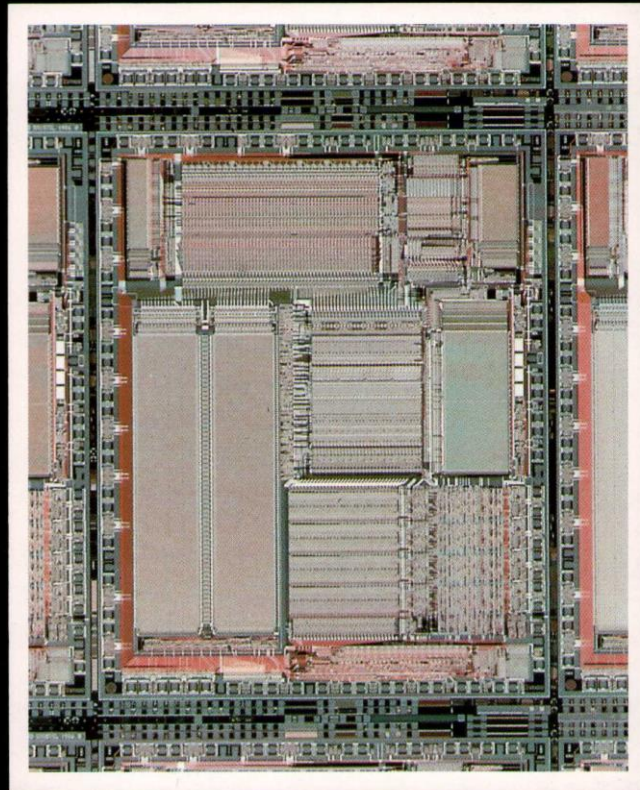




SERC/DTI TRANSPUTER INITIATIVE



**Science & Engineering Research Council
&
Department of Trade & Industry**

CO-ORDINATION

Located in the Informatics Department at the Rutherford Appleton Laboratory.

Responsible for:

- o Day to day management of the Initiative, including the Loan Pool;***
- o Publicity - mailshots etc;***
- o Organisation of Workshops and Conferences;***
- o Identification of key software developments and letting of contracts to ensure they are carried out.***

LOAN POOL

A substantial Loan Pool of transputer equipment and software has been set up for use by the academic community. This ensures maximum exposure of and access to, transputers, and the software associated with parallel processing systems.

The Loan Pool is held at Rutherford Appleton Laboratory and is managed by the Coordination Team. All the hardware and software items are commercially available products, ranging from basic development systems to significant multi-transputer systems.

Loan Pool equipment is offered to academic research groups for a maximum period of 8 months.

Software resulting from effective use of loaned equipment will be made available to the Academic community via the Software Library at the National Support Centre.

SERC/DTI Transputer Initiative

THE INITIATIVE

The Transputer

The transputer is a "micro-supercomputer", designed and manufactured in Great Britain, for building ultra-high-performance computer systems. It is the first device in the world to provide an effective methodology for parallel processing (i.e. the technique of applying many computers simultaneously to the same problem). Parallel processing has the potential to provide computers with several orders of magnitude greater price:performance than previously, and hence improve the effectiveness of many current applications or to make feasible new applications which have previously been limited by available technology.

Exploitation

The technology offers enormous potential benefits to many sectors of UK industry, particularly device manufacturers, systems builders and systems users. The potential scope for benefit is seen as, with full exploitation, to be of the order of £billions. A major proportion would be in the form of exports of systems and derived products, with user companies, because of the competitive advantages of transputer technology, leading the way.

Present Position

A number of companies have, or are now developing, hardware products, which are seriously limited by the lack of applications software, and this hampers the exploitation of the technology by industry. A window of opportunity exists on which the co-ordinated programme set up as the SERC/DTI Transputer Initiative is targetted. The primary objective is to harness the available resources in a cost-effective manner in order to protect and enhance the technology leadership currently enjoyed by Great Britain.

