DATAFLOW COMPUTING   1

Presenters: Drs J Gurd, C Kirkham, I Watson (Manchester).
J Glauert (East Anglia).

The basis of fifth generation super computers, principles and practice.

This tutorial will describe the Dataflow approach to parallel computation, one of the bases on which parallel super computers of the future will be constructed.

Topics covered will include the basic principles of Dataflow computing, the evolution of Dataflow computer architectures and the high level languages used to program them. Some details of the Manchester Prototype Dataflow computer structure and performance will be presented and a practical session will permit programs for this machine to be executed.

The tutorial is intended for professional computer scientists, computer architects and designers interested in the development of high speed computer structures. Some familiarity with current approaches in this area will be assumed.

DECLARATIVE LANGUAGES AND ARCHITECTURES   2

Presenters: Dr R Sleep (East Anglia),
Dr J Darlington (Imperial College),
W Clocksin (Cambridge).

The essence of the declarative approach to programming is shifting the burden of saying in detail **how** something is done from the programmer on to the architecture. This tutorial will introduce a specification-like approach to programming, based on both functional and logic formalisms. Implementation techniques - both conventional and novel - will be presented, and an overall evaluation of how close we are to the "programs as runnable specifications" view will be presented.

The tutorial will give a grounding in both functional and logic programming, the conventional approach to implementation (what can be done now), and the novel (parallel) approach which will be with us very soon.

The tutorial is aimed at professionals wishing to be up to date on the formal approach to the fifth generation.

LOOSELY-COUPLED DISTRIBUTED SYSTEMS   3

Presenters: Dr I Wand (York), Dr K Bennett (Keele).

Loosely-coupled distributed systems are multi-computer configurations that do not share immediate memory and can be dispersed over wide geographical areas. They form much the greater part of distributed systems that have been investigated and are in common use today. This series of lectures will describe their general architecture, and will examine the detailed requirement of the various components of such systems. In addition it will consider the operating systems appropriate in this environment together with the related programming languages.

The lectures will summarise the current ideas on the architecture of loosely-coupled systems, and will detail the construction of the various layers in such systems. They will emphasise the results that have been achieved in the SERC sponsored DCS Programme, particularly in ring technology, distributed operating systems and programming languages.

The lectures are intended for all those designing state of the art distributed systems, including networks of personal computers, distributed program support environments, etc. In addition, the lectures will be suitable for research students who are starting work in distributed computing.

CLOSELY-COUPLED DISTRIBUTED COMPUTING SYSTEMS   4

Presenters: Professor R Grimsdale, Dr F Halsall (Sussex).
Professor D Aspinall (UMIST).

This course of lectures examines in detail: the alternative architectures that may be adopted for the design of closely-coupled multiprocessor computing systems, the structure and features of typical programming languages for such systems, the function and structure of the run-time support software, and the different software development tools for debugging and testing application software on multiple processing elements.

In addition, two case studies will describe the overall design of the hardware and associated software tools in two experimental multimicroprocessor systems which have been implemented as part of SERC's DCS Programme.

The tutorial is aimed at engineers and programmers seeking to gain an insight into the underlying concepts of closely-coupled, parallel-processing systems; also engineering managers needing to judge the importance of multiprocessor structures in future product designs.

MODELLING AND VERIFYING CONCURRENT COMPUTATION   5

Presenters: R Milner (Edinburgh), S Abramsky (Imperial College).

What is a good mathematical model of concurrency?

Is there a common model for both hardware and software?

How do we prove properties of concurrent systems?

In recent years concurrent computing has come closer and closer to users, both through distributed hardware and through programming languages. A concurrent program may be thought of alternatively as software to be compiled or as a description of the behaviour of a piece of hardware.

The tutorial will address the question of fundamental notations for such programs/descriptions, and will illustrate (using simple examples) some approaches to verifying them mathematically. The intention is to treat concurrent programs/descriptions and their analysis as a branch of applied mathematics, whose essentials at least are easy to grasp.

The audience is expected to be convinced of the need for rigorous analysis of systems, but no particular mathematical expertise will be assumed. The material is impartial between hardware and software, and will interest equally programmers, telecommunications designers and VLSI experts.

Monday 3 Sept	2.00pm-5.30pm Tutorials
Tuesday 4 Sept	9.00am-5.30pm Tutorials
Wednesday 5 Sept	10.00am-5.30pm DCS 84 Conference
Thursday 6 Sept	9.00am-5.30pm DCS 84 Conference 8.00pm Conference Dinner

The programme includes both a two-day conference involving presentations by many distributed computing researchers, and a set of five parallel tutorial sessions on the Monday and Tuesday exploring in more detail some of the principal themes. Registration is available for tutorial and conference or conference only, and includes attendance at the conference dinner on the Thursday evening. Conference proceedings are included in the registration, as is a full set of notes for tutorial attendees.

