks to date.

Impressive. Techniques for texturing smooth surfaces (recall the synthetic strawberries and oranges produced by Blinn) have also advanced apace.

A problem besetting raster graphics at all levels is the so-called aliasing problem, manifested in its simplest form in the stepped appearance of straight lines on low resolution raster displays. It is possible, while not increasing the resolution of the display, to sample the scene at higher reduction and then use an averaging technique to compute the intensity at each picture point from a set of neighbouring high-resolution sample points. Much research remains to be done on the most effective and economical means of anti-aliasing (as the technique is known) complex scenes but at least one manufacturer now offers a raster display with hardware anti-aliasing of straight lines.

The final section of this talk was concerned with solid modelling (commonly known as geometric modelling). The approach most often taken is known as 'constructive solid geometry' in which a complex object is expressed as a combination of simpler objects, using the set operations of union, intersection and difference. Considerable effort has been expended to provide a solid theoretical foundation for this approach.

Mr Kilgour kindly produced a written version of his presentation which is printed in Vol 1, No 3 of the EUROGRAPHICS Journal, Computer Graphics Forum. Copies of this will be sent in due course to everyone who attended the Symposium. A limited number of spare copies is available from Dr D A Duce at RAL.

The other 5 talks will be summarized in the next issue of FORUM.

D A Duce - Applications Group

## 2. SERC TOWN MEETING

The SERC held a 'Town Meeting' on the subject of SERC Computing Facilities on 3 September 1982 at Imperial College.

The academic community, through the Vice Chancellors of all UK universities, major London Colleges and Principals of most Polytechnics, was invited to send representatives of those disciplines and services having a strong interest in the type of facilities SERC provides for research support. The audience of about 270 contained most of the Directors of University and Polytechnic Computing Centres, their Computer Managers and a broad range of academic users, some of whom currently have access to SERC facilities.

The meeting was opened and chaired throughout by Dr Geoff Manning, Director Rutherford Appleton Laboratory and SERC Computing Coordinator. He set the scene by stating that the meeting should:

- a) provide the community with information about SERC Computing Policy, current facilities and future planning.
- b) obtain comments from the community about these issues for input to SERC's own policymaking bodies.

The SERC was aware that with a diverse and large community of direct users and interested parties (such as academic computer centres) there were problems with getting this kind of two-way flow of information using existing mechanisms (newsletters, joint committees, etc).

The meeting was organised as a series of talks. After each talk there was a period for discussion led by a spokesman from the community with some experience of the management of SERC or Computer Board facilities. The final session was devoted to general discussion and a summary of the major comments and conclusions was presented by the chairman.

### Chairman's Summary

From the SERC viewpoint Dr Manning thought that the 'Town Meeting' had been useful. There seemed to be have been good representation from most universities and polytechnics, covering the full range of interests. He hoped that the right sort of information had been put over and thanked the speakers and audience.

The major points arising from discussion were:

- a) There was a strongly felt need for a better interface with the Directors of Computing Centres and the IUGC, particularly concerning SERC policy decisions and provision of Distributed Systems and facilities.
  - b) There was scope for better co-operation and collaboration with universities and the Computer Board on the purchase of hardware and software.
  - c) There was pressure from the community for SERC to pay for computer charges at the National Centres for approved projects.
  - d) There was concern about the arrangements for the CRAY.
  - e) The policy of decentralisation and use of Distributed Systems should be extended.
  - f) There was encouragement for standardisation of software.
  - g) There was encouragement for coordination activities of the type supported by Information Engineering Committee and their scope could be expanded beyond pure research into development and validation areas.
  - h) There was support for the idea of a Common Base Policy, though some felt that SERC should choose a second computer of much lower price so that the policy could be extended.
  - i) There was concern about any move away from PSS compatibility and encouragement to make greater use of it.
- Dr Elizabeth Barracough, on behalf of the IUGC, thanked the SERC for arranging the meeting.

