Context Analysis Palau Ministry of Education
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Organization:

The ministry is a branch of the government whose mission statement is educating the people of Palau. The central office is located in downtown Koror and employs around 60 people. The ministry itself is responsible for around 15 schools one public high school and an array of public primary schools. It has been in existence in its current form since the 1960s and has undergone changes as independence and constitutional changes have mandated changes in funding sources and curriculum. While their primary responsibilities are the public schools in Palau, they also have a mandate to assist the private school if it is funding allows. The ministry interacts with the Palauan senate and various foreign funding entities to fill their 6 million dollar yearly budget. Edwel who is the Administrative Services Manager is part of the management team and we're working with him to develop the IT infrastructure here at the ministry. Working for him are Warren and Tom who manage the support desk and are learning system administration skill to assist and eventually take over for Edwel upon retirement.

Facilities:

There are extensive computing facilities inside the ministry building. Including a server room with Network attached storage, a remote accesses server, several linux servers and windows domain servers. A well connected internal intranet with wired and wireless connectivity throughout the entire building, and computers for all employees round out a well connected office environment. There is a lot of money to acquire educational technology $66,000 was spent during our tenure there. The budget is fairly strictly regulated from a bureaucratic standpoint with an advanced save not overly restrictive bidding and purchase order procurement that was a product of independence as purchasing through U.S. government procurement channels ended after the Palauan independence. The location that were planned for computer lab installations are very remote in many cases and power and weather concerns have destroyed many power supplies so the quality of the wiring and power infrastructures creates additional problems. There are ISDN connections to some of the outer schools and planned ISDN to all those in feasible distance. DSL is being used for the closers schools as distances allows. 128k connection is leased from PNCC the local monopoly telco. It is dedicated to the ministry and all these schools will share it.

Programs:

The ministry maintains all of the public schools in the country. They handle transportation, facilities, supplies, staff, curriculum development, and instructional technology. All of the upper level staff principals, administrators, etc. have email and utilize it frequently as their primary means of communication. There is a plan to expand this email accesses to all students and staff. Teachers intend to use internet research to enrich existing curriculum in both high school and primary school.

Staff: The head of the ministry is the Minister of Education Mario Katosang who's appointed by the elected government. Under the minister is the Director of Education Emery Wenty who runs the day to day of the ministry. Alongside in the org chart are four chiefs that form the management team responsible for making decisions the guide the ministries activities. The Palauan senate has some control over the budget as well as the ministry of finance.

Technical Environment, Technology Management, and Technology Planning:

The technical environment is extensive, the management of it all runs through Edwel and he has a technical staff of 3 people who work with him and handle all the maintenance, management, setup of the computers. The average school has as a baseline a lab of around 1 computer for every 3 to 5 students. These computers ranged from old Power Macs as the low-end and old Imacs seems to be the midrange but some labs were stocked with machines that were ordered within the last 6 months. Aside from the high school which is on an 10MBit wireless connection most schools have dialup 33.6 accesses. The management team is responsible for the technology planning. The minister makes the final decision on the suggestion of the management team. The management develops technical solutions to the problems facing the ministry.

The Major consulting Tasks

Demonstration of low-cost multiple terminal computer labs:

The MOE in recent history has begun to realize its aims through the use of technology. By expanding education horizons it hopes to better equip its citizens to be effective members of society. Through feedback from teachers and students the MOE feels ubiquitous accesses to the Internet for all its students will be of enormous education benefit.

The approach is several-fold to achieve the aforementioned goal of great accesses to Internet resources for school, but central to this plan is creating a network infrastructure that facilitates the easy setup and management of the variety of machines already deployed. This management issue will be compounded by the addition of $100,000 in additional machines to be added of the next six months.

In the current environment there are a mix of Macs PCs, and Linux machines, the current funding allows for the addition of one hundred and sixty computers. There needs to be an infrastructure that supports the management of both the old and new machines. A purposed method of approaching the diversity of hardware as well as the physical distance between the different purposed lab instillations is the Linux Terminal Server Project which is an open source software solution to manage a cluster of machines with one server providing the application environment. This method was purposed to maximize the reuse of old machines along with exploiting the $100,000 dollar grant to allow the most number of students internet accesses from the classroom. This is also a easy method of managing the 160 new machines with 5 servers at the different installations sites.

This solution will allow us to maximize the connectivity of the labs in the school providing the most number of terminals and environments from which to accesses email

and the internet, which in turn furthers the educational goals of the school by allowing for the vast education resources of the internet to be more accessible to students.

