University of Glasgow
Technological Review Group

Student Cluster Provision

Draft Report of Working Group

8th June 2005

Introduction

On 20th December 2004 the Convenor of the Technical Review Group (TRG) set up a Working Group to consider the provision of student clusters within the University. A group of 6 staff, who all participate in the provision of student clusters in one way or another was formed (see Appendix 1 for details). In addition the group included an IT literate senior undergraduate student to represent the student point of view. This report is the outcome of that group's deliberations.

Remit

The remit of the group was as follows:

- To make recommendations on the optimum balance of University provided clusters for students and provision of infrastructure to support students' own systems.

- To seek to identify the necessary requirements for a student purchase/leasing scheme that would enable Computing Service to proceed with negotiating a best value solution.

No time scale has been specified for the operation of the recommended solutions.

Background

Computers first appeared in student teaching at Glasgow University in the mid eighties. Initially small clusters were set up here and there by early adopters aided by grants from outside funding bodies. As the trend progressed the university assisted by funding a number a small clusters in central locations, bookable by departments that did not have their own. In the early 90s with the arrival of ubiquitous networking the trend accelerated. Many departments installed their own teaching clusters and substantial centrally funded clusters began to appear in the Main Library and the Round Reading Room. To assist in the support of these machines Computing Service developed the first versions of a Common Student Computing Environment (CSCE) giving students a standard interface to storage, email, print services, internet access and standard applications from any location in the university.

All of these trends have continued to the present day so that, at the time of writing, there are over 500 centrally supported machines (see Appendix 2) available for student drop in use. However this provision is dwarfed by the number of machines in faculty clusters which is now estimated to be about 2600 (see Appendix 2), many with specialised teaching software added by local support teams. All students are automatically registered for the CSCE at matriculation.

These developments have resulted in a number of problems relating to continued support and future funding of clusters. In addition there is the problem of balancing central versus faculty provision. These difficulties were, in effect, acknowledged by the university when it set up a Working Group on "Provision of On-Campus Student C&IT Facilities" within the context of its recent Information Strategy. This Working Group reported in June 2003. (See http://www.gla.ac.uk/infostrat/wgroups/wg18/iswg-18-frep.html) Its report brought into focus many issues that are still relevant to the deliberations of the present working group and was an extremely influential document. It resulted in the university releasing £500K during 2004 to upgrade all cluster machines more than 4 years old, and it continues to be influential in that another £500K has been released in 2005 for similar purposes.

Since the publication of that report two additional circumstances of significance have come into play. The first is the ready availability of wireless technology. The second is the increasingly prominent trend among students towards bringing their own laptops onto campus. Both of these bring with them problems if they are not managed properly. In the case of wireless connectivity the crucial issue is security - wireless networks are very vulnerable if not set up properly. In the case of student laptops the crucial issue is support - given free rein, a miscellaneous population of laptops would result with multiple operating systems, differing versions of software, and even different languages which is impractical to support.

In 2004 Computing Service ran a successful flexible access pilot in the library. This established that there are no insurmountable technological problems to be overcome in allowing students to connect their own machines either directly or wirelessly to the campus network. It also suggested that, in network terms at least, scaling up for the student community is a practical proposition given sufficient funds to cover the additional communications equipment required, and of course the will to proceed.

Discussion

In email and face-to-face discussions the Working Group made the following points.

1) The Balance between University provided clusters and the provision of infrastructure to support student owned machines

- There is an indisputable trend towards more students bringing their own laptops onto campus. This trend seems likely to continue for the time being at least, with the ultimate scenario being all 24,000 or so students on campus having their own laptops. There are a number of reasons for thinking that this scenario will not actually occur in practice (e.g. financially disadvantaged students), but having said that, there does not appear to be any very satisfactory way of judging what the final equilibrium number will actually turn out to be. There seems to be anecdotal evidence for a figure of 75% to 80% in some institutions in the USA. Closer to home, Mr Brian Eden (GU Accommodation Service IT Manager) has supplied information that about 67% of the student residents in Halls are already registered as active users by the 3rd party provider of networks in Halls. This figure excludes use of the local clusters and so must be with the students' own kit. In other words about 67% of this subset of GU students has already purchased some sort of computer. On this basis it is suggested that a round figure of 20,000 should be assumed for the equilibrium level at Glasgow University, although it was felt by the Working Group that both the this equilibrium figure and the time within which it might be attained could well be influenced by what level of support facilities the university chooses to provide, and when. (See bulleted section "Timescale" below.)

Whatever the final numbers of student machines on campus there will continue to be a need for faculty provided clusters in some shape or form for the foreseeable future. This is usually due to a requirement for specialist hardware and/or software, but in a small number of cases it is because of the need for a different platform from the PC. Some of these machines may be available for drop in use during the day when not required for timetabled classes but most are in buildings that shut in the evenings and at weekends and therefore cannot realistically be included in the university's general drop in provision.

