

Physics Central Computing

Review Report

1. Introduction

The review group (Suzanne Aigrain, David Marshall, John Wheeler with Ian McArthur providing data and advice) looked at all aspects of the support provided by Central IT. In general terms our conclusion was that we should tighten up on exactly what Central IT provides and why. There is a tendency for user-driven demand to lead to sub-optimal arrangements which consume a lot of staff time which in turn is then not available for basic user support to the detriment of all. We must avoid duplicating services that are provided elsewhere (eg central university, RCUK facilities) and so effectively paying twice; the flip side is that we should take a much stronger interest in influencing central provision so that we get what we need. At least in the university there is a willingness now to engage with us. Most of the support functions are relevant to all users so we have structured this report by those functions rather than by user constituency.

2. Network

Wireless networking creates a lot of challenges in the Department as it does not work well in our old buildings. There are widespread problems with coverage and fixing these is time-consuming. We estimate that the cost of an external consultant survey and installation of a system to provide complete coverage would be at least £200K, which is unaffordable in the current financial climate. Moreover, new wireless standards are expected over the next few years with a trend towards single-office devices. We discussed whether we should move to the University's centrally managed Cisco wireless system, i.e., abandon the in-house "Physics_S" network. The cost implications are currently unclear as the University is revising their scheme.

We recommend that:

1. Users be encouraged to use wired network connections wherever possible (mainly in offices).
2. We should abandon large-scale attempts to improve wireless coverage in office areas until affordable technology options (eg room-level wireless) appear that can meet this need.
3. We watch and wait concerning the possibility of moving to the University's centrally managed system.

3. Email

The Physics Department is almost unique in running its own email service; users across the rest of the University are generally content with the centrally supported Nexus service. While the Department has benefited from additional functionality built into Exchange such as calendars, room bookings and a Department-wide directory, this is now progressively being built into the Nexus service. There is therefore no longer a strong case for retaining our own email service in the medium-long term.

There are significant issues that would need to be addressed during changeover to the Nexus system, for example:

- a) The mail storage limit on Nexus is about to increase to 5GB, but that is still below current usage of many in Physics. If all Physics users were to transfer their email to Nexus tomorrow, our excess usage charges would be greater than for the remainder of the University. This has been raised with University IT Services and is not expected to remain an issue in the long term.
- b) We have many mailing lists generated dynamically from local databases. In the short term we could continue to host these locally, with the intention to transfer these to the central service once the functionality becomes available.
- c) Calendar functionality is available to individuals through the Nexus system. We have also used the calendar functionality on Exchange for room bookings but this has proved very trouble-prone and we propose to move to a standalone booking system.

We recommend that:

1. We migrate to Nexus over the next few years by exploiting the natural turnover in the Department. New arrivals should be put directly onto Nexus and will not have separate Physics mailboxes. The core of permanent staff will be moved in groups when convenient.
2. Room bookings move to a new standalone system and options for using the same systems as other departments are being investigated.
3. In order to promote the Physics brand, all users transition to @physics.ox.ac.uk email addresses; other addresses will continue to work in the short-medium term for existing users, but should not be publicly advertised.

4. Media Services

The Media Services Unit provides AV support for lecture theatres and meeting rooms as well as video and printing services. The Department benefits greatly from the efficient production of posters for conferences. Nevertheless, many grants, including doctoral training grants, provide the facility to pay for poster production and it is not viable to continue to provide this service free-of-charge. Significant effort is devoted to recording audio and video of lectures and video of external seminars (around 0.5 FTE). The University is conducting trials of various different video recording solutions; we should wait and see how the University service develops before deciding on a long-term strategy. In addition to our own MSU it is also possible to use the video-ing service run by the University on a pay-by-use basis.

We recommend that:

1. Members of the Department be charged for production of posters and other media services, at a rate to be reviewed regularly along with other printing charges. Users of this service should, wherever possible, provide an account code to be charged; all other costs should be billed to sub-Departments monthly.

2. To economize on staff time production of video recordings be cut back to the highest priority items, such as public lectures, alumni lectures and promotional videos.
3. The approval process for departmental videos be implemented as soon as possible.

