Commission of the European Communities
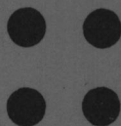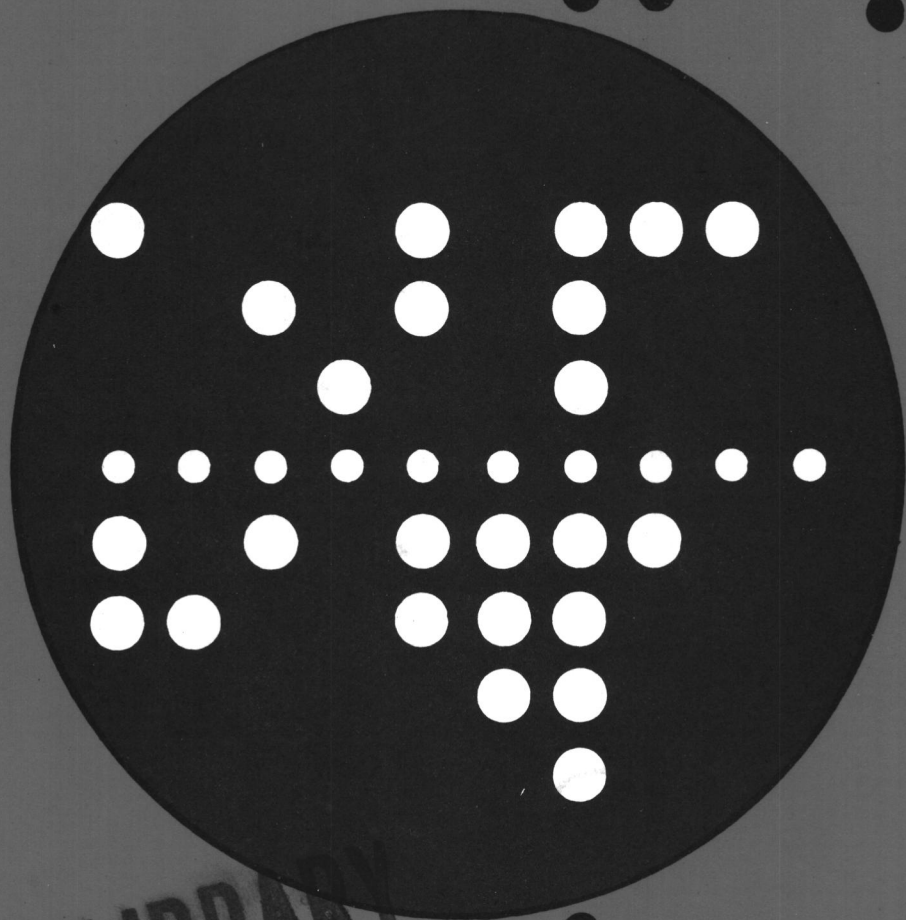
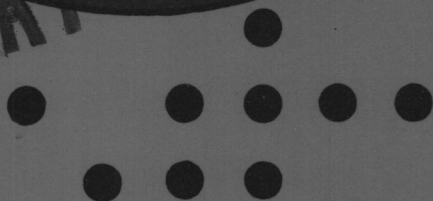## Joint Research Centre - Ispra

Computing Centre Newsletter

February 1977 ● No 8

Contents

Note of the Editor

The present Newsletter will be published monthly except for August and December.

The Newsletter will include:

- Developments, changes, uses of installations
- Announcements, news and abstracts on initiatives and accomplishments.

The Editor thanks in advance those who will want to contribute to the Newsletter by sending articles in English or French to one of the following persons of the Editorial Board.

Note de la Rédaction

Le présent Bulletin sera publié mensuellement excepté durant les mois d'août et décembre.

Le Bulletin traitera des:

- Développements, changements et emploi des installations
- Avis, nouvelles et résumés concernant les initiatives et les réalisations.

