Computing in the University of Edinburgh

Phase 5
Departmental Visits

A Report on the Consultations between
Faculty and Departmental User Representatives
and the
1990 Transition Project Teams

10th April 1989

For the attention of the Computing Policy Committee

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Phase 5 - Departmental Visits

This report summarises the consultations held with faculty and departmental user representatives when members of the 1990 Transitional project teams visited groupings between mid-January 1989 and end-March 1989.

The background to, and the main aims of, the visits are given in the introduction. A summary of the views and concerns presented by the users is given in section 2 under the relevant faculty headings. Section 3 contains an analysis of the views presented with particular relevance to the overall strategy, communications plans and EMAS transition. In section 4, several recommendations are made with the broad aim of answering the types of concern expressed in the user consultations. Section 5 contains elements of a basic implementation plan and highlights areas to be investigated in the next phase of the 1990 transition projects. The list of departments visited is given in an appendix.

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SUMMARY

The views of the departments depended to some extent on their current involvement in computing. Overall, there was considerable interest in and support for an evolutionary approach to the strategic aim of a distributed computing scenario. There were underlying worries, however, and the basic support did depend on satisfactory solutions to most of the obvious problems.

Not surprisingly, the universal concerns of the faculties were:-

- how the University was going to fund the necessary capital expenditure which would be required to realise the strategic aims, and what the consequential effect would be on equipment grants.

- how the departments could pay the escalating recurrent charges, both for hardware maintenance and software licences.

- how the distributed environment would be managed and supported in human terms.

The additional concerns of many of the users who currently depend on central mainframe time-sharing services were:

- if a move from EMAS was necessary, it had to be carried out over an acceptable timescale which would ensure as smooth a transition for production programs as was possible.

- in particular for those mainframe users who saw advantages in a distributed computing scenario, that they did not have to endure a "double transition" through a central UNIX or VMS service just because of temporal funding problems in the phased introduction of the new strategy.

- that for many of them, there would be a long term requirement for a central service capable of handling the large database and data analysis jobs which were essential to their research.

- that for other users, whose research was totally dependent on numerical computing rather than the ability to process information, a powerful central computer would also be required.

The additional concerns of these users who either didn't use computers at all or who used only stand-alone personal computers at present, were:

- that since the requirements of many of them were very straightforward, it was important to get connectivity for as many PCs at the cheaper end of the spectrum as possible rather than set the workstation standard so high that widespread access to the new network would be unlikely for most people for any foreseeable timeframe.

- that it would be necessary to ensure that DOS and Mac based systems were as fully integrated as possible into the new network facilities.

As a result of the consultations with users and taking into account parallel discussions being held elsewhere in the University, the following recommendations are made, that

- **Capital Funding** - before further meaningful planning can go ahead within EUCS, the faculties and departments, a reasonably detailed scenario is worked out which will show how the necessary funding to achieve the aims of the draft strategy can be provided over a reasonable but defined timescale.

- **Hardware Maintenance** - the University sets up a centralised scheme for the arrangement and management of all recurrent hardware maintenance burdens.

- **Software Licencing** - the University sets up a centralised software purchasing service making full use of national software deals and additional relevant local site licencing arrangements.

- **User Support** - EUCS investigates an enhanced user support scheme which would encompass the support and management of distributed LANs and filestores.

- **Training** - EUCS reviews its training policy with a view to the major retraining required for distributed systems.

- **Library & MIS** - the Library and MIS develop plans to ensure that the desired levels of access to their databases and services is provided through the standard University network.

- **University Information Service** - the University sets up a working party, with members from MIS, the Library and EUCS, to draw up a specification for access to a University Information system.

- **Workstation Pool** - the University investigates the financial and practicable feasibility of setting up a central pool of approved workstations relevant to departmental interests.

- **Communications Backbone** - the University goes ahead with the implementation of a University-wide high speed network.

- **University Wiring** - the University should cost and proceed with a phased programme of investment aimed at completely wiring the University buildings within some financially attainable timescale.

- **Existing Network** - EUCS should clarify the status of the existing X.25 network.

- **Network Protocols** - EUCS makes an early statement on the support of non-JNT approved network protocols.

- **Student Access** -the University investigates the entire issue of student access to the new network, both from Pollock Halls and from within different departmental networks.

- **Central Time-Sharing** - the University commits to the continuing requirement for powerful central time-sharing computers.

- **EMAS Transition** - the transition from EMAS is conducted both for strategic market positioning and standardisation reasons, and for other positive motivations such as the provision of enhanced user interfaces, functionality, power and capacity.

- **Retention of NAS VL/80** - the NAS computer which currently runs EMAS, should be retained at least for the duration of the transitional overlap service. It is recommended further that the University investigates the outright purchase of the NAS VL/80 in the expectation of converting this facility to a UNIX service as the EMAS service load declines.

- **VMS Enhancement** - the central VAX configuration is enhanced to allow it to support an additional 25-30 simultaneous users from an estimated additional 500-600 accredited users.

- **UNIX Facility** - investment be made in a central time-sharing UNIX based computer which is capable of simultaneously serving 100-150 "EMAS-style" users from an estimated accredited population of some 3000 users, and with performance characteristics no worse and preferably better than the EMAS service it replaces.

- **Compute Server** - consideration is given to the provision of a compute server aimed at providing considerably higher single-stream processing power than is possible in the general purpose UNIX service computer.

- **Mail, Spooling & Archive Services** - in planning the transition from EMAS, special consideration is given to the important centrally provided mail, spooling and archive service areas.

- **Seeding Distributed Computing** -as a seeding exercise, a few centrally managed facilities be provided for general service to relevant faculty or multi-departmental groupings who would benefit from a workstation environment.

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1. Introduction

As a precursor to the allocation of funds by the Computer Board in 1990, the Computing Policy Committee (CPC) undertook a consultative exercise around the University during 1987 and 1988 with the broad aim of reviewing the corporate direction which computing and information technology should take in the next decade. The outcome of the several phases of deliberations was a draft strategy which proposed that the University of Edinburgh should continue to evolve from the delivery of computing power through central time-sharing computer services (such as the EMAS service running on the NAS computer), towards a much more distributed form of computing increasingly based locally in departments and in particular utilising processing power on the user's own desk (in the form of personal workstations).

The mechanisms of actually effecting this broad strategy are not entirely straightforward and two project teams were established, one to plan the necessary network developments required to support wide scale distributed computing, and the other to plan the transitional arrangements which will be necessary to ensure as smooth an evolution (in particular from EMAS) to distributed systems as is possible.

The first priority of the project teams was to visit faculty and departmental user groupings to discuss the implications of the proposed strategy for their undergraduate teaching and academic research plans. The overall aim of these discussions was to establish a viable global plan of action which can be followed over the next few years. However, an ancillary aim was to define specific ways forward for each group of users/departments, and thereby to produce a detailed agreed plan for each department. This would include an initial assessment of the additional support required and an assessment of the problems involved in a move away from EMAS. It was expected that this plan would form the basis of future discussions and action between departments and EUCS, through both the User Support Teams and the Project staff.

