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27th October 1981.

Mr. F. Woodburn,
Old College.

Dear Mr. woodburn, ,

Report on Computer Science VAX.

As you know, your letter of 26th August to Professor Michaelson suggested that he and Dr. Thomas would be presenting a verbal report on this matter. It was only at the last moment that I heard you were expecting a written report - and, furthermore, from me! However, recognising that this is a matter of importance and interest to your committee, I am sending this somewhat hasty report to you now, rather than delay and produce something more polished for a later meeting. I have put below a number of thoughts in the order in which they came into my head and follow them by a report from our VAX Manager, Mr. Allan Vernon.

Overall Opinion.

In my opinion, the VAX machine has been a most successful enterprise. For an initial cost of about £140,000 plus £20,000 of enhancements, we have a machine that provides a most valuable multi-access service. Dr. Gordon Burns had a vacation student bench-marking the system under ERTE during the summer. He reports that 32 CS1-type users on VAX appear to overload this system to about the same extent as 64 users do on a single 2972 or 128 users on a twin 2972.

Management.

The system is managed virtually single-handed by Allan Vernon, a Departmental Computing Officer (C.O.2 in ERCC terminology). He is in charge of the service, the hardware and supervises the importing of software. In his absence, this duty is taken over Paul McLellan, another Departmental Computing Officer. I hope I shall not be thought patronising if I say I think it is unlikely that suitable people of this ability would arise in non-Computer Science departments. I suggest that any other department would be well advised to purchase management services from the ERCC; however, it would be vital that the manager be resident within the department.

Service provided.

The VAX machine normally runs 24 hours a day, 7 days a week, without operators. However, ERCC operators perform a disk back-up for us after midnight, 2 nights a week. We are very grateful to the ERCC for this.

The machine provides practically all the main-frame computing power used by our Honours undergraduates and M.Sc. students (66 in number) and a high proportion of that required by staff, research assistants and research students (79 in all). It provides a small proportion of the computing required by our second year students (98 in number). These 2nd year students are being given access for exercises involving languages not available on EMAS (e.g. ML) and for week-end work. While a week-end service is not available on EMAS, second year students are being allowed to transfer files to VAX after 6.00 p.m. on Fridays and to carry on at the week-end.

The load taken by the machine is therefore considerable. There were many times last year when the response time was intolerably slow. I hope that by restricting the (enlarged) second year class to using VAX for specially selected exercises and week-end work, an acceptable service will be maintained. I am worried, however, by the considerably increased load that can be expected as a result of the increasing and important VLSI "chip" design work being generated by fourth year undergraduates, M.Sc. students and staff. In conjunction with Electrical Engineering, we need to be looking for further ways of coping with this load, which certainly ought to be encouraged, as a matter of great national importance.

"Word Processing" and "Electronic Mail".

The arrival of a departmental machine has caused the spread of computer use to all categories of staff. All secretaries in the department now use the VAX for the preparation and storage of handouts (which are therefore becoming much more easily modified from year to year), minutes of meetings and, to a smaller but increasing extent, for ordinary correspondence. The technical staff use it to a minor extent for maintaining records and in some cases for computer-aided digital design.

The mail facility is now widely used for message passing between all categories of staff and students. At times, this can be a bit too much of a good thing: the act of logging on announces one's whereabouts to all and sundry. This is good for staff/student contact, but detrimental to concentrated effort!

Maintenance Costs.

The maintenance contracts for the VAX machine and 4 Systems Industries disks now amount to £ 13,500 per annum. Another maintenance contract for which we had not foreseen the need is the contract for the VMS operating system, costing a further £ 1,500 per annum. Without paying this, we should find ourselves paying a comparable sum to purchase updates of the system at regular intervals.

First Year Students.

Originally, it had been thought that the VAX might be used for first-year teaching, while second-year and subsequent work would remain on EMAS. It was envisaged that VAX would be put immediately onto the ERCC network so that all existing terminals in the Appleton Tower and elsewhere could be used to access it. At the time it arrived, however, there seemed to be some doubt about the communication capabilities. In addition, it seemed to us on reflection more sensible that the more senior and experienced years should be the first to experience an experimental service. The first year students, the majority of whom are not continuing with Computer Science, would more sensibly be introduced to the EMAS service, which they are likely to be using in other courses, either in the same year or subsequently. For these reasons, our original plans were swapped over.

Overall Computer Usage.

