EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH
ORGANISATION EUROPEENNE POUR LA RECHERCHE NUCLEAIRE

PS/ML/Note 88-14
Geneva, May 27th, 1988

Report of the Committee for Administrative Computing Support in Engineering

(Comité pour l' Aide Informatique Administrative à l' Ingenierie, CAIAI)

R. Hanni/ST, M. Moller/SPS, M. Mottier/LEP, A. Pace/PS (editor and chairman)

0. Introduction

The Committee for Administrative Computing Support in Engineering (CAIAI) was created on the 11th of February 1988 by the COMIMECA with an original mandate to establish an inventory of the different needs and coordinate the efforts between the different divisional groups responsible for mechanical engineering studies.

Since that date, a detailed mandate was elaborated, and four different areas have been examined. In those, the task has been:

- Study and appraisal of the different existing methods
- Proposal of a uniform methodology, when possible
- Otherwise, specify a system which would introduce this uniformity

The topics that have been investigated are: Design Offices and Workshops Management, Numerical Control Applications, Bureautique, and the Euclid Oracle Interface, that are all non CAD activities.

1. Design Offices and Workshops Management

The existing methods used for design offices and workshops management are very different and they accomplish different tasks. There are systems which run on mainframes and others which run on PCs. Some systems are used to create a database of the different activities and other systems are used to ensure efficient planning and work loading. This is why a proposal for achieving uniformity cannot be implemented immediately.

However in this particular field much hardware (such as old PCs and index lines) is under-dimensioned and will be replaced soon. This could be a good occasion for a complete specification which would accomplish all requirements. Should this recommendation be accepted CERN-wide, a successive harmonization of the different management procedures would be greatly facilitated. A proposed specification follows.

Hardware

The hardware proposed to accomplish this task is a Personal Computers' (PCs) network. This is in agreement with the tendency given by the Management Information System unit (MIS) recently created at CERN. The choice is among the two different kind of PCs recommended: IBM-Compatible or Apple Macintosh.

The Apple Macintosh is a younger product, with a graphics interface integrated in the operating system, has usually more performances and is favourite by users which know both kind of machines.

The IBM-Compatible has old fashioned operating system and the graphics user interface (Microsoft Windows) has to be loaded separately. The software for networking and communication is far more developed for the IBM-Compatible machines. In this case it is very easy to obtain shared databases or shared programs.

Anyway, the choice between Apple and IBM has yet been done in three of the four divisions concerned by this report (PS, SPS, ST). All new PCs will be IBM-Compatible, for example the various Olivetti described in the MIS book. The LEP division is going exactly in the opposite direction, purchasing Macintoshes. This inconsistency locks any further development until a policy of Personal Computer at CERN will be well-defined or, most likely, when the new technologies will make possible an integration of different machines on the same Local Area Network. In this context it should be noted that following the agreement DEC/Apple significant improvement in communicating and networking are expected for the Macintosh in the near future. Furthermore Matra-Datavision (i.e. the firm which has developed the Euclid software) is working on the use of a Macintosh II as an Euclid WorkStation. For those reasons, what follows is just an example of what the scenario could be if the choice would go in the direction of the IBM-Compatible.