5. Research/high performance computing facilities

We have a number of “research computing” facilities within the department. These are typically multiple core machines shared by multiple users. They are often acquired for specific projects, and tailored to their requirements, but in the long run they generally serve other users too. At the smaller end of the scale, e.g. in AOPP, the boundary between individual desktops and these research computing facilities is blurred; multiple users log into machines on other people’s desks and use whatever cores are available and support for these systems is not readily distinguishable from more general user support. At the other end of the scale are large clusters such as Glamdring (Astrophysics) with over 400 cores, housed in our Begbroke computer room, and supported by a dedicated cluster manager. We also have access to University HPC facilities through ARC (including CPU and GPU clusters), as well as national facilities e.g. DiRAC2 and ARCHER (through a competitive application process).

Until now the purchase of the local systems has generally been funded from research grants. However RCUK no longer fund computing hardware, with a few exceptions, (e.g., on consumables in some cases, or where the hardware is specifically needed to deliver the science; general user support for email, etc is paid out of indirect costs), and they no longer fund local HPC hardware or access: their policy is to encourage use of national facilities such as DiRAC2 and ARCHER which they fund directly. This means that there is no prospect of funding electricity for current clusters (over £200K pa) or hardware renewal of existing clusters. The situation with ARC is evolving very rapidly but basically it operates in two modes; the first is top-sliced university funding (to avoid the incentive not to use them) and the second is direct high priority provision for research that has external funding.

Despite the growing gap in research council funding for in-house research computing facility, the alternatives present some disadvantages. National and ARC facilities do not always match the needs of specific projects (e.g. data storage space and memory are insufficient), and there are support and reliability issues. We could envisage Physics IT staff providing ARC support but it is less clear how to achieve the same for national facilities. In addition national facilities such as DiRAC2, ARCHER are not normally made available for certain types of research (e.g. data reduction) which nonetheless require high performance computing.

Our present model is financially unsustainable and an exit strategy whereby we align our behavior more closely with what RCUK expects must be developed. Electricity & *support costs* must be explicitly accounted for where it is proposed to use e.g. EC grants to buy processors. We should actively encourage people to use national facilities, wherever suitable, rather than trying to get new local facilities.

We recommend that a separate working group on research computing facilities for the department should be established with a remit including:

- effective planning and allocation of grant funds for in-house facilities including electricity and support costs (to be discussed with grants team);
- how to provide specialized hardware and high quality support for Physics users on ARC machines (to be discussed with Anne Trefethen);
- how to provide support for users on national facilities.

6. Desktop Systems

We have about 700 Windows, 300 Mac OSX, and 100 Linux managed desktop systems in the department and well over a hundred Data Acquisition (DAQ) machines, mostly running Windows. To complicate matters it appears that we are at a relatively early stage of a paradigm shift – at least among researchers and students of all levels – away from desktop systems towards laptops and other personal portable devices. The evidence for this comes from the recent Theoretical Physics survey and the OUCS annual incoming student survey. Network traffic in the department shows that about 20% of desktops (200 plus machines) across the department are effectively dormant. There is some indication that desktops are being used for a variety of unintended purposes around the department; examples include use as backed-up data vaults and to provide a large screen for recent laptops which are much more powerful than the desktop machine.

It seems clear that a lower level of desktop, rather than laptop, provision across the department would not seriously inhibit the scientific enterprise and save money by avoiding duplication. Users should be encouraged to use a standalone monitor and keyboard with their laptop when working in their office (the cost of this is much lower than a separate full desktop system). Although a desktop will often be the correct choice, as many uses will continue to require centrally managed desktop systems especially for support staff, greater scrutiny should be applied to the replacement of desktop systems with like for like. This decision largely rests with the Heads of sub-Department and senior managers.

There is an irreducible overhead associated with each OS supported on the desktop and we could simplify matters, improving user support and reducing costs, by rationalising. All University business systems assume that the user has a Windows machine so we have to maintain support for Windows. Most research software is written and supported globally to run on Linux so we have to run that at least on servers. Mac OSX hardware is becoming very expensive and the current Apple habit of annual release of new OS versions with new hardware unable to run earlier versions creates a heavy burden on system support; in addition OSX servers are no longer available (in contrast to the situation when the department first moved to OSX). Theory recently decided to move away from OSX for desktop systems and to replace them with Linux machines. In terms of processing power Linux desktop machines provide much better value for money. Most users will continue to have access to OSX or Windows on laptops for Office applications. Few OSX machines have been bought since 2011 so, if no further OSX machines were purchased, desktop OSX could be entirely eliminated as machines fall obsolete over the next three years. This would not entirely remove the need for OSX support if we continued to support a Physics standard clone for OSX laptops.

