

The Evolution of Desktop Computing in CERN

J. Ferguson, F. Ovet, A. Petrilli
April 19, 1995

All conclusions presented in this paper needing further action are indicated in **underlined bold**.

History

Personal computers were introduced in CERN without any clear policy in the early 80s. Macintosh systems were available via a support unit in PPE initially for the Research community but spread into general use. IBM compatible systems were initially obtained directly by the users themselves from multiple incoherent suppliers.

Following an audit of the administrative computing of the laboratory in 1986, the "Management Information Systems at CERN" report (CERN-DD/86-19) by J. Ferguson, called for a reduction of the hardware suppliers in the personal computer area: recognizing the existence of different requirements, the continuation of the Macintosh line and of a single supplier for the IBM PC compatible line was postulated. The creation of a single unit for the sales, distribution, software installation, support and repair of desktop computers was also postulated. It was also recommended that there would be a unique purchasing officer for all such acquisitions. Following the above report, the MIS unit, consisting of the Administrative Data Processing and the Office Computing Support groups, was created inside DD Division in 1987, became the AS-MI group in 1990 with the addition of the Printing and Document production activities. In 1993 the unit was reorganized into 4 relatively specialized groups within AS. While the IBM PC compatible line has been available since 1987 from a single internal supplier (the current AS-DC group), Macintosh support was performed in parallel by AS-DC for administrative uses and by PPE/ECP division for research uses. The two support units were merged into AS-DC during 1993.

A paper presenting a common view of Policy and Divisional responsibilities in Distributed Computing was written by D. Williams (26/2/1993) in discussion with J. Ferguson and P. G. Innocenti and is interesting background information. A similar paper was presented to ACCU at the end of 1993 by P. G. Innocenti: Desktop Computing for Experiments and Divisional Responsibilities, ECP/DI/PGI, 26/11/1993. It contains full details about all desktop related CERN units and their mandates.

Desktop Systems

IBM compatible personal computer systems (PCs) were acquired mainly in the Engineering, CAD and Accelerator Controls area but also used for office work in some cases. Because of the engineering, technical development requirements, users have usually gone for the current high-end PC (i.e. maximum memory, fast, good graphics, etc.) as standard. These systems had originally no built-in networking or printer sharing possibilities and software was difficult to install and maintain. Over time, Novell Netware has become a de-facto standard for file servers and printer sharing over Ethernet. Netware 4.0 allows up to 1000 connected users and can support both PC and Macintosh.

Macintosh systems were acquired mainly for office applications but have also been used in experiments and in laboratories for technical work (PPE, ECP). Until recently, due to the relatively higher cost compared to PCs, most machines purchased were mid-range ones. Macintosh has always had basic built-in LocalTalk printer sharing with a modest transfer rate of 230 Kbits/second, Appleshare was available slightly later for server based file sharing. Today, peer-to-peer file sharing is available without a server and it is possible to run the Apple protocols over Ethernet directly. An Appleshare server can support up to 250 connected Macintosh users.

The total number of units, all models, purchased by CERN since 1987 is in excess of 4000 evenly split between Macintosh and PCs. There is some uncertainty due to the information available for systems acquired in the research sector and for non standard systems bought as e.g. controllers or communications objects rather than PCs.

Since 1987 (when record keeping was invented!!) there has been a yearly average expenditure on material of 1.3 MSFR for Macintosh and of 1.6 MSFR for PC (plus around 600 KSFR for the NICE servers purchased directly by CN-DCI).

The estimated¹ total number of installed machines is:

PC Systems	Qty	Macintosh Systems	Qty
286 & older	809	Plus, SE, Classic	350
386	464	LC, II;x, cx, si, ci, vx, vi	900
486/33	255	LC475, IIFX, Centris	200
486/66	406	Quadra	267
Pentium	27	PowerMac	133
Portables	39	Portables	150
Total	2000	Total	2000

NB An unknown number of PC have been upgraded by mother board exchange to newer models directly by divisions and 13 Quadra machines have in the meantime been upgraded to PowerMac.

It is assumed that some fraction of these 4000 desktop machines have become obsolete or are no longer used actively². A number that seems to us reasonable for the actively used desktop computer is of the order of 3000 but there is some uncertainty about this. Assuming a lifetime of the order of years, the replacement rate would be of 600 machines per year, including Macintosh servers and PCs used as local Novell servers. This number fits reasonably the known number of machines purchased in recent years (e.g. in 1994: 262 PC, 261 Macintosh). Given the rate of increase of system resources required to make a system usable (e.g. CPU, disk, memory and network facilities for modern applications) the five year useful life postulated seems reasonable.

