

EDITORIAL

ERCIM: Shaping its Future in a European Research Environment

After less than two years the existence of the European Research Consortium for Informatics and Mathematics (ERCIM) has created a corporate identity among its scientists which seems rather unique among research laboratories of different countries.

The series of scientific workshops hosted alternately by the ERCIM members has brought scientists much closer together and has contributed considerably to this development. The workshop participation, so far only open to ERCIM scientists, offered opportunities for intensive discussions, gave an idea of the research environment of the colleagues from the other research laboratories and provided the incentive to work together on a daily basis outside the workshop events. In fact, it is not only the workshops themselves but the preparatory work and meetings in between the workshops which forged the cooperative spirit which is so important for the success of such a multinational venture on its way to a European future.

It has been clear from the beginning and pointed out in a joint policy paper that the three founding members wanted to attract more research laboratories from other European countries to join them in their effort to strengthen European information technology research by creating a centre of excellence. The objective of such a centre is to cope with the many worldwide challenges and opportunities in an efficient way taking into account the limited resources of the individual members.

After consolidating its initial organizational structure and long term research objectives and poli-

cies, ERCIM has made its first membership offer on the occasion of its workshops on April 26-27 at GMD in Birlinghoven. As a result of several visits and very fruitful discussions between representatives of ERCIM and the Rutherford Appleton Laboratory (RAL), United Kingdom, both sides concluded that the Computer Science and Computing groups of RAL are willing and able to contribute substantially to ERCIM goals as they are laid down in the ERCIM scientific agreement. It was agreed that RAL will join ERCIM as soon as the necessary board agreements have been made. Although different from the other ERCIM partners with regard to the number and volume of research and service activities outside the field of informatics and mathematics, RAL qualifies on the basis of

- excellent connections to the university research community,
- its involvement in a number of EC projects related to informatics,
- its activities in a number of research fields identical with the activities of ERCIM partners,
- its excellent connections to industrial partners (e.g. engineering community) through its educational and technology transfer activities concerning its research,
- its experiences in several fields of science where ERCIM partners could benefit from this situation in the context of interdisciplinary and applied research projects.

With the additional asset of having RAL as a member, ERCIM will move on to structure itself as a European Economic Interest Group and communicate and interact more intensively with the academic science community in Europe.

ERCIM intends to strengthen its organizational structures — without creating unnecessary bureaucracy — and to refine its research policy and objectives. At the same time ERCIM

- emphasizes its openness to include more members,
- will improve and increase joint project activities,
- supports EC programs and actions related to information technology, and
- will intensify links to the science and industrial community in Europe.

ERCIM should become a European focal point for a worldwide research network dedicated to information technology research and knowledge transfer. Let us continue to join forces in order to achieve this ambitious goal to the benefit of a global society, having Europe in mind.

Gerhard Seegmüller

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COOPERATION

Rutherford Appleton Laboratory New Member of ERCIM – Fourth Joint Workshop at GMD

The British Rutherford Appleton Laboratory (RAL) is to become a member of the European Research Consortium for Informatics and Mathematics (ERCIM). This was agreed by the directors of the three founding organisations of this European computer science initiative at their meeting at GMD in Sankt Augustin on 27 April, 1990. At a first workshop in November 1988 in Amsterdam, the directors of CWI, GMD and INRIA agreed to strengthen cooperation between these respective national computer science research agencies of The Netherlands, the Federal Republic of Germany and France with a view to the development of the Single European Market. The entry only eighteen months later of the British national research institute, the Rutherford Appleton Laboratory, means that a further vital step has been taken towards European cooperation in the field of computer science.

The ERCIM meeting at GMD in Birlinghoven on 26 and 27 April, 1990, provided scientists from the member organisations with the opportunity for extensive exchange of information. Below short accounts are given of the three workshops on "System and Control Theory", "Multimedia Document Production and Distribution" and "Operating Systems".

System and control theory

Three subjects were discussed:

- linear system theory and deterministic systems
- stochastic systems and stochastic control
- discrete event systems.

In the first subject attention focussed on singular linear systems and descriptor systems, realization and approximate realization, and mechanical systems. The second subject covered realization and identification, control theory and filtering, and control of queueing systems. The third subject is a relatively new research area of system theory. Its motivation lies, e.g., in developing mathematical models for the control of flexible manufacturing systems, communication



protocols and the scheduling of transaction execution in databases. In particular the modelling of discrete event systems by Petri nets and systems on diodes has been discussed.

In particular between CWI and INRIA an exchange of scientists has started in this field since last year. Ramin Nikoukhah and Philippe Nain visited CWI last fall, whereas CWI's Peter de Waal visited INRIA for two months in the spring of 1989 and Margreet Kuijper plans to do the same coming fall. Such short exchange visits up to two months are generally felt to be highly effective and financial means should remain available at least at the present level to warrant these exchanges.

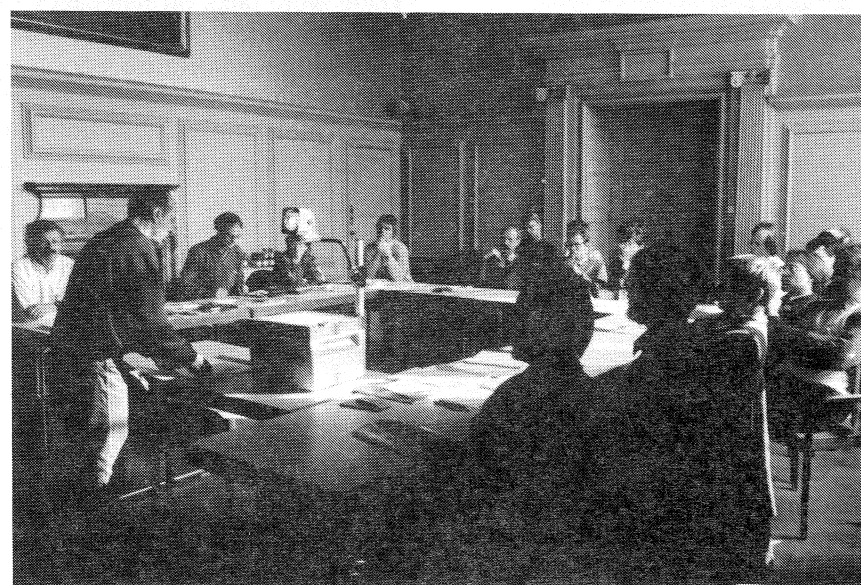
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Multimedia document production and distribution

The aim of this workshop was to give a global overview of the ERCIM activities relating to the general theme of multimedia. Given the wide spectrum covered by multimedia, the presentations ranged from man-machine interfaces to document databases as well as hypertexts and electronic publishing.

In particular, GMD presented a technology integration project for publication and hypermedia which incorporates the latest multimedia products and prototypes, their

Prof. Alain Bensoussan, INRIA, addressing participants at plenary session (left). Scientists from European member organisations meet for the three workshops at Schloß Birlinghoven. Photos: Münch



involvement in the ODA and SGML standardization work, and the SEPIA knowledge-based hypertext-authoring system.

INRIA presented the GRIF structured editor and its multimedia components, a speech recognition system and their involvement in the ESPRIT Multiworks project, as well as a brief overview of INRIA's other hypertext activities, in particular hypercentaur and linguistic aspects of hypertext.

CWI presented its work on viewer dependent coding of animated images, database support for multimedia applications and the ESPRIT Multos project, plus a demonstration of the Views user interface system.