We recommend that:

1. The OSX desktop managed service is phased out over the next three years.
2. Like for like replacement of desktop systems is scrutinized to ensure that it is really necessary.
3. Provision of screen, keyboard and mouse should be offered as an alternative to a full desktop system.

7. Information Systems

We support a large number of information systems which broadly fall into two categories: A) databases and B) websites and sharepoints.

A) Databases

There are 24 databases regularly supported by IT but most of them individually generate an insignificant part of the 0.8FTE workload. Just a few dominate and/or have mission critical implications, in particular:

- a) *Physics Financials* 0.2FTE provides (almost) real time accounting information to budget holders from the University's Oracle system. It is a great deal of work to support, even on average, with large requirements whenever there is a major upgrade to Oracle. The review group takes the view that basic tools for people managing money should be provided by the University so we are paying twice. In the short term Physics Financials will have to stay but we should be pressing the University to make more satisfactory provision for budget management.
- b) *SAGS* 0.2FTE is evolving from a primary information repository to pulling in data from other systems (CORE, GSS, etc) with an overlay which allows us to make corrections and add functionality. It drives many functions in the Department (including laser safety, computer accounts, etc) and we will need it for the foreseeable future.
- c) *Lecture Database & Room Booking* is now used only for undergraduate lectures and is obsolete, the graduate lectures having moved to the GAP system as the primary source of information. This is a case where working with other departments may yield economies and discussions with Mathematics have taken place over the summer.
- d) *Net2* manages main door locks. It is not connected to SAGS and will ultimately be replaced by the university-wide Salto system. CL2 will have a large scale electronic lock installation. We should delay widespread installation of electronic locks in other buildings until after CL2 is commissioned and the cost has come down to more reasonable levels (this is policy agreed by PMC). It will be necessary to interface the new system with SAGS to provide fine-grained access control and the optimal mechanism for this is currently unclear.

B) Websites and Sharepoints

The full list of physics *Web* activities and sites is quite anarchic. The capabilities of www2.physics are not well used by most people as it is not very user friendly and there are many truly terrible and out-of-date web pages which demonstrate that creating web sites is much more fun than maintaining them. There is bound to be a blurred edge between supporting the platforms and the content; the former is the responsibility of IT

staff while the latter is not. IT staff endeavor to provide what they are asked for, while at the same time rationalizing the underlying systems, but we have no clear policy on what it is reasonable to support given the effort available and what not.

Sharepoint support takes about 0.1FTE. Existing Sharepoints are steadily being moved to the University Nexus Sharepoint site which reduces support overheads as old servers can be turned off. This process should continue wherever possible. In a few cases this is apparently made difficult by requirements for version control in multi-institution projects; the review group is not totally convinced by these arguments.

There is a particular issue with Websites for teaching support. Currently web pages for lecture courses are not in a standard form and are located in many places on our websites, the most common location being the lecturer's own personal web pages. The University's Weblearn system is designed to provide a systematic repository of teaching materials but is not widely used in Physics for a number of reasons. Those we know about include:

- a) There is a view that the existing messy system is fine. This may be true for those of us with a lot of web material developed over the years but it is unlikely to be so for the students and it is not helpful for new staff members starting from scratch. When the lecture list system is replaced it would make sense to set it up so that web pages for lectures were automatically created on a well organized Weblearn site.
- b) There are some technical limitations (e.g. video compression, rigid mark schemes) in Weblearn which seems to have been designed without taking into account the needs of large science departments. Furthermore Weblearn staff/University IT Services have seemed uninterested in fixing the problems. This is unacceptable as it means we are paying twice and we should pursue this with University IT in order that, as Weblearn is developed, it becomes more usable for us.
- c) A lack of guidance on how to use the system. A physics-specific guidance document has now been developed which should help with this.