Aims of the Initiative

- to capitalise on the strength of the existing community;
- to develop the necessary software base;
- to facilitate the technology transfer to British Industry.

Components of the Initiative

- a small Co-ordination Team based at the Science and Engineering research Council's Rutherford Appleton Laboratory;
- a significant transputer hardware and software Loan Pool;
- Regional Support Centres, one of which has a National Support role in managing a Software Library facility;
- a budget to enable the letting of Extra-Mural Research contracts so ensuring that vital developments are undertaken.

Funding

In recognition of the joint value to academia and industry, the Transputer Initiative is funded by both SERC (approx. 67%) and the DTI (approx. 33%), of a total programme costing some £2.6 million over 4 years, ending in March 1991.

SERC/DTI Transputer Initiative

CO-ORDINATION OF THE INITIATIVE

Introduction

A Co-ordination Team is located at the Rutherford Appleton Laboratory. Its role is to manage the programme and ensure that the whole "Transputer Community" works closely together and that information flow is both frequent and easy.

Main Functions of the Co-ordination Team

These are:

- to identify those members of the academic and industrial communities who would participate in, and benefit from, the programme;
- to identify key software developments and fund specific Contracts to ensure they are carried out;
- to encourage, guide and comment on transputer related research grant applications from the academic community, promoting collaborative proposals with industry wherever possible;
- to set up and manage the Loan Pool;
- to organise a monthly Mailshot;
- to organise appropriate workshops, and an annual conference, based around the programme;

There is also close liaison between the Co-ordination Team and the Support Centres to ensure the smooth running of the programme and the identification of any major problems within it.

SERC/DTI Transputer Initiative

THE CENTRES

Introduction

The Industry focus of the Transputer Initiative is at the Support Centres. Six Regional Support Centres have been established, with one of them taking on a National Support role to operate and maintain a Software Exchange Library for the Initiative.

Location of the Support Centres

- National and North East - Sheffield (run jointly by the University and City Polytechnic)
- London & South East - Rutherford Appleton Laboratory
- Northern Ireland - Belfast (run jointly by Queen's University and Ulster University)
- North West - Liverpool
- Scotland - Strathclyde
- South West - Southampton