J Brown - User Interface Group

### 3. PLANS FOR THE RUN-DOWN OF ELECTRIC

The lifetime of ELECTRIC should not be longer than that of MVT because:

- (a) ELECTRIC needs to run under MVT and we would not wish to continue supporting MVT just for ELECTRIC.
- (b) There are no plans to implement job submission from ELECTRIC to CMS.

Assuming 18 months to 2 years from June 1982 for the development of a production MVS system means that the changeover from MVT to MVS will take place during 1984. The following notes discuss the run-down plan.

### Effort

There are no problems in maintaining the ELECTRIC service for another 18 months. It requires very little operational knowledge and minimal systems support although consideration will be given to switching off the cache.

The user advisory service will be reduced gradually and users should expect the level of support to drop. User Interface Group are already adopting a policy of not training new people to handle ELECTRIC problems.

However, many users will be faced with a considerable amount of work in transferring their files to CMS. Computing Division personnel, particularly User Interface Group and Systems Group, will devote as much time as possible to helping users with this transition.

### Filestore

The on-line filestore will continue to be available from CMS via CMSELEC after ELECTRIC closure, albeit in read-only mode. This will allow users to copy files into CMS using the group edit facilities but the ELECTRIC files will be 'frozen' and not able to be altered in the ELECTRIC filestore.

There should only be a problem in cases where users have built up complicated edit file structures as other files can be transferred to CMS without any difficulty.

The archived filestore will not be directly accessible from CMS but some method will be provided for moving archive files to CMS. Users are encouraged to restore archived files before the closure date. To achieve this users will have to delete a lot of files from the on-line filestore.

Resource Management have started to contact users who have transferred completely to CMS so that their files can be deleted from ELECTRIC. This can be achieved without much effort provided that all the files in a user's tree structure below the main directory can be deleted. This will allow some small increases to be made to space allocations in the on-line filestore.

Archiving will be stopped well in advance of ELECTRIC closure and only restoring from the archive filestore will be allowed.

The implementation of XPLANT in CMS makes it very much easier to transfer, especially if a method of

automatic conversion of ELECTRIC edit files to XPLANT files can be provided and this will be investigated. It has been agreed that the XPLANT documentation currently available is not adequate, particularly for new users of XPLANT, and a more 'user friendly' version will be written.

### Graphics

The graphics filestore, including pictures and routed lineprinter output, does not present any problems as these files are deleted automatically if they have not been accessed for a week. In other words they are regarded as temporary files and users would not expect to retain access to them after ELECTRIC closure.

The only exceptions to this are archived picture files which cannot be accessed from CMS. It may be possible to convert these files to a format suitable for CMS and copy them into the CMS graphics filestore. This is being investigated.

### Other considerations

The number of simultaneous users will not be altered as this is controlled by the allocation units. However, the number of PACX slots and network connections to MAST will be reduced gradually and transferred to CMS.

File transfer and the use of ESEND/ELDIRE will cease when ELECTRIC closes.

### Timescales

- 3Q 82 - All users have access to CMS.
- 2Q 83 - Prevent further archiving, allow restore only.
- 4Q 83 - Close ELECTRIC service at the end of the calendar year.

Continuing activities during these 18 months:

- (1) Remove files of users who have transferred all files to CMS.
- (2) Transfer PACX and network slots to CMS.
- (3) Provide utility to convert ELECTRIC edit files to CMS XPLANT files.
- (4) Provide as much help as possible to move users to CMS particularly any 'difficult' cases.
- (5) Give frequent publicity to changes in the service and any changes in the planned timescales.

T G Pett - Systems Group

### 4. IBM 3081D PERFORMANCE

Any users whose programs run slower on the 3081D than on the 360/195 should contact Dr M R Jane, ext 5408. Every effort will be made to compensate users for any problems resulting from this.