Since it was important to get the views of as many departments as possible in the limited time available, we tried to arrange meetings with relevant groupings of users (either by location or by academic function) wherever possible. Several departments were visited individually where they requested this and in particular where specific problems (mainly associated with the move from EMAS) were known to exist. Inevitably therefore, the size of the user meetings varied somewhat.

Obviously the actual format of the meetings had to be flexible but an attempt was made to structure the discussions sufficiently such that a similar spectrum of topics was covered with each grouping. In general, meetings opened with the departments giving their overall reaction to the strategy followed by more detailed discussions highlighting their support or concerns. Most departments took the opportunity to emphasise their main requirements from the central Computing Service. Usually this was followed by a detailed consideration of how the proposed higher speed campus network might help their academic plan and in particular what timescales would be relevant to them for connection to the new communications backbone. Finally, time was reserved to discuss the implications of the proposed closure of the central EMAS time-sharing service, and what each department's preferred alternative would be.

2. User Views

Some forty meetings were held with various levels of user groupings including faculties, schools and individual departments. Two meetings were held with the Library and one with Management Information Services. Two open meetings were held for clinical departments in the Faculty of Medicine, one in the Royal Infirmary and one in the Western General Hospital. A small number of written submissions were received, either as a supplement , or in preference, to a meeting. For completeness, a detailed list of user departments seen is given in Appendix A. The transition teams will be happy to visit any other department which could not be fitted into this round of visits, in April or May.

Obviously it is not possible to detail all aspects of the discussions from over forty meetings, but the following summary of views expressed gives an overall picture of the main aspirations and concerns presented. They are grouped by Faculty. It is worth noting here that we were not attempting to do a review of requirements as in the earlier consultation exercise which resulted in "the green document". Although requirements were presented, these were discussed in the context of ensuring a smooth transition or developing a departmental plan for the future.

2.1. Faculty of Arts

Overall, the faculty felt that the distributed model of computing provision was probably the right one for most of their users but expressed very strong concern that they could not see sufficient funds being made available to allow Arts to benefit fully from it. Indeed lack of funding was the overriding issue raised throughout the meeting and it was pointed out that this faculty did not have the same opportunity of access to non-UGC funds as other faculties had. Any suggestion that extra computing provision should be funded by cuts in staffing or books was unequivocally rejected. If extra funding was not forthcoming they felt Arts would fall even further behind other faculties in complete contradiction to one of the aims stated in the draft strategy of providing modern facilities throughout the University. In brief, unless the funding issue was tackled, the strategy was almost irrelevant to them.

On the communications front, Arts urged that information on exactly what items of equipment would be funded centrally should be provided as soon as possible so that departmental plans could be formulated positively; this was particularly relevant to wiring, file-stores and communications gateways. It was felt there would be problems networking the faculty sensibly because of its physically dispersed nature. From the workstation point of view, it was felt that for most of its users PCs at the cheaper end on the price spectrum would be powerful enough, and in any case would be all that could be afforded. It is essential, therefore, that DOS and Mac systems should be fully integrated into the new structure.

Although distributed computing was felt to be the most suitable for Arts users, several departments emphasised their belief that central time-sharing mainframes had an important role to play for them for the forseeable future, particularly for access to expensive packages which they couldn't afford to purchase themselves. Microlabs were felt to be more suitable for some of the special facilities required by the Arts faculty for teaching purposes. It was generally felt that existing EMAS users could move to a central UNIX facility if their requirements could not be met through a distributed framework. It was emphasised, however, that a major training exercise would have to be embarked upon especially if the user interface was not friendly as they had been told was the case. No one was dependent on VMS and it was unlikely that Arts would use the central VMS service in any numbers.

The following important general points were made:

- they would need a considerable amount of central human support if distributed computing was to become a reality.

- they felt that the University, possible through EUCS, should provide basic I.T. training in computers for new undergraduates.

- they wanted improved access to the Library's facilities, particularly to capture bibliographic information on to local PCs to create personal databases.

2.2. Faculty of Divinity

The Faculty of Divinity was in broad agreement with the strategic move to distributed computing, but they had serious reservations as to how the funding could be provided to achieve the desired end result. Even assuming it could be provided, however, they were equally concerned with the escalating recurrent charges for hardware maintenance and software licencing.

Divinity wanted assurance that they would not be left out of full participation in the new University communications network because of the location of New College. Although it was agreed that enough bandwidth could be provided between New College and George Square to meet their current needs, they felt it could be short sighted given their interest in transporting images across the network. Their basic requirements for foreign language character sets would certainly require substantial bandwidth. On the workstation front, Divinity felt that the more powerful UNIX and OS/2 workstations were beyond their means at present, and were simply not necessary for the majority of their users' requirements which would be satisfied by PCs running MS-DOS for the forseeable future. They would, however, at some point require more substantial systems, the cost of which might be beyond their current level of equipment grant.

Divinity made significant use of EMAS, but for the majority of their users there should be little difficulty in moving their work to locally based computers. However, if sufficient funding was not forthcoming, the heavier work which they would prefer to move to the more powerful workstations would have to remain on central mainframes. Although they accepted the move away from EMAS, one group emphasised the importance of a residual though declining EMAS service until the central UNIX service was able to match the facilities of EMAS which were important to them.

The following general points were made:

- they were very interested in a special initiative being sought in order to get plans for the use of computers in teaching off the ground.
- they hoped that EUCS would consider teaching basic word processing to undergraduates.
- they would like to see much better integration of the Library and MIS services with the academic network.
- individual access to national and international databases was increasingly important to Divinity.
- sight should not be lost of the advantages of having "bottom-end" facilities in faculties similar to those which researchers and students could afford to purchase privately.

2.3. Faculty of Law

The Faculty of Law fully supported the draft strategy and had taken the decision several years earlier that a distributed computing environment was the correct solution to their computing requirements. Their relatively limited funding meant that their phased implementation plan would take many years to come to fruition. They were heavily MS-DOS based and wanted to be sure that their investment strategy would be effective for a considerable number of years. Their basic requirement was for an integrated office environment suitable for all levels of users. However, they foresaw an imminent major growth area in the setting up and managing of a Scots Law database. Much of recent Scottish legislation and also EEC legislation was already available in machine readable form and the eventual data storage requirements could

be very large.

Law's communications plans were already well addressed and an Ethernet/3-COM LAN should be installed later this year. Their provision would need to be gradually expanded and in five years time they would expect that their database facility would be connected directly to the high-speed backbone from which it would be accessed by groups such as the Scottish Law Commission, Government departments and other Scottish Universities.