Aims of the Support Centres

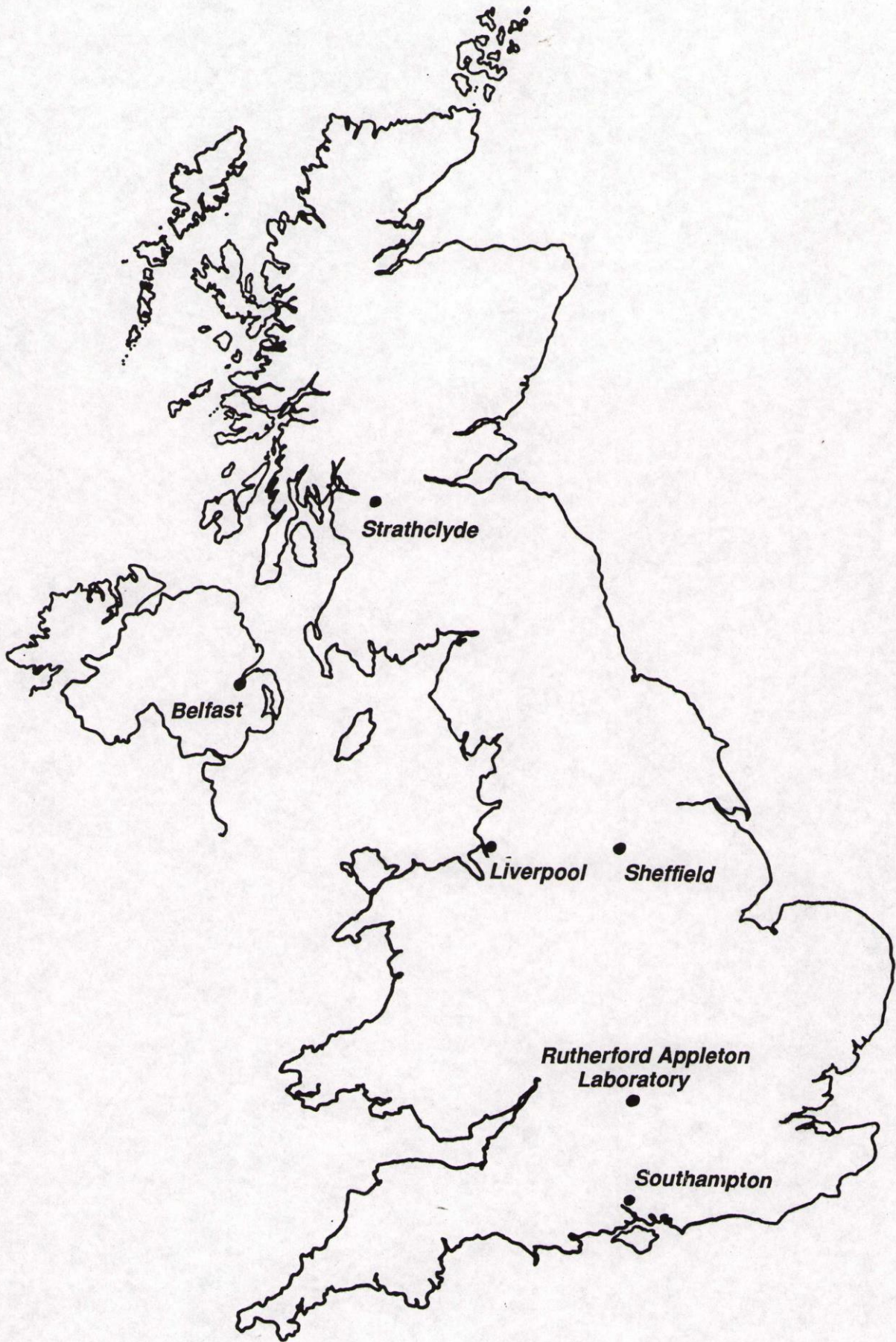
The aims of the Centres are:

- to promote awareness of the potential of the transputer and its associated technology
- to provide "hands on" training and consultancy for British manufacturing industry in the use and exploitation of the transputer
- to make use of the expertise within the academic community in order to develop a viable software base for the exploitation of the transputer in industry
- to promote high quality research using transputers, with the emphasis on ongoing applications

- to facilitate technology transfer to British industry and to assist faster co-operation and collaboration between industry and academia
- to offer a range of services, including (i) advice and assistance on the hardware and software aspects of transputer installation, usage and application, (ii) support services for visitors, (iii) run training courses on the use of transputers and their applications, (iv) dissemination of information through appropriate documentation, reports and newsletters.

Equipment

Each Regional Support Centre has been equipped with a representative range of Loan Pool equipment (see separate sheet). Two types of powerful parallel processing systems have been installed at each Centre: a MEiKO Computing Surface and an Inmos Transputer Evaluation Module (ITEM). Both types of systems have 4-transputer boards and graphics boards installed. In addition to these, there are also a number of PCs, each with a single-transputer board, to enable new users to become familiar with using transputers. A continuing programme of enhancement to the Centre hardware and software is committed.



Strathclyde

Belfast

Liverpool

Sheffield

**Rutherford Appleton
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Manager: D Thurgate

SERC/DTI Transputer Initiative

LOAN POOL

Introduction

A significant hardware and software Loan Pool, consisting entirely of commercially available products, has been established for the Transputer Initiative, to ensure the maximum exposure of, and access to, transputers and software associated with parallel systems. The Loan Pool is held at Rutherford Appleton Laboratory and is managed by the Co-ordination Team.