M R Jane  
Head of Resource Management and Communications

## 5. CMS RECOVERY AT ASCII TERMINALS

"It started printing this enormous file and I could not stop it. I even switched my terminal off but when I logged in again it still poured out".

There is no standard solution to this problem. Not only do people use a variety of systems (CMS, ELECTRIC, GEC, PRIME, etc.) but access them in a variety of ways (Network, Rutherford PACX, distant PACX, and direct communication including dedicated screens).

When a user logs in to a computer service, several processes are brought into operation. A terminal driver controls the keyboard and screen, appropriate network processes transmit text, the operating system sends and receives data, delivering it to the appropriate task such as the command processor, an editor, or a user program running interactively. Under normal circumstances traffic proceeds smoothly but certain problem conditions can arise, such as:

- (a) interrupting output in order to regain control of the dialogue;
- (b) loss of synchronisation in the dialogue;
- (c) terminals that go dead;
- (d) terminals treating what you type as data;
- (e) characters that cause strange effects;
- (f) problems following time outs;
- (g) not being able to login after losing contact.

This article discusses these problems as they pertain to a CMS user working at an ASCII terminal, either via a network call across SERCNET or via the Rutherford PACX. (Users making PACX calls to a MUM followed by a network call should regard themselves as SERCNET users.) Users of other systems may recognise some of the problems discussed here and the general principles used here may help them. The article excludes IBM3270 equivalent screens, partly because the trouble shooting methods are different and because they are adequately discussed in "The CMS Terminal User's Guide".

### Interrupting Output

Unfortunately typing NO (or HX or anything else) after a MORE message is no good. If you have logged into CMS via SERCNET, you can generate a suitable interrupt by typing @Y. (If the call enters SERCNET from another network then an additional @ will be required). When CMS responds with a . prompt, you should type HX which will halt your output after clearing a few more buffers. The rules for breaking in at the terminal will depend on the local system but most systems, including GEC and PRIME, display what the system sees of your typing. If continuous output is being produced on a PRIME such that you cannot type @Y you should use Control-P to produce a CMS interrupt.

If your call is via the Rutherford PACX, you may generate the CMS interrupt by typing two successive Control-F characters. (CFER terminals with a CMS BREAK key may use that key for this purpose). Do not use the BREAK key as that will disconnect your terminal. After receiving the . prompt you should type HX as above.

If you get into a situation where you are unable to induce the . prompt but merely get the i character to denote attention, your virtual machine probably needs to IPL CMS. You should break the network

connection (by @Q) or the PACX call (using the BREAK key). If you login again before the timeouts take effect, you will be told that you have been RECONNECTED. Do not make the mistake of typing BEGIN because that will return you to the same problem condition that you left. What you should type is IPL CMS and you should then be able to proceed as if you had just logged in.

### Loss of Synchronisation and Dead Terminals

ASCII terminals display a . prompt character to indicate that input is expected from the user. Whenever a command (in its most general sense) is typed by the user, a period elapses during which replies are sent to the terminal followed by another prompt. Once that prompt is displayed, with the exception of operator warnings no further replies can be sent and that applies to system broadcasts, user messages and the notification of spool file arrivals. Thus to bring a 'dead' terminal to life it may be sufficient to input a null line which will release any queued output. This is a feature of ASCII terminals only and does not apply to full screens unless they are in an input mode. Users have some control in EXECs about delaying the appearance of the . prompt by making use of the SLEEP command.

When CMS commands or programs take longer times to execute there is no . prompt displayed at an ASCII terminal. If you type when the terminal is in this state, the first character will act as an Attention Key. This will cause an ASCII prompt and unless you have specified otherwise what you type thereafter will be processed by CP. If you had typed prematurely then you can resume the execution by typing BEGIN. On the other hand you may stop the execution by entering the Debug submode. First you type EXT causing the system to reply DEBUG ENTERED and EXTERNAL INTERRUPT. You should then type HX which will return control to CMS. It should be added that some commands do not recover properly from this situation and in such situations an IPL of CMS will be required. (It was assumed in the above that the terminal had not been timed out due to a visit, phone call or taking too long referring to something).