There is likely to be a residue of students who can't afford to purchase their own machines whatever balance is struck, and whatever purchase/lease schemes may be put in place. These students will inevitably be dependent on continuing provision of drop in clusters by the university. At peak times these central clusters currently experience greater demand than can be easily satisfied by the present provision. Queues of students waiting for machines are fairly common at the busy periods of the day especially approaching examination time. It has been suggested that more effective use of the present central cluster provision could be achieved by implementing one of the cluster management tools now available. See for instance http://www.itsltduk.co.uk/mypc.asp

- Increased numbers of student laptops on campus will of necessity affect many aspects of the university's infrastructure. The working group discussed the following:

  - *Buildings*

    - *Network infrastructure*
      The number of ports and/or access points would have to be increased substantially over current provision. John Young (CS Networks team) states that, at the time of writing, a typical wireless access point will support about 20 connections. It is unlikely that all 20,000 laptops would connect simultaneously to the network but if even half this figure connected at peak times, 500 additional access points would still be required (current price approximately £200 each). Extra routers etc. would also be required to deal with the additional network traffic. It should be borne in mind that additional network provision will also be required at off campus sites such as Crichton, Garscube and the teaching hospitals.
    - *Mains power provision*
      It is assumed that most students would prefer to power their machines from the mains when studying rather than drain the laptop batteries. This suggests that in key areas such as the library there will have to be a provision approaching 1 power socket for each study place. This is far in excess of that which is provided at present. With relatively conservative assumptions 20,000 additional laptops on campus will result in an added load of about 1 Megawatt (MW). According to the university's energy conservation officer the main campus currently peaks at about 8MW (round about lunch time during the winter). The laptop load therefore represents about 12% increase in peak load. This would have significant implications for the university's planning of its future supply provision.
    - *Energy consumption*
      Initial calculations based on 20,000 laptops running for an average of 3 hours a day, 5 days a week for 30 weeks a session suggest that the resulting increase in the University's electricity bill would be about 2%. At the time of writing this represents about £20,000/year extra (again, figures from university energy conservation officer). While obviously not welcome this would not break the university's back, and might be reduced somewhat by energy awareness campaigns within the student community. In this connection it is worth pointing out that conventional desktop machines tend to be less energy efficient than

laptops and those in clusters tend to be powered up for the length of the working day or longer. Thus, once a laptop scheme begins to take effect, each desktop machine that can be removed is the equivalent of about 4 or 5 laptops in energy terms. This suggests that in due course the overall energy consumption situation is likely to be more favourable than the above figures indicate.

- *Air Conditioning*
  It is difficult to judge the effect on air conditioning requirements other than to acknowledge that there will likely be a greatly increased number of machines (and perhaps bodies too) in certain areas of buildings as compared with the present. Depending on actual numbers and current provision there might be a need for additional air conditioning. Having said that, as wireless connectivity spreads throughout the campus, the increasing number of public spaces available within which laptops can be operated online might actually alleviate any potential air conditioning problems by easing pressure in key study areas.

- *Technology infrastructure*

  - *Authentication*
    All students have to log in to authenticate to central servers. The nightmare scenario would be, say, 10,000 of them attempting to do so between 9:55 and 10:05. Experience with the 8:55 to 9:05 slot on Serviced Staff Desktops suggests that a lot of work and resources will be required if impossibly long login times are to be avoided at peak periods.
  - *Data Synchronisation*
    Data/documents will inevitably end up on C: drives when students are off campus. Servers will therefore have to synchronise H: drives when the laptop reconnects. This is not a function which has hitherto been provided on student accounts and therefore development effort would be required in this area. An alternative approach would be to put effort into developing systems aimed at affording easy access for students working off campus to full CSCE facilities including their own H: drives. In the short term the availability of relatively cheap pen drives (memory sticks) might provide a solution to this problem by allowing students to physically move memory from their own laptop to cluster machines.
  - *Backups*
    All students have H: drives which are already backed up. It is therefore assumed that the widespread arrival of laptops on campus will not result in a dramatic increase in demand for additional backup volumes. What it may do is result in an increased demand for restore operations since the added complexity of the data transfers involved and the use of the laptop off campus seem likely to result in increased instances of files getting mislaid. If this becomes a problem it would be desirable to publish a policy defining the circumstances under which Computing Service will accede to a student request for a restore operation. There is a potential problem in that students' own personal data on a laptop is more likely to become mixed up with university related data and end up on university backup systems with possible consequences for security, data protection etc. Student education would be needed in this area.
  - *Network segmentation*
    Significant provision of untrusted network segments will be required so that laptops which have been off the network can be swept for viruses etc. when they reconnect before being allowed wider access. Network segmentation has been planned for some time but progress has been slower that hoped due to lack of allocated funding. Properly implemented network segmentation would be absolutely vital in an era of ubiquitous student laptops.