As a first encounter, the workshop succeeded in bringing together researchers with a diversity of interests within the same subject area. Those working on technology integration projects were of course interested in all aspects of multimedia, others will establish contacts on a one-to-one basis. Those interested in taking part in future cooperation and in further information about hypermedia/multimedia activities in the respective institutes can address their interest to the following contact persons.

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Operating systems

GMD, INRIA and CWI all have groups working in the area of distributed systems and all three have experience in building distributed system prototypes. Among the presentations of a large number of varying subjects were four devoted

to different aspects of security in distributed systems.

Now that distributed computing has reached a certain level of maturity, it is high time attention was given to the difficult problem of making distributed systems secure. Security is one of those aspects in systems where the case for traditional, centralized time-sharing computers is fundamentally different from that of modern distributed systems. Time-sharing computers were always assumed to be in a physically protected environment, whereas most of the computers that constitute a distributed system can easily be tampered with. In time-sharing machines, a trusted operating systems kernel would thwart attempts of user programs to break the security. In distributed systems, even the operating system kernels may engage in funny business.

We discussed the problems of and proposed solutions to authenticating software and computer users in distributed systems, and spent a large amount of time discussing ways of making those parts of a distributed systems that can be trusted identifiable.

In the other two sessions, labelled 'wild ideas' and 'communication and fault tolerance', a wide range of topics was discussed. There were talks on languages for quickly building simple distributed applications, building operating system kernels using an object-oriented methodology, structuring communication to allow encapsulation for testing, monitoring and security, or to provide more reliability, on distributed transaction management and on name servers.

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Fourth ERCIM partner – The British Rutherford Appleton Laboratory

RAL – The Rutherford Appleton Laboratory (RAL), United Kingdom, is the largest laboratory in SERC – the Science & Engineering Research Council. SERC is one of the five Research Councils supported by the 'Science vote', that is, government expenditure on civil science by the Department of Education and Science in the United Kingdom. SERC was created by Royal Charter in 1965 and has as its primary purpose 'to maintain standards of education and research in Britain's Universities'. This is interpreted as embracing all Higher Education Institutions (HEI) in the UK. Topics covered by SERC's remit includes a broad spectrum of science and engineering. Information technology and computing science form an important area of its work.

RAL is located in Chilton, Oxfordshire. It provides central facilities and specialist resources to support HEI research in Britain and has a growing network of international collaborative programmes. RAL employs about 1400 people of whom half are professional scientists and engineers. The gross budget of the Laboratory in the financial year 1990/1991 (April to April) will be £69M. RAL provides mainframe and distributed computing support for SERC-supported scientists and engineers and has a significant 'in-house' activity in information technology. About 285 people work in IT programmes and the associated budget is £13.8M (ECU 18.6M).

RAL has three main departments concerned with information technology activities:

- Informatics
- Central Computing
- Technology



Participants from Rutherford Appleton Laboratory in director's meeting at GMD: Prof. David A. Duce, Prof. Bob Hopgood, Dr. Paul Williams (from left to right)
Photo: Münch

These departments are subdivided into organisational units with the following activities:

Informatics Department
Systems engineering

- integrated project support environments
- formal methods and tools
- formal specification of computer graphics
- translator writing systems
- functional languages
- knowledge representation
- knowledge acquisition (user modelling)
- life cycles of knowledge based systems.

Design

- novel user interfaces
- user interface management systems
- workstations and window management
- engineering databases
- product data exchange
- software environments for engineers.

Computational modelling

- parallel computing (transputer based systems and virtual architectures)

- visualisation (PHIGS PLUS, AVS)

- computational fluid dynamics
- finite element analysis
- electromagnetic design
- image processing
- VLSI process and device modelling.

Distributed computing systems

- local and wide area networks (NFS, X, OSI)
- graphics (EKS, EKS-3D, PHIGS)
- text processing (SGML)
- assessment.

Central Computing Department

Computer services

- operation of RAL supercomputers Cray X-MP/48 and IBM 3090 600E/6 VF
- support for remote and local users of the services
- network connections to external users
- marketing a commercial bureau service.

Software and development

- computer operating systems development and maintenance
- decision support systems and office automation

- visualisation and graphics development.

Advanced research computing

- use of supercomputers to solve scientific and engineering problems
- numerical modelling
- algorithm development
- visualisation.

Advanced communications

- studies in multimedia communications systems by satellite and terrestrial links.

National networks

- development and operation of JANET, the national network linking universities, industry and the national computer centres
- standards
- protocol development
- wide area network systems.

Technology Department

Electron beam lithography

- advanced mask making
- direct write processing
- mask repair for sub-micron VLSI.

VLSI design

- comprehensive microelectronics design, fabrication and test service for UK academics
- participation in ESPRIT VLSI Design action (Eurochip).

RESEARCH ACTIVITIES

**The BirlIX Operating System
 — the Basis for Reliable
 Distributed Applications
 Systems**

GMD — The demand for distributed, reliable and secure applications systems has combined with the challenges of new hardware architectures to stretch existing operating systems to their very limits. Ever increasing requirements resulting in repeated expan-

sions have caused originally well-structured systems to become unclear and highly complex. As a result, several international projects have concentrated on combining two of the key developments made in the eighties in operating system design, i.e., distributed operating system kernels and the Unix interface which became a de facto standard for vendor-independent operating systems.

The BirliX operating system developed by GMD is also designed around the Unix interface on the basis of a distributed kernel. In addition, however, attempts were made to identify common functions and characteristics of the various operating system services and to support these through the system architecture. The aim is for operating system services to benefit from these generic functions, among which fault tolerance and data security play a central role.

In a computer network environment, application programs using BirliX are distributed to the individual computers, either explicitly through the application itself or implicitly through strategies designed to increase performance or reliability which can be incorporated in BirliX. In general, the probability of faults in distributed applications increases with the number of computers involved insofar as the applications do not deal with partial system faults by transferring system components

from failed computers to those still functioning properly. Fault detection and support for fault tolerance strategies are thus essential features of BirliX. Distributed systems add a further dimension to the problem of data security, as is dramatically shown by the viruses and other "Trojan horses" that have become known to date. BirliX therefore supports the implementation of a wide range of security strategies through appropriate protective mechanisms.

BirliX is based on the general principle of expanding functionality by adding new, abstract data types. These new, abstract data types inherit a series of characteristics with regard to the distribution, recovery and security of a primary type. To permit implementation of the abstract data types irrespective of the hardware used, threads and segments are employed as abstractions of active and passive physical resources. The quality of this design was demonstrated by the emulation of BSD 4.3 Unix with the aid of fifteen abstract data types tailored to Unix, e.g., file, directory and socket.

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DISCO — a System for Programming and Controlling Distributed Office Applications

GMD — GMD has recently developed the DISCO (Distributed Communications-oriented Office applications) prototype programming and run-time system for distributed office applications. DISCO provides support for cooperation functions in the office sector.

This system relieves the applications programmer of many prob-

lems of form-oriented terminal input and output, interprocessor communication and restart after technical faults or interruption of work by the user, thereby ensuring maximum simplicity, comprehensibility and adaptability of the application programs. This greatly simplifies the task of the applications organizer in the management of programs, forms, computer addresses, users and organizational units and their respective authorization status. At the same time, DISCO offers the user a uniform, form-oriented terminal interface to various types of computers and terminals, combined with flexibility in selecting, deferring, diverting and delegating tasks as well as problem-free resumption of interrupted operations.