La Rédaction remercie d'avance ceux qui voudront bien contribuer au Bulletin en envoyant des articles en anglais ou français à l'un des membres du Comité de Rédaction.

Editorial Board / Comité de Rédaction

S.R. Gabbai, D.G. Ispra
H. de Wolde, C.C. Ispra
C. Pigni, C.C. Ispra
J. Pire, C.C. Ispra

Computing Centre References

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Division Informatics — Computing Centre

H.J. Helms

As many readers will know, various measures have been taken recently for a restructuration of the Joint Research Centre in order to prepare for the execution of the 1977-1980 Programme.

Amongst other actions a Division Informatics — Computing Centre has been defined in this context in Department A (Informatics, Information Analysis and Elaboration, Systems Analysis) of the Ispra Establishment.

The Division Informatics — Computing Centre is responsible for the central computing service of the Establishment and for those JRC programme oriented activities which by their very nature are closely related to the computing service.

In order to fulfill its objectives the Division Informatics — Computing Centre is divided into three function areas which are:

- Informatics Support
- Basic Software and Systems
- Computers

Informatics Support is in charge of relations to the users in scientific — technical fields, and take a particular interest in the programme library service and some special application areas including graphics. This line of actions immediately leads to that the section is also in charge of the project EUROCOPI (European Computer Program Institute) which is part of the JRC 1977-1980 Programme. EUROCOPI develops a computer program dissemination and information service on a European basis, maintain, an association of similar actions working on a national basis and is concerned with development and research in methods for meaningful software transfer.

Basic Software and Systems is in charge of development, implementation and maintenance of basic software systems for the computer installation and for all aspects relevant to teleinformatics. For this reason we find the project European Informatics Network, COST 11 which is part of the JRC 1977-1980 Programme placed in this section. Moreover working relationship with EURONET on teleinformatics is being developed as well. as the section will play a strong role in the further development to teleinformatics applications for the users of the Computing Services.

Computers is in charge of day to day operations of the computer installation with all associated equipment and services including data-preparation. This important and highly responsible task will gradually increase as the installation becomes more network and teleinformatics oriented and ultimately demands a redefinition of the procedures for ensurance of operations efficiency and operation reliability.

The Division Informatics — Computing Centre is thus in general oriented towards providing several services to computing users both around the local installation and on a European basis and engaged in actions which on a long-term or short-term basis are intended to extend the facilities to computing users.

In fulfilling its objectives the Division has to operate in strong and close contact with computing users, and with other divisions of Department A and throughout in the Establishment. This is in particular important as there are competence of importance for the proper work of the Division which is concentrated elsewhere. For the Programme oriented actions the Division works in a very close relation with similar units in many European Universities and research laboratories, and this in turn brings much inspiration which ultimately will be of benefit of the Computing Service users.

Mr. Jean Pire has been appointed head of the Division which presently has some 50 collaborators. It is hoped and foreseen by suitable arrangements to increase somewhat this number in order to ensure the foreseen activities of the Division for 1977 and the coming years. ☐

Software Portability

With this introduction the Newsletter begins the publication of a series of articles on **software portability.**

This article introduces the problem; consequently specific applications fields will be discussed, for example:

— problem oriented languages portability,

— standards of FORTRAN, COBOL, etc.

The editorial board welcomes all those who will controbute to this important aspect of Informatics.

Software Portability: An Introduction to the Problem

A.A. Pollicini

Portability is a relatively recent informatic concept, and means the independence of a software product from hardware features.

At the beginning of computer exploitation, each computing installation aimed at covering all its own application software needs.

Later, in order to avoid duplication of programming effort, software distribution agencies spread information on software products to promote program exchange.

Definitions

Software is said to be portable, if, all or most of it, can run directly or with few and simple modifications on several computing installations, with hardware equipment from different manufacturers, producing the same results.

Portability is hence a property of **software.**

To achieve portability one must resort to proper tools during both the design phase and the implementation phase.

