COMPUTING IN ST: EVALUATION OF THE PRESENT SITUATION AND PLANS FOR THE FUTURE

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Abstract
A general overview of the current situation will help to define plans for the future in order to obtain maximum profit of the resources we have and to better plan future investments. The main computing issues for 1998 are presented and their effects evaluated: Migration of QuickMail towards the CERN central mail server, in parallel with a migration of MAC to PC when needed; -rationalization of the ST desktop inventory and analysis of needs for the near future; migration from RAPIER (the Computerized Maintenance system) to its latest version R5, and re-organization of the different databases concerned; extensive use of the WWW as common communication system. Also, a divisional strategy for computing is presented: standardization, choice of solutions considering that the convenient solution is not always the best technical one, importance of training in general organization and in specific domains in order to increase efficiency in daily work.

1. INTRODUCTION

The purpose of this paper is to give an overview of the computing in ST. For this, however, a study of all the domains concerned would be needed, this is too broad a task. I will, therefore, point out the main computing events foreseen for this year, 1998, and present the problems involved. I will present events concerning the following domains: the desktop environment, the computerized maintenance management system, and the use of the WWW as communications media. I will propose several actions to be taken.

The computing events studied are of general interest as they affect either all the ST users or a big community. The aim is not simply to inform and make people aware of these matters, but to define plans that would help us to adapt well to the near future and take maximum benefit of the new functionalities and systems introduced.

1.1 ST Desktop Inventory

During 1997, many MACs were replaced by PCs, either old or new. No MACs were bought except in few exceptional cases (2); on the contrary, an important number of PCs were bought (87). Desktop users in ST are distributed as follows: 191 PC users and 31 MAC users.

Comparing those figures and considering the current PC strategy, it is obvious that, in the near future, we will only have PCs. Another issue to be considered is that there has been a large increase in the number of network printers, which shows the general strategy towards a share resources network.

1.2 Upcoming Changes in the Desktop

The fact that we are working in a Network Integrated PC Environment (NICE) makes our live much easier but we are at the same time constrained to accept the changes introduced by the team responsible for maintaining that environment.

1.2.1 Migration out of Quickmail to the CERN Central Mail Server

Netscape Mail has been proposed as a mail client but alternative clients are also being studied. The products are continuously being evolved. Despite the fact the product we choose now may or may not be improved, it is time to decide on a simple solution which covers at least the mandatory requirements of CERN users (multiplatform PC-MAC and file attachments of the CERN standard recommended tools).

1.2.2 NICE Server Configuration and Desktop Tools Evolution

The upcoming changes are either transparent or imply an improvement. There are good reasons for all these changes: fixes for open problems, addition of new features requested by users; products deemed to be strategic to the long-term forward planning of NICE; and the replacement of products or product versions no longer supported.

The impact on users and a good timing for introducing the changes are being carefully studied. The penalty could be the operations time response which, in most cases, can be solved without having to replace the machine just by increasing the disk space or extending the memory. For the user, it is always annoying to change tools or environment but, in his mind, the benefits provided should be an encouragement. Among those benefits, I would like to point out the following: a unique stable environment allows a better support at a lower cost and solves information exchange problems, improves printing and mail services.

1.3 Planned Actions

Concerning the progressive migration of Quickmail users to Central Mail Server, the order followed is, for the moment: first, the volunteers; second, the new PC users migrated from MAC to PC; and last, the MAC users. Before the migration, we must study the user's equipment to be sure it will map the upcoming hardware requirements of the new mail system. (This applies to any upgraded or new system to be introduced.)

Also, we must encourage and help users to define their needs in order to make the appropriate requests to the available CERN Central computing services.

2. MIGRATION OF RAPIER TO R5

2.1 RAPIER Background

RAPIER is a Computerized Maintenance Management System (CMMS) intended for the management of preventive and corrective maintenance of industrial equipment. Functions are grouped in modules that deal with equipment, work to be done on this equipment and stores from which the articles required for the maintenance are issued.

RAPIER has been in production at CERN since 1988 and is currently used by some 200 people spread through eight Groups in three Divisions, as follows: ST-TFM-CE, ST-TFM-CV, ST-TFM-IE, ST-HM, ST-MC, SL-PS, LHC-ACR, and LHC-ECR. The maximum number of simultaneous users is around 40. An important issue to be considered is that many users are employed by maintenance firms situated off the CERN site, which implies side effects and constraints not always easy to face.

