

my file.

SCIENCE AND ENGINEERING RESEARCH COUNCIL
RUTHERFORD APPLETON LABORATORY

COMPUTING DIVISION

DISTRIBUTED INTERACTIVE COMPUTING NOTE 679

issued by
I D Benest

Trip Report
Visit to CERN on 20 August 1982

9 September 1982

Distribution: F R A Hopgood
R W Witty
K Robinson
I D Benest
Trip Report file
DIC file

(see other page)

1. Conversation with Dave Foster

Dave Foster shares a room with Ian Willers and because Ian was unavailable when I arrived at reception, Dave looked after me until Andy van Dam's talk.

Dave is involved in the MODULA-2 compiler which he feels will be the standard language used at CERN. (There will probably be two standard languages.) He had no axe to grind between Domain and PERQ, but because of the modular nature of the Domain system he felt that it might be used for general office work and the PERQ would only be used for those special purposes where speed was important. One can infer from this that Domain has presented itself as being modular, while the PERQ has not been so presented. I got the impression that there was a feeling that both systems would coexist at CERN and this would be in line with the standardisation of 2 compilers, 2 microprocessors etc, ie two of everything.

2. Talk by Andy van Dam

2.1 Introduction

Andy had been to CERN in 1978 on sabbatical from Brown University and had previously returned to give talks at CERN. He has spent a number of years giving formal talks on personal workstations and his talk on 20 August was an informal presentation on this theme. He is an enthusiastic speaker and gave an excellent presentation.

Andy's talk was concerned with the usage of personal workstations for the professional person; he was not considering home computers such as the IBM personal machine, Apple or TR(ash)-80s. Instead he was considering such machines as PERQ and Domain.

His slides were either provided by Apollo or were taken by him from an Apollo screen at Brown University. Otherwise he did not overly emphasise Domain or praise Domain at the expense of PERQ. He was trying to convince the audience that personal workstations such as PERQ and Domain would increase the productivity of professional people and that CERN should start to get on the 'learning curve' so that they can make good use of this type of computer in the mid-eighties.

The fact that what Andy wanted to say could be demonstrated on a Domain meant that the Domain came over well. But I may have been more sensitive to this than the rest of the audience. Indeed the questions at the end were only concerned with the use and expense of personal workstations and were not concerned with the relative merits between the machines.

This report describes the main theme of Andy van Dam's talk and highlights his specific comments on the Apollo Domain. It does not faithfully reproduce the order given in his presentation or in the discussion which ensued.

2.2 Main Theme of Talk

The appearance of video text in the familiar surroundings of the home on an ordinary television set has enabled people to be introduced to the use of computers without really being aware that they are interacting with a machine. This type of facility is going to raise the general level of awareness of computers particularly in the use of menu selection and interactive graphics.

Andy used an Apollo slide to describe the evolution of computing. From batch in the 1960s, which provided no interactiveness and no sharing, a split occurred in the 70s which resulted in either the use of a timeshared system with poor interactiveness but good sharing or in the use of a dedicated minicomputer with good interactiveness, but poor sharing. This split is now converging, and in the 1980s the Apollo Domain philosophy of good interactiveness and good sharing will become the norm.

These machines have the following characteristics:

- Dedicated CPU per user
- Integral wide band local network
- High level design (ISP, VAS, PMS independence)
- Use of advanced technologies (VLSI CPU, Winchester disk, etc)

There were over 100 companies building professional workstations with bit mapped displays, but by the 1990's the number of such companies would probably be much less. Andy was looking towards IBM, DEC and HP for developments into the 1990s.

Xerox Parc had produced a 16 bit minicomputer called an ALTO in the early 70s and had produced a really good professional workstation with a local area network capability. Xerox are going to market Dolphins, Dandelions and Derados. A Derado has approximately the same power as an IBM 3033. In terms of software, Xerox have a 10 year lead over anyone else including Apollo. But Andy was concerned that Xerox management may bungle the whole product.

The Xerox Star has a mouse which controls a cursor and has two or three buttons on top. Human factors experiments have shown that it is faster to use a mouse than any 'artifact' such as a light pen or tracker ball. Andy remarked that 'typed interaction was evil' and that icon picking was preferable.

He then showed a picture of a portable flat panel display with a green screen (called a grid system?) which was close to what he feels is the ideal device. He actually wants and expects by 1990, a portable, colour workstation.

The Domain provides high level programming by means of PASCAL but in the near future C will be available. Andy prefers C because it does not have the constraints which result from strong typing. Apollo are going to switch back to UNIX.

The PERQ will have Bell Labs system 3 which is being provided by HRC of Canada.

These personal workstations have the following advanced concepts:

1. A system environment with (a) network organisation
(b) ring network protocol
(c) node architecture
2. A processing environment with (a) network wide virtual memory
(32 bits)
(b) process streaming
(c) shell programming
(d) compilation/binding/execution
3. A user environment with (a) user name space (96 bits)
(b) concurrent processing
(c) bit map display management

A Domain PAD provides the user with a virtual terminal which preserves the entire history of the interaction which has taken place. When three or four modules are being developed in parallel it is not abnormal to have ten windows displayed, containing module listings, compilation errors etc.