A prototype of the DISCO system has been developed for Sun3 workstations (using SunOS), PCS/CADMUS computers (using MUNIX) and an IBM/4631 computer (VM/CMS).

For some years now, office communication and automation have been relying increasingly on networked systems of workstation computers, departmental computers and central mainframes. These networked systems have tended to grow from smaller, "island-type" subsystems where there are often considerable differences between the makes and operating systems of the computers in the individual "islands". DISCO attempts to provide the conditions required to overcome the serious obstacles presented to the development of distributed office applications by the heterogeneity of these networks.

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The BirliX-Logo

New Version of FELIB Released by Numerical Algorithms Group

RAL — The Finite Element Library (FELIB) is a program subroutine library for the numerical solution of partial differential equations using the finite element method. It has been designed to meet the needs of the algorithm developer. Being a set of software tools the library is applicable to any new research area in mathematical physics where packages don't exist, e.g. in free-surface flows and non-Newtonian mixing. Salient features are thus:

- large suite of subroutines
- portable software
- wide range of applications
- effective teaching aid
- easily extendable example programs.

The first library was developed at the University of Manchester and has subsequently been rationalised and extended at RAL, where it is still under continuous development. Because of its very wide range of application the software has been released through the Numerical Algorithms Group Ltd. for use by industrial and university research workers.

FELIB is a two-level library. Its current contents are: thirteen application programs for both steady-state and time-dependent problems, mainly in the fields of (elastic) solids and potential problems, and a hundred subroutines to perform many of the basic tasks required by a finite element program, e.g. element matrix assembly, numerical quadrature and equation solution.

All the software is written in ANSI(66) FORTRAN and conforms to the PFORT subset. Thus the library software and any programs written using the library are very portable. This makes use of

the library very attractive in many forms of co-operative research.

Although the Library is firstly a research tool, it is nevertheless very useful in the teaching of the finite element method. Its basic modular nature ensures that all the steps in a finite element analysis are transparent.

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The ABC Programmer's Handbook

CWI — ABC is a new programming language, developed at CWI. It is designed to make programming easier by letting the computer do the work, not the programmer. Its simplicity and power makes it an ideal language for daily programming, prototyping and teaching, and for learning programming. It is:

- interactive — commands are executed as you type them
- structured — both data and programs are structured
- simple — it can be learnt in a couple of hours
- powerful — it has very high-level data-types
- friendly — the language is embedded in its own programming environment
- concise — typical programs are around a fifth the length of equivalent programs in, for example, Pascal or C
- readable — ABC programs resemble the pseudo-code that people use to design programs.

For instance, here is a function that produces a cross-reference listing of some document. This would need more than 100 lines in C or Pascal:

```
HOW TO RETURN index doc:
  PUT {} IN where
  FOR line.no IN keys doc:
    TREAT LINE
  RETURN where
TREAT LINE:
  FOR word IN split doc[line.no]:
    SAVE line.no IN where FOR word
HOW TO SAVE item IN table FOR key:
  IF key not.in keys table:
    PUT {} IN table[key]
  INSERT item IN table[key]
```

Recently The ABC Programmer's Handbook (authors Leo Geurts, Lambert Meertens and Steven Pemberton) appeared in Prentice Hall (ISBN 13-000027-2). The Handbook is intended for people who have experience in at least one other programming language, and gives:

- an introduction to the language
- many fully worked-out and interesting programs
- a user's guide
- a complete definition of the language.

Implementations of the language, for the IBM PC and compatibles, the Atari ST, the Apple Macintosh, and Unix, are available for free from many bulletin boards and servers, or at cost from CWI.

Many ideas, originating from ABC, are presently explored at CWI in a new project, Views, which focusses on user interfaces.

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Multimedia at CWI — a Large-Scale Effort

CWI — Recently CWI decided to embark on research in the field of multimedia. CWI's research structure is pre-eminently suited to such a multi-disciplinary effort, housing many different disciplines in mathematics and computer science under its roof. With respect to multimedia CWI expertise comprises the following fields:

- user interfaces
- interactive data manipulation
- database design
- distributed systems
- wide-area networking
- performance analysis
- image processing.

The effort is structured as an umbrella project, covering several separate projects, to be staffed mainly with existing manpower.

Two projects have been defined so far, one on multimedia messaging (called Van Gogh, project leader Dick Bulterman) and another on interactive picture recognition, modelling and visualisation (project leader Iván Herman).

In April a two-day workshop was held at CWI on the state-of-the-art of multimedia. Half of the 26 participants came from outside CWI (e.g. Philips, Océ, Elsevier and PTT). ERCIM was represented by Carsten Wieschialek (GMD) and Vincent Quint (INRIA). Some important issues discussed were: the bottlenecks of data transmission and storage, and standardization (highlighted by GMD). Mik Lamming of Rank Xerox EuroPARC (UK) reported on an interesting experimental set-up.

It was suggested that the present ERCIM partners alternatingly organize such workshops with an annual frequency.

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European Online Market Study

GMD — European Online Market Study (EGHOST) is a collaborative project which aims at a coordinated survey of EEC host organizations engaged in the provision of electronic information services for professional users. It runs

from July 1989 to June 1990, seeks to collect reliable statistical data concerning the online/vidcotex industries in the EC Member States.

The project brings together nine industrial organizations and research institutes from seven of the twelve member states of the EC and is expected to involve others in the future. The project is coordinated by the European Information Industry Association (EIIA) and the costs are shared by the participating organizations and institutes and the EEC Commission. Its main objectives are:

- to measure the size of the professional electronic information services industry in the EC in order to provide the industry with reliable benchmarks for business analysis and planning,
- to establish a secure framework for the collection, analysis and presentation of reliable industry statistics on a continuing basis.

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Common Research Action on Iterative Procedures in Statistics

INRIA/CWI — In the area of statistical methodology and data analysis, INRIA's project CLOREC (led by Edwine Diday) has initiated cooperation with the Department of Operations Research, Statistics and System Theory at CWI. The cooperation is in first instance limited to iterative procedures in statistics. The long term aim is to establish a broader common research action, fruitful for the members of both departments.

As a first cooperative event, a seminar on iterative procedures in

statistics was organized by Gilles Celeux and Conchita Callant of CLOREC (April 3, 1990 at INRIA Rocquencourt).

Kacha Dzhaparidze (CWI) presented an approach to optimization problems based on methods which are developed in numerical analysis (quasi-Newton or conjugate gradient methods, or rather their appropriate stochastic modifications) which possess the so-called quadratic termination property: the minimum of a quadratic function is found in at most k iterations, where k is the number of unknown parameters.

Jean Diebolt and Gilles Celeux (INRIA) gave a lecture on other algorithms based on the Estimation-Maximization (EM) strategy. The EM algorithm is a widely applicable approach for computing maximum likelihood estimates for incomplete data. They presented improved versions of the EM algorithm: the Stochastic-Estimation-Maximization (SEM), and the Simulated Annealing type Estimation-Maximization (SAEM). These algorithms execute the iterative procedure better and more efficiently and overcome most of the well-known limitations of the EM algorithm.