The faculty made some use of EMAS for electronic mail and certain packages. They would still need access to a large central mainframe for some of their work but foresaw no problems in moving from EMAS. It was agreed that they would be one of the earlier groups to make a transition.

The following were the other main points raised:

- they would require long term archive storage.
- they would like primary in-house support, probably a lawyer with some computing experience who relied on EUCS central user support for more technical matters and backup support.
- they had no preference for UNIX or VMS for their central mainframe requirements.
- from MIS they required integrated management and administrative systems, with on-line access to student records for Directors of Studies.
- they felt it was important for staff with home computers to have full access to any Law networked services.
- they found package documentation to be intimidating and would like user support in terms of practical demonstrations aimed at getting new "first-time" users started.

2.4. Faculty of Medicine

The Faculty of Medicine consists of a large number of departments based at several different sites and having widely differing backgrounds in computing usage. It is difficult to believe, therefore, that one view would emerge to represent their diverse requirements. Unfortunately, not all departments were able to attend the open meetings. A further complication in the case of Medicine, of course, is the vital interaction with the Lothian Health Board, but any close integration with NHS networks raised important security issues.

In general, the faculty was cautious in its support for the new network strategy. Some groupings such as at the Western General Hospital and the School of Dentistry could see the advantages in the local work group concept inherent in the strategy but others were less convinced of the relevance to them. As with all faculties, the funding issues dominated the concerns expressed. If new money were available, most departments would move to a distributed computing environment in a phased manner, while the small number who make extensive use of time-sharing services would continue to rely on central mainframes for a considerable period. Without extra funding it was not at all clear how their computing plans would develop.

Spread as the faculty is over several hospitals in Edinburgh, the maintenance and improvement of links to the proposed central communications backbone was an important point raised at all meetings. On the LAN front, it was pointed out that NHS reviews of all hospitals were currently under way and that any communications strategy would have to be very flexible since considerable re-organisation within sites was a distinct possibility. There was a requirement from at least two groups for a fast network link to the parallel processing facilities at King's Buildings. Several departments wanted to capitalise on their recent investment in X.25 connections and some asked if existing wiring could be utilised for Ethernet connection

in the future.

The use made of EMAS was very variable across the Faculty. Although the Medical Faculty is mainly micro based there were several groups who made heavy use of EMAS especially for statistical package work. Most of these groups emphasised that they would have a long term requirement for a central time-sharing service. Most users accepted UNIX as the sensible alternative choice although a few indicated they would use the central VMS service if the software was only available there, such as in the case of the Wisconsin package. They did indicate, however, that the EMAS replacement had to provide at least equivalent functionality including good tape and batch facilities.

Other important points included:

- the analysis of images was important throughout the Faculty and they wondered if a powerful centrally managed image processing facility could be provided.

- computer assisted learning material could be very useful in some areas of Medicine.

- they needed a centrally managed long term archival facility and would want much of their existing archive material transferred to it.

- in general they wanted improved access to the medical library; at least one department felt strongly that MIS needed to provide better support for accountancy systems, and also electronic access to MIS databases.

2.5. Faculty of Music

The Faculty of Music was a small faculty and historically had had little involvement in computing. They had not used central time-sharing services such as EMAS at all and had few stand-alone PCs in the faculty. Recently they had acquired a powerful configuration based on a stand-alone SUN workstation and they hoped that eventually this would be a host on the new University network. Overall, a move in the general direction of the strategy could only be beneficial for Music, and the emphasis on UNIX was good for them.

From the communications viewpoint the most useful connection for Music would be to Artificial Intelligence but there seemed no immediate need for a LAN dedicated to them. However, the nature of their current work on electronic composition meant that large amounts of data storage were required and this might have implications for transmission capacity. They also indicated that there were U.G.C. recommendations for co-operation between the Edinburgh and Glasgow University schools.

Other points discussed were:

- Currently undergraduate teaching did not involve computers but they were interested in CAL techniques being developed at Lancaster.

- An automated music printing capability would be of considerable benefit to the faculty.

2.6. Faculty of Science

The faculty decided to leave it to departments to reinforce the messages which were contained in the Dean's reply to the Computing Policy Committee; consequently, most of the departments in the faculty were seen either individually if requested, or in relevant subject groupings. Science is the biggest user of computers in the University by far and the diversity of interests inevitably led to differing views within the faculty. In common with most other faculties, however, they were united in their concern over both the

capital and recurrent funding implications of the draft strategy, irrespective of their individual views on the value and relevance of distributed computing to their departments. It was pointed out time after time that the flexibility which Science apparently enjoyed because of the absolute sums of money going to science-based departments was an illusion in terms of the overall needs of a technology based faculty and that this fact was recognised nationally. Many departments, both large and small, raised the issue of the manpower necessary to manage a distributed computing environment.

In overall terms, the support for the draft strategy was cautious but actually Science was very divided in its views. If a comprehensive distributed computing service could really be funded and adequately managed then many departments could see considerable advantages accruing as a result, but several doubted that it was a realistic possibility in any meaningful timeframe.

The departments in the IT School were the most supportive of the new strategy, as in fact was Astronomy. Despite their support however, Computer Science, probably the department with the most experience in the workstation environment, felt that the previously proposed timescales were too short and that departments need to move to distributed computing at their own pace. They felt it was vital that the University evolved its new strategy at a rate which allowed all the problems to be overcome smoothly. Most of the other departments, however, expressed major concerns and most had reservations, about the viability of the strategy. Even departments who felt it was probably the right way to be heading thought it was "pie in the sky" without considerable input of funds.

On the communications front, most departments were keen to have their departments costed for Ethernet wiring as soon as possible. One or two departments felt they had to capitalise on their X.25 investment; others, potentially involved in departmental re-organisations, as in the Biological Sciences, would hold off until any consequential building moves had taken place. Perhaps the most serious doubt raised in this area was on the need for a high speed inter-departmental communications network. A few departments indicated that, while they appreciated the ability to communicate effectively around and outside the University, if it came down to priorities then it was much more important for them to have money spent on computing power (whether provided in a central mainframe or on their desks) than on communications connectivity; the former was essential for them, the latter merely an advantage (which they felt the present network in fact satisfied).

The Faculty of Science is the largest user of EMAS and some strong views were expressed in this area of the strategy. Several departments felt that if there were not enough funds made available to achieve a distributed computing environment quickly, then the decision on the timescale of moving away from EMAS had to be reconsidered. Obviously most users did not want to have to undergo a "double transition" within a few years by being moved to an interim UNIX service while distributed computing was evolving more slowly. Although a reasonable proportion of the work in Science could move to the more powerful workstations, virtually every department indicated their need for long-term powerful central "processing engines". Parallel processing machines were likely to play an increasing role for some types of work. At least one department went as far as to say they could not see any logical or financial argument for "going distributed" and almost irrespective of funding, they would wish to remain on a central time-sharing mainframe. If required to move off EMAS several departments in the Biological Sciences, and Physics, would wish a proportion of their work to move to VMS rather than UNIX. Most of the Physical Sciences would move to UNIX provided it had the necessary raw power and could be made as friendly and functional as EMAS was.