- *Operating System patching*
  Many security threats nowadays arise from operating system vulnerabilities. Patches are issued on an almost daily basis. The patch status of a laptop connecting to the network would have to be checked automatically and new patches applied whenever a machines which had been off the network reconnected. Not all OS patches achieve their intended aim with complete success so it would be prudent to have some form of legal disclaimer to cover the university in the event of patch failure.
- *Virus checking and virus checker updating*
  In light of the frequency of major virus attacks in recent years this hardly needs comment. A similar situation to OS patching would apply. These problems again highlight the crucial need for network segmentation to mitigate the effects of compromised systems on other users.

➢ *Laptop orientated services within buildings*

- Printing/Print charging
- Scanning
- CD Burning
- Physical security of laptops
- Battery charging facilities

The first three of the services listed above already exist. Even so the increase in numbers of laptops contemplated is likely to result in substantial increases in demand for them. Demand for printers in particular is likely to grow quicker than the rest since students will probably choose to come onto campus to print rather than incur costs of printers/consumables at home. The need for physical security measures for laptops would arise from students not wishing to carry their machines about with them everywhere during the course of the day. There would therefore need to be some provision of secure storage for laptops. Ideally the need for secure storage and battery charging could be simultaneously satisfied by banks of small left-luggage style lockers with built in charging facilities which the students could hire for a small fee.

- *Software Issues*

➢ *Operating System and standard software*
Ideally, the CSCE would be the software configuration for the student laptops. However the CSCE is a locked down system that would be politically unacceptable on machines that are not owned by Glasgow University. A more acceptable alternative would be whatever operating system was currently standard plus a manifest of software applications similar to that provided within the CSCE but not locked down. This could be provided in the form of a standard image that would also be used to resurrect wrecked machines quickly by support agencies. Some form of student portal might also be considered for the provision of software.

A related challenge would be the problem of software change management in an environment of 20,000 laptops. Once again this might be assisted by a portal approach.

➢ *Software Licensing*
The current GU MS Campus Agreement does not cover students using their own machines. It would be possible to negotiate a new version of the Campus Agreement to include students, but of course this will incur significant additional costs. Other

licensable products that commonly occur on campus (e.g. the Adobe range of products) need to be similarly treated. A possible solution would be for the per-head cost of additional licensing to be rolled up into the overall cost of a student laptop purchased under the student scheme. Some form of software auditing of student machines would be desirable but it is difficult to see how effective auditing could be achieved in practice and there may be legal issues in auditing machines that do not belong to the university. It has been suggested that a leasing (as opposed to purchasing) scheme might alleviate these licensing problems but leasing does not appear to be a popular option with institutions that already have a scheme in place, presumably because of cost.

- *Provision of Faculty required software/functionalities on student owned laptops.*
  As alluded to above most faculties run additional software on their own clusters. It seems likely that there will be a demand for some, at least, of this software to be available on student laptops. As things stand this would have to be added by faculty support teams. It might be possible to come up with faculty software images to make this task easier. The additional licensing of such software could be problematic to say the least where such software was not already covered by site licences. Again, a student software portal might provide a solution.

- *Copyright issues*
  Already existing copyright problems with Powerpoint presentations and other material may be exacerbated by the need for such material to be distributed widely to the student machines. The Library has copyright expertise and would need to be consulted on this matter.

- *Support Issues*

  - *User Training*
    User training is not so much of an issue as it once was. The population at large is much more IT literate than a decade ago, and this applies equally (perhaps more so) to the student population. All undergraduates are already required to satisfy various IT literacy criteria, either by attending courses run by the University's IT Education Unit or by exemption. It is not anticipated that a move to widespread use of student laptops on campus would alter this situation significantly.

  - *User Support*
    At present centrally provided user support for students consists principally of the Help Desk in the Library and the student demonstrators of the Student Help Desk. There are about 12 of these in total at present of whom a maximum of 2 to 3 are on at peak times for the 500 or so machines in the library. Providing support in a situation in which there will be perhaps 20 times as many machines throughout the university would suggest a significant increase in the pay bill for student demonstrators. Even allowing for some take up of slack this increase is likely to be of the order a factor of 10. The cost implications are obvious. Also, the management of a group of between 50 ands 100 demonstrators rather than the present group of about 10 would require a significantly increased administrative and managerial input. Presumably there would also be an impact on faculty IT Support Teams.

