

Personalisation and Service: Finally, how to get the vice out of (ICT) service.

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A long term aspiration, something that has been largely elusive up until now, is for the end user to be able to personalise, in a limited way, the technology and related ICT services on offer. The reasons for wanting to do this are that we might expect a higher level of consumption and satisfaction with what we offer which in turn may better justify the time and effort in providing such services. Staff morale in delivering such services may also be enhanced.

ICT service providers and their users are locked into a service model that neither particularly wants; providers need to supply and manage the devices that access their services and users have little choice but to use those devices. A solution to this problem that satisfies both parties is now possible.

This paper describes a programme of work at the University of Auckland Business School that seeks to develop systems which better meet our aspirations for staff and students. It looks at the current situation, defines the limits of personalisation on offer, with a sketch of a plan for the medium term development of the programme, and concludes with a scenario in which some current fixed costs may be eliminated.

Keywords: Cloud, personal, service, VDI, virtualisation.

Introduction

One of the questions that the conference organisers have posed for this year's speakers and delegates was that, in the future, will we still have data centres and computer labs? Our answer is a qualified no. We anticipate that these services will still be available, probably to meet specialist need, but that the great bulk of what is used today will not be required in the future. The future will be dominated by access devices owned by the staff and students, the growth in the number of wireless connections point in that direction, and serviced from off-premise data centres. It will allow technology and ICT service providers to concentrate on service rather than infrastructure. The perhaps more interesting question, assuming this is a good idea, is how do we get to such a position? This paper will describe how the University of Auckland Business School is preparing for such a future.

Many of our current ICT services are characterised as 'take it or leave it', 'do it here and now' or 'you can only use this technology but not that one'. This situation is very far removed from any characterisation of being personal or the kind of service we might want to deliver. If, in the past, some choice was made available then the cost of providing it was likely to have well exceeded its utility. Take it or leave is really an admission that we have technical limitations in how we have provided some services up until now. We have been able to do one thing but unable to give a choice. An example might be two incompatible software services where we can provide either one but not both. The phrase 'anywhere and anytime' has been a common aspiration for many service providers but the truth is rather different. Computer labs for example are often overcrowded and closed at times that are inconvenient for some students. Computer labs are mostly 'do it here and now' and the antithesis of 'anywhere and anytime service'. The requirement to only offer one particular technology has in large measure been because the applications required were also tied together with a specific technology. Linux and Microsoft Office perhaps is a simple example of such an incompatibility.

In any business case that is proposing change, one of the alternatives considered should be to do nothing or to keep the status quo. It is the base case against which alternatives are evaluated. Why in this case is doing nothing not a viable option? One set of numbers I keep in mind are the total numbers of staff and students, and their recent growth trajectory, in the University of Auckland.

Table 1: Staff and student full time equivalent numbers

	Year 2000	Year 2011	Change
Postgraduate	6,914	10,323	+49.3%
Undergraduate	21,178	30,056	+41.9%
Staff (academic)	1,556	2,050	+31.7%
Staff (non-academic)	1,811	2,734	+50.9%

(University of Auckland. Key Statistics. 2012)

It is likely that we will see continued growth in the number of postgraduate students and a consequential rise in the number of staff too.

Also, here are three key actions from the University of Auckland Strategic Plan 2013-2020 which are relevant to this question.

- Ensure that all parts of the University actively meet the needs of those to whom they provide services, and that service delivery is client-focused, responsive, constructive, and helpful.
- Ensure that the work environment is sufficiently flexible to accommodate the diverse personal circumstances of staff, and to support high performance.
- Enrich teaching, learning and outreach activities by drawing on international best practice in the use of new technologies.

The assumption must be that we currently fall somewhat short or else they would not be key actions. To be able to meet anticipated future growth and these key actions, it will mean that the status quo in ICT service provision is not a realistic option. Only by addressing our capacity constraints and service shortcomings, with a new service model, can there be a proper solution. For both staff and students the new services will have to seem more personal and better targeted to their particular needs.

Personalisation

What is meant by a more personal service? A definition of personalisation as it relates to this programme has three broad elements.

- The right to choose when and where a service is taken.
- The ability to opt in or out of a particular service.
- The choice of platform used to receive our services is as wide as possible.