A few of the large number of general issues raised were:

- departments wanted guidance as soon as possible on what equipment they should be bidding for to ensure compatibility with the emerging strategy.

- one or two departments were very worried about security and felt that more attention needed to be paid in this area of the new network strategy; software encryption methods had to be investigated.

- supercomputer facilities, especially the parallel processing kind, were of interest right across the faculty and it was felt by some departments that these had been underplayed in the strategy.

- for the faculty as a whole there was no possibility of a start being made to a move to a central UNIX service until the necessary elements of a scientific type service were in place; this was particularly important in relation to graphics facilities.

- most of the faculty would move to microlabs for undergraduate teaching but Agriculture, Chemical and Mechanical Engineering would wish to continue on EMAS until a viable replacement central facility is available.

- there needed to be a university wide user number allocation scheme which allowed flexibility, within which local filestore managers could issue local accreditation.

- Strong views were expressed across the faculty on the necessity for proper network access to all Library and most MIS data.

- several departments would continue to need good access for magnetic tape based data and good batch facilities on the EMAS replacement service.

- the range of word-processing packages supported by EUCS needed to be improved.

- a few departments suggested that locally based Multi-user minis would be more cost effective than LAN fileservers for them.

- there must be continued and enhanced central User Support including operational help.

2.7. Faculty of Social Science

The Faculty of Social Science indicated that it welcomed the recent consultation processes in that these had highlighted the importance of introducing computers to all levels of the University in the 1990s as part of a corporate Information Technology initiative. The departments of Architecture, Cognitive Science (seen here in the context of their user support team and their physical location in Buccleuch Place) and Geography were particularly strong in their support for the new communications infrastructure. In principle, the Faculty as a whole could see significant benefits from the widespread distribution of computing facilities, but in virtually all meetings held in Social Science, considerable misgivings were expressed in several areas. As always the main concern related to funding; it was vital to sensible planning that specific details of exactly who would pay for workstations, fileservers, departmental wiring etc., was made available soon. Most departments indicated that even if the capital funding of distributed computing was favourably resolved, there was no possibility of them individually bearing the consequential recurrent software and maintenance charges out of the current levels of class grant. They felt also that they could not provide the personnel to manage LANs and indicated that increased support from EUCS staff would be required in a distributed environment especially for the management of departmental filestores. Basically, without new funds for the "have-nots", the strategy was impossible.

From the communications stand point, there was a strong feeling in some departments that the network wiring should be provided centrally as far as the outlet in a room. Otherwise, they felt they would be at a disproportionate disadvantage because many departments occupied older buildings which would be more expensive to wire up. One or two groups indicated that they were currently, and would be in the future, at a disadvantage compared with other universities in bidding for external contracts when communications connection charges had to be included in their tender. Assuming the funding problems could be overcome, there was considerable interest across the Faculty in the wiring up of departments. It was felt important to have an integrated solution such that for example Sociology and Politics would be properly linked to the departments and microlabs in the Adam Ferguson Building. The need to have a co-ordinated rather than a

piecemeal (say by local work groupings) approach to wiring buildings in the George Square area was highlighted since groups from different faculties shared the same buildings and rationalisation of accommodation was a continuing process.

Although relatively few users were dependent on EMAS specific facilities, there was general concern about its premature removal before distributed computing was fully established on a wide enough scale. Many users throughout the Faculty emphasised that they foresaw a long term requirement for a powerful central mainframe service in order to exploit the very large datasets on which their research depended. Geography again emphasised that they felt that equal priority should be given to UNIX and VMS in the future mainframe provision. One or two other groups indicated that they would prefer to use a central VMS service provided it was adequately resourced. Several groups indicated that if a change had to be made from EMAS to UNIX or VMS there would have to be a major improvement in the documentation of these systems and a more friendly on-line HELP system, especially on UNIX.

Some of the other important issues raised were:

- they required central management of their data (including backup as well as archive).

- central spooling to expensive devices such as quality laser printers and graph plotters was required by the Faculty.

- some groups emphasised their preference for the widespread provision of entry level workstations across the University rather than promote the more powerful workstations which few departments could afford; these could then be compatible with those being purchased by staff for home use.

- most of the Faculty wanted assurances that there would be full support for, and integration of, both DOS and Mac based workstations.

- the advantages of a friendly central time-sharing service to the isolated user or the casual or infrequent user was also stated.

- the Faculty felt that EUCS should be more software conscious in the future and Geography emphasised that a single central corporate database should be supported; they wanted a guarantee that ORACLE would be the one and felt that there was too much human investment in databases for the decision to be made on cost factors alone.

- TLA felt that facilities for students were inferior in Edinburgh to those available elsewhere; the use of computers in teaching could mushroom in a very short time and they wanted to know how students would fit into the new strategy.

- Education asked for the needs of disabled students to be borne in mind when planning facilities; such students were able to get a grant from the SED to purchase equipment.

- Some strong views were expressed over the need for vastly improved access and extracting facilities to bibliographies and catalogues from the Library, and the provision of facilities from MIS for departmental accounts, and access to student records and matriculation information.

- they felt EUCS could play a important role in introductory courses for first and second year undergraduates.

2.8. Faculty of Veterinary Medicine

The discussions with the Faculty of Veterinary Medicine were held in the context of the uncertainties relating to the UGC recommendations on the Scottish Veterinary Schools. Overall they thought the draft strategy was laudable in its aims but their support for it would depend on how it would work in practice. In particular, they wanted to know precisely how the money would be found to fund the distributed computing environments; this was especially important for this faculty since its own future funding was in a state of flux. They were equally concerned with the recurrent costs associated with distributed computing and the inherent human support implications of LANs.

Since the faculty didn't know exactly which buildings they would be occupying in the future, it was pointless to progress any plans for network wiring at present. Their current wiring system had grown only slowly and they doubted if the faculty could fund an extensive Ethernet network. They expressed concern over the speed of connection to the Bush Estate where the Veterinary Field Station was sited and expressed hope that such peripheral locations would not be left out of participation in the new high speed communications infrastructure.

The faculty did not see the transition away from EMAS as a major problem, but they stressed the importance of good documentation provided before any moves were made; they would require, however, some assistance from the User Support Team and the EMAS Transition Project Team. 1992 was acceptable.

Other important points mentioned were:

- they would use central UNIX and central VMS services depending on where the appropriate software was available.

- from MIS they required a package which would satisfy their University and Business accounting requirements with adequate links between their different sites; they also wanted on-line access to student records for the Directors of Studies.

The future organisation of the faculty would be clearer later this year and it was agreed that the project teams would return for further discussions at that stage.