Tutorial Sessions
The tutorials, covering a day and a half of presentations and, in some cases, workshop, are intended to give a grounding in the basic elements, and present state of knowledge, concerning grand themes in distributed computing. Whilst a general familiarity with relevant aspects of computing is assumed, specialist knowledge is not required. Presentations are by leading researchers within the DCS programme.

DATAFLOW COMPUTING

Dataflow Fundamentals – Dr J Gurd

Architecture and Performance – Dr I Watson

Manchester Machine Level Features – Dr C Kirkham

High Level Programming – J Glauert

Practical Programming – hands-on experience.

DECLARATIVE LANGUAGES AND ARCHITECTURES

Introduction to Functional Languages – Dr J Darlington

Conventional Implementations of Functional Languages – Dr J Darlington

Introduction to Logic Languages– W F Clocksin

Conventional Implementations of Logic Languages – W F Clocksin

The Rise of Novel Architectures – Dr R Sleep

Novel Architectures: Present and Future – Dr R Sleep

LOOSELY-COUPLED DISTRIBUTED SYSTEMS

Loosely Coupled System Architectures – Dr I C Wand

Communications – Dr K H Bennett

Filestores – Dr K H Bennett

Mechanisms for Distributed Control – Dr K H Bennett

Distributed Operating Systems, including case studies – Dr I C Wand

Languages for Distributed Computing – Dr I C Wand

CLOSELY-COUPLED DISTRIBUTED COMPUTING SYSTEMS

The Architecture of Closely Coupled Systems – Professor D Aspinall

Programming Languages for Closely Coupled Multi-Processor Systems – Professor R L Grimsdale

Run Time Support Facilities – Professor R L Grimsdale

Development Aids for Multi-microprocessor Systems – Dr F Halsall

Case Study No 1 – CYBA-M: The UMIST Multi-processor – Professor D Aspinall

Case Study No 2 – POLYPROC: The Sussex Multi-processor Development System – Professor R L Grimsdale

MODELLING AND VERIFYING CONCURRENT COMPUTATION

Using Functions and Streams to Model Concurrency – S Abramsky

Proving Properties of System Behaviour by Reasoning about Functions – S Abramsky

An Example of Specification in CCS – A J R G Milner

Implementing the Specification, and Verifying the Implementation – A J R G Milner

Introducing non-Determinism into the Functional Model – S Abramsky

Further Examples in CCS, and Discussion of the Model – A J R G Milner

WEDNESDAY 5 SEPTEMBER

Session 1
Introduction and Review: DCS 1978-84
R Newey (GEC) – Chairman DCS Panel.

Session 2
Languages in Distributed Computing: A Review
R Bornat (QMC)

Parallel Algorithm Design
Professor D Evans (Loughborough)

Functional Operating Systems
Professor P Henderson (Stirling)

Session 3
Implementing a High Performance LAN
Dr R Ibbett (Univeristy of Manchester)

Modelling Performance of Distributed Systems: A Review
Dr I Mitrani (Newcastle)

Session 4
Local Networks: The Broad Band Approach
Professor R Grimsdale and Dr F Halsall (Sussex)

Active Memory: The PN Machine
Professor J Iliffe (QMC)

Hardware and Software for Parallel Update of Raster Graphic
Images
I Page (QMC)

THURSDAY 6 SEPTEMBER

Session 5
The COSY Approach to Distributed Systems
Dr P Lauer (Newcastle)

Developing Concurrent Systems with DTL
Mrs J Hughes and M Powell (UMIST)

Session 6
A Strongly-typed Distributed Virtual Memory
Mrs J Hughes and M Powell (UMIST)

Distributed Systems: Ease of Use through Proper Specification
Dr C Morgan (Oxford)

Building Flexible Distributed Systems in CONIC
Dr M Sloman and Dr J Kramer (Imperial College)

Session 7
Directions in Functional Programming Research
S Peyton-Jones (UCL)

Dataflow in Practice: Manchester's Experience
Drs J Gurd, C Kirkham and I Watson (Manchester)

Session 8
ZAPP: The Zero Assignment Parallel Processor
Dr R Sleep (East Anglia)

An Overview of ALICE
Dr J Darlington (Imperial College)

DCS, The Alvey Programme and the Future of Computer Science
Research in the UK
B Oakley CBE (Alvey Directorate)

(Details of programme and speakers may be subject to change)