There are two broad themes that relate to offering a more personal service as defined. The first is an observation that it is not always necessary to mandate what software staff and students use so why should we? This will not be true for some commercial businesses but for the tertiary education sector it often is. Enterprise applications apart, this means that the staff and students could be offered a choice as to which toolset they prefer with only limited loss of functionality. Questions as to which operating system is needed, which web browser to use, which email client is required for example matter little to the end result. There may well be a support cost to allowing such freedom and one issue is whether such costs outweigh any perceived advantages. It should also be noted that personalisation may come at a price that is not always borne by the provider. There may be instances of where the choice of toolset causes downstream issues. An example here might be allowing staff to produce a PDF file using technology X, which fails to print properly, and causes issues for the students who want a paper copy. Experience would say these issues are uncommon and usually simply sorted.

The second reason for wanting to offer more personal choice, as defined, lies in a belief that you should expect a higher level of satisfaction not just from the users but from the providers too. Because service providers would be able to see the level of non-mandated take up of their services it might allow those products with little patronage to be phased out. Providers would only supply what was necessary or demanded. We should not be afraid of what the user may choose.

Virtualisation

Before being able to reach the position where it will no longer be necessary to control or own the access devices, for example desktop PC's, laptops and tablets, and allow users to opt-in or out of a particular service, there had to be some technology developments to make that possible. The two that are most important in this respect were the development of the hypervisor, which provides an ability to run a software emulation of a physical computer, and application virtualisation, which provides the means to run software that is abstracted from the underlying operating system.

The development of application virtualisation is helpful for two specific reasons. Firstly it allows the service provider to create software packages that can be consumed on several different platforms and without physical intervention. Also, the end user can install the software themselves, usually very simply, without needing to know any of the usual installation questions or licence keys.

The second reason application virtualisation is helpful is that it allows a user to obtain some degree of autonomy and personalisation. The target device for the software does not have to be owned by the University and the user does not have to install it. The software can be generated centrally, updated and managed at a distance. It is a win-win for both provider and user.

There are a number of drawbacks however that make application virtualisation only a partial solution. Not all software is able to be repackaged in this way and will still need a traditional means to install and manage these particular items. Also, even if the software is able to be virtualised, it will only work on a limited number of user devices and operating systems. I can package a product for Windows 7 but it will not be usable on an Apple Mac. The second of the technology developments needed, the hypervisor, is able to fill these two gaps.

The modern hypervisor has been a key technology that is central to the growth of local, public and private computing clouds. Instead of having a single computer run just one operating system and a limited number of applications, the hypervisor has allowed multiple operating systems, and hence multiple applications, to coexist on the same computer. The efficiency gains in doing this have been well documented. Data centre servers now run at or near capacity most of the time and save on space and hardware costs. A degree of autonomy from the hardware manufacturer is also possible that allow the use of commodity servers. It is to be noted that there is no need to run these services locally, they can be run from a public cloud.

The main point to note is that it is also possible to run multiple virtual personal computers on a single physical server. Densities of 30-50 personal computers per server are possible; a whole computer lab of desktops on one server. The generic name for this type of application is Virtual Desktop Infrastructure or VDI. We also include, somewhat unconventionally, the idea of delivering a single application, running from such a desktop, under the same terminology.

In a parallel development, the desktop hypervisor has also been established, allowing multiple operating systems to be run from one desktop computer. Taken together, these hypervisors, remote and local, underpin what has been called Bring Your Own Computer or BYOC.

The development of the hypervisor has enabled the gaps in software virtualisation to be filled in two ways. Because software is installed on a virtual pc in the same way as it is installed on a physical computer, there should be few software products that are unable to run on a virtual computer; the issue of some software being unable to be virtualised mostly goes away. The second reason is that the access to these virtual personal computers is available from a wide range of devices and operating systems. Virtual PC's, and the applications that are installed on them, can be accessed from most of today's common devices which include Linux workstations, Apple Mac computers, iPads and Android tablets.

What is the cost of VDI?

The overall cost will vary from case to case for the following three reasons.

What performance do you want?

The performance of a remote virtual pc is related to the capability of its host and its contention for resources. It is unlikely that it could ever exceed that of a physical workstation set up for the particular task required. However, based on personal experience, most applications run sufficiently well as to not be a concern. There is however one aspect to performance that is currently well short of what you can achieve with dedicated hardware and that is a virtual PC's graphics performance. Even here the gap between virtual and real can be expected to decrease as new protocols and better hardware improve performance.