CERN (ST-MC) bought the RAPIER sources. Several other CERN systems have been interfaced to RAPIER. Over the last nine years, RAPIER has been continuously changed, customized and developed by consultants, CERN and other contracted staff. Support of the current version of RAPIER still mainly depends on only two staff members.

2.2 Problems with the Current Product, RAPIER

Maintenance and development of the current system has proved to be a very difficult task, because it requires an in-depth knowledge of the software, much of which is undocumented due to the lack of assisted development tools in the past.

Moreover, RAPIER is based on systems that have a limited lifetime. RAPIER is based on ORACLE Forms V3 and is currently running on an OpenVMS machine. The user interface is character-based (constraint of Forms V3) and interaction with the system used to be done mainly on character-based terminals, though now that users have also a PC the old terminals are almost no longer used. ORACLE dropped ORACLE Forms V3 support at the end of 1996 and so will do the IT/DataBase support team at the end of 1997. Also, VMS support at CERN is expected to be dropped at the end of 1998.

The vendor of RAPIER has provided some training support over the years for the part of the product which had not been too modified, but they will no longer be able to provide training for CERN because the two versions have become too different.

Computing and its associated technologies are moving from mainframes to desktop systems connected to servers. Users are demanding the benefits of Graphical User Interface (GUI) technology (e.g. mouse, button and menuing facilities to access the system from their PCs). It has become necessary to substitute the RAPIER current system for another product that could answer to the challenges of the future and benefit from industry advances on the equipment maintenance area.

2.3 CMMS Upgrade Project

In the middle of 1996, a collaboration project between ST and EST, CMMS Upgrade, started. The aim of the project is to put a modern CMMS system in production during 1998 that will substitute the current system RAPIER. The project is led by the EST/ISS Group and has one representative from each division involved (now, ST and SL). The CMMS task force includes also representatives from all users groups.

2.3.1 Possible Solutions

Possible solutions for the CMMS future vary, depending on the nature and degree of changes to be made. All of them require a team of 3-4 staff persons who will help users to specify their needs, show them how optimize the use of the new CMMS facilities, and last but not least, provide knowledge of some of the divisional and CERN-wide specific applications to which the system has to be integrated or interfaced. The solutions studied were:

i) Conversion of Forms 3.0 to 4.5 using one of the existing commercial converter products;

ii) Re-engineering of the current system and Migration to Forms 4.5;

iii) Upgrading RAPIER;

iv) Acquisition of a new commercial product.

i) Despite the fact that a conversion could be a relatively easy way to update the current system, the maintenance and enhancement of such a system would continue to require at least two full-time CERN staff members with good knowledge and experience in today's system. Moreover, a conversion solution may have a short life since it depends on the evolution of the associated technologies used (ORACLE and Microsoft Windows). It would also be unrealistic to expect to implement new industrial trends and techniques on a converted version.

ii) A software re-engineering approach would reduce to about one man-year the effort dedicated to give the needed support of the product. But, on the other hand, it would imply a significant amount of effort on the re-engineering process. This solution means that the new software would be a 100% in-house developed and supported product, and also fully dependent on ORACLE's tools. Experience in the past has shown that large in-house software applications can be more expensive than commercial ones and require too much effort to be maintained, apart from not benefitting from industry advances.

iii) Upgrading RAPIER means in fact purchasing a new product because the CERN's version and the current commercial version are now too different, and that an upgrade is no longer possible. The purchase of a new product would simplify the maintenance of the CMMS itself. It would imply an initial effort for the migration and/or conversion of the existing data, and the customization to CERN's requirements using the tools provided by the product's vendor. However, once the new system is in production, support could finally be focused on solving user problems and not on maintaining the software of the system. The vendor will carry out the maintenance of the system.

iv) The EST/ISS team responsible for the CERN's RAPIER program gave an estimation of the total cost of the change, so that the savings achieved due to the improvement of the new system can be compared with the cost involved to maintain the current situation. Comparing the estimations of cost for each option for a period of 10 years shows that the cheapest solution is to purchase the new version of RAPIER, which is called R5. Even though, a market survey of CMMS products was carried out.