### The Terminal Treats what you Type as Input Data

User programs which accept input data from terminals would process instructions such as HX as data. To recover from loops in programs and EXECs you should proceed as follows. (Network users may type @Y which will induce another . prompt after which they may type HX as before). The general method which works for either type of connection makes use of the CP lined character. (This has the default value of & sometimes appearing on keyboards as dollar or pound but usually as upper case shift 3. Users may redefine it by the TERM command from the keyboard or in a PROFILE EXEC. In that case substitute the appropriate character). If you type &CP EXT you will receive the replies DEBUG ENTERED and EXTERNAL INTERRUPT. You may then type HX to return to CMS.

### Lost Characters

Symbols not People! Problems arise because certain characters are used to control terminal input and network calls etc. They are sometimes referred to as logical line editing symbols. Users who are unfamiliar with their use may be puzzled why characters such as & @ \ " and maybe others appear

to be ignored or induce strange effects. It is important in that case to read again the account of logical line editing symbols in the CMS User's Guide and to check what characters are in force for your virtual machine. (Section C of the User Reference Manual also contains explanations). Use the CP command Q TERM to display what characters are in force.

However, the situation is worse than an innocent user might imagine. Not only does CP (the control program which accepts the input) perform logical line editing but so do various utility programs notably XEDIT. In some cases the same characters are used but not always. In XEDIT, Q ESC will display its Escape character. For example the default line delete character of CP is & which can be changed or suppressed using the TERM command. However XEDIT also uses & as its lineend character except when in input mode. Thus even if CP has LINEEND OFF, you can type things such as TOP&C/A/K/##&FO&IT&9 but had XEDIT been in input mode and CP LINEEND been OFF this would be all one line. Turning CP LINEEND ON would present four input lines to XEDIT.

**Problem:** How does one edit & characters that are in a CMS file without retyping entire lines?

**Answer:** First switch off the CP LINEEND by typing CP LINEEND OFF. Then switch off XEDIT lineend after entering XEDIT by typing SET LINEEND OFF. (Alternatively you could define some other character as the lineend symbols. This is safer because if you have LINEEND OFF you would be unable to use &CP EXT if needed later). This is a simple recipe for users who are unfamiliar with the use of Escape characters.

Many users have experienced difficulty due to the above, but if you really wish to make trouble for yourself you can introduce character translation using the CMS commands SET INPUT and SET OUTPUT.

Networking adds the further complication that lines which begin with the @ symbol will be regarded as network control commands. For example @Y generates an interrupt and @Q a disconnection. To overcome this an additional @ (which the network call will remove) should be provided to ensure transmission. Users making calls involving more than one network may need further such prefixes.

Network users should also familiarise themselves with local editing conventions of the terminal driver. For example, GEC 4000 machines interpret Backspace (Control-H) locally but that may be suppressed by typing ?S. (On such machines any text involving ? is likely to be processed by the local terminal driver).

### Problems Following Timeouts

Both SERCNET and PACX operate timeouts which close a call after about 10 minutes inactivity. It is untrue to say that CMS logs you out, it disconnects you. If you do not login again within 15 minutes of the disconnection (ie about 25 minutes since the last transaction), the system will then log you out. Subsequent logins will IPL your machine as normal.

If you login within the 15 minute period CMS reconnects you. After replying to the LOGIN, CMS will not execute your PROFILE EXEC. What you type will be processed by CP. (If you input a null line

here you will receive the reply CP which confirms this). You may type BEGIN to re-enter CMS and resume your previous activity. However, the page and line lengths will now have the default values of 0 (giving continuous printing) and 72. Alternatively you may type EXT to enter the Debug submode, followed by HX to halt the previous activity and enter CMS. Another choice following reconnection would be to IPL CMS followed by PROFILE to reset your page size etc.