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Legal Requirements Relating to Public Sector

GMD — Legal Requirements Relating to Public Sector Information (PUBLAW) is a research project sponsored by the European Economic Community (General Directorate XIII: Telecommunications, Information Industries and Innovation) in the context of the EEC program on

Information Market Policy Actions (EEC Council Decision of July 26, 1988). The project team consists of Professor James Michael (University College London), Professor Yves Poulet (University of Namur, Belgium), and Herbert Burkert (Senior Researcher of GMD, Cologne).

The project will collect and analyze the legal texts and the practices in the member countries with regard to access to public sector information (or the distribution of such information by the public sector) in view of commercial use of such information by information market participants to examine the necessity of community action.

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LiE — Software for Lie Group Computations

CWI — A software package LiE for Lie group computations has been developed by CWI's Computer Algebra project group. LiE gives on-line information on Lie groups and provides a programming environment to interactively perform computations of Lie group theoretical nature. For complex reductive groups LiE provides several characteristics, such as root systems, Weyl groups, the Littlewood-Richardson rule, and tensor product decompositions. Apart from its powerful built-in functions, LiE provides a programming language with control structures (while loops, etc.) and the possibility to define new functions. The present version 1.3 is available for the following computer systems: VAX 11/750 and 11/780 (under BSD UNIX 4.3), SUN3 and SUN4 (SUN OS), IBM RT (AIX 2.2.1), IBM PC compatibles (MS DOS) and Apple Macintosh.

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ESPRIT Project COMPARE — Compiler Generation for Parallel Machines

CWI/INRIA/GMD — Three ERCIM partners — GMD, INRIA and CWI — will participate in the ESPRIT project COMPARE. Other participants are: ACE Associated Computer Experts bv. (The Netherlands, coordinator), Harlequin Limited (UK), STERIA (FRANCE) and the University of Saarland (FRG, GMD subcontractor). COMPARE will run for five years with 100 man-years on a budget of 7.6 million ECU. The contract is expected to be finalized within two months, and the project will probably start early 1991. After investigation and implementation of a new compiler model, first hand-coding of compiler components will be undertaken and in a later stage generators for these components will be created. Finally, demonstrations of the ideas developed through COMPARE will involve the use of the tools and components developed in the project to create one or more actual compilers. In this project expertise will be contributed by GMD in the area of code generator generators, by INRIA on attribute grammars and vectorization, and by CWI on the generation of programming environments from formal specifications.

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STANDARDS

Quality of Application Software

GMD — The national standard DIN 66 285 "Information processing; application software; quality requirements and testing" is going to appear. The pre-standard has been the basis for awarding a quality mark since 1985 ("Gütezeichen Software"). The knockout criteria from the pre-standard (now tightened up) are:

- documentation is incomplete,
- installation is impossible when following the instructions,
- minimal hardware configuration as indicated is insufficient,
- a documented function (or a part of it) is missing,
- a failure leads into a state which the user cannot control,
- a failure leads to loss or corruption of data,
- a failure leads to a wrong result,
- any regulation claimed to be satisfied is violated.

GMD has been charged with assessing the testing laboratories, and the text editor of the DIN standard is affiliated with GMD.

A draft translation to English was submitted to ISO/IEC Joint Technical Committee 1 Sub-committee 7 "Software development and system documentation" in 1989 with a motion to make it a New work item. This has now been accepted. Again GMD undertakes the task of project editor.

Anyone who is willing to return comments may ask me for a copy of the draft English translation. The DIN Standard (in German) can soon be purchased from Beuth Verlag, Postfach 11 07, D-1000 Berlin 30, or from your national ISO member. Information on the quality mark in English, French

and German and the quality requirements in German (equal to the DIN standard) can be obtained free of charge from Gütegemeinschaft Software e.V., Postfach 71 08 64, D-6000 Frankfurt (Main) 71, Tel. +49 69 66 03 533, Fax -510.

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Conformance Testing Services

GMD — The Commission of the European Communities (CEC) launched in 1985 the first phase of the conformance testing services programme (CTS 1). The programme aimed to establish the groundwork for testing in the Open Systems Interconnection (OSI) and telecommunication area and to enhance existing testing in other areas to bring it in full alignment with the Community policy. The Community funding was provided for approximately 50% of the costs. As a result of a contract a European wide harmonized test service has to be provided at least in two EC member states. The test service will lead to a certificate of conformity that will be recognized in all participating countries.

GMD in cooperation with other partners developed a test service for testing implementations of the Graphical Kernel System (GKS). One of the participants was the new ERCIM member Rutherford Appleton Laboratory (RAL). A harmonized test service is offered by AFNOR, GMD, IMQ, NIST and NCC. The tests by different testing laboratories must lead to identical results if the same implementation is tested. The test service uses the FORTRAN language binding of GKS. All levels of GKS can be tested. Tests for the C language binding are foreseen.

Within CTS 2 a project has started in April 1988 to develop

test tools for the Computer Graphics Interface (CGI, ISO/IEC DIS 9636/1-6) and to offer a test service for CGI. Partners in the project are GMD, Fraunhofer Arbeitsgruppe Graphische Datenverarbeitung (FhG-AGD, Darmstadt), Instituto de Engenharia de Sistemas e Computadores (INESC, Lisbon), The National Computing Centre Ltd (NCC, Manchester), Association Française de Normalisation (AFNOR, Paris) and the University of Leeds (Leeds).

Although the CGI standard foresees different language bindings and different encodings there should not be different test tools for different CGI implementations. For testing CGI devices there will be one test suite as the common basis for all CGI implementations, independent of the language binding or the encoding supported by the CGI. A CGI will be tested using the same test cases no matter what addressing mechanism is supported by the CGI implementation. For this reason the test cases are written in an independent test description language. A test suite interpreter maps the test description language to the CGI language binding or a CGI encoding as necessary.

The implementation language chosen by the project is C. C now is ISO/IEC DIS 9899 and it is expected to provide programs that are portable. The development will be done in UNIX and VAX-VMS environments.

A prototype of the CGI test system was presented at the European Conference on Conformance Testing and Certification in Information Technology and Telecommunication, June 13 – 15, 1990 in Brussels. The full test service is scheduled for April 1991.

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LE-LISP: V16 Announced to the Press V15.2 Reference Manual in English

INRIA — The last version of the LE-LISP system, LE-LISP V16, was officially announced by INRIA and ILOG at a press conference on April 25. Development of the LE-LISP V16 kernel was financially supported by the French Ministry of Industry. The development environment of LE-LISP is being done in the scope of the EUREKA Project ELSY in collaboration with BULL, ILOG and CRIL on the industrial side, and INRIA and GMD on the research side.

INRIA provided the source of the system to the porters of LE-LISP for evaluation. The system is actually composed of an architecture based largely on LE-LISP version 16 itself, first class functions and lexical closures, a new memory management system, a simplistic development environment, a version of the object-oriented system TELOS, a modular compiler and a binary fast loader

On 680x0 and on MIPS based machines, LE-LISP V16 will be available in June 1990 and on the main other UNIX machines of the market, at the second quarter of 1991.

The LE-LISP V15.2 reference manual is now available in English. It will be distributed by INRIA for universities and public research organizations and for others by the distributors of LE-LISP.

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Structured Documents Editor GRIF Distributed by GIPSI SA

INRIA — The French company GIPSI SA, a start-up of INRIA, recently signed a contract for the distribution of GRIF. GRIF is an editor for structured documents developed by I. Vatton (CNRS) and V. Quint (INRIA). The main functionalities of GRIF has been chosen by both main projects of software houses, ESF and EAST (two EUREKA projects) for the conception of their documentation.