2.4 Selection of a New Product

The selection of the new CMMS product consisted of the following phases:

2.4.1 Definition of Required System Capabilities

i) Determine specific types of maintenance operations that the system must be able to cover.

ii) Definition of User Requirements according to ESA standards. A questionnaire was sent to all users, studied and discussed within each group, and finally reviewed and accepted by all. A User Requirements Document (URD) was issued, Ref. [1].

iii) Definition of System Capabilities. The current data was used to define the system requirements: number of assets to maintain, work orders per month, etc. It was also taken into account where the system's input data will come from, what outputs the system will be asked to produce, and where/to whom those outputs will be distributed.

iv) Definition of Software Requirements based on the URD and common standard CMMS functions. A Software Requirements Document (SRD) was issued, Ref. [2].

2.4.2 Market survey and Selection of Candidates

The SRD was sent to three suppliers candidates (Datastream/SQL Systems-R5, ABB-CMC Systèmes- MAXIMO, and SAP-R3) for them to make a proposition that matched our requirements.

Candidates were invited to present their proposal to CERN's CMMS community and demonstrationss of R5 and MAXIMO were held.

The selection of a candidate for validation and test was based on the best feasibility of the product to meet the CERN CMMS requirements and considering the two following issues: first, we already have a large database that we cannot lose and, second, there are a few connections between the existent CMMS and other systems which cannot be ignored when looking for a substitute. Only solutions that will take most of the existing data and will also provide the necessary interfaces to other systems were considered. Another important issue taken into account was to ensure that the system's supplier provides the level and quality of support services deemed necessary. The candidate chosen is R5, which is the market production current version of RAPIER, the product currently being used.

2.4.3 Validation, Testing and CMMS Selection

We are now in the phase of validation of the supplier's claims and testing of the system performance, which includes agreement on terms, initial discussions with the supplier to verify that what we understand they are offering is indeed what they intend to deliver. The training of people responsible for the project and future administrators has been done, and the training of a first group of users is scheduled for January 1998.

There are two pilot projects underway. One concerns the Cryogenics environment, which was implemented two years ago using RAPIER strictly in its standard way; neither special customization nor extra development was done. The second pilot project concerns the Civil Engineering environment and was also implemented two years ago, and based only on standard RAPIER functions without adding extra functionality. Both Cryogenics and Civil Engineering are planned to be in production with R5 at the end of January 1998. Projects to convert to R5 the other existing RAPIER databases will start in 1998.

At the end of the Pilot Project Phase, we should be able to decide on the number of future production databases, build a list of all the modifications to be introduced in R5 in order to accomplish SRD's needs, and with the help of the R5's vendor experts, define and implement a complete migration procedure for all the current RAPIER databases. At the same time, during this phase, we will be able to test the time response of the vendor's technical support.

2.5 Overview of the R5 Product

2.5.1 Generalities

R5 is a Computerized Asset Management and Maintenance System (CAMMS) that runs on UNIX and Microsoft Windows platforms. It is an information management tool that enables to obtain better performance from physical assets. It also provides all the traditional functions needed to maximize maintenance efficiency and minimize costs.

As RAPIER, R5 is a modular system. The R5 system provides support to the Asset Management as well as fulfills the CMMS functions of controlling maintenance work, materials and purchasing. It is a comprehensive ORACLE-based solution that can be easily tailored to fit every specific environment. Its fully integrated modular approach lets every company or group of users use any or all of its modules to help streamline their operations.

R5 consists of the eleven following modules: Base, Assets, Work Management, Materials Management, Purchasing Management, Project Management, Budget Management, Inspection Management, Bar-code option, Scheduling, and Asset Management Graphics.

Most of these modules existed already in RAPIER but important improvements have been introduced in the Purchasing and Inspection Management modules. The Project and Budget Management did not exist in RAPIER.

The Project Management module simplifies project work overall. It allows breaking a large project down into more manageable sub-projects, assigning individual work order activities to each step. Budget requirements can also be set. Work orders and purchase orders can be charged against the project, so costs can be readily monitored. The system gives you actual costs, committed costs and planned costs. A very useful feature is that it interfaces with Microsoft Project.

The Budget Management module automates the process of setting up budget and the subsequent capture, monitoring, control and analysis of expenditure associated with maintenance work. The module provides a link between the financial structure of the company, its organizational structure, and the physical asset hierarchies. Automated collection of maintenance costs (estimated and actual), together with flexible consolidation and analysis facilities, allows users to calculate a variety of financial and performance indicators.