  - *Technical Support*
    It is widely acknowledged that the university's IT support provision is already stretched in places. Given that the appointment of extra support staff is not likely to be an option, it is difficult to see how the university could support an additional 20,000 machines however desirable the "in house" treatment might appear in terms of being seen to look after our own students. The only practical alternative therefore

seems to be for support to be rolled up as part of the laptop scheme. (See section 2 below). One of the principle advantages of such a scheme would be to encourage uniformity of hardware/software on campus and thereby simplify support problems. However this still leaves the difficulty of those students who can't or won't adopt the recommended solution. And of course visitors. (See below.)

- *Subsections of the University Community which may have particular requirements*

  - *Post Graduate Research Provision*
    The IT needs of postgraduate research students are inevitably more complex and more individual than the needs of undergraduate students. They are also likely to vary widely from faculty to faculty. Faculty IT support teams will be the principal source of support for postgraduate students with laptops.

  - *Special Needs Provision*
    The CSCE already contains a significant amount of software and other additions to cater for Special Needs students. The university is separately reviewing its Special Needs provision with a view to bringing it more generally into the main stream of its IT provision. At the time of writing it is not possible to say what the final outcome of this review process will be, but it seems likely that as more students have their own laptops the numbers of those presenting with special needs will also increase. This will inevitably impact on the university's requirement for Special Needs IT provision.

  - *Halls of Residence*
    Currently all rooms in the University's Halls of Residence have telephone and data ports. There are a relatively small number of drop in machines - 43 in total - in the halls so it is likely that students who have their own machines already use them there. The running of the halls is presently outsourced by the university to a 3rd party operator as is the networking in these buildings. It will be important to ensure that this 3rd party operation does not do anything inconsistent with the provision of services in the environment of increase in numbers of laptops which is envisaged.

- *Health & Safety Issues*

  - *Electrical Safety - PAT testing*
    All electrical equipment in use in university premises is legally required to be regularly checked for electrical safety. Strictly speaking this does not apply to student owned laptops since the students are not employed by the university. However the university does have the normal duty of care to its students and beyond that a duty of pastoral care both of which suggest that it should not just dismiss the issue out of hand. Discussions with Mr David McLean, Deputy Director of the University Safety and Environmental Service suggest that at the very least information about electrical safety and instructions on how to carry out a visual electrical safety check should be supplied to students on web sites and as part of the laptop scheme documentation. He also suggested that as part of the deal with any commercial partner the laptops could be supplied with a sticker containing the university crest and a brief set of electrical safety instructions. A stage on from this would be the provision on campus of a PAT testing service for student machines for at least part of the year, although the legal implications of providing such a service would have to be assessed.

- *Health*
  A large increase in the number of laptops on campus may cause additional health problems within the student population. See

  http://www.humanresources.ed.ac.uk/news/staffnews/latest/Laptop_Use.htm

  This arises with laptops because it is not normally possible to separate the screen from the base/keyboard. Adverse viewing angles may therefore become more common resulting in increase numbers of students presenting themselves at the University Health Service with neck/back pain problems. It is perhaps worth noting that the increasing number of staff also displaying a preference for laptops may well exacerbate this problem.

- *Exceptions: Students without laptops. Students with the wrong laptops. Visitors*

  There will be instances of students and others who, for whatever reason, can't or won't fit into any established student laptop scheme. The most obvious are the groups listed above but there may be others. There will also always be some students who are temporarily without their laptops for reasons such as loss, theft, left at home etc. Initially these students will be able to make use of centrally provided clusters. However, if the university eventually scales down its central clusters provision the needs of these groups will have to be taken into account by some other means, most likely a temporary loan scheme (see below). Visitors would also be able to take advantage of such a scheme.

  Students who have the wrong laptops i.e. machines not supported by the student loan scheme would cause problems if the numbers were to become significant. The best approach would be to head off this problem in as far as possible before it arises. This will involve university documentation and the web site clearly and widely stating the existence of the GU laptop scheme and giving details of preferred models etc. School liaison and outreach departments, the Registry and Publicity Services would all need to get in early while the scholars are still a year away from university so that when parents get round to purchasing a machine for their about-to-be student offspring (as many now do) they have the appropriate information to purchase the correct type of laptop. There might be a case for allowing scholars who have accepted unconditional offers from the university early access to the GU laptop scheme before they actually arrive on campus.

- *Timescale*

  In general terms the university could take two very different approaches to managing the arrival of increasing numbers of laptops on camps. It might put a laptop scheme in place and then sit back passively and await results. On the other hand it could put a scheme in place and then very proactively promote it, encouraging students to purchase via the scheme, persuading faculties to realign their teaching on the assumption that laptops are widely available, and announcing early on that in due course central clusters will be scaled down because the majority are expected to have laptops of their own.

