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An in-depth look at how SUNY Potsdam setups, deploys, and maintains their computers in the classrooms and computer labs.

Managing and maintaining computer labs and classroom computers at SUNY Potsdam is not an easy process. There are near 600 computers that need to be configured to allow individual user login, to print to multiple locations across campus, and to contain the software that students and faculty need and expect in order to do and teach their coursework. There are four main objectives that this internship focused on. The first deals with my supervisor's expectations of what needs to be accomplished by the end of the internship. The second point deals with how the Computing and Technology Services (CTS) at SUNY Potsdam manages and maintains computers within a computer lab and classroom environment. Also, explaining what I was to focus on. The Third point is my personal criticism of the internship and the way CTS manages and maintains their labs. Finally I will explain how I benefited from the internship and how I believe CTS benefited from me.

The internship supervisor's expectations was to immerse in reverse engineering of their systems, review and update existing documentation in their code, preparing flowcharts for all processes, and making recommendations for improvements or changes to existing systems/processes. At the beginning of the internship I had couple of expectations. One was to learn how a lab computer differed from a "normal" Faculty/Staff computer and secondly, to be able to understand the difference between how a lab iMac is imaged compared to a PC is imaged.

SUNY Potsdam deploys 3 types of Lab computers. The first type is a dual-boot iMac and this is the type the internship is based on. The other two types are single-boot iMacs with OS X and PCs with Windows XP. Usually if the lab is small they will have single-boot iMacs or PCs but this deployment style is considered outdated and CTS is converting all labs over to dual-boot iMacs, thus why the internship is focused on dual-boot iMacs. I documented in notes and also flowcharts the boot-up process (our customization to it) of both OS X and Windows XP. The flowchart maps from the time the computer powers on until a user is at the desktop. I concentrated more on the boot and login process of the iMac seeing that is where coding/scripting and imaging processes done. In order to properly manage, maintain, and deploy the iMacs

important software is needed. The more important type of software needed is Radmin, Deploy Studio, Deep Freeze, and Symantec Ghost. Also customized Perl, VBS, and bash code is needed. Radmin is a Remote Administration Daemon. What that means is it is a client management system that allows a user to create a specific setup on a single Mac OS X system and then be able to implement that same setup on multiple clients. It allows the user to install updates and new apps on a "Master Client" and then force the other clients to inherit the same configuration. Also, it can be set to automatically restore the other clients to a pristine state every night or whenever needed (Usually used in a college lab environment). Essentially Radmin operates as a tripwire which means that once Radmin gets the instruction (tripwire) to do its job then it detect the differences between the server and client to any managed file system objects (ie. files and directories). Once it detects a difference then it will either add the necessary missing files or it will delete any file system objects that are not suppose to be on the clients. Deep Freeze is used only on PC's in our lab/classroom environment. Deep Freeze is an application that protects core operating system and configuration files on the clients. It restores the clients back to their original configuration every time the client is rebooted. No matter what a non-administrator user does to the client machine the client will restore itself back to its original configuration. Deploy Studio images & deploy Macintosh computers and PCs, allows advanced computers reconfiguration (Macs only), full automation support, and real-time deployment monitoring. Symantec Ghost is a disk cloning program. There are a few main important custom scripts and code that are executed during the boot-up and login process. On the Mac side these customized scripts are run after iHook has been started. iHook is a graphical front-end for any command-line executable, meaning it executes (runs) the scripts. During the boot-up process of a Mac launchd, which is a service management framework for starting, stopping and managing daemons, programs and script, runs scripts from the `"/Library/LaunchAgents/"` and `"/Library/LaunchDaemons/"`. Launchd runs "property list files" (.plist). Within the LaunchAgents we focus on the `com.apple.education.bootpicker.plist` and the `management.plist` scripts. The bootpicker is a program that lets you choose which operating system to use (in our case, OS X and XP). `Management.plist` runs iHook and `startup.pl`. `Startup.pl` is one of the most important custom scripts used in the boot/login process. This script starts by checking to see if a temp "boot flag" exists. If it does then exit and go to the bootpicker screen to choose the OS. If it does not exist then we check to see if Windows Updates are underway and if it is then the computer will reboot into Windows. If it is not running then we show the XP partition. After that is done then we setup the network interfaces, date

