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The Desk-top Supercomputer

Staniforth Webb

ELECTRONICS engineers at Southampton University plan to unveil a supercomputer this year to match the most powerful machines now in service, but which could be produced and sold at about only one-tenth of their price. Designed by Dr Chris Jesshope and Dr Denis Nicole in the University's Department of Electronic Engineering, it has been developed as part of the ESPRIT programme the European initiative at government level which aims to keep advanced technology in Western Europe well abreast of that in other countries.

The main reason for the low cost of the Southampton computer is that it is built on a modular principle. It is assembled from 350 so-called transputers, each of which is a complete computer in miniature with its own memory and an appropriate set of connections to link it to other transputers or to other computers all on a single silicon chip of about 100-mm^2 area. This contrasts with the design of the Cray supercomputer, for example, which is composed of four linked mainframe computers.

Transputers sell at about $500 apiece. A commercial computer built on the Southampton design could be sold for around $800000; a Cray costs somewhere in the region of $6 million.

So far, such enormously powerful computers are used in only a few specialised applications such as weather forecasting, aircraft design and some areas of scientific research. But reducing the cost of supercomputing power by a factor of 10 would obviously open up far more applications and bring supercomputing power within the reach of many more potential users. In words of Chris Jesshope, "It could put yesterday's supercomputer on today's posh office desk."

Mainframe Power

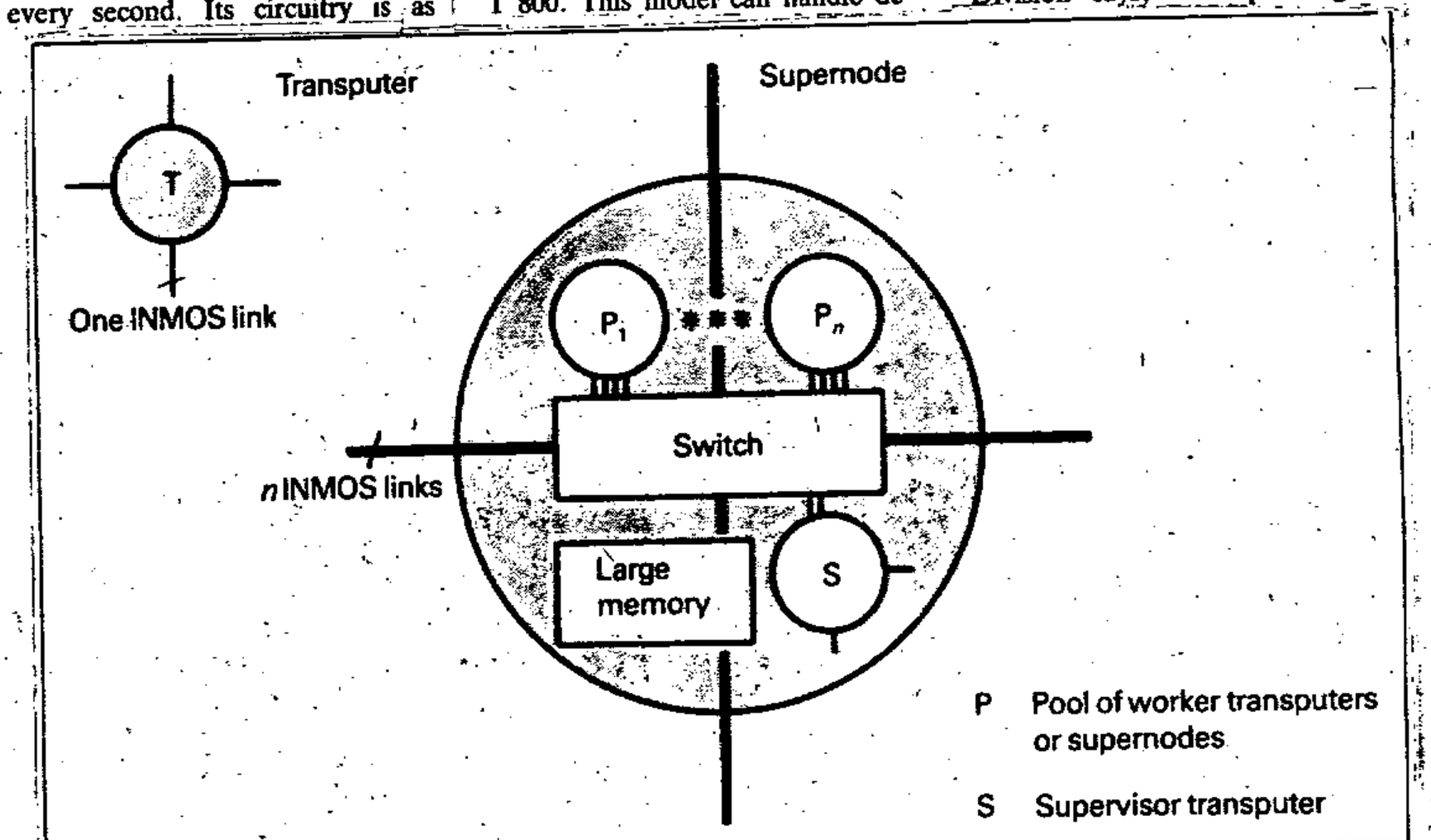
The transputer has been developed and is being marketed by the British silicon chip company INMOS. Each carries a processor that can be programmed to perform various tasks, a memory that contains a large part of the information the processor needs for its job, and all the connections for linking into other devices.

A single transputer is as power as an average full-sized mainframe computer. It is able to perform one-and-a-half million operations every second. Its circuitry is as complex as a complete street map of London with all the gas mains, electricity cables and sewers superimoposed. It works faster than comparable processors, is easier to programme and is more compact. But from the point of view of assembly into supercomputers, its most important advantage is the ease with which it can be linked to other transputers or to other computers with no need for extra electronic circuitry.

Because of the Southampton project's significance for the future of the company, INMOS supplied the University with the first of a new generation of transputers, the IMS T 800. This model can handle decimal points or fractions as well as integers; it is the first microprocessor to incoporate a floating-point processor capable of dealing rapidly with decimal digits on the same piece of silicon as a conventional processor handling integers.

In technical language, the IMS T 800 includes a 32-bit integer processor which is the world's fastest with special instructions to support graphics operations, a 64-bit floating-point processor, four kilobytes of fast on-chip RAM and four standard INMOS communications links, all on a single chip.

As Peter Cavill, Director of the INMOS Microcomputer Products Division says, "Incorporating all



The basic transputer (T) is incorporated into a pool to make up a 'supernode', which in turn is linked into an array to give a multistage switch with hierarchical control.