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Two INRIA Prototypes Commercialized by E3X

INRIA — E3X is a young French Lyon-based software house, specialized in UNIX applications. Recently E3X industrialized two INRIA prototypes and commercialized the resulting products:

- UCOM-X is the commercial name of MPLUS, developed by C. Huitema at INRIA Sophia Antipolis; it is an ISO compatible interface through X400 electronic mail.
- ODIS-X was initially developed by A. Caristan and his team for the automation of management services at INRIA; it is a platform for the development of administrative applications.

E3X presented these products at Infomart (La Defense) in Paris last April.

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GMD at German Trade Fair in Tokyo

GMD — The Tokyo branch of GMD exhibited five key GMD research projects to Japanese visitors during the German Trade Fair in Tokyo. From 11 to 14 April, 1990, at a stand shared with the German Embassy, the German Chamber of Industry and Commerce and the Japanese export promotion agency JETRO, GMD staff provided information on

- BABYLON, the tool system for expert systems,
- L3, an operating system for PCs,
- MOCKA, the Modula-2-compiler from Karlsruhe,
- SNAPAD, a software system for improving communication between mainframes,
- SUPRENUM, the supercomputer for numerical applications.

A total of 30 German companies exhibited at the Tokyo fair. Politicians and industrialists from the two countries took the opportunity of exchanging information, while the several thousand visitors gained an overview of current research findings and of the performance of German industry. The GMD staff used information boards and brief descriptions in

Japanese to convey research work of the GMD institutes to the visiting public.

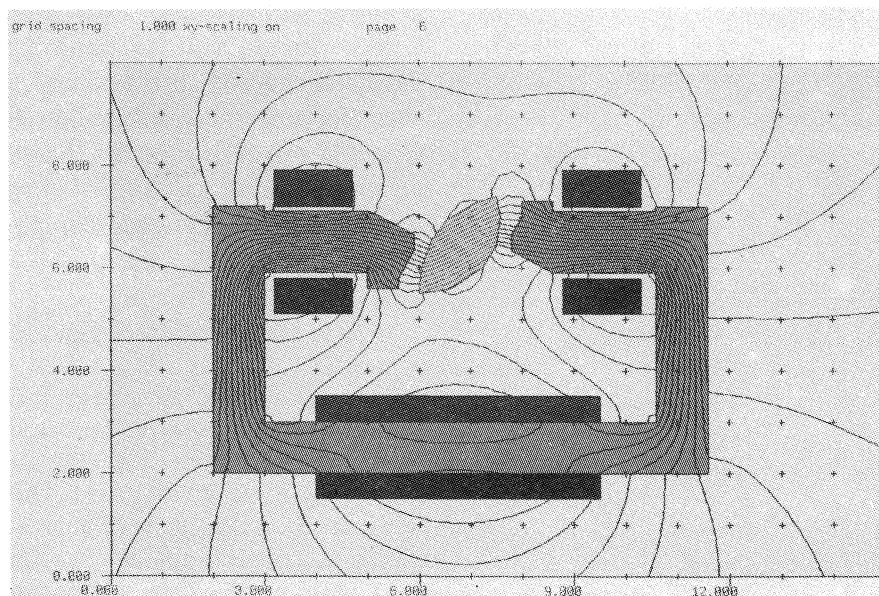
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Vector Fields and RAL Collaboration in ACCORD

RAL — RAL has been assisting Vector Fields, a software house in Oxford, on the ESPRIT ACCORD project. Vector Fields market a range of electromagnetic design software, some developed in conjunction with RAL.

Vector Fields demonstrated their ABEL suite at the 1989 ESPRIT Conference on an IBM 6150 with 32 T800 transputers supplied by RAL. ABEL is a boundary integral solver for magnetic and thermal configurations. The major disadvantage of the boundary integral technique is the time taken to form the stiffness matrix. However, this can be completely parallelised so that a 32-fold increase in speed is possible using the transputers. This gives the boundary integral method a new lease of life.

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A magnetic computation display typical of ABEL

Mathematical Analysis of Software Reliability

CWI — As software systems have increased in size and complexity, reliability tests have become more and more important. Finding the proper balance between development time and reliability is here an important economic issue. Dozens of models have been proposed in the last twenty years to describe the evolution of reliability or the error intensity of software during its development and testing phase. Two well-known so-called Error Counting and Debugging Models are the models of Musa and of Littlewood, developed in the 1970s. Some models appear to work very well, but the reason for this has never been understood mathematically. At CWI in a project sponsored by the Foundation for the Technical Sciences (STW) a statistical analysis of certain classes of such models, among them the Musa model, is carried out (in cooperation with Richard Gill, University of Utrecht). It should bring more light in the mathematical statistical aspects of software reliability models, which are inherently stochastic in nature. In STW projects industrial interest is always built in, in this case from the side of, e.g., Philips and the National Aerospace Laboratory.

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INTERNATIONAL RELATIONS

Australian Microelectronics and Software Mission Visits ERCIM Members

GMD/INRIA/CWI — An Australian microelectronics and software mission came to Europe in May, 1990. The mission was headed jointly by Dr. Dennis Cooper, Chief, Division of Radiophysics, Commonwealth Scientific and Industrial Research Organisation (CSIRO), and Mr. Ian Dennis, President, Software and Services Industry Federation of Australia. They were accompanied by three officials of the Australian Department of Industry, Technology and Commerce, by five university professors, and thirteen leading information technologists from Australian industries and public research laboratories.

The mission's objectives were to

- establish links and projects which will further Australian technological development and improve commercial ties with European firms,
- promote Australian capabilities in the microelectronics and software sectors, and increase awareness within Australia of international developments and opportunities,
- develop ongoing collaboration in strategic research projects, based on complementary activities in European institutions and companies.

The mission was carried out in connection with existing governmental agreements on science and technology cooperation between Australia and France, the Federal Republic of Germany, and The Netherlands, and in view of negotiations on a similar agreement with the Commission of the European Communities.

At GMD headquarters Australian mission members introduced their institutions and indicated possible fields for cooperative actions. Scientists from various GMD research groups reported on their research approach and research projects. Most of the discussion was devoted to the problem of how an efficient cooperation to the benefit of both countries could be achieved and maintained. In a next step and among other things a joint workshop with a more narrowly defined scientific topic was encouraged as well as a more numerous exchange of scientists and the definition of proposals for joint projects. Afterwards the Australian mission visited various other organizations in Germany.

In France, the Australian mission was received by SYNTEC Informatique and a number of French companies and research organizations. A delegation of scientists specialized in software visited INRIA. In particular they were interested in INRIA's project on medical computer science, led by Nicholas Ayache. In the near future cooperation in the fields of software engineering and image analysis will probably occur.