Academic Access

Loans from the Pool are offered mainly on a Pump-priming basis to academic research groups for a maximum period of 8 months. This ensures that the hardware and software in the Loan Pool are recycled, with appropriate upgrades being made available at different stages of the evaluation. Users are required to make formal applications for such loans. Longer term provision of transputer hardware and software is provided through the normal research grant process.

As a condition of loan, written reports of work carried out with the equipment are required from all benefitting groups, and any software developed is made generally available to the transputer community through the Software Exchange Facility at the National Transputer Support Centre in Sheffield.

Industrial Access

Industrial Access to the Loan Pool equipment is made via the National and Regional Transputer Support Centres, which are equipped with a complete range of Loan Pool equipment. British companies are able to book time to use any of the facilities offered at a Support Centre, for which they are charged at a nominal rate. Necessary "hand-holding"

services are available within the range of facilities provided for this nominal charge, including hardware and software support, documentation and tutorials.

Current Loan Pool Items

INMOS:

- Inmos Transputer Evaluation Module (ITEM)
- B004-4 single-transputer boards (to plug into PCs)
- B003-1 quad-transputer boards (to plug into ITEM)
- B007-1 graphics boards (to plug into ITEM)
- Transputer development systems, including Occam
- Fortran, C and Pascal compilers

MEiKO:

- M10 Computing Surface
- MK009 quad-transputer boards
- MK014 local host boards
- MK015 graphics boards
- MK021 mass store boards
- MK026 PC interface boards
- Transputer development systems, including Occam
- Fortran and C compilers

TRANSTECH (Inmos compatible):

- TSB04-2 single-transputer boards (to plug into PCs)
- TSB44-4 quad-transputer boards (to plug into PCs)

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THE TRANSPUTER AND OCCAM

The Transputer

The Transputer is a programmable component. It consists of a computer on a chip, complete with a processor, memory and communications links for connection to other transputers. A system can be constructed from a collection of transputers which operate concurrently and communicate through the links.

Occam

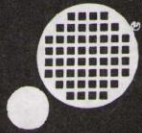
Occam is a language which enables systems to be described as a collection of processes which operate concurrently and communicate through channels. It was developed as a language for describing and programming transputer systems and the transputer was designed to execute Occam programs.

How Occam and the Transputer Work Together

A system programmed in Occam can be implemented in a variety of ways because the same model of concurrent programming is supported on a single transputer and over a network of transputers. An implementation of an Occam program may assign each concurrent process to a separate transputer to achieve the maximum possible concurrency. Alternatively, the whole program can be executed on one transputer which shares its time between the different processes.

Occam and the transputer open up a new approach to designing a digital system. The logical behaviour of the system is first described in Occam. This is a program which can be executed as a simulator, or prototype, of the system and which can be investigated and modified with as simple a tool as a program editor.

When the program has been thoroughly tested on a single processor, it is configured to execute on a network of transputers. Configuration affects the performance and responsiveness of the system without changing its logical behaviour. Performance may be improved by increasing the number of transputers. The responsiveness of a process may be improved by allocating it to its own transputer or by giving it a high priority.