When the machine was first proposed, it was hoped that the Computer Science load on the ERCC services would halve after the introduction of the VAX service. This prophesy failed to take into account the fact that the Computer Science student load was about to start a spectacular rise; our full-time equivalent student load doubled in the three-year period immediately following. Thus, although about half our load was transferred to VAX, it was half of a doubled load, so that our need for EMAS service did not in fact drop. Fortunately, the EMAS service has been considerably enhanced with the replacement of the 4-75's by the 2972's.

Operating System.

We use the standard DEC operating system, VMS. We considered writing an EMAS operating system and some initial experimental work was done. It was at this time, however, that our teaching load started rising catastrophically and the manpower was no longer available, especially as a number of our relevant staff were also involved in helping the ERCC produce EMAS for the 2900 series. Furthermore, doubts arose in some people's minds as to the wisdom of pursuing the EMAS route, when there was software we wished to import already running under VMS. It is fair to say that opinion in the department was divided, but the rapidly rising teaching load was the over-riding factor. UNIX was also considered. Among other factors here was an objection to the political constraints implied by the licencing conditions. Professor Michaelson felt very strongly about this and will perhaps say more about it to your committee.

Communications.

The VAX machine is now connected to the ERCC network and communications between the two are fairly reliable. It should be noted, however, that the DQS11 used at the VAX end was taken from research equipment bequeathed by the SRC at the end of a research project and is not considered by DEC to be satisfactory equipment for them to accept on a maintenance contract. There are grounds for believing that it has been a source of trouble at times and expenditure on some replacement equipment must be considered.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'P.D. Schofield', with a stylized flourish at the end.

P.D. Schofield.

1. Hardware Configuration

The original configuration installed in the Autumn of 1978 comprised:

- 1 VAX 11/780 Processor
- 1 Mb 600ns MOS memory
- 2x28 Mb RK07 disc drives
- 1 8-line DZ-11 multiplexor

The system has since been upgraded to the present configuration shown in Figure 1.

One of the 300 Mb System Industries disc drives is on loan from the ERCC till mid-1982.

2. Operating System

The system currently runs under version 2.3 of the manufacturer supplied operating system VMS. (Virtual Memory System)

3. Reliability

The main reliability problems arose in the Autumn Term of 1980 when the system crashed frequently (i.e. several times a day) when under moderate load. The problem was traced to:

1. A hardware problem related to the non-DEC supported devices attached to the UNIBUS (including the DQS-11). DEC carried out a hardware modification to the UNIBUS Adaptor which cured the problem.
2. An fault in version 2.0 of the operating system which was cured in release 2.1.

In the period between the installation of Version 2.1 of VMS in the middle of February and the end of September 1981, the total down-time resulting from Hardware or Software faults has been in the region of 8 hours.

4. Disc Storage Usage

In the absence of archive facilities, all system and user files are held on-line.

System Software is held on one of the 300Mb System Industries discs with user files contained on a further two. The fourth drive (on loan from the ERCC) is currently used during disk backup/file recovery and as a reserve in case of drive faults. Pressure for storage space is such that some users may have to be transferred to the fourth drive in the near future.

5. User Community

Currently, the system has approximately 280 accredited users consisting primarily of all staff/research students in the Computer Science Department and all students involved in the second or later years of the Computer Science course (including MSc). A few members of other university departments also have access.

6. Service Hours

The aim is to provide a 24hr service to users 7 days a week, excluding time reserved for disc backup and system development.

ERCC operators perform disc backup on 2 nights per week from midnight to 7.00am.

Three half hour slots during the day are reserved for system development when required; 11.15 - 11.45, 13.15 - 13.45 and 16.15 - 16.45. Use of these slots is normally confined to vacations or otherwise "quiet" periods. Since the beginning of 1981, an average of 3 slots per month have been used for development.

7. Performance

The system normally has between 20 and 35 simultaneous users running a variety of software. Experience suggests that distinct overloading becomes noticeable at around the 30 user mark.

8. CPU Usage

The following figures cover the period Oct 1980 - Sept 1981 inclusive.

	CS2/3/4	MSc	Others
Number of logins	41550	5880	130883
Connect Time (hrs)	16309	3463	162034
CPU Time (hrs)	740	207	1073

9. System Staff

The system is managed by one full-time Computing Officer. No operations staff are employed but assistance is given by ERCC operators in performing disk backup.

10. RCO Network Connection

VAX is connected to the RCO Network via a 19.2 baud synchronous communication line and software developed in the department by a Computing Officer and a Research student. Integration into the Network is such that

VAX is available as a host from any RCO Network terminal.