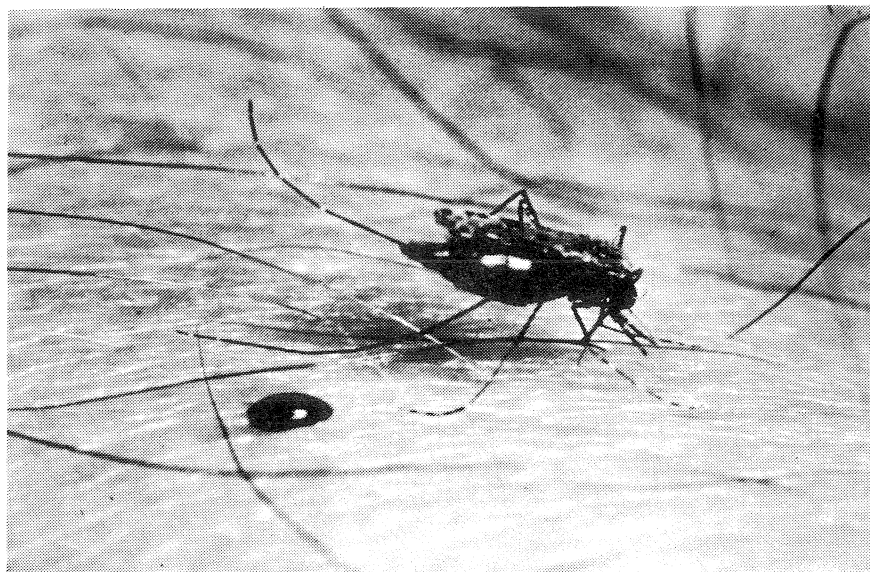
In The Netherlands the mission was received at the Ministry of Economic Affairs in The Hague. There the delegates met with representatives of the software industry and computer scientists. CWI was represented by the head of its Algorithmics and Architecture Department, Lambert Meertens. The possibility of a joint Dutch-Australian workshop on persistent environments and object servers was brought up, amongst other ideas.

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Visits to INRIA

INRIA — In April three representatives of institutions from abroad visited INRIA:

- Professor Alexcev (USSR), head of the Novosibirsk Computer Centre, in the framework of a collaboration in inverse problems in geophysics.
- Mr D. Popescu (Romania), chairman of the newly created National Committee for Information. A collaboration protocol between INRIA and the Romanian Institute for Research in Informatics was signed, in which the two organizations agree to represent their respective scientific communities.
- Christine Glendey (USA) of the National Science Foundation, to discuss further collaboration in the framework of the existing INRIA-NSF agreement. At present 12 collaboration projects are in progress.



A malaria mosquito takes a meal of blood and gorges until overflow. This is how the malaria parasite is conveyed from mosquito to man and vice versa. Mathematical models are used for obtaining insight in the spread of infectious diseases. The study of evolutionary systems is supported on the European level by the SCIENCE RTD Programme. Photo: van der Kaay

EC support For Research in Evolutionary Systems

CWI — The Commission of the European Communities has allowed a grant for three years in the framework of its SCIENCE RTD programme to eight European academic research groups in order to intensify their scientific contacts in the form of exchange of researchers, organization of workshops, etc. The activities cover the field of evolutionary systems: deterministic and stochastic evolution equations, control theory and mathematical biology. The participating institutions are: the universities of Tübingen, Besançon, Graz, Mons and Zürich, the Scuola Normale Superiore, the Technical University of Delft and CWI.

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Cooperation with Tokyo University

CWI — During the first half 1990, CWI's Paul Vcerkamp worked at the University of Tokyo (department of Mechanical Engineering) in the group of Prof. Hiroyuki Yoshikawa, a specialist in CAD-CAM (robotics). Main goal of his visit was to coordinate his work on specification methods for design systems with similar work by Prof. Tetsuo Tomiyama of Prof. Yoshikawa's group, who spent almost two years (1986-1988) at CWI. Further efforts in this field will be undertaken jointly, and cooperation will remain also in the future.

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Image Analysis — Exchange with CSIRO

CWI — At CWI one project concerns statistical aspects of image analysis. In this field contacts exist with CSIRO (Commonwealth Scientific & Industrial Research Organization) in Sydney, Australia. Around the end of last year Murray Cameron and Nick Fisher from CSIRO's Division of Mathematical Statistics visited CWI. These visits were partly connected with CWI acting as an 'alpha test site' for ACE, an extended version of the well-known package S developed by CSIRO. S was developed by AT&T around 1983 as a programming environment for data analysis and graphics. The CSIRO extension is directed to graphics facilities and CWI's role is to take care of the aspects of image analysis. In this connection, some short-term visits by young CSIRO scientists to CWI are envisaged for the near future.

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Technical Assistance for the Nicaraguan Elections

GMD — The aim of establishing a fair, complete and correct central electoral register for the first democratic elections in Nicaragua has been achieved. This was the verdict of Elliot Richardson, the personal representative of the UN Secretary General, and former US president Jimmy Carter, who visited Nicaragua as international election observers. According to computer experts, the systems employed for the elections on 25 February, 1990, set technical standards in their field, the project being unique in Central America and the Caribbean region.

The Information Technology department of the Universidad Nacional de Ingeniería in Managua, headed since 1985 by Cornelius Hopmann (on leave from his post at GMD), was responsible for organizing the largest data-processing project to date in Nicaragua. This involved recording the data of almost 2 million voters. 40 lecturers and students had to set up the necessary hardware and software, and also plan the sequence of operations. At times, more than 500 people were working on the project. Instead of the approximately nine months estimated to be necessary for planning and preparation, only 3 months were available between the registering of the electors and the deadline 60 days before the election. Both Nicaraguan and international agreements depended on successful completion of the project, while the political and technical prestige of the Federal Republic was also at stake.

The Federal Minister for Economic Cooperation, Jürgen Warnke, made an important contribution to the success of the project. In late August 1989, an agreement on technical equipment worth over DM 2 million was reached with the German government and the

Society for Technical Cooperation (GTZ). Siemens data-processing systems and Fujitsu printers were delivered in mid-September and put into operation at the University at the start of October 1989. The political parties received the first list on 18 December, 1989, and the final list with a delay of only 19 days on 14 January, 1990.

The computers donated by the German government mainly remained in Managua Technical University for training, educational and R & D uses. Four CADMUS/PCS UNIX computers donated by GMD are to be integrated into the existing system network via TCP/IP. The University is the first universal node in Latin America for the "Internet" international computer network, offering worldwide communication facilities.

The final report "Technical Assistance for the Nicaraguan Elections", Bonn, April 1990, is available from GMD as a 3.5" MS-Word disk.

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Canadian Information Technology Mission at GMD

GMD — A Canadian communications and information technology mission visited the Federal Republic of Germany from March 19 to 24, 1990. The visit took place in the framework of the bilateral consultations held under the Canada-FRG Science and Technology Agreement. The principal objectives of the visit were to further develop contacts between institutions in the communications and information technology sector, to review existing cooperative projects, and to identify additional areas of future cooperation.

The delegation visited Bonn (GMD headquarters are at Birlinghoven, near Bonn), Mulheim, Darmstadt, Berlin, and Hannover. The Birlinghoven programme included briefings on R&D in Germany and on the GMD's mandate, organization and activities, as well as presentations by GMD institutes and GMD research groups. In addition, a "Canada Day" session at GMD-Birlinghoven enabled Canadian members of the delegation to describe the nature and activities of the departments, research organizations and universities participating in the visit.

Despite many existing contacts, there was a strong view that an attempt should be made to better focus the cooperative activity between the FRG and Canada, concentrating when possible upon a few major projects. Priority should be given to the following sectors:

- Telecommunications
- Software engineering
- Artificial intelligence
- Microelectronics/VLSI
- Behavioural areas of activity.