  These two approaches are likely to result in very different uptake curves. For the first the uptake would probably drift up towards equilibrium fairly slowly, to begin with at least, perhaps taking seven, eight or more years to get there. The second approach would almost certainly result in a much faster uptake. It seems not unrealistic to assume that from the time that a student laptop scheme commences operation equilibrium would be approached in something like one degree course cycle - 4 to 5 years. Many of the changes in facilities discussed above could only be introduced gradually, probably initially picking off hotspots such as the library, public spaces in key buildings, lecture theatres etc. If the second approach were to be adopted by the university there would be a

need to move forward rapidly on a broad front for the required expansion of building services to keep up with the expected increase in laptop numbers.

Obviously it would be possible to contemplate a combination of these two approaches, starting off passively to allow time for building services to be put in place and then moving into active mode at a later date.

2) A University wide Student Laptop Scheme

In discussing the idea of a university wide student laptop scheme. The Working group made the following points.

- *One size doesn't fit all*

  Students in different faculties and at different stages in their courses will inevitably have differing IT requirements. Therefore it will be desirable to have a selection of models available within the scheme so that students have some choice of memory, processor speed, peripherals etc.

  This observation applies physically as well as technologically. People come in a variety of shapes and sizes. In particular, variable hand size might well result in one user finding a given style of keyboard difficult/uncomfortable to use while another user is perfectly happy with it.

- *A 4 year warranty period is not appropriate for all students*

  At the time of writing 4 year warranty agreements are becoming the norm. Some faculties have undergraduate degree courses that are longer than this (e.g. Medicine). Other university schemes get round the problem by offering additional years of warranty as a chargeable item over and above the basic cost of the purchase scheme price. The warranties also need to be valid internationally in order that the purchase scheme be attractive to our increasing numbers of overseas students.

- *For laptops new "Standard Models" tend to appear most years.*

  A consequence is that there is likely to be several so-called standard models in circulation at any one time. This has support implications. It would also seem desirable to include some mechanism within any purchase scheme that would allow students who wish to upgrade to a newer model during their course to do so. Modern laptops are easily powerful enough for most undergraduate purposes but peer pressure might play a role in this.

- *Laptops purchased under the scheme should normally be supplied with an agreed, preloaded GU image.*

  If faculties or individuals want a different software image that would have to be negotiated (and paid for) separately.

- *Level 3 and level 4 students (and graduate students) may well require more powerful machines than Level 1 level 2 students.*

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  A two-tier scheme might be a possible solution, or as already suggested above a recognised upgrade path that could be taken at about level 3 if a student wanted. Within

the context of such an upgrade scheme it might prove possible to recycle cheaply the resulting 2-year-old machines back to first year students who could not afford new ones. Again peer pressure might be a driver here.

- *Technical support should be part of the package.*

  The Working Group acknowledged that the university does not have the capability to support an additional 20,000 machines with its current resources. Support would therefore have to be supplied by a commercial partner as part of any laptop scheme. This could be achieved in a number of ways. Two possibilities are

  - *A "drop-in-and-replace" shop on campus*
    The idea behind this is that the scheme's commercial partner runs a shop somewhere on campus where a student with a faulty machine could exchange it for a functional one. Obviously, for this to work smoothly all email, storage, data would have to be standardly held on central servers. Therefore technical functionalities such as data synchronisation touched on elsewhere would have to be completely reliable.
  - *A loan pool.*
    A small pool of laptops could be held at some central location on campus and loaned out to students whose own laptops had been returned to the commercial partner's own premises for repair.

  The first would require the university to find space for such a shop but has the advantage of being convenient for the students, and allows for the possibility that trained staff in the shop could carry out preliminary screening of the supposedly faulty machine. Obviously this option would be more expensive than the second were no additional staff or premises are required on site.

- *Some form of insurance for loss or theft should be part of the scheme.*

  In a population of 20,000 some losses, thefts and breakages are inevitable.

- *The cost of disposal must be included as part of the package*

  With something like 20,000 laptops in the scheme at any one time and an average of a 4 year degree course, about 5000 machines will come out of the system at the other end each year. Presumably not all of these will end up in the University's hands for disposal, but if even a proportion of them do then the disposal problem ceases to be trivial. Such machines would have to be disposed of in accordance with the University's Disposal Policy (http://www.gla.ac.uk/services/computing/regulations/disposal.shtml) and there would be costs associated with the administration of this. These should be part of any laptop scheme.

- Finally, it hardly needs stating that, with a maximum of 24,000 students involved, any GU scheme will be potentially large. The resulting "clout" should be used to maximum effect when negotiating with aspiring suppliers of the scheme.