IMS T800 transputer

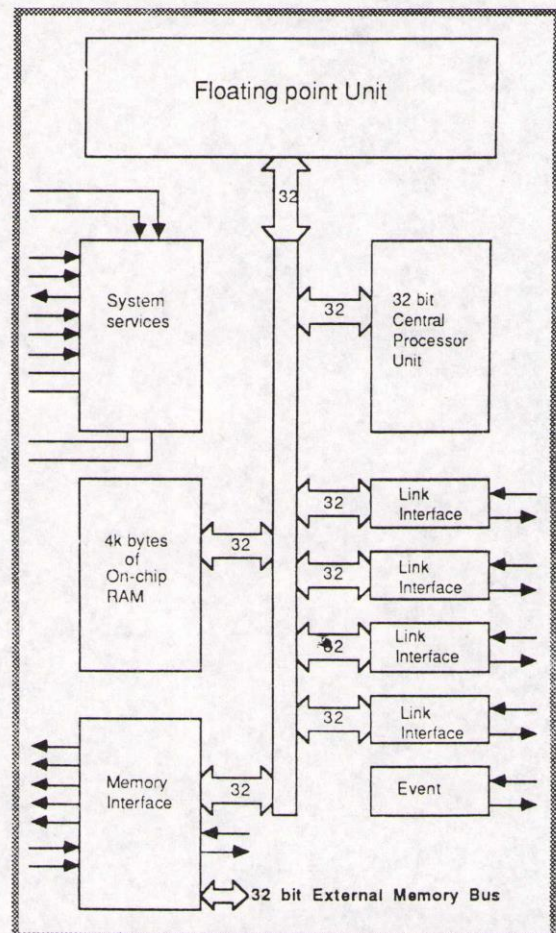
Features

Integral hardware 64 bit floating point unit
 ANSI-IEEE 754-1985 Floating Point Representation
 1.5(2.25*) Sustained MegaFlops/sec
 Full 32 bit transputer architecture
 Pin compatible with the IMS T414-20 transputer
 4 Kbytes RAM on chip for 80(120*) Mbytes/sec data rate
 32 bit configurable memory interface
 External memory bandwidth 26.6(40*) Mbytes/sec
 High performance Graphics support
 Single 5 MHz clock input
 Power dissipation less than 1 Watt
 DRAM refresh control
 Four 10/20 Mbits/sec INMOS serial links
 External event interrupt
 Internal timers
 Support for run-time error diagnostics
 Boot from ROM or link

APPLICATIONS

Scientific and mathematical applications
 High speed multi processor systems
 High performance graphics processing
 Supercomputers
 Workstation clusters
 Digital signal processing
 Accelerator processors
 Distributed databases
 Simulation
 Telecommunications
 Robotics
 Fault tolerant systems
 Image processing
 Molecular modelling
 Pattern recognition
 Artificial intelligence

*IMS T800-30



SUPPORT CENTRES

There are six Regional Support Centres for the Transputer Initiative, one of which is also the National Support Centre running and maintaining a Software Library.

o National Support Centre & North East:

Sheffield (run jointly by the University and Polytechnic)

o London & South East:

Rutherford Appleton Laboratory

o North West

Liverpool University

o Northern Ireland:

Belfast (run jointly by Queen's University and the University of Ulster)

o Scotland:

Strathclyde University

o South, South West & South Wales:

Southampton University

The Regional Centres are the focal points for Industry and provide the opportunity for Industry and Academia to meet and work to their mutual benefit.



The Transputer Initiative is a programme being jointly funded by the Engineering Board of the Science and Engineering Research Council (SERC) and the Department of Trade and Industry (DTI). Joint funding means that both industry and higher education institutions can take part.

The aims of the programme are:

- 1 to provide awareness of the potential of the transputer and its associated technology and applications to the solution of problems requiring parallel processing;*
- 2 to use expertise within the academic community to develop a viable software base, which is regarded as being essential for the exploitation of parallel processing systems in industry;*
- 3 to promote high quality research using transputers;*
- 4 to facilitate technology transfer to British industry.*

The transputer is a new super-microcomputer on a single silicon chip, designed and manufactured in Great Britain by Inmos Limited. It is the first discrete silicon device in the world to promote an effective vehicle for parallel processing - the simultaneous application of many processors to the same problem. This technique gives rise to computer systems with a better price:performance ratio than those available at present. Future parallel processors will greatly reduce the cost of tasks performed by today's computers and will solve important problems which are not yet feasible.

The Transputer Initiative is co-ordinated at Rutherford Appleton Laboratory and there are a number of Support Centres throughout Great Britain and Northern Ireland.