How well can you scale your solution?

The major reason why unit cost decreases as the number of virtual PC's increase is that there is a fixed cost for some of the licences required. For example, one of our biggest costs is that we need a Microsoft licence, essentially a Windows and Office Cal, for every student irrespective of whether they will ever use it.

What management software are you buying into?

Creating a single virtual pc, either locally or remote, is simple. Creating hundreds and being able to manage them is not possible without assistance. You need a packaged solution that will cope with the workload and technology you want to use. Assuming nothing else changes, implementing VDI will add significantly to your costs however you architect the solution.

The programme

The programme to address our capacity constraints and service shortcomings described in the introduction was simple but ambitious; we would develop both local and remote VDI services that enabled a BYOC service for staff and students. The service goals for staff and students are different but have similar strategies and underlying technologies. For students the requirement for fixed computer laboratories, spaces that mostly serve only one purpose and need significant capital investment, should be eventually run down and phased out. In their place will be technologies that deliver similar services but to a broad range of devices the student will own and carry with them.

For staff the goals are less radical but perhaps just as significant. Whether or not we own the computer that has access to these new services, the setup and support will look very different. The user will be responsible for the mix of services consumed; a la carte and not table d'hôte.

The first issue to overcome was to fund the Microsoft licence for students that would allow access to central services from off campus using equipment not owned by the University. The University funds such a licence for staff but not for students, a situation common in most Universities. (In 2011 when the first licence was purchased, Microsoft confirmed we were the only such Australasian University to have the licence). Without this student option we were never going to have a Bring Your Own Computer service for students. The prospect of future savings, by reducing lab capacity, was not part of the argument to fund this licence.

The next decision, having secured funding for the Microsoft licence, was which supplier to choose to deliver a remote and local VDI service. There are several providers that offer similar services to meet different budgets, levels of expertise and local circumstances (VDI Smackdown, 2012). We chose to use a product called Quest vWorkspace, recently acquired by DELL in 2012, for our remote VDI solution. For a local VDI solution we have chosen a product called MokaFive, distributed by DELL. We had the option of running the vWorkspace solution on either Microsoft Hyper-V or ESX from VMWare and we, for reasons of simplicity, chose the Microsoft hypervisor.

To provide software virtualisation, we were already using two services, Microsoft App-V and Spoon and no decision to change was necessary. Microsoft App-V allows software to be streamed over the network on demand whereas Spoon delivers self-contained packages able to be distributed over the network or on a memory stick. Neither care if the desktop is real or virtual. If your VDI is available off-line (local) then it cannot rely on software over the network, hence the need for two complimentary solutions.

Transitioning issues

It is not going to be an easy or quick transition to a future in which all end user devices are owned and managed by the user. This makes life difficult for two reasons; the burden of running two services in parallel will add to the workload and costs will increase before they start to decline. There is unlikely to be any way around this problem as the services that replace what we have currently will need to be developed and deployed before the old services can be reduced. It is also likely that the pace of change cannot be too fast.

Surveys looking at student ownership of computers may no longer cite a specific figure, presumably because it is so close to 100% that the difference is negligible. Most interest now is not on ownership per se but on what type of device they own. For example, the Stanford University Student Computing Survey simply says 'Most students now own their own computer'. Indeed, the ECAR Undergraduate Students and IT, 2012 publication, specifically asks the question 'Why provide desktop computer workstations when nearly all students own a laptop?' The same study showed that desktop ownership is declining. The ECAR paper suggests we need to understand why students continue to use institution-provided computers rather than their own before reducing on-site provision, a view we would concur with. Studies such as the Student IT Experience from Macquarie University show that few students bring their laptops onto campus citing weight and power problems.

Understanding why students would prefer our computers to carrying their own is perhaps not so difficult. Many services have only been available on institution-provided computers, sometimes because of licencing issues, so the expectation will have been that you needed to use one and in that case why bring your own? The additional factors around weight and power, with desk space at a premium, only reinforce that conclusion. The programme of work we have undertaken here means that getting an equivalent service on your own device should no longer be a barrier but that access to a desk and power remains an issue.