### Not being able to Reconnect

This happens sometimes if the network or PACX signals induced by a broken connection are not received by CMS. When you attempt to LOGIN the system denies you access because the previous login is still in force. You may overcome this by supplying an additional parameter, DISC with your LOGIN, for example

LOGIN userid password DISC

On rare occasions problems occur with the operating system VM, which cannot be overcome by the above form of login or by the normal timeout mechanisms. In such cases operator intervention is required. This can be arranged through the PAO or, outside prime shift, through the shift leader.

P J Hemmings - User Interface Group

## 6. CLOSURE OF \*\*\*

UCL have announced that the PDP9 which provided ARPA access via the MAST address \*\*\* ceased operation on 1 October 1982. Users not already using the recommended route via a network call to ZUXA should do so straightaway and refer to the September issue of FORUM (27).

P J Hemmings - User Interface Group

## 7. INDEX

The following is a list of articles taken from issues 23, 24, 25, 26 and 27 of FORUM and mainly of interest to IBM users.

- 23.3 Tape Library and TDMS news
- 23.5 IBM User Representative Meeting - 17/3/82
- Supplement to Forum 23 -
- 24.2 Computing Services Survey 1981-82
- 24.7 Questions raised at CCR meeting - 17/3/82
- Supplement to Forum 24 -
- 25.1 CMS Users Command List and useful hints
- 25.2 Questionnaire results -
- 25.3 List of worst cases
- 25.2 Central Computer Replacement
- 25.3 MVT Batch Usage
- Supplement to Forum 25 -
- 26.1 Tips on how to write XEDIT macros
- 26.1 CCR meeting notes - 8/7/82
- 26.2 Questions raised at CCR meeting - 8/7/82
- 27.4 M&G Mark 9 Library
- 27.6 PASCAL/VS
- 27.7 IBM Systems Channel Configuration