We recommend that:

1. The rationalization of supported systems and platforms should continue.
2. There should be a simple approval protocol for web developments (similar problem to the one being put in place for videos) to prevent systems multiplying and creating support implications in a haphazard manner.
3. Web and other information system developments that belong to particular research projects should be funded through those projects – so the funding required must be identified at the grant proposal stage (see also 9.1).
4. We should continue to migrate Sharepoints to Nexus and not enter into new commitments to host Sharepoints on Physics servers.
5. We should strongly encourage the use of Weblearn for providing lecture materials within an easy to use standard structure.
6. We should not create new systems that replicate functionality provided by central University systems and a protocol should be set up to monitor this issue.

8. User Support

User support across the department is currently rather uneven with widely varying satisfaction levels among users. We have examined the support load from various points of view using the data from the ticket system. There is no identifiable single cause which is a very large drain on support effort but we do take the view that it is desirable to have clearer rules about what is supported and what is not, reinforced by very firm management support for computing staff who are inevitably at the sharp end.

The administration of individual systems is largely central in the case of desktops while it has to lie in the hands of the owner/user in the case of laptops; support regimes should be uniform across the department and the regimes available should be broadly similar for desktops and laptops/PPDs in future.

We looked into various possible back-up regimes and concluded that automated centralized back-up of laptops is not practical, while the current centralized procedure for back up of centrally supported desktops and servers is satisfactory.

We recommend that the general principles of user support should be:

1. Support effort available should be uniform across the department.
2. Available management regimes for laptops and desktops should be uniform across the department.
3. Before embarking upon IT related projects we should properly take into account the support staff costs as well as the utility to end-users.
4. No support can be provided for non-standard systems or home systems.
5. Retired staff: use of the Department's limited resources cannot be justified.
6. There should be an absolutely clear Service Level Description document.

At present the users of machines that are supposedly self-administered tend to seek help from IT when they get into difficulties with virus infections or have problems installing software. Furthermore in reality these have to be dealt with because they constitute a threat to other systems on the local network. This already creates a workload of about 0.5 FTE and we are concerned that an increase in self-managed systems could make this worse so we need to disincentivise the behavior which is largely responsible for this sort of problem. Experience has shown that systems which have a Physics standard clone installed, even if subsequently self-managed, are much easier for IT staff to sort out later.

We recommend that

1. There should be three support regimes:
 - i. centrally administered systems which are fully supported;
 - ii. self administered systems with up to date operating systems whose support is the responsibility of the owner/user, and which have access to the internet (we should encourage people to use the Physics standard clone);
 - iii. DAQ machines running obsolete OS versions which are self-administered and are forbidden direct access to the internet; these machines should not be used for general purpose computing.

2. A cost recovery is established to provide, under certain conditions, 'self-administered' systems with emergency support which will be charged for.
3. The department should provide advice on backup mechanisms which we envisage would be:
 - i. the HFS for desktop machines;
 - ii. use of two individual storage devices kept in different places for laptops (possibly alongside HFS where practical) - this is cheap and robust solution but does require some user discipline; encryption should be turned on in all instances and clear instructions should be provided to users.

A detailed implementation is described in Appendix 3.

9. Funding IT support

IT support for general computing needs associated with research is funded by RCUK through overheads. In some cases they will also pay for research project specific computing support of various sorts. Our other major funding source, the EC in its various manifestations, pays much lower general overhead but it is usually possible to ask for computing support as a DI item in the grant. Even on RCUK grants DI/DA computing support can sometimes compensate for otherwise depressed overhead levels. In many cases it is very difficult for us to separate out general and project-specific computing because it is done on the same physical systems. In the current financial climate we need to raise as much funding for IT support from external sources as we can and we recommend that:

1. It should be a requirement, implemented by the Research Grants Administration, to apply for general computing support, including software licensing, on grant applications wherever it is reasonable to do so.
2. The IT compensation mechanism whereby sub-Departments are 100% reimbursed when grants raise general computing support, often for project-specific work, is expensive and should be phased out.
3. Grants which have general IT support funds should be billed regularly against the staff providing that support.
4. A checklist on project-specific computing support implications for grants should be developed for the Research Grants Administration so that we can be sure to get these properly funded.

10. Visitors

There are at present some general issues with the categorization of visitors in the Department which impact upon IT; from this point of view it is highly desirable that the Department has a uniform policy on visitors. Our recommendations are self-explanatory.