2.9. The Library

Two meetings were held with the Library. As it was another service department, the format of the meetings was slightly different from those with academic departments.

Overall the Library fully supported the basic strategy and was committed to forming an integral part of the University's computing environment for the dissemination of information. It felt a key part of its future role was the co-ordination of access to relevant databases and wanted close links to the Data Library. Basically they saw their primary role as providers of information over a network supplied and maintained by EUCS. Obviously, the Library also had a particular responsibility to people who used libraries as study areas and for access to more traditional material. To this end they had to run the Library effectively and needed to use automated systems for professional library management. They were happy for their integrated user and management operations to be compatible with any other standard University system provided it could fulfill the Library's requirements.

The Library felt it required its own separate network to provide the necessary security for management access to its primary database which was currently based in the GEAC 8000 and that this was a very cost effective method of providing that security. It was already possible for users to access it from any Ednet terminal and they were sure that the new GEAC 9000 would improve response times. As with MIS, there is a conflict between trying to run an internal "administrative" system along with an "open access" system on the

same hardware box. In the proposed new communications environment, they would offer access to their services on duplicate copies of their database held possibly on several other network hosts.

The Library also emphasised the importance of digitised images in their future services and EUCS agreed to consider these when looking at networking requirements. Departmental access to external databases was discussed since many academic staff had indicated they should have access from their desks instead of having to channel their enquiries through the Library. The Library pointed out that this was possible in fact at the moment from the networking point of view but felt there was considerable benefit to the University in having professional staff carry out the searches as they knew how to find the required information quickly, thereby keeping the real money charges to a minimum. They also pointed out that currently academic staff were offered the option of having the results transferred to an EMAS file but very few took up this offer.

The Library had no worries about the removal of EMAS so long as the replacement offered the same or, preferably, a better system than the current AMCAT arrangement. At the moment this was their only back-up to the GEAC when they had to take it down for housekeeping. As AMCAT was written in Fortran, it should be possible to port it to UNIX, but they felt it was probably timely for the Library to look for a more effective alternative system. This could involve BASIS, currently only available on the central VMS service. They also had an interest in the Data Library service hosted on VMS and were concerned that it would not receive sufficient resourcing to cope with the CURL database.

Among the other general issues which were discussed were:

- It was felt that the requirements of remote libraries such as those at Bush Estate, the Western General etc., should be co-ordinated with departmental requirements wherever possible.

- The Library was concerned about the criticism expressed in some quarters about their services especially where these were based on possible misconceptions about what services were actually available. They also pointed out that the improvement in response times which would be seen from the new GEAC 9000 service would satisfy much of the criticism. In any event, the Library was about to carry out its own survey of users (larger in numbers than EUCS users) where a truer picture of any concerns would emerge. In the meantime they requested critics to contact them directly.

- Along with MIS, the Library recognised the need for a comprehensive Community Information Service, which of course had to be accessible across the University network.

2.10. Management Information Services

As in the case of consultations with the Library, the course of the meeting with Management Information Services took a different form from meetings with the academic departments. Overall, although MIS could see the benefits of the new computing strategy for the University as a whole, they had serious reservations about the implications it might have for the efficient running of the University as a business if MIS service priorities were rearranged to fit an open network strategy. In particular, since this would mean a move away from IBM mainframe solutions, it would take both time and money to achieve smoothly, just as it would in the proposed move away from EMAS in the academic service arena.

MIS emphasised that their broad objective was to provide secure, university-wide management information services, supportive of the primary University teaching and research functions and aimed at easing the administrative load on all levels of staff. Although they accepted the criticism that they were not providing the services that were required to all parts of the University, they were annoyed that the blanket blame was laid at the door of **"the IBM"** and not at the University management which over the years had failed to specify or encourage any alternative requirements.

As with the Library, MIS were concerned at the openness of the network strategy, and felt they needed full control in order to maintain the integrity of the primary copies of the key University data bases. Although data encryption and complicated authentication systems could facilitate the demand for wider access, they also thought it would be easier to arrange access to secondary copies of the data held on other filestores.

Of all the users of MIS, the Faculty Offices were the groupings which most neatly fitted the local work group concept of the draft strategy. It was felt it would be useful to initiate a pilot project in association with one of the Offices to ensure that the model would work for this type of requirement.

MIS were not dependent on EMAS in any way but had concerns as to whether UNIX would be any better vehicle for the "core services" offered by MIS. The finance systems software did run under VMS and a change in this direction was under consideration. Other core services such as staff personnel and payroll, and estates and buildings, would depend on a suitable relational data base management system such as ORACLE or INGRES. These could be hosted on either UNIX or VMS, and MIS had a strong preference for ORACLE.

It was pointed out that possible solutions might have to be formulated in terms of the "family concept" arising out of the UGC initiative in management and administrative computing. It might be September before the implications of the initiative for Edinburgh were known.

NOTE:- We have not reported on much of the detailed discussions which took place with departments on particular requirements, including mandatory and desired software provisions. This information will be useful to the User Support and EMAS Transition teams over the next year as detailed departmental transition plans are formulated.

3. Summary and Analysis of Consultations

We are confident that this round of user consultation was both necessary and useful to the transition project teams and to most of the user departments. In particular, the clarification of some of the points in the earlier strategy papers and the ability to give some reassurances to a few of the immediate concerns, have been justifiable results. However, the inability to talk in quantitative terms, particularly in the area of funding, led to meetings which had to investigate two possible scenarios; what could be achieved with some injection of new funds over the next two or three years, and what would happen if something close to the current funding situation were to continue.

Several user groupings commented on the valuable side-effect of all the recent consultations in that they had been encouraged to discuss their future computing aspirations in a more organised way which they felt would lead to more effective investment plans.

The following sections give a brief analysis of the views expressed during the visits to departments specifically in terms of the overall strategy, communications infrastructure, and EMAS transition.

3.1. Overall Strategy

The overriding concern with the proposed strategy was how it could be funded in total, and who was going to fund it. Virtually no department felt it could achieve a distributed computing environment from its normal funding resources, although it was pointed out to them that in total the University does spend large amounts of money on computing equipment and software. Properly channelled, this could lead to an effective provision within a reasonable number of years, especially as capital costs were expected to drop significantly over the coming years. The problem of escalating recurrent costs was, for many groups, just as serious a problem as capital investments. The faculties were clearly looking for some central lead from the University in both financial areas. The management and support of the proposed new environment were also major concerns.

On the technical issues, the support for the strategy tended to depend on users' current dependence on central computing facilities. Those users who did not use computers at all, or mainly used stand-alone or networked microcomputers, were generally enthusiastic about the distributed computing scenario. Although more aware of the problems of distributed computing, the front-line I.T. departments were all fully supportive also of the long-term strategy. In faculty terms, Law, Divinity and Music were most supportive of the concepts of distributed computing with Arts not too far behind in their percentage support.