8. IMPROVED CENTRAL COMPUTER INTERACTIVE SYSTEMS  
STATISTICS

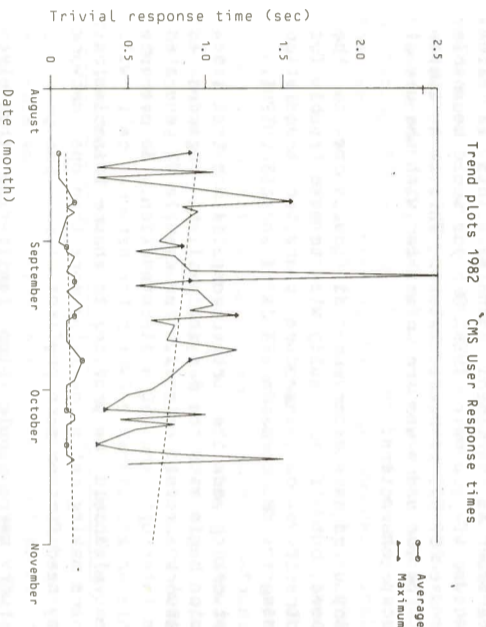
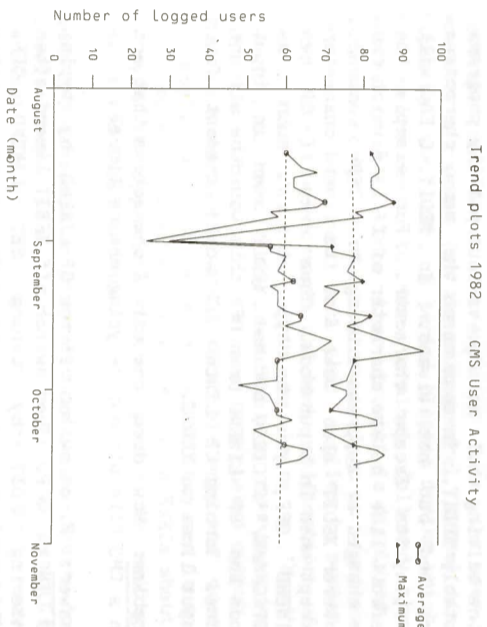
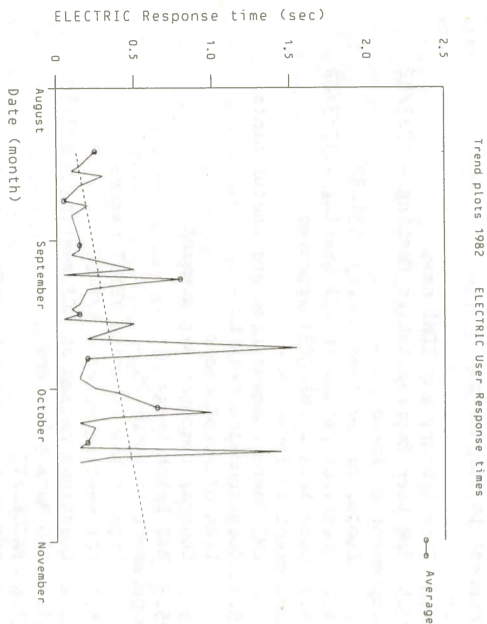
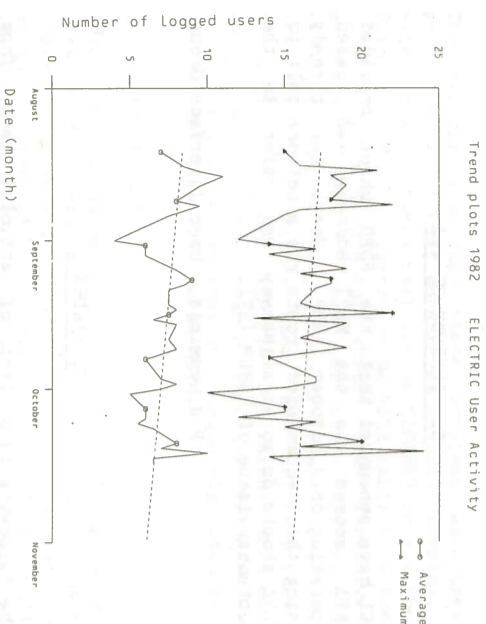
The current terminal system response and usage statistics do not provide an adequate view of the performance of the interactive systems on the central machines.

The following usage graphs show the average and maximum number of users logged-on to the ELECTRIC and CMS systems. The response graphs for ELECTRIC show the average time taken by a command and for CMS show the average and maximum time taken for a trivial command. A trivial command is one which does not use the whole of its initial timeslice. Each graph has a dashed trend line drawn by using a least squares fit to the available data.

The data from which these graphs are calculated is collected from 08:30 to 17:00 on Monday to Friday of each week. The data will be presented for the current month and the previous two months to enable the trend line to present a picture not unjustifiably distorted by public holidays etc.

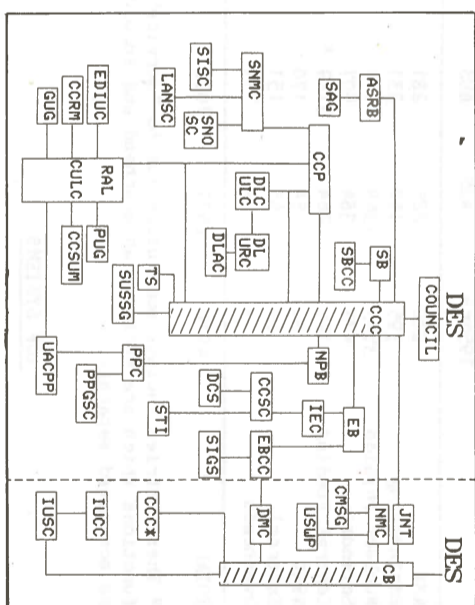
It is thought that these graphs will give a better representation of the use of the central machine interactive systems.