Other Laptop Initiatives

The Universities and Colleges Information Services Association (UCISA) runs a nationally negotiated notebook (*sic*) scheme (http://notebook.procureweb.ac.uk/)

A representative selection of institutions which have opted wholly or in part for that scheme are

Edinburgh University (www.studentstore.co.uk/edinburgh)
Aberdeen University (www.studentstore.co.uk/aberdeen)
Northumbria University (www.studentstore.co.uk/northumbria)
City University, London (www.studentstore.co.uk/city)
University of Surrey (www.studentstore.co.uk/surrey
University of Lincoln (http://www.studentstore.co.uk/lincoln)
University of Stirling (http://www.studentstore.co.uk/stirling/)

All of these schemes offer similar standards of good quality equipment from reputable suppliers at keen prices with appropriate warranties and return-to-supplier support. (In fact, all of the above links appear to go to the same page.) As far as is known none of these institutions pushes for large scale uptake by its students. The scheme is just there as a convenience to its staff and students, and no doubt helps to promote some degree of uniformity for support purposes which would not otherwise be the case.

Since 2000 Strathclyde University has run its own Student Laptop Initiative (SLI). General information is available on its web site at

http://www.strath.ac.uk/projects/sli/

A particularly informative page can be found at

http://www.strath.ac.uk/projects/sli/Pages/whybuyalaptop.htm

which gives a fair insight into how the SLI works. Just some of the benefits Strathclyde claims for its scheme are

- Substantial discount
- Industry standard specifications
- Proven robust and reliable design - extended warranty available
- Fully compatible and pre-configured for *(Strathclyde)* University IT systems
- Radio connection to network
- Full on-campus technical support (for the duration of (*the student's*) degree) through the IT Helpdesk
- IT Helpdesk loan pool facility for software and hardware problems
- Additional off-campus Helpdesk support via email and telephone
- Off campus warranty valid worldwide
- Full academic software load
- Additional software - virus protection and Adobe Acrobat Reader
- Integrated backup facilities

It is believed that Strathclyde does, in fact, vigorously promote its scheme in those of its faculties that participate. Unfortunately issues of commercial confidentiality have intervened and it has not been possible to gain access to Strathclyde's detailed experiences in setting up its scheme. One comment that was made however is that for such a scheme to be successful the faculties must be involved early on. Their activities are what provide the main driver for additional student uptake of laptops and therefore they have to be convinced of the benefits of such a development.

Conclusions

- An ever-increasing number of students are arriving on campus with their own laptops.

- The support problems associated with these machines will rise along with the numbers, and will eventually become unmanageable if nothing is done to address them.

- The solution in other comparable institutions is some flavour of student laptop scheme. Typically the institution enters into an agreement with a commercial partner to promote uniformity of kit, and to provide technical support via the commercial partner as part of the deal. Leasing schemes have some attractions but most institutions which have gone down this route have opted for purchase schemes, presumably because they are cheaper.

- The university could adopt a passive or an active approach to a student laptop scheme. These approaches will result in very different uptake rates which will significantly affect the rate at which additional services will have to be provided. This will be particularly important in the area of building services which take time to put in place. The university needs to do some sort of cost benefit analysis to decide which approach it wishes to take.

- It seems unlikely that any student laptop scheme could be totally self-financing. The ramifications for the university's technological, building, support and administrative infrastructures are so widespread that it is difficult to see how the resulting costs could all be rolled up into the per unit purchase price of laptops under any scheme, and that scheme remain financially viable. However there is more to it than price. Factors such as reputation as a forward-looking institution of learning and effectiveness in the increasingly competitive student market are also relevant. Once again the university needs to do a cost benefit analysis including these sorts of factors in order to decide how it wishes to proceed.

- A small-scale loan scheme would be a desirable adjunct to the main laptop scheme to cover for losses, thefts etc. and visitors.

- Faculty clusters will be required in some shape or form for the foreseeable future in order to provide specialist hardware/software facilities that it is not practical/legal to port to student owned machines. Obviously, the level and quality of provision of such clusters will be decisions taken by individual faculties. These parameters may well change in the light an increasing population of student laptops on campus.

- Central clusters will continue to be needed on something like their present scale until well into the active phase of any student laptop scheme. It is difficult to predict when it might be possible to begin scaling down central cluster provision. However if it is assumed that it will take 2 years to put any laptop scheme in place and a further 2 to 3 years for the scheme to really bed into the student community then it seems likely that central clusters will be required in their present form for at least 5 years from the time a decision is taken to proceed. Monitoring of student use of central clusters would be the obvious guide as to when scaling down should commence, and would be highly desirable anyway to manage effectively the available resources.

- Obviously Computing Service will be one of the main players in any student laptop project with all of its teams being involved at one time or another. However many other agencies within the university also need to be involved. These include Estates & Buildings, Safety and Environmental Service, the Library, Registry, Schools Liaison Service, Department of Adult & Continuing Education, Publicity Services, Student Health Service, the Web Support Team, the Help Desks (particularly the Student Help

Desk), and Faculty IT Support Teams. There may be others. With a project of the size contemplated, involving so many separate agencies, it would be essential to have some sort of co-ordinating mechanism.