Modularity and **hierarchical Abstraction** are suitable properties of **design techniques.**

Standard definition is a suitable property of **programming languages.**

Design Techniques to Enhance Portability

From the above definitions, it appears that portability is firstly a matter of design and only secondly a matter of programming.

Indeed the software must be created with a structure that permits machine independence.

To this end, the topics which are implicitly machine-dependent (i.e. character and string manipulation, physical access to auxiliary storage, etc.) must be hidden at the lower level of implementation.

Among the proposed approaches to problem decomposition, two are of interest:

- Modular organization, which implies:
- Definition of modules following self-supporting functions (Ref. 1 and 2)
- Information exchange between modules only by means of fixed interfaces
- Encapsulation of complex data structures (Ref. 3);
- Hierarchical organization which isolates:
- Logical functions in descending level of complexity (Ref. 4 and 5)
- Implementing assumptions at the more detailed level (Ref. 6).

In both cases, a limited number of basic functions, closely dependent on machine architecture, might have to be coded in assembly language, but only these functions need be translated to transfer the software to other computers.

The Choice of an Appropriate Programming Language

High level languages may be used to code portable software. Of course, as a basic condition the language must be supported by a wide range of computer manufacturers.

A more important condition is that the grammar and the syntax of the language be standardized.

For instance, extensive standardization efforts have been carried out on the widely diffused languages COBOL and FORTRAN IV.

Furthermore, among the languages developed within the academic environment, the programming language PASCAL has been recently standardized (Ref. 7).

Another attempt to make software portable is the introduction of a precompiler (Ref. 8).

In this case a set of tools must be established:

- a new high level language designed according to the principle of machine independence,

- a set of precompilers (one for each computer manufacturer supporting the language) processing the source language to generate statements according to an existing standard language to be compiled later.

Analogous result can be obtained in the development of large application systems, using problem oriented languages.

The application system will be portable if the basic system (monitor, precompiler, command interpreter, etc.) is supplied for different computers.

One may distinguish two policies:

- the basic system is fully machine-dependent, for example the ICES system (Ref. 9),
- the basic system itself is largely machine-independent, as in the case of the GENESYS system (Ref. 10).

It is clear that portability is a real problem for all those developing scientific applications software. For this reason, the above-mentioned topics will be developed in a more detailed way to stimulate JRC personnel concerned to advanced programming applications.

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10. R.J. ALLWOOD, GENESYS-Machine independent software sharing. In Structural Mechanics Computer Programs, University Press of Virginia, Charlottesville, 1974

ERRATA CORRIGE

Newsletter No. 7 — January 1977

page 11 :   last 6 lines replace by

Batch compile for test:
```
//       EXEC  IMSC
//CMP.SYSIN   DD  *
       Source deck
/*
```
Batch execution for test:
```
//       EXEC  IMSCLG,  PSB=psbname
//CMP.SYSIN   DD  *
       Source deck
/*
```
page 12 :   replace line 8 by
```
//       EXEC  IMSG,MBR=objname,  PSB=psbname
```

EQUIVALENT TIME TABLE FOR ALL JOBS OF THE ADMINISTRATION/MONTHLY AND CUMULATIVE STATISTICS

	January	February	March	April	May	June	July	August	September	October	November	December
Year 1976	84	82	101	77	57	64	73	54	61	59	36	46
accumulation	84	166	267	344	401	465	538	592	653	712	748	794
Year 1977	42											
accumulation	42											

EQUIVALENT TIME TABLE FOR THE JOBS OF ALL THE OBJECTIVES/MONTHLY AND CUMULATIVE STATISTICS

	January	February	March	April	May	June	July	August	September	October	November	December
Year 1976	206	237	270	241	229	248	249	223	233	244	159	150
accumulation	206	443	713	954	1183	1431	1680	1903	2136	2380	2539	1689
Year 1977	135											
accumulation	135											