A P J Lobbey - Systems Group



9. COMMITTEES CONCERNED WITH COMPUTING  
IN SERC AND COMPUTER BOARD

The following list and diagram shows the many formally constituted bodies within the SERC and the Computer Board for Universities and Research Councils which are principally concerned with computing. Where those bodies have delegated powers of spending (SERC money), their limit is given in brackets in units of K£s.



SERC CENTRAL COMPUTING

- CCC Central Computing Committee (300). Reports to council of SERC. Membership includes the Computing Coordinator and representatives from: Boards, User Liaison Committees, Joint Network Team, Network Management Committee
- CCP Computing Coordinators Panel. Reports to Directors Committee. Membership includes Laboratory heads of Computing Divisions.
- SNMC SERC Network Management Committee. Reports to Coordinator. Coordinates Network within SERC. Subcommittees are: SERnet Implementors Sub-Committee Local Area Network Sub-Committee SERC Network Operations Sub-Committee
- LANSC LANSC Local Area Network Sub-Committee
- SNOSC SERC Network Operations Sub-Committee
- DLUCULC Daresbury Computer User Liaison Committee. Representatives of user of DL. Reports to Coordinator. Membership includes:
  - RALCULC Rutherford Computer User Liaison Committee. Representatives of users of RAL. Reports to Coordinator. Membership includes:
    - EDIUUC Edinburgh Decsystem-10 Installation Users Committee
    - CCRM Central Computer Representatives Meeting (Batch + CMS)
    - GUCG Prime User Group
    - PUG Central Computer Site Users Meeting (Representatives from RAL on-site users)
  - TS Technical Sub-Committee. Set up as required by CCC to study technical details.
  - SUSSG Single User System Steering Group. Set up by CCC to control the provision of Single User Systems (eg PERQS)
- SCIENCE BOARD
  - SB Science Board (300). Advice on computing matters handled by:
  - SBCC Science Board Computing Committee.

ASTRONOMY SPACE AND RADIO BOARD

ASRB Astronomy, Space and Radio Board (300). Starlink computing is handled by: Starlink Advisory Group. Other computing matters dealt with by board, based on advice from its Committees.

NUCLEAR PHYSICS BOARD

NPB Nuclear Physics Board (300). Board relies on advice from Scientific Committees such as:
 

- PPC Particle Physics Committee (200) and its subcommittees, including:
  - UACPP User Advisory Committee on Particle Physics
  - PPGSC Particle Physics Grant SubCommittee

ENGINEERING BOARD

EB Engineering Board (300). ICF Applications Software is handled by:
 

- EBCC Engineering Board Computer Committee (200) deals with SERC DAP and has a number of:
  - SIGS Special Interest Groups

Other Computing is covered in a number of different Committees especially the:

- IEC Information Engineering Committee (200) which has:
  - CCSC Computing and Communications Sub-Committee (100) which includes:
    - DCS Distributed Computing Systems (50) and
    - STI Software Technology Initiative Panels

JOINT COMPUTER BOARD COMMITTEES

There are three joint bodies with the Computer Board:

- JNT Joint Network Team. Responsible for University and Research Council Network Standards
- NMC Network Management Committee. Responsible for proposing the joint Universities/Research Council Academic Network. Subcommittees are:
  - CMSC Common Management Study Group
  - USWP User Specification Working Party
- DMC DAP Management Committee. Responsible for coordinating the work done on QMC DAP.

COMPUTER BOARD

The Computer Board (CB) has two main advisory bodies:
 

- CCC\* Computing Consultative Committee. Deals with general policy and funding.
- IUSC Inter-Universities Software Committee. Advises CB on software. It is a subcommittee of:
  - IUCC Inter-Universities Committee on Computing which had no formal links with CB.

R F Thomas - Head of User Interface Group