Those users who were completely or almost completely dependent on central time-sharing services were much more cautious in their support for distributed computing. Some users could see the advantages for their work style in having particularly the more powerful UNIX workstations on their desk, but even here the overall feeling was one of a need to see the new scenario in place before giving up the central mainframe. It has to be said that the Faculty of Science (with the main exception of the I.T. School) expressed the strongest concern on the strategy. This is not really surprising, as historically, the Faculty of Science has been the major user of mainframe computers. For most of the departments in the faculty, computers are indispensible tools without which most research work could not be contemplated; their use as corporate processors of information is merely an ancillary use akin to the utility of the telephone. A significant proportion (perhaps 50%) of the Faculty of Social Science expressed similar concerns and re-emphasised their long-term requirement for a powerful central mainframe.

The Faculty of Medicine was also divided in its views but there was in fact significant majority support for a distributed computing world. Veterinary Medicine are largely dependent on mainframes currently but expressed considerable interest in moving in the direction of the strategy over a period of time.

We were able to allay many of the fears of central mainframe users by indicating that it hadn't been the intention to remove all time-sharing facilities, a fact that had been overlooked in their reading of the Draft Strategy document. However, in the light of the views expressed during the visits it will certainly be necessary to ensure that an adequate mainframe service is maintained.

3.2. Communications Infrastructure

Given the specialist technical nature of the discussions on communications in previous documents and the traditional invisibility of the network to the typical end-user, it was not surprising that most departments had less clear views on the proposed communications developments. Of the more technically knowledgeable departments, only MIS expressed doubts about the technology itself as they felt that the case for standardisation on Ethernet had not been sufficiently argued. The rest were happy to leave the technical issue to EUCS, provided that clear, early advice and support were available.

The main issues on networking were the funding of the local network within departments (backbone wiring being assumed to be centrally funded), the speed of access for sites not in the immediate George Square or KB area, and, from parts of the Science faculty, the need for a higher speed network at all.

As in the case of the wider costs of distributed computing, departments did not think they could fund the wiring associated with Ethernet LANs in their buildings and the overall feeling was that unless some central wiring initiative was forthcoming the timescales for full connection to the proposed central university fibre backbone would be very long indeed. In addition to the capital cost, it is clear that the University must have an agreed strategy for network maintenance costs.

Several departments in the Science Faculty, but notably not the IT departments, expressed doubt over the need for the installation of a high-speed university-wide network. They felt that for their work, computing power, wherever it was provided, was essential to their research programmes and would have to take priority if necessary over high quality communications however "nice" these would be. While understanding and appreciating the reasons for this view, the Computing Service feels this is one of the occasions when it has to be trusted to make the right investment at the right time. Edinburgh University has benefitted from a significantly better overall service than most other universities in the past 15 years, due in no small part to the early installation of the existing University Network. If the University does not install the basis of a high-speed network for the 1990s now, it will undoubtedly fall behind most other universities in terms of network provision. In particular it seems clear that future communication services under development, not just in the field of data communications, will be based on fibre optics.

The final area of concern was over the timescales for continued support of the existing X.25 based network. Most users were happy with the reply that the new network would not replace the existing one overnight and that support would continue for the foreseeable future.

3.3. EMAS Transition

Possibly as a result of all the previous publicity of the impending removal of the EMAS service, there were few users who pressed for its long term retention, although a small number did query who was pressing for its closure when there wasn't any effective alternative actually available. What was clear, however, was that most of the affected users trusted EUCS to know that if EMAS had to go, it should be replaced with a service offering equivalent facilities and, as always with a Computer Board upgrade, with considerably enhanced power, capacity and functionality. Although opinion was divided, most people felt that if an equivalent service was provided they would accept the move away from EMAS.

Given that no proprietary operating system could provide currently the quality of services provided by EMAS in most areas, there was little strong feeling as to what central system should replace it for large scale computing work. There was little enthusiasm for UNIX with only a few departments (all current UNIX users) feeling that it would be a major advantage to them. Similarly and surprisingly there was no push at all for VMS to be the sole central service instead of UNIX, although several groupings emphasised how important it was for them and requested a guarantee that VMS would be supported at an enhanced level for the foreseeable future, or at least until UNIX had demonstrated its ability to handle the type of work and support the packages on which they were dependent. However, all but one of the departments currently running a local VMS service indicated that they were also watching how UNIX functionality developed, and two departments intimated their plans to move from VMS to UNIX both as a supplier independent operating system and as the probable basis of the emerging technical workstation world.

Of more interest to EMAS users were the arrangements for the transitional period. The desirable period of overlap of a declining EMAS service, with the evolving mixture of a central UNIX service along with increasingly distributed computing provision, may be affected by such matters as the University's financial position and the views of the Computer Board. As a first target, the late summer of 1992 has been set as the timescale for a complete move from EMAS. Assuming that the functionality of EMAS can be provided on the alternative environments in a timely fashion, most departments accepted that September 1992 was an acceptable target for the closure of the EMAS service.

One further cautionary note was sounded. Most of the users we spoke to during the visits were computing experts in their field and, although they mostly indicated that they would probably be able to cope with a transition, they registered concerns for the much larger number of more casual users, most of whom we were not hearing from.

It is quite clear that the most cost effective way to provide the maximum amount of time-sharing for the minimum amount of money is for the limited continuation of EMAS as a strategic transition aid; this must of course recognise that the strategy calls for its demise as soon as is practicable, i.e. when all users have been successfully established on distributed systems, or on a central time-sharing UNIX or VMS service where a long term powerful central service is still required. The advantage of this tactic is that a much smoother evolution will result as time will be available to sort out all problems in each of the target service areas thus ensuring minimal disruption to users. Every effort will have to be made to meet the 1992 timescale, of course, if at all possible.

3.4. General Conclusions

In attempting to encapsulate the views of so many users with often diverse requirements, it is inevitable that we will have overstated some concerns and underemphasised some other deeply held views. It is important to note that this round of visits is not the end of the consultation process; it is the intention that there will be continuing contact with departments by the relevant User Support Teams and the Transition Project Teams over the coming months and years to ensure as smooth an evolution as possible.

There have been some changes in emphasis since the draft strategy was first proposed. Indeed part of that strategy was to carry out regular reviews in order to take account of what is a very rapidly changing computing world. One example of this is the emergence in the past few months of an upgraded terminal, called an X-terminal, which combines the advantages of the windowed management of good resolution bit-mapped screens seen in the powerful workstation products, with the overall benefits of central mainframe resource management relevant in the last twenty years. We will have to investigate this development (based on the X-windows protocol) as soon as possible as it offers some hope of providing the light or casual user who may never require or afford a dedicated workstation with many of the benefits of the distributed environment at lower costs.