EQUIVALENT TIME TABLE FOR THE JOBS OF THE EXTERNAL USERS/MONTHLY AND CUMULATIVE STATISTICS

	January	February	March	April	May	June	July	August	September	October	November	December
Year 1976	18	19	28	16	25	32	14	11	27	31	29	12
accumulation	18	37	65	81	106	138	152	163	190	221	250	262
Year 1977	13											
accumulation	13											

EQUIVALENT TIME TABLE FOR ALL JOBS OF ALL USERS/MONTHLY AND CUMULATIVE STATISTICS

	January	February	March	April	May	June	July	August	September	October	November	December
Year 1976	233	271	313	280	277	281	260	245	273	287	206	172
accumulation	233	504	817	1097	1374	1655	1915	2160	2433	2720	1926	3098
Year 1977	158											
accumulation	158											

Statistics of computing installation utilization

Report of computing installation exploitation
for the month of January

	YEAR 1977	YEAR 1976
Number of working days	20 d	21 d
Work hours from 8.00 to 24.00for	16.00 h	14.00 h
Duration of scheduled maintenance	27.00 h	25.02 h
Duration of unexpected maintenance	86.10 h	5.08 h
Total maintenance time	113.10 h	30.10 h
Total exploitation time	206.90 h	251.90 h
CPU time in problem mode	71.36 h	77.45 h

Teleprocessing:

	YEAR 1977	YEAR 1976
CPU time	1.10 h	1.60 h
I/O number	136,000	904,000
Equivalent time	2.00 h	7.90
Elapsed time	75.00 h	110.00

Batch processing:

	YEAR 1977	YEAR 1976
Number of jobs	6,246	8,650
Number of cards read	1,827,000	2,603,000
Number of cards punched	96,000	175,000
Number of lines printed	16,478,000	24,482,000
Number of pages printed	364,000	548,000

BATCH PROCESSING DISTRIBUTION BY REQUESTED CORE MEMORY SIZE

K BYTES	100	200	300	400	600	800	1000	1400	total
Number of jobs	1731	2616	1089	572	64	52	30	-	6154
Elapsed time (hrs)	66	227	100	97	15	10	5	-	520
CPU time (hrs)	2.7	25.2	16.9	15.9	4.8	4.2	1.5	-	71.2
Equivalent time (hrs)	14	55	36	33	7	8	3	-	156
Turn around time (hrs)	1.6	3.7	3.8	6.3	7.2	11.8	11.8	-	3.5

PERCENTAGE OF JOBS FINISHED IN LESS THAN

TIME	15'	30'	1h	2h	4h	8h	1D	2D	3D	6D
% year 1976	29.3	47.6	64.5	78.3	90.3	97.2	99.4	99.4	99.5	100
% year 1977	33.7	49.3	65.0	77.0	87.0	94.4	97.2	98.0	99.2	100

Utilization of computer center by the objectives and appropriation accounts for the month of January

1.20.2	General Services - Administration-Ispra	42.56
1.20.3	General Services - Technical-Ispra	1.63
1.50.2	Department B	0.09
1.90.0	ESSOR	1.90
1.92.0	Support to the Commission	1.28
2.10.1	Reactor Safety	33.35
2.10.2	Plutonium Fuel and Actinide Research	0.52
2.10.3	Nuclear Materials	1.20
2.20.1	Solar Energy	0.24
2.20.2	Hydrogen	0.03
2.20.4	Design Studies on Thermonuclear Fusion	0.82
2.30.0	Environment and Resources	18.33
2.40.0	METRE	0.52
2.50.1	Data Processing	31.51
2.50.3	Safeguards	1.13
	TOTAL	135.37
1.94.0	Services to external Users	13.37
	TOTAL	148.48

Guide to users

We inform the users on the new work-classes that they can utilize for the batch-processing:

class 1	position size	100 K
class 2	position size	200 K
class 3	position size	300 K
class 4	position size	400 K
class 5	position size	600 K
class 6	position size	800 K
class 7	position size	1000 K
class 8	position size	1200 K
class 9	position size	1400 K
class A	position size	100 K
class D	position size	400 K (reserved to administration)