Recommendations

It is not part of the remit of this Working Group to consider the effect of the large scale introduction of devices other than laptops e.g. WAP phones, palmtops etc onto campus. All that need be said is that in this particularly fast moving area of technology it is difficult to predict what sorts of devices students may have at their disposal in 5 or 10 years time. Most of the recommendations below are, in fact, device independent, dealing as they do with processes and infrastructure rather than front-end technology. However some are laptop specific and this has been noted.

- The University should seek to identify an appropriate commercial partner for the purpose of entering into a student laptop scheme. The scheme should have the following characteristics.

    - Provision of competitively priced new laptops for Glasgow University students (and possibly staff also). The possibility of allowing students who have opted to come to GU but not yet arrived to take advantage of the scheme should also be investigated.
    - An agreed preloaded software image.
    - Internationally valid warranty.
    - Options for more than the minimum 4 year warranty.
    - An upgrade path for students who need a more powerful machine towards the end of their courses. Perhaps in association with a recycling mechanism for the less powerful machines back to earlier years of students.
    - A support scheme for the return and repair of faulty machines.
    - An insurance element to cover theft/loss/breakage etc.
    - A provision for ultimate disposal of the machines if need be.

    The scheme should result in a direct student/supplier relationship, with the university acting only as a facilitator rather than having any financial or legal role. A leasing scheme has some attractions in the area of software licensing, but if a purchase scheme produces more competitive prices then this should be taken into account in order to attract the maximum number of students possible into the scheme. As a standard for comparison the scheme should be no less attractive than the UCISA notebook scheme already noted.

- In association with the student laptop scheme a loan scheme should be implemented, perhaps based on the Computing Service Help Desk, through which a small(ish) number of compatible laptops are available on loan to cover situations where students are without their own machines for a period of time (e.g. repair, theft etc). This pool of machines could also be made available to visitors to the campus, but with a lower priority than students.

- Some form of on-campus electrical safety testing service for laptops should be costed. Such a service should be seriously considered since the publicity consequent upon an electrical accident involving a student user of a scheme laptop would most likely be high profile and damaging to the university. It could conceivably also have a prejudicial effect on student attitudes towards the laptop scheme.

- In association with the student laptop scheme the university should review its existing software licensing agreements and where practical the terms of the licenses should be enhanced to allow for use on student laptops. Where such arrangements are impractical, usually due to cost, then some form of student portal or licence serving

arrangement should be considered to control the numbers of concurrent users of a particular product.

- The university should decide, perhaps by means of a cost benefit analysis, whether it wishes to adopt a passive approach to the promotion of the laptop scheme or to actively promote the scheme in a strategic way since these two approaches will result in very different uptake curves. If the active approach is adopted it is essential that the Faculties be strongly involved since they will provide the principal driver for students to purchase laptops who might not otherwise have done so.

- Central drop in clusters should continue at their present level of provision for the time being but a process should be put in place to monitor student usage of these clusters. It is assumed that use of these clusters will begin to drop as the student laptop scheme takes effect. Provision can then be reduced accordingly to meet demand as needed.

- In sessions 2003/2004 and 2004/2005 the university provided central funding for replacement of older machines in faculty clusters. If some form of central funding continues then as the student laptop scheme begins to take effect faculties should be asked to review and justify their requirements for in-house clusters. If central funding for faculties clusters ceases then they should be allowed to continue for as long as individual faculties are prepared to fund and support such clusters.

- Many agencies within the university other than Computing Service will be involved in a project of the size and duration contemplated. These are likely to include

  - Estates & Buildings
  - Safety and Environmental Service
  - The Registry
  - The Schools Liaison Service
  - The Department of Adult & Continuing Education
  - Publicity Services
  - Student Health Service
  - The Web Support Team
  - The Help Desks (particularly the Student Help Desk)
  - Faculty IT Support Teams
  - The Library

  This list may not be exhaustive.

  If the university opts for an active rather than a passive approach a supervisory body with a project management remit should be created to liaise with, receive expert advice from, commission work from, and co-ordinate these agencies to ensure that the overall aim of a viable student laptop scheme does, in fact, materialise within a projected period of time.

Iain G.Logan
Computing Service
Glasgow University

Appendix 1 - Membership of Working Group

The membership of the group was chosen to represent the variety of roles that Technological Delivery staff can have in the university. No attempt was made to be representative in the Faculty or Departmental sense.

- *John Buchanan, Help Desk Manager, Computing Service*
  (X4823 j.buchanan@compserv.gla.ac.uk)

  John Buchanan is Computing Service Help Desk Manager, based in the library. As such he is much involved with the problems of running the 400+ student drop in machines in the library and the Round Reading Room.

- *John Malcolm, IT Manager, Faculty of Social Sciences*
  (X5051 J.Malcolm@socsci.gla.ac.uk)

  John Malcolm is responsible for, amongst many other things, the large and tightly grouped undergraduate clusters run by the Faculty of Social Science in the Adam Smith Building.