We recommend that:

1. The SAGS visitor categories should be organized so that only medium and long term visitors who are actually here appear on the website, that they appear in an appropriate category, and disappear when they leave.
2. Former members of the Department who require continued access to the Department's computer systems because of ongoing research collaborations should be categorised separately in SAGS and should not appear as visitors.
3. Visitors should not be given an Oxford email address and should be required to give their home email address when registering.
4. Visitors must be made aware of the terms and conditions for access to our computer network, particularly to guard ourselves against illegitimate use of licensed software.

11. Upcoming Issues

There are some looming issues that have potential support implications for us including:

- a) The upgrade of Drupal, the underlying platform on which www2 is built from v6 to v8. This is necessary as v6 will drop out of support in the next year.
- b) The replacement of the telephone system by VOIP. It is unclear at present how the effort for this is to be resourced but we should take the point of view that this is a central infrastructure issue and that the effort should not come from within Physics IT Support. Many departments in the university will be unable to provide the technical expertise from within their own resources and we must be careful to avoid paying twice.

Appendices

A. Support levels in other MPLS departments

JFW made enquiries of other departments to establish the level of IT support they provide. Most of the information was supplied confidentially so this is just a summary of the conclusions we reached from it.

- a) Most IT staff are in grades 6 to 9 so Physics is fairly typical.
- b) Supporting IT staff through external funding is rare. Physics is unusual in having c. 4FTE supported in this way.
- c) Non-experimental departments have about 30 staff of all types (faculty+postdoctoral+support) per IT support FTE. Experimental departments have about 20 staff per IT support FTE. Physics has about 22; if one excludes grant supported IT staff the latter numbers become 22 and 26 respectively.
- d) The amount of IT support time committed to teaching varies greatly but is largely driven by the nature of the subject and no other general conclusions can be drawn.
- e) The slimmest support requirements are in a department where only a single variety of centrally managed desktop system is supported and there is little HPC or cluster support.

- f) Departments do not have a clear specification of what is supported – mostly support provided is very much demand led.
- g) None of the departments surveyed allowed visitors access to their computer systems, Oxford e-mail, etc, beyond the standard visitor network access.
- h) Other departments share the usual concerns: data not backed up; lack of security; growth in scope of IT pressuring growth in numbers of support staff, etc.

B. Summary of comments received

We received input from a small number of individuals and also from the Theoretical Physics survey which was done earlier this year. Granted that this input is from a rather small sample across the department among the points made were:

- a) Good front-line support is vital.
- b) The current SLD doesn't include some of the key requirements of people running small computational clusters, some of whom are struggling to get support.
- c) It is difficult to find the information one is after from the IT Website.
- d) Media Services work should be charged for, as many grants have funding for this.
- e) That IT has in the main coped very well with the growth in use and diversity of IT systems over the past decade.
- f) Laptops increase the productivity of individuals but do generate support challenges.
- g) Increasingly people are using laptops as their primary computing resource – though this does depend very strongly on what people mainly use computers for.
- h) It is a false economy to divert student and post-doc time to IT support.
- i) We should use students and post-docs more to provide IT support.
- j) The extent to which we can fund IT directly from grants depends strongly on the conventions of the funding agencies we deal with.
- k) Support for some of our databases is mission-critical and it should be increased.

C. Possible rules for proposed emergency support charging mechanism

The purpose is to provide emergency support to self-administered machines and recover the costs of doing so. The rules would be:

1. Machines must be registered with central IT
2. DAQ machines have no direct internet connection (because they are mostly old with old OS and cannot be kept up to date) but have access to:
 - a. internal services including file servers for backup, and to download e.g., driver updates from internet;
 - b. multi-user interactive systems for internet connection.
3. Normal user machines which do have direct internet connection must:

- a. be kept totally up to date, have Sophos installed, etc;
 - b. keep regular back-ups.
- 4. If machines are compromised beyond their user/administrator's competence to rectify or restore from backup then central IT will:
 - a. reload them with the standard Physics image without charge;
 - b. or endeavor to resolve the problem charging an administration charge of £50 plus an hourly rate (which would be the same as CEG, currently £41.64 for a Grade 6 and £48.13 for a Grade 7).