For more information the users can refer to pages 10 to 12 of Newsletter No. 1 and can obtain more details by the installation notes executing the following job:

```
//......JOB (your job card)
$       TIME    TTT
$       LINES   LLL
//      EXEC    LIHNO,MEMB=NNNN
```

where TTT,LLL and NNN depend on the user choice:

NNN	Contents	TTT	LLL
INFO	general information on 370/165, O.S. and HASP utilization	001	002
PROC	note on installed procedures	001	003
PPGL	information on program product compilers	001	002
UTIL	programs and utility routines	001	002
CSSL	scientific subroutines	001	003
PCAL	calcomp program library	001	003
TELE	tele-processing	001	003
TPUT	utility routines for teleprocessing	001	002
SUPA	IBM 3270 display station	001	002
TEK	Information about Tektronic terminal	001	002

The Graphics Facilities at the Computer Centre

Herman I. de Wolde

Graphics traditionally has two fields of application:

A Computer aided design, C.A.D., an interactive process involving designer and computing system.

B Editing of function tables and diagrams.

Additionally one may define a third application since it uses the same type of hardware:

C Textprocessing and editing.

Of course the boundaries of these areas are not precisely defined, but for the present purposes they are adequate. Each of these areas has special hardware and software requirements but many graphics applications contain elements which basically belong to another category.

The graphics facilities offered by the Computer Centre have so far been rather limited:

— The off-line Calcomp plotter which serves only part of the applications type B, the editing of function tables and diagrams. It fails in cases where large numbers of drawings are requested and the response time for an active user is frustrating. However the software for the Calcomp plotter is extensive and useful in a wide range of applications.

— The Tektronix 4002 is functioning well for C.A.D. applications where no great resolution is needed. The projecting format is too small for complicated tasks.

— The software for the Tektronix is limited to the basic functions and is based on the present T.P. system. Consequently any C.A.D. application needs extensive programming.

Today some of the J.R.C. activities need more extensive graphics facilities these may be listed, without any references to importance, as follows:

— Teledetection, the interactive classification of images based on satellite observations.

— Electronics, the design of electronic circuits.

— Safety, the investigation of shockwave propagation in structures and fluids.

— Structure analysis, structure deformation and stress calculations.
— Environment, the interactive classification of resonance spectra and the retrieval and display of chemical structures by characteristic substructures.
— Reporting and editing, the printing of periodically recurring large computer outputs and publications which need frequent updating.
— Batch-processing of programs with large output.

It is clear that the need for additional facilities is very urgent. A sequence of priorities has to be defined as the available manpower and the budgetary resources are very limited. A provisional list of priorities has been composed as follows:

— The acquisition of a high-speed plotter.
— The programming of a software interface which allows for the existing Calcomp applications combined with new output-only devices.
— The definition of software standards for output-only and interactive use.
— The acquisition of a second high-accuracy pen plotter for stand-by.
— The installation of a Tektronix-4015 under the present regime, with hardcopy option for the high-speed plotter.
— The installation of a microfilm/microfiche computer output system with the appropriate software.
— The definition of the standards for graphics within the J.R.C. environment with the participation of the users.

The software aspects become very complicated when many different devices are involved, especially when one wants to keep the drawing program flexible as regards the output units. Special features of the graphics hardware make standardisation of the software difficult including:

• Line plotting by continuous deflection
• Intensity levels
• Gray Levels of surfaces
• Interactive applications
• Colours

A useful approach is the definition of an intermediate file, constructed by a standard set of subroutines embedded in the drawing program. After the execution of the source job, one has access to all the installed devices through a translator program which omits the specifications not relevant to the particular device.

The structure of such an intermediate file is still an open problem. Many datastructures have been proposed and some are in production. A software package is marketed under the name GINO-F and evaluation studies are being performed to decide on its usefulness for our purposes. GINO-F may be installed on any computer with a Fortran compiler. It can be interfaced with almost any graphics device. Besides the basic routines it offers higher level packages. A library of images may be stored for repeated use.