- *Graeme McCombe, IT Manager, Vet Faculty / CSCE Development, Computing Service*
  (X2638 g.mccombe@compserv.gla.ac.uk)

  Graeme McCombe has 2 hats. 4 days a week he is responsible for all IT in the Vet Faculty out at Garscube. On the remaining day he works for Computing Service where he is responsible for the development of the Common Student Computing Environment.

- *David Muir, IT Manager, Department of Electrical & Electronic Engineering*
  (X5241 D.Muir@elec.gla.ac.uk)

  David Muir is IT Manager in the Department of Electrical and Electronic Engineering within the Faculty of Engineering. As such he is responsible for a number of student teaching clusters with some very specialist software and hardware interfaces.

- *Tom Muir, IT Manager, Faculty of Clinical Medicine*
  (X8048 T.Muir@clinmed.gla.ac.uk)

  Tom Muir is responsible for IT in the new Wolfson Medical School Building plus Medical Faculty student teaching clusters spread throughout various hospitals.

- *Sandra Rosendahl, a 3rd year undergraduate student studying Archaeology*
  (X0432 0206441r@student.gla.ac.uk)

  As well as being able to give the student point of view Sandra Rosendahl is a long established member of the Computing Service demonstrators team which operates in the library to help students who run into problems while using the drop in clusters. She is therefore very much at the sharp end of support for student computing.

- *John Young, Networks Team, Computing Service*
  (X4853 J.Young@compserv.gla.ac.uk)

  John Young is a member of the Computing Service networks team with particular expertise in VPN and flexible access. Whatever futures we envisage for student

computing there will inevitably be very significant implications for network provision. His expertise is essential to our deliberations.

- *Iain Logan, Deputy Director (Distributed Support Services), Computing Service*
  (X 2969 I.Logan@compserv.gla.ac.uk)

  Working Group Convenor

  (In a former life IT Manager for The Faculty of Biological Sciences which runs some 300 machines in faculty clusters.)

Appendix 2 - Numbers of cluster machines

Centrally provided - On Campus

Location	**Number of PCs**
Library level 2	68
Library level 3	118
Library level 3 north	109
Library level 4	32
Library level 5	36
Library Total	**363**
Round Reading Room	126
Grand Total	**489**

Centrally provided - Halls of Residence

Location	**Number of PCs**
Murano St	18
CairnCross House	15
Wolfson	10
Total in Halls	**43**

Faculty provided

Faculty	**Number of PCs**
Arts	370
Clinical Medicine	322
Education	102
Engineering	415
FIMS	627
FBLS	298
Physical Sciences	188
Law & Financial Studies	106
Social Science	167
Veterinary Medicine	50
Total in Faculties	**2645**

Appendix 3 - Sources

Report of the Information Strategy Working Group on "Provision of On-Campus Student C&IT Facilities" available at
http://www.gla.ac.uk/infostrat/wgroups/wg18/iswg-18-frep.html

University Disposal of Computer Equipment Policy available at
http://www.gla.ac.uk/services/computing/regulations/disposal.shtml

The Strathclyde Laptop Initiative available at
http://www.strath.ac.uk/projects/sli/

UCISA Conference on Itinerant Computing April 2002 available at
http://www.york.ac.uk/services/cserv/ms-os/itinerant_computing/

Health problems associated with the use of laptops
http://www.humanresources.ed.ac.uk/news/staffnews/latest/Laptop_Use.htm

Cluster Management software
http://www.itsltduk.co.uk/mypc.asp

UCISA national notebook scheme
http://notebook.procureweb.ac.uk/

The Working Group also acknowledges expert input from the following members of staff from various universities:

- Mr Brian Eden, IT Manager, Glasgow University Accommodation Service
  (0141 330 2936 B.Eden@admin.gla.ac.uk)
  for information relating to GU Halls of Residence.

- Mr Scott Currie, Assistant Director for Infrastructure Services, Edinburgh University
  (0131 650 4947 s.currie@ed.ac.uk)
  for discussions on the laptop scene at Edinburgh University.

- Mr Brian Henderson, Assistant Director for User Services and Support, Information Technology Services, Strathclyde University
  (0141 548 2048 mailto:brian.henderson@strath.ac.uk)
  for discussions on the Strathclyde Laptop Initiative.

- Mr David McLean, Deputy Director, Glasgow University Safety and Environmental Protection Service
  (0141 330 4678 D.C.McLean@admin.gla.ac.uk)
  for information relating to electrical safety testing of laptops.

- Mr Bert Young, Glasgow University Energy Conservation Officer
  (0141 330 5932 A.Young@admin.gla.ac.uk)
  for discussions in relation to the energy requirements and increase in power provision implied by the envisaged widespread take up of laptops by the GU student population.