DESIGN AND DEVELOPMENT OF A COMPUTER LABORATORY ADMINISTRATION SYSTEM FOR MPBL

By

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ABSTRACT

The current focus towards teaching and learning in fulfilling vision 2020 requires teachers to empower students to be knowledge critiques, creators and discoverers. This empowerment comes with the price of providing an environment which will support students exploring and searching for information as well as collaborating with one another which goes beyond the formal timetabled class session. When computers are included as part of this environment, lab administration increases many fold. With small institutions that does not warrant full time competent technicians this desire for a pedagogical environment becomes almost impossible. This paper describes the design of a desired system for a teacher training college which might alleviate the administrators' nightmare and even make administering unsupervised labs a reality. A prototype model for a software based solution is proposed which takes into account the fact that educational institutions must provide a student friendly environment which is very tolerant towards student nature to explore and make mistakes and yet at the same time avoid creating nightmare for the lab administrator. Also described in this paper is how this model will be able to support automatic gathering of data on student trends on the usage of computers which in turn can help the college make informed decisions when planning better support for students.

INTRODUCTION

As part of achieving vision 2020, there has been a gradual shift towards creating environments that encourages empowering students to be self directed learners. Technological environments like computer labs are no exception. More instructors are integrating technology into teaching and learning. The college curriculum also encourages more work and collaboration outside the formal face to face sessions with the instructors. This translates to a progressive need for more frequent and longer period of access to technological resources by students both during class and outside class hours. Thus it is no surprise to see an increase in the demand for access to computer labs extending late into the night.

Teacher training colleges can be considered small institutions when compared to universities which have a larger population, size and budget. As such, it is not feasible for these colleges to provide separate labs like teaching labs, multimedia labs and student labs. For the same

reasons stated above, it may not be feasible to have highly trained fulltime technical staff managing these labs. More often than not, IT instructors double as lab managers and technicians with one or two non teaching staff retrained on the job to help administer the labs. Thus the approach to managing a lab has to be different than that of managing labs in universities where university lecturers have almost complete say in dictating how and when computers should be used (Minnick, 1998).

This mismatch between progressive demand for more access and the lack of infrastructure and human resource to adequately support this need creates an administrators' nightmare (Tapp, 1997). This is further compounded by the fact that the public tend to view access to computer labs in terms of the physical condition of the lab as opposed to how far the lab satisfies the needs of the trainee teachers. As a result, one can observe at least three strategies used by the lab managers to handle this mismatch.

- Lab access only when absolutely necessary (e.g., only for formal IT class with an IT instructor present)
- Adequate access but use draconian approach which discourages use (e.g., fill a form in triplicate two weeks ahead and to wait for formal decision by lab manager and insist that a computer savvy person be found to monitor the session)
- Administrator working long hours to bridge the mismatch (e.g., lab manager tries to allow trainee teacher needs to dictate usage but works long hours to keep lab in constant working condition)

Casual interview with teachers who come for inservice courses in the college suggests that these lab management issues are real and unless they are addressed, one should not expect labs to be optimally utilized. Administrator constraint will always take precedence over student need, unless, some way is found to alleviate this administrator constraint.

IDENTIFYING THE PC LAB ADMINISTRATORS' NIGHTMARE

The writers' experience with managing computer labs suggests that the task of administrating a computer lab can be broadly divided into three categories:

- Physical (e.g., clean room, clean mouse and keyboard, inventory)
- Hardware (e.g., change hard drive, send motherboard for repairing)
- Software (e.g., reinstall software when a user accidentally deletes it)

Physical maintenance normally does not require computer expertise and thus can be delegated to non teaching staff. Hardware maintenance can normally be handled by lab technicians who have undergone hands on training. In addition, the issue of handling physical repair of computers is straightforward; whether the college has money or not and whether it has effective mechanisms to arrange for repairs in a reasonable amount of time. Statistically speaking, hardware problems which requires the presence of computer savvy lab administrators hardly occur frequent enough to warrant classifying it as an administrators' nightmare.