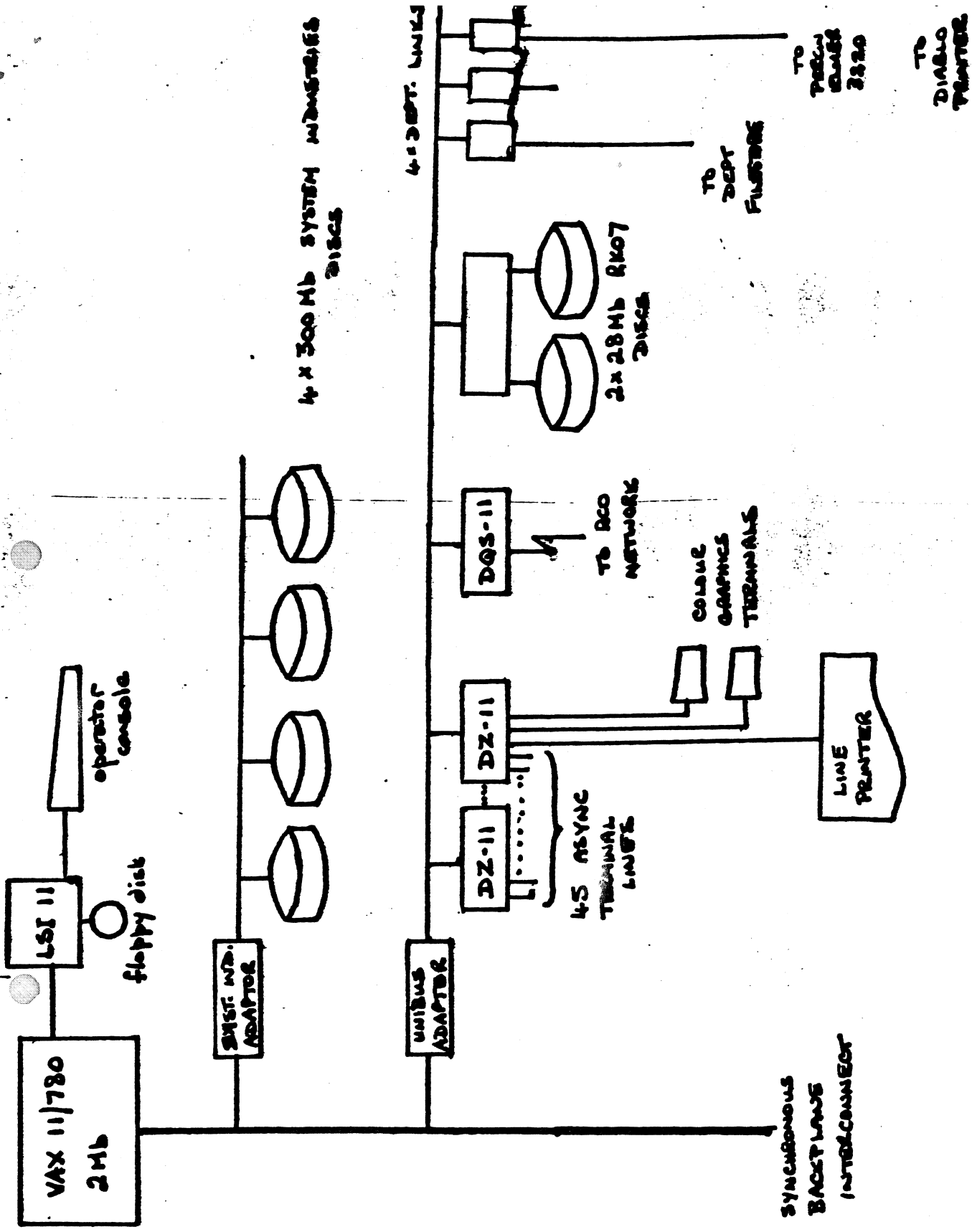
Files can be transferred between VAX and any other station on the Network.

VAX users can send/receive "mail" to/from users on other hosts via the standard mailing software.

11. Software Developments

Members of the department have developed a great deal of software to run on the VAX system. Such developments include IMP77 and ALGOL68 compilers, VLSI design aids, graphics packages, editors, document production aids, device drivers, and database software.

With the increasing number of VAX's at institutions both in Britain and abroad, the opportunities for software exchange are increasing and much of the above software is now in use on other VAX sites.



E.U. COMPUTER SCIENCE VAX CONFIGURATION OCT 1981
 FIGURE 1.