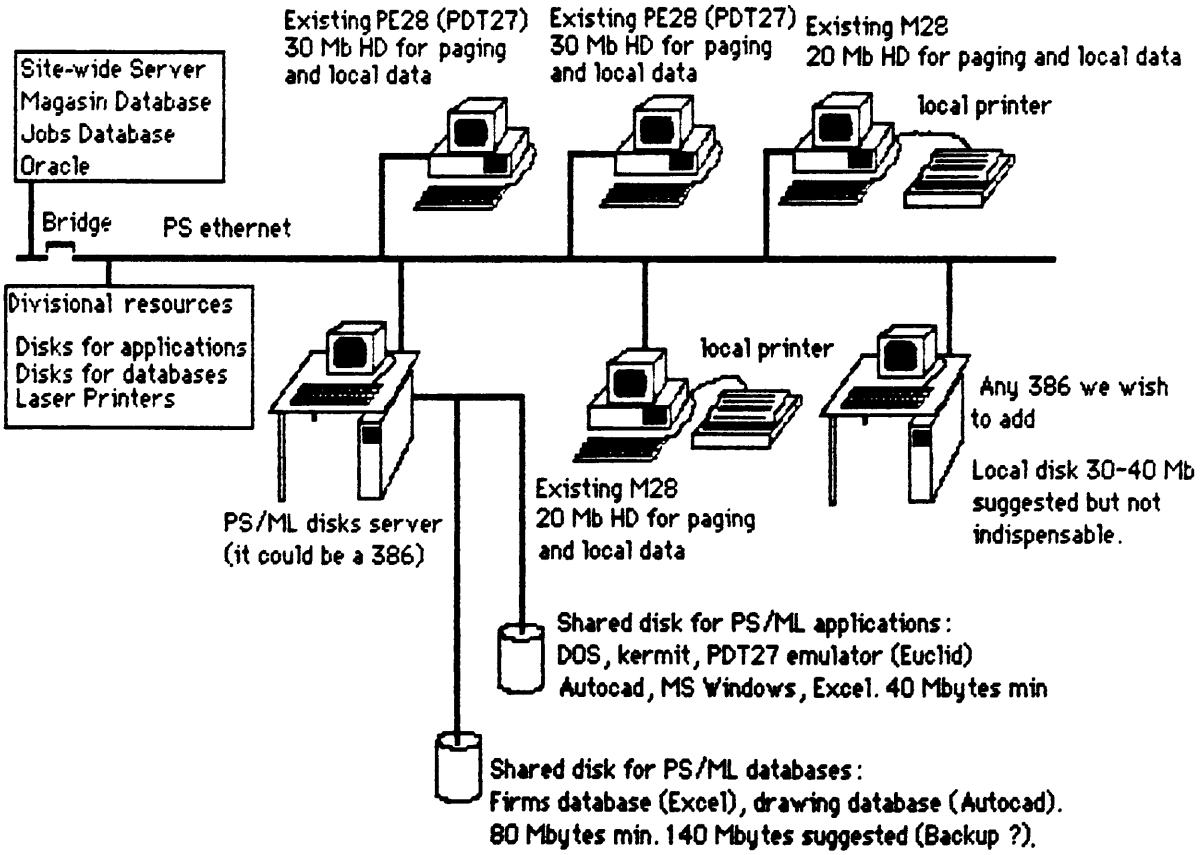
The machines suggested for the design offices and workshops management are the 80386 microprocessor based personal computers. An example could be the Olivetti M380 with a local hard disk of at least 40 Mbytes and a colour graphics monitor. Those machines are in agreement

with the PC contract awarded last February and may be purchased at the CERN PC Shop (513/R-048).

The suggested network medium is Ethernet, which is the CERN Communication Board's recommended standard.

For each group, there should be a disk server machine where local databases can be stored. Then, one site-wide disk server for general databases and for the software package to interface the database is needed. The local group server could also be one of the M380s with sufficient disk space running "Novell" or "PC Lan". Note that at present there is no recommendation for disk servers. It is being established by the DD/CS group.

An example of this hardware architecture is shown in the diagram for the PS/ML group. All the envisaged hardware does not need to be purchased because it exists already except the 386s (a general PCs category, which includes the Olivetti M380s).



The site-wide server should be one of the services supported by the DD Division. If it is not the case, each group would provide their own databases server for use by the other groups. For example, the access to the stores database, could be provided by ST division.

Software

Two kind of software packages are necessary. The first should be a database management system and the second should be used for job planning and progress.

For the database management the choice is between Microsoft Excel and Oracle.

Excel is suggested for its very powerful, easy to learn, user friendly, graphics interface integrated in Microsoft Windows (the interface is similar to Macintosh). Excel' s databases are Macintosh compatible.

Oracle is suggested for the existing applications that are already using it. The ST workshop is now using VM/CMS Oracle, and the LEP/IM Design office is developing a system which will integrate VAX/VMS Oracle together with Euclid (See the last chapter). Of course Oracle will not be less powerful, but the actual version 4 suffers from the lack of a graphics user interface. It would therefore be of considerable interest to exploit these programmes under Oracle version 5.1 in order to edit graphs with SQL GRAPH. With SQL NET it is possible to interrogate a mainframe computer from a PC.

On PCs, the Oracle version 5.1 does not allow the use of SQL GRAPH, but it is possible to gain access to LOTUS 1-2-3 using ADD-IN.

The software for jobs planning could be - for example - Microsoft Project. Experience has usually shown that the software packages which accomplish that task are more complicated than the objective needs. That is also why a simple program developed at CERN, which retrieves information from the databases and produces the planning (and a graphics representation !) can be envisaged.

Use of the management system

In any choice made in the future, the three following points seem to be crucial:

- The software must be compatible with the existing databases
- The software and the hardware must have a graphics user interface.
- The software and the hardware must be easy to use and little training should be necessary to use it (this is not an easy task).

In any case it is indispensable that the database may be consulted by anybody interested and that the consultation does not require a dedicated

operator between who is consulting and the machine (as happens now with Oracle and Euclid databases).

