

RAL

DESIGN & DISCOVERY

Open Days July 1990

RUTHERFORD APPLETON LABORATORY
SCIENCE AND ENGINEERING RESEARCH COUNCIL

Central Computers

IBM 3090 600 E with 6 Vector Facilities

The IBM 3090 at RAL consists of six Central Processing Units (CPUs) which all share the same memory.

It requires an air-conditioned environment where the temperature and humidity are kept constant. It must also be linked to a cooling water supply and this water is pumped around the CPUs to keep them cool. The heated water is pumped to a different part of the building to be cooled again.

The CPUs run as individual units but have the capability of working together in processing a particular program, or for each to be assigned to a particular task. Each CPU can process up to 18 million instructions a second.

Along with the six conventional **scalar** processors we have six **vector** facilities, each of which can process up to 116 million calculations a second.

Scalar processors execute single step instructions i.e. one at a time.

Vector processors are those that execute instructions with operands that are arrays of data rather than just single step instructions.

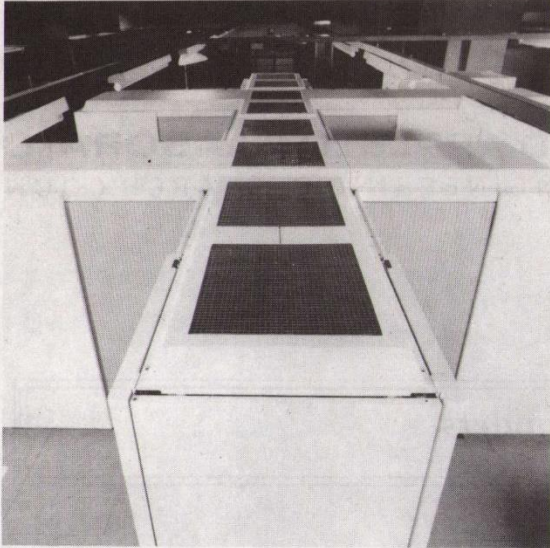
The two types of processor provide a service for two different applications.

The conventional, or scalar, processors are used for the online interactive facility CMS where users can interactively create, edit and delete their own files. There is also a computerised "office" system (PROFS), which handles such things as a person's weekly schedule, lecture room bookings, document preparation and mail.

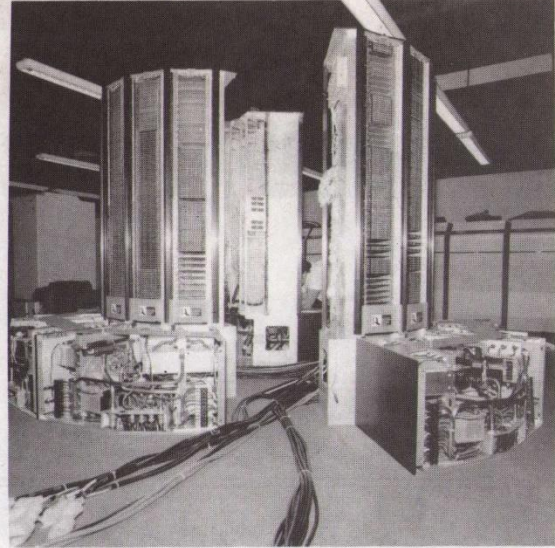
Software (RSCS), that enables the outside world to communicate with our system, also runs on these processors.

Batch jobs (individual packets of related data with accompanying instructions, which are no longer under the direct control of the user), are run in either of the two main batch systems on the 3090, SLAC BATCH and MVS/370. These jobs range from local stores inventory to the most complicated scientific research project and they can use either the scalar processors or the vector facilities mentioned above, depending on their nature.

The IBM 3090 has 256 million bytes (Mbytes) of main storage (a byte can hold one character) which is shared by the six CPUs. It also has one thousand million bytes (1 gigabyte) of additional fast access storage. Data, such as programs or scientific results, can be stored on magnetic disks. The total capacity at RAL is 104 GBytes. This would accommodate 104,000 copies of the modern bible!



IBM 3090-600E/VF



CRAY X-MP/416

CRAY X-MP/416 Computer

CRAY X-MultiProcessor with 4 processors and 16 Mega-words (128 MBytes) of memory

The CRAY architecture makes it an extremely fast machine, suitable for running programs which necessitate the processing of vast amounts of related data. Each processor can operate at a speed of over 200 million calculations a second.

It gets extremely hot in operation and so needs an air-conditioned environment where the temperature and humidity are kept constant.

Liquified FREON gas is used as coolant, because the machine's components are packed so closely together that water would not be able to cool them fast enough. The gas is cooled back to a liquid in another part of the building and then returned to the computer for reuse.

The shape of the computer is also significant in that it is designed to give minimum cable lengths from the smaller tower to the larger 'C' shaped tower where the Central Processing Unit is situated.

The smaller tower controls all that is going on whereas the CPU carries out all the calculations.

An ideal research machine, it can be used for wind tunnel simulation, ocean current/wave simulation, atmospheric turbulence and so on. A current project simulates part of the Antarctic Ocean! Before the advent of the supercomputer, a wind tunnel was necessary to detect the pattern of wind flow around a new aircraft shape: it is now possible to gain the same results in a fraction of the time, by feeding this type of computer with appropriate data.

The following attributes contribute to the machine's high speed performance:

- the physically compact design, which minimises current flow time;
- the vector processors which execute instructions with operands that are arrays of data rather than just single step instructions;
- internal circuitry designed to minimise system overheads, giving more calculation time.

The Cray has its own set of disk drives for data storage, with a total capacity of 22.5 Gbytes (22,500 bibles!).