Andy spent some time describing work on Domains at Brown. He showed a Domain simulating recursion where each time a procedure was called a copy of the source appeared in a window on top of the previous copy representing the previous invocation; and a simulation of various sort procedures with graphical scatter plots being gradually sorted. There was a greater emphasis on non-overlaid windows, than overlaid windows.

2.3 Andy's Comments on Apollo Domain

Brown has 17 Domains with, on average, 3 nodes sharing a Winchester. They hope to install the 17 Domains in a classroom by September and Andy predicted that by 1985 he would have about 100 workstations. He gave the impression that he used a Domain with a 12 MHz CPU. He expected that a domain with a 20 MHz CPU will be produced. They leave their Domains on all the time.

A Domain with 256k bytes of memory runs 10 times slower than a 1M byte machine. Andy feels that you must have a minimum of 1M byte. 256k byte and 512 kbyte configurations are definitely not sufficient. His measurements suggest that the Domain operates at close to 1 million instructions per second and a Domain configuration of 1M byte, peripheral enhancement board (4k cache + FPA) is roughly (0.8 to 1.0) equivalent to a VAX 750 with FPA.

Five to ten Domains (or PERQs) cost the same as a VAX and you get 10 times the MIPS with the Domains (or PERQs).

Brown University has 6 Winchester disks and have had on average one problem every 3 or 4 months with them. Their main problem has been the network cable; people keep rolling chairs over them. This means to say that if filestores are shared then broken connections may upset other nodes. Brown have also experienced difficulties caused by wire fixes to boards.

They have a PERQ but it is more deficient in software than the Domains and Andy has no record of a distributed filestore as on the Domain.

The Domain is too keyboard and FORTRAN orientated.

Apollo have announced a colour node and Andy showed us a slide. When the colour PERQ is available it will 'leap-frog' the Domain colour node. Apollo will be introducing a mouse soon.

Andy seemed to feel that the Domain operating system was more sophisticated than UNIX and that Apollo were only mounting UNIX on the Domain because of user pressure, not because it was superior to the Domain's software tools.

He spoke of a 40,000 line FORTRAN program which someone mounted in one day. This included learning to use the machine. He did not know of a similar instance with a PERQ, implying that it was difficult to mount software on the PERQ.

Apollo are committed to halving today's price of their machines, within 2 or 3 years.

They can start up a process on another CPU.

Although file transfer between nodes is a little slow, paging between a machine with a hard disk and a machine without, is fast. The host node with the disk suffers slightly because it services remote node requests before its own requirements; the affect however is virtually unnoticeable.

CERN will have at least one Domain by 1st October 1982 and will be receiving software from Brown University.

2.4 Additional Comments

Andy also made the following comments:

1. UNIX was more sophisticated than CMS and CMS was more sophisticated than Wilbur (which CERN runs on its IBM system).
2. APL is an interactive integrated environment with an awful cryptic language. If the user is prepared to make the effort to learn the language then he can make better progress with APL than with other languages.
3. You should want to program by example.
4. He wants 2D pipelines rather than simple linear pipelines.
5. Brown University's acquisition of Domains is financed by the National Science Foundation.
6. May be in the future flow charts will be used for programming.
7. However literate a person is, it is easier to read a manual with graphical illustrations than pages of description.

8. In the future you will either get more computer power for the same money or the same computer power for less money.
9. Disks will be the main item which will determine the cost of these machines, although disks are currently falling in price.
10. At Brown University they are experimenting with a 300 MHz broad band coaxial cable which provides 1M band communication. To this will be connected one or more 10 MHz local area networks.

2.5 Discussion

During the discussion period the audience were concerned with the cost of these machines. The UK members did not feel that SERC would provide half a million for each University to buy 17 such machines. Indeed even when they are half the price they would not be cheap enough to have in every office. Andy replied that his main message was that CERN should be learning to integrate these machines with other computers and to realise their true potential. He did not expect CERN to buy huge quantities of these machines immediately.

3. Lunch time Conversation

Ian Willers, Roger Vinnicombe and myself had lunch during which the following comments were made by Ian Willers.

1. CERN had not dealt with Apollo UK but with someone in France and directly with Apollo in the US. CERN were not particularly happy with the French contact.
2. CERN are holding a 'computer appreciation course' for physicists which looks quite promising. Ian is giving a talk on personal workstations and would like the ideas that he wishes to convey, to be demonstrated on a PERQ. Unfortunately, he did not feel that the PERQ would be in a state where this would be possible. He asked Roger Vinnicombe if he could help on this matter.

4. Afternoon

The afternoon was spent viewing an experimental area, the computing centre, the central control room and data processing areas.