Wireless coverage and capacity has in the recent past been an issue with respect to on-site participation rates. This no longer appears to be an obstacle at this University with a considerable upgrade to the wireless currently taking place. The issue of wireless being seen as a convenience rather than a necessity is hopefully behind us. The next level of development will be in having commercial carriers take our network off campus and into the city for a more seamless experience. That will add greatly to the appeal of carrying your own device.

When we look at staff and the concerns they may have, the issues facing students do not present as impediments. Staff have few issues in finding a desk to work from or power for their computer for example. They also have better access to support staff should they have configuration issues. The concerns staff have are more about security for their data and questions of compatibility. We have seen growth in the number of secondary or additional devices staff use, such as tablets and notebooks, and while they will not easily give up their primary device provided by the University, they are exploring and using our new services on these secondary devices.

Transitioning plan

The transition plan is based on encouraging staff and students to try out the new services and take advantage of the flexibility they offer. There is no planned action at this time that will either close down a computer lab or remove a computer from the desk of a member of staff. There is a natural caution to change among the executive that, while agreeing to the development of such a programme, would want to see some solid evidence of its success before a wider adoption. We are not unhappy with that stance as the change being promoted is considerable. The precautionary principle means that it is still up to us to prove that no harm will come from using your own device rather than one that we provide. Across a broad spectrum of use cases we are demonstrating that it is not always necessary to book class time in a computer lab or have your teaching software included in an image that is cloned everywhere.

It should be pointed out that it is not a dichotomy of we do or we do not have a BYOC service. There have always been individuals who have provided for themselves with little effort on our part needed to assist them. On the other hand there are some users who would be hard pressed to provide for themselves and achieve the same level of service. We are happy to continue to carry those who need such support.

The question is one of degree for both staff and students. Have we put in place sufficient incentives and reduced barriers to the extent that BYOC is a choice worth considering?

There is no plan to promote BYOC to staff at this time, as their primary means of access, other than to encourage them to try it. For the majority of staff, the current policy of providing, free of charge, at least one modern computer with full support outweighs any perceived advantage from BYOC. Despite this, there are still some additional services that come out of this work that are of benefit to most staff. For example the ability to run multiple research machines that are distinct from your day-to-day computer, the provision of disposable test computers that enable some experimental development, or simply an additional computer to offload a particular task. We are however promoting to staff the idea that they can leverage a student owned computer into their teaching of particular courses by offering additional software, services and branding through those devices.

We do actively promote BYOC to students. The plan has been to replicate what is available on a computer in a computer lab to a virtual computer they can access anywhere. For students, the message is that the answer to complaints about insufficient computer lab time available, opening hours, and the contention for on-site computers is now in their own hands. Local surveys (2012 Teaching and Learning Survey Report) show that with ownership rates of suitable devices exceeding 80% they have the means to provide for themselves. We promote the message that it is free, there are no queues and its available when they need it through social networking sites, electronic displays, websites and the wallpaper on the student desktops.

Summary

We have reduced peak loading in our computer labs by delivering our current student service, the one we provide in our computer labs, to a mix of student owned devices using remote VDI, both on or off campus. This has immediately addressed the capacity constraint issues relating to self-study and goes some way to meeting the Universities Strategic Plan goals.

One postgraduate class is now serviced entirely by a pool of virtual PC's and no computer lab time has been booked for this course. Several courses now have course components that are only available outside of our computer labs and could not have been provided by them. Feedback from staff and students has been positive.

One member of staff has provided their own bespoke computer image that we have deployed for student use as part of a course, something that would have been very difficult without the developments described here.

In response to the availability of service from off campus and reduced contention for on-site service, we have reduced the extended opening hours of our computer labs and they are now closed on a Sunday. We will review our late evening closure times in the coming semester. As the new services gain the confidence of staff and students we expect that the growth we have seen in the use of VDI will continue with an eventual decline in the use of on-premise provision.

Progress has been made in delivering a more personal service as described, which in turn has open up the possibility that the computer lab, mostly unchanged in almost twenty years, might be phased out and a greater reliance on students own computing devices made obligatory. For both staff and students, the use of their own computer will not restrict their access to any service.

It is envisaged that the fixed costs in deploying and managing our computer labs will decrease as they become redundant. Even if short term costs increase, the improvement in service and the prospect of future reduced costs make this an attractive programme to continue to develop.

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