Current issues

Networkery for Macs

The most severe problem today is the network situation of the Macintosh community. There are of the order of 600/700 systems which are not equipped with an Ethernet capability. This restricts their ability to use modern networked applications and prevents manpower efficient software installation and license control. Modern machines (around 200) could receive an Ethernet card for a price of 170 SFR or 350 SFR, depending on the model. **It is recommended to move to Macintosh solutions which have Ethernet but the way in which this is done depends on the server solution adopted.**

User forum/communications

There are currently two different user groups in this area. The first is the NICE forum whose membership is largely highly specialized technical users and Novell administrators. The Macintosh user forum consists mainly of users' representatives from each interested division. **It is proposed to create a Desktop Forum chaired by the Director responsible for computing with Divisional representation (formally appointed) meeting perhaps 4/6 times per year to discuss all desktop related subjects and ensure strong communications line to the Divisions.** The current bodies do not seem to achieve this. More specialized user groups (e.g. Physics, MIS, Engineering, etc) should provide the link between the Desktop Forum and the user community.

¹ Estimation affects only older machines that could be purchased at the time via other services than AS-DC.

² This could mean the missing machines are used as small workgroup servers, home, in experiments, etc.

Applications responsibility/Rate of change of applications

Since MIS services were set-up, only application software that was compatible across the two platforms and that was a likely candidate to become a de facto standard has been recommended to the users. Across the years, the MIS main choices in word processing, spreadsheets and simple data bases have become real de facto standards (mainly the Microsoft Office suite and FileMaker) and AS-DC has continued to support those products. A Word, Excel, PowerPoint and Project site upgrade license has now been purchased for the whole of CERN. The current versions of all Microsoft products and of filmmaker not only offer identical visual interfaces and functionality, but also common file formats on both platforms. CERN developed applications for the administration, through the AIS project, also offer cross-platform compatibility.

Some non-MIS applications may still force users into one or the other platform. As it has already been pointed out above, today's users' problem is mostly one of compatibility between file formats. Keeping at least 'standard' applications, i.e. the ones every desktop owner should know: Word, Excel, PowerPoint, Project, FileMaker and e-mail, at the same release level is of top importance and, for many users, is the only requirement. **It has been clearly defined that the responsibility for application selection and support lies with AS for the MIS applications (including the above office products with the exception of e-mail), with ECP for physics applications and with Computer support for Engineering for engineering applications.**

The rate of exchange of standard applications tend to be driven by fast moving improvements in technical functionality for the specialist user, general increase in functionality required by the 'average' user and pure commercial considerations. The very advanced technical user (e.g. CAD/CAM or software development) often requires new software and consequently higher powered hardware. This leading edge type of use must be supported. In general for office applications the user requirement for improved functionality and performance is not as dynamic as the rate of change suggested by the suppliers for commercial reasons and a slowing down of this cycle is desirable. **It is suggested that the specialized units responsible for applications should make proposals to the Desktop Forum on the scheduling of introduction of new versions and new applications.**

Installation of Mac software

The current method for installing software on Macintosh is to do so from 3 AS-DC servers to those systems which are Ethernet connected. However for the other systems, heavy human intervention in the user's office is still required. This style of software installation which is manpower intensive must be eliminated.

Server solutions ... novell/mac

There are of the order of 40 servers in use in the PC and Macintosh service areas (i.e. 80 in total). The main difference between the two platforms is represented by the central NetFrame servers run by CN-DCI. Some other differences and features are linked to the protocols (e.g. fail-over feature of Novell).

The Novell structure is more centralized and users need a server available to be able to work, a way of working reminiscent of CERNVM. Macintosh users have always relied less on servers, mostly because of the slower network access. A comparison of the costs involved in both approaches is not easy, some of the issues are:

- Novell: NetFrame cost, support cost, flexibility, double costs (local disks and central disks), network traffic, portables support, functional justification for local servers.
- Macintosh: manpower intensive software installation, support cost, server administration overheads, backups, incoherent environments.

It is proposed that a small technical working group analyse the server situation and make proposals for future server infrastructure for both PC and Macintosh areas.

Mail systems and support

E-mail products are different on the two platforms, but exchange of plain e-mail and of e-mail with enclosures between PC and Macintosh is possible. Of course, the enclosures must be of a type that can be used on the receiving platform. Sticking to standard products, Word, Excel, PowerPoint, Project and

FileMaker or to widely accepted file formats (e.g. gif or jpeg for images) guarantees today complete transparency for document interchange. **It is considered that support for e-mail on all systems should be provided by CN Division.**

The replacement of CERNVM for e-mail has been discussed at the Telecom Board meeting of April 5, 1995. This operation seems a good opportunity to unify the transmission format of enclosures (MIME) and at the same time remove the need for the currently used e-mail products, QuickMail and Microsoft Mail, using in their place either public domain or commercial products not linked to specific vendors' protocols.

Recommended systems for communities

This is a rather difficult question to which the answer is not intuitive. The laboratory will undoubtedly be perceived as 'rich' if we install top of the range systems on all desks including those used for secretarial and administrative purposes. On the other hand, the difference in price between the top end system and the mid range one is of the order of 1000 SFR and it is not obvious, looking at a projected lifetime of 5 years, the rate of change of applications resource requirements and the cost of machines upgrades, that the top end system is not the most cost effective solution.