New graphics applications have to use the specified calling sequences if GINO-F is chosen as the standard package. Existing programs with the Calcomp convention may still be used without any modification through an additional interface.

Concerning the planned acquisition of new hardware, we shall try to offer access under the present rules as soon as possible.
The high speed plotter will be an electrostatic plotter with a linear paperspeed of about 5 cm/sec and an accuracy of 8 points/mm. Complete images of, for example, A4 format take 7 seconds independent of image density. The installation offers roll- and folding paperfeed.
The device will operate in open shop to improve the turn-around time.
Authorized programmers may mount their tapes and receive the images immediately.

A software operation mode has been designed allowing for all the existing Calcomp applications, without modification. The high level Calcomp routines (DESSIN, AXLOG, CURVE, COMAP, etc.) will also be directly available for the high speed plotter. The output of the drawing program will be stored and afterwards used as an input to the Calcomp and/or to the electrostatic plotter.

It is expected that the device will considerably improve the turn-around time and will serve those applications with a large number of drawings.

Animation of images and administrative applications will be served by the Microfiche/microfilm computer output system. Realisation of drawings and printed output will be possible on 16 mm film and on microfiches which have card size format with a direct readable heading and may contain up to 270 pages of printed text or computer printout.
The application of microfiches for administrative purposes will be limited to visual archives building as it is expected that direct consultation of the files will be performed through computer terminal functions.

The 16 mm film option constructs images with a speed of 3 sec/image. This feature is very useful for the study of time dependent phenomena and effects of parameters.

An additional peripheral device may produce, from a single film image, an offset plate which may be used to produce some thousands of copies at low cost.

Editing of publications may be performed through the E.T.C. system, (Extended Text Composer). This is a versatile software product to edit printed texts. Corrections, inserting and page formatting, including right-adjustment, are easily done by simple commands. Presently the system is being tested in combination with COREA, to allow for interactive updating. If the results of these tests are satisfactory we will compose a manual for the editing and printing of periodically recurring computer outputs.

Concerning interactive graphics, it may be noted that a Tektronix 4015 has been ordered. The System group will perform tests with the Tektronix software packages on this device under T.S.O.. These packages are not available for the 4002 terminal as Tektronix intend to cease supporting this type. An interface to the GINO-F system is also possible. We intend to make a careful study of the possible solutions for C.A.D. standards and to offer a software mode which may be sustained for many years.

As a conclusion we may state that something is moving in the field of graphics but we ask the users to have some patience as the available manpower for this activity is limited to 1 man-year.

The installation and availability of the new hardware will be announced subsequently. ◻

Note from the Program Library

G. Gaggero

As mentioned in the Newsletter of May 1976, the Program Library collects and distributes computer programs of general interest. These may be programs as developed in-house or adaptions of existing outside programs.

Dissemination may be limited to the J.R.C. or may be authorized for external contacts.

Many programs are developed and consequently presented at conferences or discussed in scientific publications. The authors have the obligation to offer these products in presentable state, unless it is explicitly stated that the package is not available for distribution.

Many requests for officially announced programs have been forwarded to the J.R.C. Program Library, which could not be satisfied because the authors did not submit their product to the Library. This regretable situation gives a bad impression of the managing skills at our institute.

All exchange of software products between the J.R.C. and other parties have to be performed through the Program Library, being the officially nominated liaison contact. Any program suitable for a larger audience must be made available by compiling the submission request form (see Newsletter May 1976), and preparing the specified materials. In particular, this is of highest urgency for programs which are subject to discussions with other parties.

We request our readers to follow the rules with respect to this point.   □

Les personnes intéressées et désireuses de recevoir régulière-
ment "Computing Centre Newsletter" sont priées de remplir
le bulletin suivant et de l'envoyer à

Mme A. Cambon
Support to Computing
Bât. 36, Tel. 721

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