Open problems

(In increasing order of importance)

- All the local group databases will require a certain maintenance (tape backup every week, for example). Who is going to do this work? (proposed answer: The person(s) who modifies the database or DD if it is a site-wide database in a server managed by DD)

- The problem of the Macintoshes is still unsolved. What to do with the existing machines and for the next coming ones (LEP division) ?

- When will the Ethernet network be site-wide available ?

2. Numerical Control Applications

All the numerical control applications, in the context of the Computer Aided Manufacturing (CAM) project, have been integrated in the Computer Aided Design (CAD) environment. In fact both the CAM and the CAD activities are carried out using the same Euclid software package from Matra-Datavision.

The numerical control languages available at the moment are ISO (PS workshop), APT (ST workshop), FANUC (not used) and CLFILE (not used).

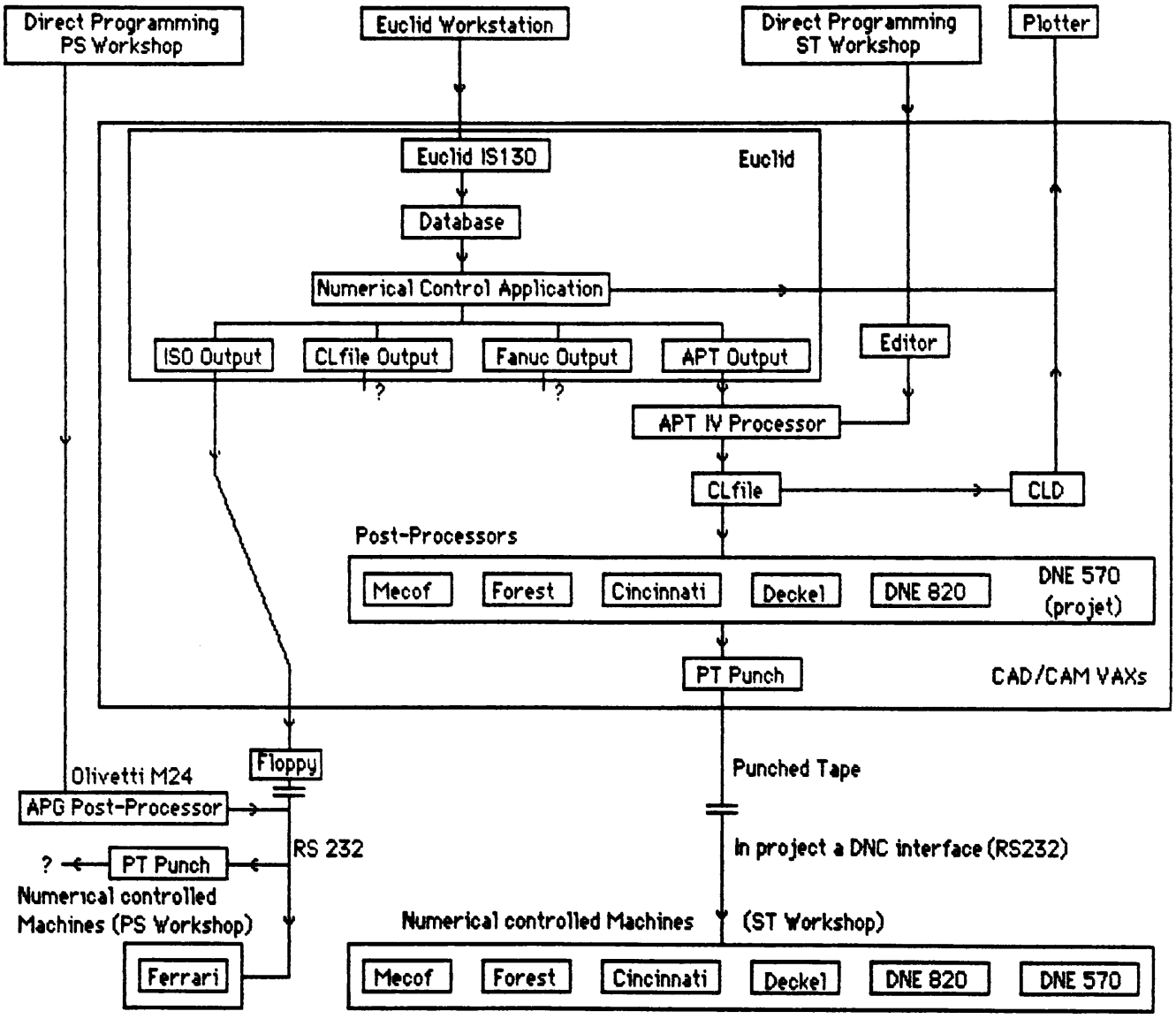
The actual Euclid capabilities satisfies all needs met until now and both CAD and CAM are completely integrated under the same user interface. This is why continuation in this direction is recommended.