In the next phase of more detailed planning, it is essential that we keep our options open and adopt a flexible evolutionary plan. Edinburgh has an excellent base position from which to follow this route. Even although the overall view emerging is that we may not (for various reasons) be able to progress as fast as we might wish, there is considerable evidence that there is scope to progress certain critical phases of the likely overall implementation plans.

Some aspects of this report may have seemed slightly negative in tenor. This is not too surprising as the initial enthusiam for what is really quite an exciting strategy is tempered by the realisation of the scale of the problems, both technical and financial, which must be overcome to achieve the desired result. Nevertheless there is considerable underlying support for the new computing strategy chosen to reflect the outcome of the initial user survey which showed that users wanted quality interaction and not just "dumb terminal" access to computing facilities. What is required now are various initiatives aimed at realising the overall plan, at least eventually. Without such initiatives the feeling is that the strategy has little real substance.

4. Recommendations

It is difficult to make meaningful recommendations for future investment when we are all aware of the perilous financial position into which the University has been forced in recent years. Nevertheless, we feel it is important to try to identify the type of facilities which should be provided if the University is to evolve towards an effective distributed computing scenario. Some of the points which are made are obvious and several of the recommendations associated with funding are already in hand as a result of initiatives which were progressed in parallel with the departmental visits; they are included here for completeness since they relate to concerns voiced in the round of visits.

4.1. Strategy

We recommend that

1. **Capital Funding** - before further meaningful planning can go ahead within EUCS, the faculties and departments, a reasonably detailed scenario is worked out which will show how the necessary funding to achieve the aims of the draft strategy can be provided over a reasonable but defined timescale. It is recognised that this issue is so basic and important that it can only be tackled at the highest levels within the University.

2. **Hardware Maintenance** - the University sets up a centralised scheme for the arrangement and management of all recurrent hardware maintenance burdens, thereby getting the maximum value from the increased scale of business.

3. **Software Licencing** - the University sets up a centralised software purchasing service making full use of national software deals and additional relevant local site licencing arrangements. The appointment of a Software Librarian within the EUCS is seen as a key step in co-ordinating this area. The procurement of hardware, software and related maintenance should be founded within a common management structure.

4. **User Support** - EUCS investigates an enhanced user support scheme which would encompass the support and management of distributed LANs and filestores.

5. **Training** - EUCS reviews its training policy with a view to the major retraining required for distributed systems. The teaching of basic computer and keyboard skills to first year undergraduates should also be investigated, in association with the Department of Computer Science and the TLA.

6. **Library & MIS** - the Library and MIS develop plans to ensure that the desired levels of access to their databases and services is provided through the standard University network.

7. **University Information Service** - the University sets up a working party, with members from MIS, the Library and EUCS, to draw up a specification for access to a University Information system to cover all aspects of computer provided information for staff and students, including facilities required by the information providers.

8. **Workstation Pool** - the University investigates the financial and practicable feasibility of setting up a central pool of approved workstations relevant to departmental interests. This pool of equipment could be available for extended loan periods to departments perhaps until they were able to finance their own workstations. This centrally loaned equipment would be returned to the pool for

possible cascading to the next department eligible in some agreed University-wide phased plan. If such a scheme could be set up, it would have to support two levels (as opposed to types) of workstation provision, with the entry-level provision being affordable by even the poorest department.

4.2. Communications

We recommend that

1. **Communications Backbone** - the University goes ahead with the implementation of a University-wide high speed network. The installation of the basic fibre optic spine is a sensible long term investment which would be capable of being enhanced as higher speeds become both necessary and demanded over the next 20 years. The windows of opportunity for making such strategic investments are limited and we should capitalise now on the union of the accumulated EUCS surpluses and of part of the Computer Board seven-year investment funds. The potential sharing of this infrastructure with other organisations, such as libraries and museums, should be investigated. The Data Network Project must plan for a phased implementation of the high speed network, possibly involving an interim slower speed backbone.

2. **University Wiring** - the University should cost and proceed with a phased programme of investment aimed at completely wiring the University buildings within some financially attainable timescale. Decisions on priority within phases would pose problems, but the overall benefits to departments in knowing where they stand on the financial front would undoubtedly alleviate some major concerns. In the event of such a programme proving impossible to implement then at least two other schemes should be thoroughly investigated as providing encouragement to departments, namely a buy-back scheme for old network ports and a port rental scheme. The recurrent funding of the new network also requires investigation.

3. **Existing Network** - EUCS should clarify the status of the existing X.25 network. There is considerable concern about the loss of recent investments in traditional wiring. If it is the intention to completely phase out the X.25 network in the late 1990s, then the timescales and implications should be publicised in detail.

4. **Network Protocols** - EUCS makes an early statement on the support of non-JNT approved network protocols, in particular TCP/IP, NFS, PC-NFS, Novell Netware, Appletalk etc. There is considerable concern over the future support of existing systems.

5. **Student Access** - the University investigates the entire issue of student access to the new network, both from Pollock Halls and from within different departmental networks. This is seen as an important point in maintaining Edinburgh's position in the general university market place. Staff/student access from home and the special needs of disabled students should be included in this review.

4.3. Central Computing Facilities

We recommend that

1. **Central Time-Sharing** - the University commits to the continuing requirement for powerful central time-sharing computers to the benefit of the general purpose casual user as well as the cpu-demanding numerical users.

2. **EMAS Transition** - the transition from EMAS is conducted both for strategic market positioning and standardisation reasons, and for other positive motivations such as the provision of enhanced user interfaces, functionality, power and capacity. In that direction lies the basis of a successful progression; any other criteria will almost certainly result in disillusionment and recriminations. This means in practice that we recommend that users are not forced into making a "double transition" within a small number of years if at all financially and politically possible. Note that this is not inconsistent with the setting of reviewable target dates against which both progress and problems can be highlighted.

3. **Retention of NAS VL/80** - the NAS computer which currently runs EMAS, should be retained at least for the duration of the transitional overlap service. It is recommended further, that the University investigates the outright purchase of the NAS VL/80 in the expectation of converting this facility to a UNIX service as the EMAS service load declines.

4. **VMS Enhancement** - the central VAX configuration is enhanced to allow it to support an additional 25-30 simultaneous users from an estimated additional 500-600 accredited users. This is necessary because of discussions during our visits which elicited limited but nevertheless strategic interest in a continuing central VMS service. In addition to a boost in raw processing power it is obviously vital that it receives a significant upgrade in terms of on-line disc store; the opportunity should also be taken to improve the direct magnetic tape provision.

5. **UNIX Facility** - investment be made in a central time-sharing UNIX based computer which is capable of simultaneously serving 100-150 "EMAS-style" users from an estimated accredited population of some 3000 users, and with performance characteristics no worse and preferably better than the EMAS service it replaces.