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EVENTS

CDCS-10 — a Conference on Distributed Computing Systems

INRIA — The 10th International Conference on Distributed Computing Systems, organized by INRIA in cooperation with the Institute of Electrical and Electronics Engineers Inc, IEEE, U.S.A., took place in Paris, May 28 – June 1, 1990. These conferences are usually held in the United States. This time it took place under the responsibility of co-president Gerard LeLann. Two preceding training days, organized by INRIA, were dedicated to users and engineers on subjects as high speed LAN/MAN, distributed architectures, distributed real time and fault tolerant systems. At the conference four panels were held on commercial distributed systems and algorithms. More than 400 delegates from 20 countries attended the conference. The proceedings will be published by the IEEE Inc.

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Connection Machine at INRIA

INRIA — The second Connection Machine in Europe (there are three at present) was installed at INRIA-Sophia Antipolis last Spring. It consists of 16384 processors with a memory of 512 Millions Octets. Two Sun 4/390 machines act as a front-end. Local and distant access is provided by Tx terminals of the company GIPSI SA. This Connection Machine was financed by the French Government, the Regional Council of PACA (Provence Alpes Cote d'Azur), the General Council of Alpes Maritimes and INRIA. It is one of the most important components of the Centre Régional de Calcul Scientifique, which will play an essential role of competence in European programmes like Hermes or ERCOFTAC.

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CERMICS — a New Collaboratory between INRIA and ENPC

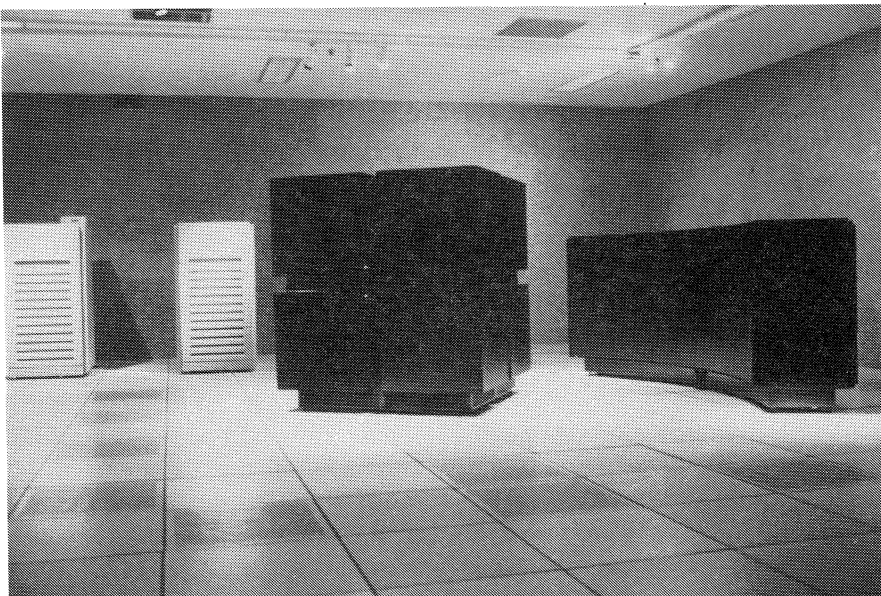
INRIA — Recently the Ecole National des Ponts et Chaussées (ENPC) and INRIA created CERMICS, a centre for education and research in modeling, computer science and scientific computation. It is conducted by Bernard Larrourou, an ENPC engineer and former research director at INRIA. Research at CERMICS will be oriented towards the theory of language and programming environments, expert systems and scientific simulations, especially in physics and chemistry.

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Third Conference on High Speed Networking

GMD — After the highly successful high-speed LAN workshops held in Aachen (FRG) and Liège (Belgium), a third event is planned to be held in Berlin, March 18 – 22, 1991. The conference will focus on one of the most dynamic fields of technological developments: high speed networking (>50 Mbps). The rapid technological changes in LAN, as well as in metropolitan and wide area networks and the new application fields will be the main areas of interest during this conference. Original contributions discussing the following topics are solicited:

- high speed LAN/MAN/WAN network architectures
- end-system architecture for high speed applications
- HSLAN/MAN/WAN interconnections
- protocols for high speed networks
- intelligent networks architecture
- multimedia applications.



The connection machine of INRIA Sophia Antipolis
Photo: Eidelman

Contributions, limited to 5000 words, should be submitted to one of the programme chairmen.

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Third European Conference on Multigrid Methods

GMD — Continuing the sequence of conferences in 1981 and 1985, the Third European conference on multigrid methods will be held on October 1 – 4, 1990 in Bonn. It will be organized by GMD under the chairmanship of Ulrich Trottenberg (SUPRENUM GmbH, GMD and University of Cologne) and Wolfgang Hackbusch (University of Kiel). The conference will again bring together specialists and others with interest in the general area of multilevel methods. Themes of the conference will range from basic research to industrial applications, with special emphasis on

- adaptivity
- parallel computation
- applications.

Invited lectures will be given by Achi Brandt (Rehovot), Erik Dick (Gent), Pieter W. Hemker (CWI Amsterdam), Anthony Jameson (Princeton), Paul G. Lauwers (Bonn), Oliver McBryan (Boulder), John W. Ruge (Boulder), Klaus Stüben (GMD Sankt Augustin), Pieter Wesseling (Delft), Harry Yserentant (Dortmund).

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Workshop on Work Conceptions for Software Development

GMD — Conditions of work in software engineering were discussed on a workshop in Königswinter (near Bonn). Engineering experts as well as human factors specialists investigated deficiencies in current engineering "work conceptions". The main focus of interest was on "Taylorism" of work in a prospective "software-factory" environment. Various approaches of "work conceptions" were compared and evaluated.

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Computer Browsing: Workshop Hypertext/Hypermedia '90

GMD — Around one hundred scientists and representatives of industry from throughout the German-speaking world met in the GMD Institute for Integrated Publishing and Information Systems in Darmstadt on 23 and 24 April, 1990, to exchange experiences and discuss new research approaches and applications in the media and information fields. The over 20 system demonstrations given at the first German workshop "Hypertext/Hypermedia '90", organized by the Gesellschaft für Informatik (GI) and GMD, indicated the broad range of applications for this innovative technology.

These hypermedia consist of large electronic information bases which can include written texts, graphics and animations, still and moving images, spoken voice and sound documents. Although the individual news items, descriptions, explanations and image or

sound sequences are not in any specified order, they are linked in terms of content. The user can select the subject which particularly interests him and call up the available text, film or image material. If requested, the computer can also suggest which additional information could be called up, viewed or output.

In a few years time, such multimedia books and newspapers will be available as additional information sources with the aid of powerful computers, comparable to televisions with connected videodisc player and integrated video section, connected via the wideband networks which the telecom authorities will have established by then. The scientists gathered in Darmstadt also believe that such systems will soon find a place in schools and universities. Industrial applications already exist in the fields of diagnostics, training, training materials and operating manuals.

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Yugraph'90 — Computer Graphics in Engineering

RAL — Yugraph '90, a computer graphics conference with a strong engineering flavour, was held 18 – 22 June, 1990, in Dubrovnik, Yugoslavia. About 50 papers were presented with most of the authors coming from Eastern Europe and Italy. Most of the CAD/CAM areas were represented, but there was also a strong emphasis on the theory of solid modelling, curves, basic algorithms and user interface techniques.