2.5.2 System Configuration

The system can be tailored to the needs of the organization.

i) Installation parameters.

ii) Codes for types and status. A large number of R5 data types have either or both a status attribute and a type attribute. The functionality of R5 depends on the values of these types and statuses and hence they come predefined with the system. It is however possible to create one or more user-defined codes for each system code in order to make it more comprehensible, creating a set of sub-types (which are functionally the same that for R5) and more statuses for the life cycle of one or more data.

iii) Functions within R5 represent screens for entering and inquiring about data, reports, graphs, and menu entries. Although functions are system data, they have a number of configurable properties. Moreover, it is possible to extend the system with user-defined functions that are based on an existing function or call an external application. An important feature is the interfacing with all the Microsoft Office 97 tools as well as some Windows Graphical Designer tools.

iv) Report parameters and queries. For most reports within R5, the user should provide one or more selection parameters in order to limit the output to his needs. It is possible to configure the parameters in several ways.

v) Changing terminology and texts**.** R5 provides the possibility to replace standard R5 terminology, as used in screens and reports, to terminology preferred by your organization. It is also possible to adapt field help texts and error messages to your own style.

vi) Changing screen layouts. R5 lets you hide fields that are never used, make fields that are mandatory, move fields to other positions, or resize fields.

vii) Tailoring the remember mechanism. While moving from one R5 function to another, the system remembers values and carries them over to the other function, or uses them to query automatically data in the other function. It is possible to fine-tune this mechanism.

viii) Custom Attributes. The most powerful configuration feature of R5 is provided by the Custom Attributes functionality. Custom attributes are data tables and fields that are not part of the standard system, but which can be attached to standard R5 data types (entities) or used to define classes of such data. Besides providing extra data entry fields (attributes) for an entity

class, it is also possible to define a List of Values for the attribute, specify a data type, minimum and maximum values, a unit of measure, or make the attribute mandatory. The attribute can even point to an existing R5 entity.

ix) Auditing. R5 is equipped with an auditing option. It is possible to record, for each table and each attribute in the table, changes with a date/time stamp and the user ID.

x) Configuring font keys and colours of the applications. The appearance of R5 in terms of fonts and colours is partly controlled by the system itself and partly by the user interface or window system your computer is equipped with.

2.6 Migration Planning and Procedure

The current production RAPIER databases to be migrated to R5 are the following four: ST/MC, ST/TFM-CE, ST/CV-ST/TFM-CV and ST/TFM-IE. The planning for the migration of the ST RAPIER databases will be decided in January 1998.

A migration path containing the following elements must be defined: training, determining which functionalities to use and how, adapting and/or creating procedures, and transfer and/or conversion of existing data.

3. WWW in ST

3.1 Current use

Since 1996, the divisional annual document *ST Info* has been published and maintained in the Web. These pages present the ST Divisional Organisational Information (structure and groups), Divisional Representatives, as well as information concerning workshops and conferences. Lately, the minutes of the main ST committees meetings (GLS, STTC, and STGC) have been added.

Up to now, few groups are publishing information. The ST/MC Group has several publishers on the following activities: Access Control, Telecommunications, and the Technical Control Room. The ST/HM Group publishes information on the passenger transport system. The ST/TFM Group has made the CERN Patrimony plans available. Under preparation are the pages of the ST/CV Group and ST Planning.

At the beginning of 1997, the AS Division implemented a Web Conference Room Booking System to which ST joined.

3.2 Foreseen

CERN-wide Web calendar: public and private use. Information concerning dates of the CERN Committees meetings, as well as public part of the agenda of their members, will be available, helping the all organization.

4. CONCLUSIONS

Desktop hardware upgrades (CPU, RAM, disk size) will allow to fit the software upgrades foreseen. Improving daily desktop work with new tools would bring time saving. A common environment would reduce conflicts between users and platforms**.** Users do not always accept changes easily, but one has to be aware that it is for any individual benefit. More resources should be dedicated to training. Also, in order to benefit more from the CERN Central Computing Services, a special effort should be made to study, define and present the ST Computing needs.

The ST Web site should be expanded (i.e., to include a complete list of all the services provided by ST Division to CERN community with all useful information).

The CMMS migration is a unique opportunity to evaluate the current implementation and adapt it to the present requirements, as well as the new possibilities offered by R5. Obsolete data can be removed, errors corrected and inconsistencies solved. The CMMS migration has to be considered as a collaboration project that requires a combined effort from administrators, users and managers from three Divisions in seven Groups. The obvious benefits are the following: increased efficiency in the maintenance of the technical installations, simplified work, better services, and lower costs.

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