PRACTICAL INFORMATION

WHEN			
	Tutorials	Registration	1100-1400 Monday 3 September
		Sessions	1400-1730 Monday 3 September 0900-1730 Tuesday 4 September
	Conference	Registration	0900-1000 Wednesday 5 September
		Sessions	1000-1740 Wednesday 5 September 0900-1730 Thursday 6 September
		Conference Dinner	20.00 Thursday 6 September

WHERE

University of Sussex
Falmer
BRIGHTON

TRAVEL

Rail – Falmer Station 5 mins on foot
(Brighton/Eastbourne line)
(Concessionary conference fares available)

Road – A27 5 miles east of Brighton
parking available

Air – Gatwick Airport, thence rail.

Taxi – No taxis are available at Falmer station;
Brighton station is recommended.

REGISTRATION

1 Tutorial + Conference £100.00 (£40.00*)
Conference Only   £ 40.00 (£20.00*)

*Reduced fees for staff of UK academic institutions.

DCS researchers and graduate students – fee waived.

ACCOMMODATION

Single-bedded university residence accommodation is available
for Monday 3 September through Friday 7 September.

4 nights £60.00
3 nights £50.00
2 nights £35.00
1 night £20.00

MEALS

Registration fees include breaks, lunch and dinner on each day,
including the conference dinner on Thursday evening.

Accommodation fees include breakfast.

PAYMENT

Payment should accompany registration by cheque payable to
'University of Sussex'. Receipts will be provided.

REGISTRATION DEADLINE

20 July.

The Science and Engineering Research Council is responsible for sponsorship of the bulk of basic and applied scientific research within the UK academic world, including information technology. Over the past seven years, through its Specially Promoted Programme in Distributed Computing Systems, the Council has invested some £6M in 120 research grants within 26 institutions. As the Programme draws to its conclusion, the present conference has been organised to review the achievements of its activities, and to provide a forum for the growing community of researchers and practitioners who have been drawn together by the Programme.

The Conference Proceedings will be published by
   Peter Peregrinus Ltd

The supporting notes for the tutorial sessions will be published by
   Academic Press Ltd

Copies of these are included in Conference and Tutorial registration fees. Additional copies will be available for purchase at the conference.

DISTRIBUTED COMPUTING 84

DCS CONFERENCE

September 1984
University of Sussex

List of Delegates

Name	Institution
Prof I Aleksander	Brunel University/Imperial College
A E Abdallah	University of Oxford
S Abramsky	Imperial College, London
M Ajab	Queen Mary College
D Allsopp	University of Nottingham
Ms R Altoft	Academic Press
Prof D Aspinall	UMIST
B Bacarisse	University College London
Dr J Bacon	Hatfield Polytechnic
D L A Barber	Alvey Directorate
Dr R Barlow	Logica Limited
N K Barrett	University of Nottingham
I Barron	Inmos International
M Beedie	Electronic Design
K H Bennett	University of Keele
G Binks	UMIST
J E F Black	University of Sussex
A P W Bohm	University of Manchester
R Bornat	Queen Mary College
Dr D F Brailsford	University of Nottingham
Ms P Brereton	University of Keele
G Bull	Hatfield Polytechnic
Ms V Bush	University of Manchester
Dr D W Bustard	Queen's University of Belfast
J Butler	University of Edinburgh
F Chambers	Logica Limited
S L H Clarke	Alvey Directorate
G Cleland	University of Edinburgh
W F Clocksin	University of Cambridge
Dr D J Cook	Loughborough
R C B Cooper	Cambridge University
A D B Cox	SERC RAL
Prof E Dagless	University of Bristol
M J Dance	University of Keele
Dr J Darlington	Imperial College, London
S R Dauncey	General Technology Systems Ltd
P Davies	University of Bradford
I L Davies	GEC Research Labs, Hirst Res Centre
Dr G L Davies	University of Bradford
G M Davis	BTG
A Davison	Queen Mary College
B De Decker	K U Leuven, Belgium
F C S de Moura	University of Manchester
Dr L Dixon	Hatfield Polytechnic
Dr D A Duce	SERC RAL
R J Duckworth	University of Nottingham
Dr D A Edwards	University of Manchester
Dr E F Elsworth	University of Aston
Prof D J Evans	Loughborough University
Ms E Fielding	SERC RAL
D C Findley	SERC RAL
P Frewin	Brunel University
P Garratt	University of Southampton
Dr P J Gawthrop	University of Sussex
D R Gibson	SERC RAL
R Gimson	Oxford University
H Glaser	Westfield College
Dr J R W Glauert	University of East Anglia
Dr Godfrey	ICL
G Gomberg	Logica UK Limited
P Griffiths	Queen Mary College
Prof R L Grimsdale	University of Sussex
J P Gupta	Polytechnic of Central London
Dr J R Gurd	University of Manchester
J E Hailstone	SERC RAL
Dr F Halsall	University of Sussex
Dr L Harrison	University of Nottingham
S Harrison	University of Sussex
S Hayes	Westfield College
J G B Heal	University of Newcastle
P J Hemmings	SERC RAL
Prof P Henderson	University of Stirling
C P Hendrickson	L. Livermore Nat Lab, USA
P L Higginson	University College London
Y Hoffner	University of Reading
L Holenderski	Imperial College, London
N P Holt	ICL, Manchester
Prof F R A Hopgood	SERC RAL
T P Hopkins	University of Manchester
J Howlett	ICL, London
Ms J Hughes	UMIST
S C Hui	University of Sussex
R Hull	University of Sussex
R N Ibbett	University of Manchester
P G Jenkins	University College Swansea
Dr S B Jones	University of Stirling
Ms G P Jones	SERC RAL
L E Jordan	STL, Harlow
W H Kaubisch	Oxford University
D Keeffe	University of York
P H J Kelly	Westfield College
Dr J M Kerridge	Sheffield City Polytechnic
J S Khatri	Queen Mary College
G Kindervater	CWI, Holland
A J Kinroy	SERC RAL
S G Kirk	British Telecom
C C Kirkham	University of Manchester
T Y Kong	University of Oxford
Dr J Kramer	Imperial College, London
Dr J E Lambert	University of Sussex
R Laney	Westfield College
Dr P E Lauer	University of Newcastle upon Tyne