Bob Hopgood and David Duce from RAL contributed with

respectively an invited lecture on superworkstations and a discourse on formal methods in computer graphics. They also presented a pre-conference tutorial on the ISO/IEC standard the Programmers' Hierarchical Interactive Graphics System (PHIGS), published in 1989. PHIGS attempts to combine a modelling system and a viewing system in a single standard. Implementations of PHIGS are appearing on the market, particularly on workstations (Sun, DEC, IBM, HP etc). The tutorial gave an introduction to the ISO/IEC standards for computer graphics, the essential features of PHIGS, a review of the limitations of PHIGS and the steps taken by ISO/IEC to extend PHIGS.

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ESPRIT/Eurographics Workshop on UIMS

RAL — For some time now, the Eurographics Association has been working with DG XIII of the Commission of the European Communities to establish a programme of technical activities on graphics and interaction in ESPRIT. Bob Hopgood and David Duce of RAL have played a prominent role in these. At the request of participants in the programme, a workshop on user interface management systems (UIMS) and environments was held 4–6 June, 1990, at INESC in Lisbon, Portugal. David Duce was secretary to the organizing committee and Bob Hopgood a member of the committee. Paul ten Hagen (CWI) gave an opening presentation titled 'A critique of the Seeheim Model for user interfaces'. It is hoped that the proceedings will be published in the EurographicSeminars book series (Springer-Verlag).

An earlier Eurographics workshop in 1983 at Seeheim (FRG) established several of the foundational concepts in User Interface Management Systems. Since then, we have seen the development of windowing systems, object-oriented methodologies and AI-inspired techniques, on a scale which it was hard to anticipate at that time. The ideas embodied in the Seeheim Model are beginning to show their age.

A re-examination of the basic notion of a User Interface Management System is now needed: we need to question its continued appropriateness in the context of current, and probable future, systems. This entailed a proper attempt to relate it to the newer paradigm of 'user-interface development environments', and an assessment of the impact of 'knowledge engineering' (both in the interface and in the application) on interaction strategies.

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ICS90 — Supercomputing in the 1990s

CWI — The 1990 ACM International Conference on Supercomputing was held 11–15 June, 1990, in Amsterdam. About 150 researchers, users and manufacturers (one quarter of them from the US and Japan) discussed issues on supercomputers and their use in the 1990s. This fourth ACM conference on supercomputing was organized in cooperation with CWI. The keynote address was given by Wim Nieuwpoort (University of Groningen) on 'Universities and supercomputers: do they need each other?' Invited presentations included:

- The Tera computer system (Burton Smith)
- Parallel multilevel algorithms for PDE's (Tony Chan)
- The Collaboratory: a larger context for support of computational science (William Wulf)
- Iterative methods and supercomputers and supercomputers for VLSI device simulation (Wolfgang Fichtner)
- Dataflow computer development in Japan (Toshitsugu Yuba)
- Strategies for large-scale structural problems on high-performance computers (Ahmed Noor)
- Parallel ODE solvers (Piet van der Houwen)
- Supercomputing with transputers — past, present and future (Anthony Hey).

There were separate sessions on hardware and architecture, algorithms and applications, compilers and systems, performance assessment, architecture performance evaluation and modeling, and run time system support. There were also seven technical presentations by supercomputer manufacturers (Cray, NEC, IBM, Meiko, Convex, Alliant and BBN).

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Visits to CWI

CWI — Delegations of some national institutions recently visited CWI, in order to be informed about CWI's present research policy and to look for possible fields of cooperation. In April the Government's Advisory Council for Science Policy was received. This was followed in May by a presentation of SERC, the Software Engineering Research Centre. A major aim of SERC is linking academic computer science research with industry. CWI is interested in participating in SERC projects. Finally, also in May, in a meeting with the Dutch PTT Research, views were exchanged in fields as system & control theory, signal processing, image analysis, interactive systems and software technology.

PEOPLE ...

INRIA — Professor Laurent Kott has been appointed vice-General Director of INRIA. His scientific specialism is parallelism. Kott holds a professorship at Rennes University and is director of IFSIC (Institut de Formation Supérieure en Informatique et Communications). His former position as director of IRISA, the INRIA Research Centre at Rennes, will be taken by professor Jean Pierre Banatre, who is also professor at INSA (Institut National des Sciences Appliquées). Banatre's research at INRIA deals with distributed systems, in particular fault tolerant systems and security.

INRIA — Patrick Rambert has been appointed director of INRIA's centre at Nancy. One of the Centre's annexes is now located at Metz (address: INRIA - Lorraine - CESCO, Technopole de Metz 2000, 4 rue Marconi, 57070 Metz Cedex, tel. +33 87 20 35 00).

INRIA — Professor Gérard Huet has become a corresponding member of the French Academy of Science.

INRIA — François Morain, researcher in Philippe Flajolet's project on algorithms and complexity, has shown the primality of the number $(2^{3539}+1)/3$ by the A+BIN algorithm. This number of 1065 decimal places is at present the largest prime number whose primality has been demonstrated by a computer program.

CWI — Piet Hemker, leader of CWI's project on Steady boundary-value problems and appointed last September as professor in industrial mathematics at the University of Amsterdam, held his inaugural address on June 12. The title of his speech

was 'Making errors and correcting them'. The first chair in industrial mathematics in The Netherlands was created a few years ago at the University of Eindhoven.

GMD — Prof. Dr.-Ing. Wolfgang K. Giloi, head of the GMD Research Centre for Innovative Computer Systems and Technology, has been appointed honorary professor of Jiao Tong University in Shanghai. The title was conferred at a ceremony attended by the Chancellor and Vice-Chancellor of Jiao Tong University and representatives of the Chinese Science Foundation. In his address, the Dean of the Computer Science Department stressed that the title was intended to honour an internationally recognized computer expert for his contributions to the development of innovative computer architectures and, in particular, his help in the establishment of computer science in China.

GMD — Dr. Eckart Raubold, manager of the GMD Institute for System Technology, was awarded an honorary professorship at the University of Frankfurt on 1 March, 1990. He is to lecture on standardized components of OSI applications, i.e., on open-system communication, in the Computer Science Department of the University.

GMD — Dr. Angelika Voß, Werner Karbach, Uwe Drouven and Darius Lorek, have received the Digital European A. I. Research Paper Award for their contribution to the European Conference on Artificial Intelligence (ECAI '90) entitled "Competence Assessment in Configuration Tasks". The prize will be awarded during the conference in Stockholm in August.

GMD — Dipl. Inform. Wolfgang Toelle, project manager at the Quantum GmbH software company in Dortmund, is to become head of the GMD branch

in Washington. Until the start of 1989, Toelle, who will take up his new post in July 1990, worked for several years in the Computer Science Department of Dortmund University.



THIRD CONFERENCE ON HIGH SPEED NETWORKING BERLIN 18-22 MARCH '91

CALL FOR PAPERS

The Conference After the most successful high-speed LAN workshops held in Aachen(FRG) and Liège(B), a third event is planned to be held in Berlin in 1991. The conference will focus on one of the most dynamic fields of technological developments: high speed networking (> 50 Mbps). The rapid technological changes in LAN, as well as in metropolitan and wide area networks and the new application fields will be the main areas of interest during this conference. Original contributions discussing the following topics are solicited:

- High Speed LAN/MAN /WAN Network Architectures
- End-System Architecture for High Speed Applications
- HSLAN/MAN/WAN Interconnections
- Protocols for High Speed Networks
- Intelligent Networks Architecture
- Multimedia Applications

Contributions Please submit 5 copies of each original contribution in English in one of the above topics. Papers should be limited to 5000 words or max. 15 full pages. The contributions should be submitted to one of the programme chairmen.

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