The CNC machines have been connected to the CAD system through the ISO programming language in the PS workshop (Ferrari E132 V) and the APT programming language in the ST one.

Since 1974 the Main Workshop performs the programming of numerically controlled machine tools with an APT IV processor and a post processor for each of the machine tools. To date the park is made up of 4 millers and 2 lathes (see figure). In 1985 the fabrication software was modernized, adapted to the evolution of the machine tools and installed in the CAD/CAM VAXs. The connection CAD to CAM on the IS130 version is in the process of being established and an Euclid WorkStation will soon be installed in the main workshop.

In order to keep up with technological evolution, to compensate reducing staff numbers while at the same time maintaining a certain flexibility, it is obvious that the Main Workshop must continue to invest in well defined high performance numerically controlled machines capable of exploiting the advantages offered by a CAD/CAM system maintained at the top level.

Numerical Control Manufacture at CERN (May 88)



The Autocad package is used for Computer Aided Drafting by many users in the physics divisions EP and EF (~ 10) but there is no interface yet to the manufacture process. Both the users of this system and the Main Workshop are interested in establishing such a connection which would also be useful in a dialogue with the sub-contractors. The test of the Girocad software is one possibility that could be envisaged.

N.C. Hardware

The lowest cost recommended solution is the Olivetti PE28 (PDT27) Personal Computer (which is an IBM AT Compatible with high resolution graphics display). This solution can run both Autocad and Euclid (as a terminal of a remote VAX). In addition the choice of a PE28 is fully compatible with the recommendation given previously about the workshop and design office management.

This first solution should be chosen only if the work to be done with Euclid is small (such as development or small applications). If the hardware will be used for full time production using Euclid, then a powerful graphics WorkStation is recommended. The type of machine that will be necessary is now being investigated by the DD CAD support group and it seems that it will probably be a Digital VaxStation in the 3000 series (ex VS315).

The PDT27 should be used in the local workshop just for simple works, while the powerful WorkStation should be inserted in one of the CAD rooms. In this way, the designer charged of the numerical control programming would be in direct contact with the designer of the mechanical part.

Once this first step will be running some software for the NC programs management - such as DNC, see figure - could be also installed. This would replace the actual system based on punched tape.

3. Bureautique

The two methods used in the PS Division have shown that they are complementary. The first one, which runs on Apple Macintosh provides local database consultation and a user interface. The second one, which runs under VM/CMS on a mainframe, provides very short communication times between the different persons involved in the purchase process using electronic mail.

Even for this case, with the updating of the communication media (Ethernet), there is the possibility of seizing the opportunity to specify a new system in this domain which could replace both existing ones.

The hardware should be the one described in the "Design Offices and Workshops Management" section, i.e. a divisional or interdivisional local area network.

The software should provide all the features of the existing methods, which are:

- It should produce a file which contains the description of the operation wanted (Material Request, Internal Purchase Requisition, Shipping Request, etc. ...).
- The user of the program can retrieve information records from different databases or enter data manually when he fills in the different fields of the form he has chosen.
- The file should be sent electronically to the person responsible for the budget code. The file must also be printable.
- A user-friendly graphics interface is essential.

Open problems

- The stores database should be available CERN-wide together with a CERN-wide network.

- Electronic Mail will not quickly be available in local area network made of PCs. For this reason both the application and the communication software is to be developed.

4. Euclid - Oracle Interface

The Euclid - Oracle interface, which is actually being developed in the LEP Division, has the main task of simplifying the communication between the different sectors of activity that are involved during the realization of a particular project. This starts with the preliminary design, and ends, after the manufacture, with the installation. Many parties interact among those different steps, such as the client group, the design office, the workshop, the stores, etc.

To reach this goal, the two following directions of development are carried out:

1- Software realization of an application program which allows the consultation of the Oracle database during an Euclid working session. This will be obtained using the alphanumeric screen of the Euclid WorkStation as an Oracle terminal.

2- Software realization of an application program which will store all components, all sub-assembly and assembly drawings, in the Oracle database. The program will attach to the "Euclid object" all the technological informations which are necessary for the management of the design office. The Oracle database will guarantee the consistency of

the information and it will ensure the connection between the Euclid database (the object geometry) and the Oracle databases of the different parties involved in the various activities such as planning, design, manufacture and installation.

Once those two main steps are working, further development will produce the possibility of having an automatic listing of all components for a given assembly drawing, or having the history of creation and modifications for a given objet.