The only choice that can sensibly be considered is either to purchase high end systems for everyone or to purchase high end systems for technical use and the middle range systems for other use.

Low end systems can be recommended only for very limited uses, with very clear and stable requirements. For information, the current prices for middle range and top range machines are presented here:

- Middle range equipment: 486/66 (SFR 4,386), PowerMac 6100/66 (SFR 4,324)
- Top of the range equipment: Pentiums (SFR 5,337), PowerMac 7100/80 (SFR 5,629)

Two systems or one

As shown above, prices for PC and Macintosh are extremely similar. The real differences are in the server structure and the associated human support. Any possible evolution should be made in such a way that users are not affected in their daily work by such an evolution (e.g. sudden and hectic decisions, such as the one in 1993 to stop all Macintosh purchases from one day to the next should be avoided). More and more in the future, commonalities should be found and encouraged in the application world rather than in the hardware and operating systems areas. **There is no clear cut argument to dictate a specific single platform (PC or Macintosh) to the whole desktop users' community.** We see no major benefit in forcing either community to move to a unique desktop system against their wish. Clearly, a single platform could generate some scale economies, but it is interesting to note that the laboratory is considering the introduction of a second supplier for RDBMS systems (Sybase) to force our current single supplier (Oracle) to be more competitive. A single supplier in the desktop world could lead the organization to a similar situation quite soon. The argument of the Macintosh supplier being a Non Member State may vanish soon, as many computers suppliers are likely to start producing Macintosh clones (including Olivetti).

Support functions and structure

AS-DC performs the following functions:

- | | |
|----------------------------|--|
| - MIS applications choice | CERN wide standard MIS applications selection, purchases, distribution, upgrades |
| - MIS applications support | support of users through servers whenever necessary |
| - Users' advice | on hardware/software products, Macintosh and PC |
| - Virtual store | order processing, billing, installation/delivery of machines, basic system software and application software |
| - Other purchases | non standard hardware/software on behalf of users |
| - Maintenance | hardware troubleshooting/repair of machines and related products (e.g. printers, scanners, etc.), upgrades. |

Apart from each division providing some server and help infrastructure at their own discretion, the three groups which offer some central services, vis-à-vis of commercial hardware and software, are AS-DC, CN-

CE and CN-DCI but users seem very attached to their own local support and server structure. The number of people involved in each of these groups, and in the remaining of CERN, on PC and Macintosh is³:

	PC	Macintosh	Both	Total
AS-DC-Staff	1	3	4	8
AS-DC-IS	2	2	0	4
CN-CE-Staff	0	0	3	3
CN-DCI-Staff	4	0	0	4
CN-DCI-IS	1	0	0	1
Other-Staff	5	3	0	8
Other-IS	4	1	1	6
Total	17	9	8	34

N.B.

- 1) PC/CN-CE-Staff includes 2 students. Support provided is for PC only, but it would be needed whatever platform is used.
- 2) One of PC/Other-Staff is being replaced by an IS.
- 3) Both/AS-DC-Staff figure includes 2 staff supporting Macintosh for the DG unit and users in the nearby region, needed whatever platform is used
- 4) The PC/Other-Staff figure includes one CN-ASD staff supporting Oracle for PC. It is important to note the number and popularity of local support staff used in the Divisions.

From the above table, we note that the PC support, in its present form, seems to need some 8 FTEs more than the Macintosh support, for a similarly sized users' community. This difference can be partly explained by the NICE infrastructure (5 people) and the Oracle support for PC (1 staff).

Farming out or not

The current support activities are already farmed out to a significant extent, 12 out of 34 FTEs already coming from industrial support, around 1/3 of the support activity. The activities done by IS have a highly technical content, similar to the activities carried out by the staff. With the reduction in staff foreseen in the Laboratory in the next ten years in general and within the desktop support activity in particular, it seems obvious that farming out more extensively will be unavoidable. **It is suggested that the industrial support activities of this type should be centrally coordinated and that an analysis of the profiles of current staff functions carried out such that a phased increase in farming out be effectuated.** It is interesting to note that during 1991, AS has studied the possibility of merging the virtual store function inside CERN Central Stores. Due to the rapidly evolving computer technology and to the need of assembling and installing additional hardware and software before delivering to the final user, the merge was found at that time not possible. The introduction of the new AIS stores application, Triton, in the coming weeks will lead to another analysis of the situation.

Charging or not and its consequences

Almost all AS-DC services are charged, including server usage. NICE instead is free of charge. This disparity introduces artificial price differences that may favour one service over another. **It seems obvious that a coherent approach to charging should be put in place in the desktop service area.**

³ While the figures shown for the officially mandated groups are correct, the figures for other divisions are probably on the low side. Also, we only considered people working full time or almost full time into the count.