6. **Compute Server** - consideration be given to the provision of a compute server aimed at providing considerably higher single-stream processing power than is possible in the general purpose UNIX service computer. This is necessary to satisfy the heavier computational requirements of researchers in many disciplines who nevertheless don't perform the really large scale calculations which would be channelled to national facilities. In addition, because of the stated interest across the University in the power available from parallel computing architectures, we recommend that EUCS should continue its involvement in the support of the ECS project with the initial aim of targeting a relatively small number of EMAS users at that service.

7. **Mail, Spooling & Archive Services** - in planning the transition from EMAS, special consideration is given to the important centrally provided mail, spooling and archive service areas. The importance of these three services was emphasised continually during our visits. In particular, a long term archival facility should be investigated urgently, preferably based on modern media; the possible requirements of networked backup facilities and magnetic tape services, should also be borne in mind since these could utilise similar hardware provision.

8. **Seeding Distributed Computing** - as a seeding exercise, a few centrally managed facilities be provided for general service to relevant faculty or multi-departmental groupings who would benefit from a workstation environment. The draft strategy called for a move from central time-sharing computers and we know from our visits that a majority of the University supports this. The relevance of this model of computing facility could thus be evaluated in full user service. From our visits (but of course there may be other factors which could influence choice), we would suggest a choice from the following suitable user groupings:

Faculty of Arts
Faculty of Law
Biological Sciences
Mathematical and Physical Sciences
Western General Hospital

Faculty of Divinity
School of Dentistry
School of Engineering
Social Science Studies Group

It should be noted that the centrally managed facilities we are proposing would be medium to large file servers and not workstations on individual desks (this is important for Computer Board funding). In the case of the Faculty of Arts which has historically lagged behind other faculties in terms of computing provision, we would propose a full-blown prototype laboratory and fileserver. We would further recommend that it be sited in the Library, which Arts make great use of anyway, and where professional staff from both the Library and EUCS are located who could contribute to various aspects of the facility. We believe that the Biological Sciences could benefit also from a laboratory provision.

4.4. Summary of Investment Required

It is not the role of the project teams to decide what percentage of available funds should be allocated to differing and inevitably competing areas of requirements. However, from our visits to departments we are in some ways in a good position to attempt to identify the potential demands. We provide the following suggestions therefore, purely as an initial proposal as to how Computer Board and University investments might be allocated. It will be necessary to cost all of these proposed investments in detail as the negotiations with the Computer Board and the suppliers take place in the coming months.

We suggest that the 1990 Computer Board grant be used to purchase equipment in the following areas:

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Central VMS Upgrade (processor,disc store,peripherals)

New Central UNIX provision

High power compute server

Retention of NAS for EMAS Transition and UNIX 2 Service

Upgrade for NAS Central UNIX (store,disc store)

Equipment to host a central Archive facility

Bridges/repeaters for connections to Central Network

File stores for centrally managed faculty services

Workstations for centrally managed facilities + pool startup

X-terminals for centrally managed terminal areas

Seeding of Arts/Biological Sciences laboratories

Strategic Software provision
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The areas of investment which the University will be required to fund lie mainly in the provision of the communications infrastructure, e.g. the provision of the fibre based backbone at Kings Buildings and George Square, the installation of the K.B. to Central Area high-speed link, and the connection of University departments outside those campuses to the central network. Exactly how this will be done and what the associated costs are likely to be are being investigated currently and will be the subject of a separate proposal.

5. Draft Action Plan

Now that we have completed this round of departmental visits, the project teams will begin planning the next stages of the transition in more detail. The Data Network Project has already started to map out the steps which will have to be gone through in order to implement the communications infrastructure which is being proposed. Actual timescales will be dependent on the application of funds of course. The next stage which will be tackled by the EMAS transition project will be the production of detailed plans for the phasing of departmental moves from EMAS, in association with the User Support teams. From our visits, we already have a good idea into which phases of transition many departments will fall; however, accurate and full plans are some way off as they will depend significantly on what results from the next six months' discussions.

There are, of course, many other strands of the implementation plan which must continue in parallel over the next few months; the following overview summarises the main top layer actions.

5.1. Planning

Draft operational requirement to University committees	April/May 1989
Submission of new RFI procedure to Computer Board	13 June 1989
Discussions with various equipment suppliers	July/August 1989
Submission of Operational Requirement to Computer Board for approval	September 1989
Computer Board Visit	16/17 October 1989

5.2. Data Network Project

Detailed costing of new University communications backbone	May 1989
Detailed plans for phasing of proposed University building wiring programme	June-September 1989
Proposed start of new wiring programme	September 1989
Proposed start of KB to Central Area communications backbone link	April 1990
Proposed commissioning of new backbone	August 1990

5.3. EMAS Transition Issues

Produce detailed departmental transition programmes	April-June 1989

Establish viable central UNIX base	April-June 1989
Run prototype transitional training courses	May 1989
Training and equipping EUCS for support of new University strategy	April 1989 - June 1990
Provision of essential applications software on central UNIX service	May 1989 - December 1989
Provision of UNIX and transitional EMAS documentation	April 1989 - September 1989
Provision of transitional software programming aids	April 1989 - December 1989
Begin departmental programme for UNIX awareness	August 1989
Begin phase 1 of EMAS transition (for users requiring long-term use of central UNIX or VMS services)	September 1989
Begin phase 2 of EMAS transition (for users moving preferably to local faculty or departmental facilities)	August 1990
Begin phase 3 of EMAS transition (for users with difficult technical or strategic problems in moving from EMAS)	October 1991

Appendix A: List of Faculty and Departmental User Groupings visited

Faculties

the Faculty of Arts
the Faculty of Divinity
the Faculty of Law
the Faculty of Music
the Faculty of Social Science
the Faculty of Veterinary Medicine

Departments

in ARTS

Archaeology

in MEDICINE

Biochemistry
Brain Metabolism Unit
Community Medicine
Medical Physics
Pharmacology
the School of Dentistry
Royal Infirmary Open Meeting (including departments in the Royal Edinburgh, City and Princess Margaret Rose hospitals)
Western General Hospital Open Meeting

in SCIENCE

Agriculture
Artificial Intelligence
Astronomy
Biological Teaching Unit
Botany
Centre for Cognitive Science
Chemical Engineering
Chemistry
Civil Engineering
Computer Science
Electrical Engineering
Forestry and Natural Resources
Genetics
Geology
Geophysics
Mathematics
Mechanical Engineering
Meteorology
Molecular Biology
Physics
Statistics
Zoology

in SOCIAL SCIENCE

Accounting and Business Method
Architecture
Business Studies
Centre for Educational Sociology
Centre for Teaching Learning and Assessment
Computer Aided Architectural Design Studies
Economics
Economic and Social History
Education
Geography
Godfrey Thomson Unit for Educational Research
Psychology
Research Centre for Social Science
Social Studies Group

Services

The Library
Management Information Services

Written Submissions

Architecture
Artificial Intelligence
Biological Teaching Organisation
Linguistics