Software maintenance is the most difficult administration issue for lab administrators. This is because there are many types of software problems and retrained lab technicians find working with software systems very difficult to master and thus it has to be done by computer

savvy personnel which normally are IT instructors who double as lab administrators. Software problems are also time consuming and sometimes difficult to diagnose and solve. Thus it would be easy to understand why a shift towards fullfilling trainee teacher needs for lab access will increase many fold the administrators' work.

The focus of the rest of the paper is thus on attempting to reduce the administrators' nightmare by automating as much as possible the software maintenance portion.

JUSTIFICATION FOR A SOFTWARE ADMINISTRATION SYSTEM

Based on the arguments above, if a software administration system can be assembled or created that can make the software management part easy enough for lab technicians to use, then the lab administrators' work will be significantly reduced. He/she can thus focus energy on more creative work.

Such an automatic system has the potential to reduce lab administration work and thus create a condusive environment for providing good service to the clients (trainee teachers). As the need for provision of computer based environments is progressive in nature, such a system will reduce the temptation for the creation of more teachers as technicians and lab attendants. (It is the opinion of the writer that trainee teachers should focus more of their time on learning the business of teaching and learning in a technologically rich environment rather than being trained as a technician or attendant. However, the writer supports the idea of gaining skills by working with, observing and helping a competent technician).

It would be clear by now that the writers' ultimate aim is to provide a realistic argument why with a software administration system, lab managers should be able to focus more of their time on providing better access to technological resources in line with pedagogical needs without the fear of significantly increased work.

SOFTWARE ADMINISTRATION DETAILS

Observations and automatic recordings were two methods used to gather data. In observation, the writer noted the nature of the problem each time he had to do software administration for computers in the PC labs. While the software prototype was being built, some computers were installed with this software to automatically record usage patterns.

To give a context to reasons why certain activities required intervention of the lab administrator listed below are some of the existing rules for usage of computer labs in this college

- Perkhidmatan Internet harus digunakan secara bertanggungjawab. Cara anda menggunakan Internet perlu mencerminkan watak anda sebagai seorang pendidik profesional. Contoh-contoh kegiatan Internet yang tidak mencerminkan watak anda sebagai seorang pendidik profesional termasuk menerokai ke halaman web lucah, anti ras, yang membawa kepada benci terhadap manusia dan yang mengutuk agama.
- Gunakan kemudahan cetak-mencetak dengan penuh tanggungjawab. Anda hanya dibenarkan mencetak satu salinan kerja akhir anda. Anda juga tidak digalakkan untuk mencetak bahan-bahan daripada Internet.

- Untuk memastikan perkhidmatan komputer dapat disediakan dengan 'down time' yang minimum, anda dikehendaki uji disket anda untuk virus sebelum ia digunakan.
- Perkhidmatan Internet patut dihadkan kepada tujuan-tujuan pengajaran-pembelajaran sahaja. Misalnya bermain 'Chat' boleh dikatakan melanggar peraturan ini. Lagipun ia menyumbat talian Internet (hogging the bandwidth).
- Untuk membolehkan tindakan baikpulih diambil dengan segera, catatkan segala kerosakan perisian atau peralatan pada Borang Laporan Kerosakan di papan kenyataan.
- Anda tidak dibenarkan membuat sebarang perubahan kepada desktop komputer supaya pengguna yang baru tidak keliru apabila menggunakan bilik ini.
- Anda tidak dibenarkan menyalin, mengubahsuai, menghapuskan atau installasi perisian ke dalam komputer
- Anda dikehendaki mendaftarkan diri (log in) setiap kali anda menggunakan komputer dan mendaftar keluar (log off) selepas digunakan. Tutup komputer sekiranya tiada yang menunggu untuk menggunakan komputer anda.

While trying to accommodate the growing demand for access to computers in the PC labs, it was difficult to realistically monitor and enforce the above rules. Innocently or not, ignorantly or not, any break in the above rules results in increased software administration. Obviously a draconian approach to administration would have easily solved this problem of monitoring and enforcement with the price of reduced access.