and time, the computer name, start up ARD (Apple Remote Desktop), and run additional scripts. Then if the machine has not been updated on the same day this is being executed then it updates the machine and then we “rebuild the LaunchServices database, process our ByHost files, run any post radmind script additions and then reload the user template” (Taken from <http://digirom.potsdam.edu/wiki/doku.php?id=management>). The last thing that setup.pl does is it creates a temp folder “boot flag” so we do not run this entire process again this bootcycle and then reboots the computer. After the computer is rebooted and is now at the bookpicker process then we choose which OS we want to use. If we choose the OS X OS then the login window will appear and run the login.pl script which hides the Windows XP partition, runs script_additions, and brings the user to the desktop. When a user logs out the logout.pl is executed. This script makes the Windows XP partition visible, it runs script_additions again, and checks to see if updates need to be done. If updates need to be done then update and reboot the machine, otherwise, go back to the login screen. When a user chooses the Windows XP partition the standard boot process takes place so we will focus more on login process and the custom scripts that are needed. First when a user logs in a file is executed called login.bat which is located in “\\images\images\common\”. This .bat file runs another file to set the screen resolution of all lab/classroom computers that are connected to a projector, it deletes all mapped network drives and writes it to a log file, it maps “\\helios\%username%” to the “H:” drive and writes “\\helios\%username%” to the previous log file, it sets the date and time (pulls it from the Zeus server), and then runs “\\images\images\common\setdefaultprinter.vbs. The setdefaultprinter.vbs removes all connected printers and assigns printers to the computers based on the computer’s name. After that is done then the desktop appears for the user to use the computer. When the user logs off “\\images\images\common\logout.bat is executed. It deletes “C:\common\defaultbackground.bmp” and copies “\\images\images\common\defaultbackground.bmp” to “C:\command\defaultbackground.bmp” and then goes to the Windows XP login screen.

One question I asked myself before I started the internship is “How am I going to benefit from this internship?”. There are a few ways that I have benefited from this internship. One way I benefited is now I know more programming languages such as VBS, Pearl, and Bash. I now understand the boot process of Mac and I understand the importance of customizing software and scripts in order to adapt to the right lab environment. Being

able to experience of working in a professional environment is also a benefit. Another question of importance is “How did CTS benefit from this internship?”. I believe that they benefited from this internship by having a detailed flowchart of the boot-up and login process, having someone critique their custom code, and potentially having a student worker (myself) work during the school year in helping maintain the current system and improve on it.

One of the task of the internship is to critique the current way they they manage and deploy the labs and the custom code/script that they created. Seeing that this is my first experience in a computer lab environment there is not much I can critique. About the only thing I feel I personally can critique is the coding/scripting and documentation of the existing code. The documentation on the Mac side of things is documented well enough for someone who knows nothing about coding to understand what the code accomplishes. On the PC side of things the code/scripts are very poorly documented , if not documented at all. This could be a potential problem in the future for a new person who is trying to understand what the code is supposed to do. I suggest that in the future the scripts and code that are within the “Library/Management/” should be “cleaned-up”. What I mean by this is that any code once used but is commented out now should be either deleted or put at the bottom of the currently working code. Hopefully my insight and mapping of certain processes will help future employees understand the process of managing and deploying lab computers at SUNY Potsdam better.

Throughout my college career this internship has been one of the most challenging yet rewarding experiences. I have learned that it is really important to comment code to help others comprehend the code more easily, how reverse engineer more efficiently, and more. Being able to understand how things work “under the hood” when it comes to the bootup/login process has been an interesting experience and now every time I log into a lab computer I can’t help but think of the boot/login process and all the things necessary to configure everything properly for the user.