Create new intranet with email, shared folder space, unified user logins and management:

Creating unified logins for all existing and new machines along with home folders and working environments will not only facilitate easier user management but also make the working environment across labs and machines and operating systems more uniform making classroom environments with a diversity of hardware easier for students to work in. To achieve this end we plan to use OpenLDAP to manage the logins along with SAMBA, with the same LDAP backend, to be the windows Domain Controller or PDC. This along with a NFS file server will provide a working environment that is cross platform and centralized. Both tasks will hopefully ease management woes as well as allow students to be more effective in the classroom. With the addition of all these machines it is becoming increasingly necessary to find a management technique to handle account maintenance for an ever increasing user base. The OpenLDAP/Samba solution provides a centralized database for user accounts while serving these accounts to Windows, Linux, and OS X.

Linux is a new direction for the ministry due to the fact that the majority of computers used are either Mac OS or Windows. So the MOE needed to look at the capability of its existing staff to support such a move. That was critical to assessing the possible viability of such an approach to providing connectivity. It will require the support of the technical staff in using and maintaining the system to serve all the students. It represents a new centralized approach to managing users and will allow for the expansion of capabilities the MOE can offer all students like email and file storage through unified logins. This is hand in hand with a centralized student information system that is being developed for the ministry's use in the upcoming school year; both are ideologically similar in that we want to have a central database that holds information including logins and files for each user.

Feasibility:

10 weeks is more then enough time to setup the system. The question is can it be setup in a way that it is simple enough to manage and replicate upon server failure. That will be the challenge we as a technical team (me, Edwel, and Warren) attempt to solve . We will attempt to find disk cloning or auto setup scripts to make replicating the server easy. Also imparting the skill necessary to debug the setup will take an indeterminate amount of time; it is really depending on the rest of the staff's existing knowledge which seems extensive from first examination.

Among Edwel's staff there is a great amount of experience from experimentation and they setup a K12-Linux Terminal Server Project cluster independently before I showed up. It is clear they have the ability to manage at least that element. Those Linux skills should transfer well to the other aspects of this unified login model. The risks are that the management ease that was supposed to come from this setup will actually be more difficult to manage because of the increased technical complexity of the setup. And

also the complexity of setup will not allow for repair and sustainability after I leave. I will endeavor assess that the staff here is comfortable with the setup so they understand how the different software element interact so they can replicate the setup if necessary.

Consulting Outcomes

1. Demonstration of low-cost multiple terminal computer labs:

None of the hardware for the real installations arrived during my time with the ministry; however a working demo was setup on surrogate machines to demonstrate that setup. To ease installation and repair a network boot/network install scheme was setup using a new DHCP server and NFS stored installations files. This setup allows one to place a machine on the network boot it off the network and automatically install the custom Linux terminal server setup I developed. The technology that allows for this is a combination of the dhcpd daemon with a tftp sever and Redhat's kickstart/anaconda installer.

2.Create new intranet with email, shared folder space, unified user logins and management:

A working imap/smtp mail server was created and deployed replacing the existing apple x-severs. A dialup machine was created allowing for remote dialup access for schools and principals replacing the existing unreliable Windows 2000 dialup server. Home folders were created and stored on an NFS server to serve all the machines on the MOE's network. All of these servers authenticate through OpenLDAP which runs alongside SAMBA allowing for windows users to login and authenticate through the use of a Windows Domain Controller and the LDAP database provides the backend for the mail and dialup authentication as well as the home folder permissions. The aforementioned Redhat kickstart technique allows for the quick replication of the mail server as well as the dialup machine and home folders. Backup was setup through scripted cron jobs which utilized rsync to keep hourly snapshots of all the important files on a separate NFS mounted network storage device.

The Full setup was deployed three weeks before I left and ran smoothly to my knowledge and continues to do so. The old mail server was taken off line and the new one transitioned in its place with only a couple hours of downtime. The dialup machine has been working for over four weeks with an average load of three users at any one time with as many as seven connected simultaneously. The LDAP server has been under constant testing with it being the method of authentication for the mail server which has been in constant use since its transition. As signs of sustainability knowledge about how to setup a server using the kickstart method was imparted to the staff through a workshop given by Edwel and myself, we had five additional staff go through the processes of setup and reinstallation of all the different servers using the kickstart file. We also gave a general set of UNIX/Linux tutorials and tests which showed proficiency within the UNIX environment. Confort and knowledge has grown over the 2 weeks of training.

Recommendations

Most central and important to making the current solution last is increasing the technical staff's comfort and familiarity with the Linux environment. As a first step ensuring that they can utilize the command line tools to complete their old duties

(password/account maintenance) this will be a major first step to truly making this setup one that is maintainable by all the staff not simply a select subset of the technicians. By continuing the classes that we began on Linux skills and moving more of the tasks and solutions to Linux, for example personal workstations, kiosks, etc. Comfort and desire to use and learn more about the current implementation of things like the mail server dialup machine will increase. By ensuring that there are a large number of people who understand the current setup it will be much more invulnerable to staff retirement or job change.