The following are actual instances of the rules being broken and which results in increased need for maintenance

- Installation of application like Yahoo, mirc902
- Internet Explorer or Netscape default page has been changed to some other page which sometimes can be of the unpublishable type
- MS WinXP has replaced MS Windows 98
- Desktop is virtually empty
- Desktop has been changed and look no more consistent
- Files saved all over the computer including the Desktop
- Files and folders deleted thus making some application not to work properly
- Evidence for pornographic web site viewing
- Non system disk error (latest antivirus updates not installed)

In addition, at present the college does not have enough human resources to enforce user accounting even if users are required to manually sign-in. Since no full time staf handles the administration of the network, the college is unable to guarantee total dependancy on server for user authentication.

The college, with the help of student funds, was able to provide laser printers for student use but found it extremely difficult to manage printing. The college was not in a position to assign a person to monitor and collect money for printing while at the same time trainee teachers were more than willing to pay for the services. Of course, printing could be limited to certain times to solve collection problems but that would not be 'good service'. Currently, while waiting for a better solution, printing is free with toners being changed once a week.

The above two experiences suggested that the following would be desirable

- User accounting
- Printer management

WHAT MUST THE SYSTEM BE ABLE TO DO?

Based on the above observations the following are a list of tasks that the new system should be able to do to alleviate software administration

1. A centralized way to periodically update antivirus – either the workstation pulls and runs the antivirus or the server pushes the antivirus and the workstation runs it.
2. When user add folders/files or deletes folders/files or changes settings they must be reset – but there are legal folders into which users can keep their folders/files e.g., c:\My Documents
3. User either cannot delete certain folders/files e.g., Ghost files or these folders/files are invisible
4. Certain users with special permissions can install applications on a workstation
5. Administrator can 'install' (copy) an application from the server to selected groups of computers. This application can also be 'uninstalled' (deleted) from the server.
6. Workstation must dynamically block pornography sites and create a channel for users to report if the web blocker blocks a site erronously or fails to capture a pornographic site
7. System must get periodic feedback on
    a. Frequency of use of each PC
    b. State of PC (health)
    c. Frequency of use of applications
    d. Sites visited
8. System must do printer accounting
9. Log user activity trend
    - Application used
    - Sites visited
    - Files/folders created/deleted
    - Software installed
10. Do self correction
    - Reset desktop settings
    - Delete folders and files added
    - Uninstall software
    - Put back folders and files deleted

ALTERNATE SOLUTIONS CONSIDERED

Contracting out lab administration to private firms. This strategy will involve allocating a sum of money each month for the firm technician to administer the lab. Technicians are just a phone call away to respond to any calls for help. This strategy is especially viable when money flows in consistently (e.g., monthly collections from students). The drawback is that response times are usually hours away and private administration systems usually do not have systems for monitoring which is very important for educational institutions.

Hardware solution. This strategy makes use of special PCI cards slotted into each PC (see JuztReboot). Basically it will allow the user to do virtually anything including format the entire drive, but when rebooted, it comes back to its original state. It does not get infected with virus. It comes in standalone version and network version. Its drawback is that the normal user cannot permanently save any information in the local computer although there is a workaround to it by creating a scratch disk in the server. The writer has tested one such card in a PC lab and has found it to be very stable so as not to require any maintenance except twice within about eight months when it refused to work. Each time it took the writer many hours of reformatting and reconfiguration to make it work again.

Combination of propriety software. Some lab administrators (Minnic, 1998), (Tapp, 1997), (Potter, 2000) have used a combination of propriety software (see PC-Rdist, SpyAnywhere, Symantec Ghost, Magic Folder) to build their administration system.
These software in combination does satisfy almost all the requirements of the proposed PC Lab administration system. For example, PC-Rdist is a software distribution and system maintenance program for Win 95/98/NT which keeps computers up-to-date by distributing applications, restoring damaged files, removing unwanted software and maintaining consistent settings for all the PC. The only drawback is its high cost.