D Lester	University College London
Ms K Levine	Hatfield Polytechnic
K O Li	University of Sussex
M J Loomes	Hatfield Polytechnic
Dr K Lunn	University of Bradford
M W Martin	SERC RAL
K Matthews	University College London
Dr W A McClean	Queen's University of Belfast
R Milner	Edinburgh University
A G Minter	University of Warwick
C Morgan	Oxford University
M W Morron	ICL
P Morrow	Queen's University of Belfast
A Naik	Westfield College
Prof R Needham	University of Cambridge
Dr I A Newman	Loughborough
D R Noakes	University of Birmingham
A Oram	Sheffield City Polytechnic
G P Otto	University College London
Prof D M R Park	University of Warwick
A J Parker	University of Manchester
S L Peyton Jones	University College
Man-Chi Pong	University of Kent
C H F Poon	University of Sussex
F S F Poon	University of Sussex
M S Powell	UMIST
C J Prosser	ICL, Stoke
Dr J T Proudfoot	University College Swansea
Prof I C Pyle	University of York
M Reeve	Imperial College
F Ris	IBM Research
A Rizk	University of Sussex
T B Robinson	High Level Hardware Ltd
D Robinson	Marconi Research Centre
Dr F M Russell	SERC RAL
I Samaras	UMIST
Dr M Sandler	King's College London
J Sargeant	University of Manchester
Dr J A Sharp	University College of Swansea
D N Shorter	Systems Designers
T E Shrimpton	University of Sussex
Dr B Shriver	IBM, USA
Dr M J Shute	Middlesex Polytechnic
B Sibbald	Paisley College of Technology
P Singleton	University of Keele
D Sirovica	University of Sussex
Dr M R Sleep	University of East Anglia
Dr M Sloman	Imperial College, London
R A Steele	Sheffield City Polytechnic
Dr R G Stone	Loughborough
R Sykes	Imperial College, London
C Tan	UMIST
R B Theodossiades	University College Cardiff
? Thomas	South Bank Polytechnic
P Thompson	Westfield College
D R Till	Westfield College
G M Tomlinson	University of York
N Trevett	Logica UK Limited
H W J M Trienekens	Erasmus University
Dr W R Tuck	University College London
T Tye	UMIST
Prof J R Ullman	University of Sheffield
A Veen	CWI, Holland
H Villanveva	UMIST
C P Wadsworth	SERC RAL
Prof I C Wand	University of York
I Watson	University of Manchester
A Wellings	University of York
Dr A B Wilkinson	Brighton Polytechnic
N Willis	Sheffield City Polytechnic
D R Wilson	Polytechnic of Central London
Dr R W Witty	SERC RAL
Dr A M Wood	University College London
Miss J Woods	STL, Harlow
Dr M C Woodward	Loughborough
A A G Yaghi	University of Warwick
Dr H Zedan	University of Bristol
Q Zhong	University of Sussex