Home grown software system which incorporates some elements of existing software. Home grown software systems basically uses a programming language like MS Visual Basic to manipulate the Windows registry using API calls, making use of *.ini files to push registry information (Bard, 2000), (Smiley, 1999). It also makes use of policy settings to control what users can do and cannot do (Posey, 2000). Home grown software has the advantage of being customizable exactly to institution need.

A home grown software solution is recommended for the following reasons

- Can be customized to local needs
- Source code available for others to learn and change as need changes
- Support development of local expertise
- Cheaper

PROTOTYPE

While the writer is aware of the possibility of shift from Microsoft systems to Open Source systems, currently the solution for the college will reside in both the workstations and the server using MS Win95/Win98/WinNT. The portion for the server is not complete. Thus this prototype description will focus on the client side.

Each workstation will have two partitions; C: and D: drive. Software will be installed on the C: drive. A clone of the C: drive as well as drivers and Win98(or Win95) is kept in the D: drive. At the time this study was being done we already had complete clones for each set of similar workstation. If we had to start from scratch we would have followed the advice of Minnick, 1998 of making a basic OS clone for each computer and then making copies of all software installed for various configurations

Now this image has to be prevented from being deleted; accidently or purposely. It was not feasible to keep them in the server these past few years as each image is about 1.5 GB and in

compressed mode. Thus it had to be kept locally either hidden or made undeletable by users. There is software like Magic Folder that make folders and files invisible or undeletable. Our strategy was to make the D: drive invisible by manipulating the Registry settings. It can however be viewed if booted using DOS mode. We were willing to pay for that uncertainity as this solution is free.

PCLA or PC Lab Administration system is the software which will reside on each computer. Initially it will come with the name PCLA.exe but its name can be changed to camouflage it. To keep it from being seen by prying eyes, by default it is kept deep in the C:\Program Files\Common Shared folder, but its location can be changed as Windows knows of its location through a registry setting. It is made to start automatically each time Windows starts, again through a registry setting. By making this application run as a service it is further hidden from prying eyes as it cannot be viewed through the Ctrl-Alt-Del button. This combination of techniques makes this software almost impossible to be detected by the prying eyes except for the real computer savvy person.

Since we do not have full time staff to manage the network system in the college we are unable to enforce the 'must log in to server' rule and this may prevent users from using their computers if there is a breakdown in the server. However we have come with a workaround to this problem by having three modes which a user can use the computer facilities.

- If the person does not log-in then he/she can only use the facilities that the computer provides (no Internet, no sharing of data, no network printing).
- If the user logs in with a common username (for now it is 'pelatih') then he/she is allowed to use the facilities the computer provides and sharing of data (no Internet, no network printing).
- However if the user logs with own username and password, he/she gets to use all the facilities the network and the college policies allows.

When the computer boots, PCLA does the following:

- reset all preset configuration (computer did not shut down normally)
- sends usage information to the server
- pulls information from server
- carries out new instruction from the server
- stores user information.

During computer usage, PCLA will

- record software being used
- Monitor, record and control Web sites being visited
- Stop user from using application that are disallowed

During computer shutdown, PCLA will

- Record computer usage time
- Resets all preset configuration

To handle printer accounting, it looks like it is better to install the printer accounting module in the computer to which the printer is attached to. To provide consistent service and virtually no attack by virus at the expense of dissallowing any saving of files we have used the hardware solution (see Juzt-Reboot).

CONCLUSION

A model of a PC Lab Administration System which focuses on software administration was presented. An argument was made for such a system which should have the capability to reduce Lab administrators work and thus provide a more feasible reason to provide longer lab access to trainee teachers. The suggested system is supposed to reside both in the workstation and the server to reduce competition with network traffic. Currently the workstation portion without the printer module is in its final testing. It is hoped that the complete system with the server module and the printer accounting module will be completed in the near future.

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