



K12 Open Technologies Implementation Study #1
Enterprise Level Open Source
Saugus Union School District - Jim Klein

Overview

The prospect of converting of the Network Operating System for an entire school district is enough to make most technology directors cringe. Make this a shift from an established proprietary system to blend of Open Source solutions and you have a real formula for fear. Jim Klein at Saugus Union School District took up the challenge and showed that with concerted research, testing and planning the process does not have to be onerous. The rewards for this effort were improved performance, easier administration, cost savings and the nascent change of the whole district into an “open community”. This implementation study provides the details of how Klein and his staff planned, designed and implemented open source enterprise software across the district.

Background

Demographics: The Saugus Union School District is located in Santa Clarita Valley in Northern Los Angeles County. Currently there are approximately 11,000 students attending school at its fifteen K-6 campuses. The district is rapidly growing and anticipates adding two new campuses within the next five (5) years. Their technology vision is “To select and use technology to support the achievement of the instructional goals of the District, and to support the preparation of students to live and work in the 21st century.”

Requirements: Saugus’ requirements for an enterprise Network Operating System (NOS) is shared by most IT departments; standardization, security, performance, reliability, manageability and suitability to the task. In addition, the K12 school technology environment is especially complex and heterogeneous. The IT group at Saugus must manage 800 staff accounts in addition to 11,000 student accounts and provide authentication through LDAP and authorization to 50-60 programs, some of which need to exchange data with each other. The Saugus technology department included two network engineers and two support staff led by Jim Klein.

The trigger: The district had adopted a Novell solution eight years earlier and they have continued to upgrade and stay current with Novell releases. They were concerned that education industry support for Novell NOS was not going to last. Already some of their key applications such as the Follet library automation system were not being updated for Novell. They had been monitoring developments with Microsoft and had seriously considered Apple's Mac OS X server in the fall of 2003 as a possible migration option. When Novell acquired SuSE in January 2004 it announced that it would be moving all its

services to Linux. With a major technology company throwing its weight behind Linux as an enterprise server platform they felt it was time to give Linux careful consideration.

Success: In summer 2004 they had migrated servers at 14 school sites to Linux and by December 2004 they completed migration of the District Office.

Implementation

Initial Research and Evaluation

They began by investigating various distributions of Linux while considering bundled applications and services, training options, documentation and support. A distribution is essentially a version of Linux (such as Red Hat Enterprise or Red Hat Fedora the desktop version, SuSe from Novell, Debian, Mandrake, Xandros etc) that is often bundled with several other open source products. For Saugus, SuSE from Novell and RedHat Enterprise were the main contenders. They found volumes of books and articles available about RedHat but could find no books about SuSE Linux. They attended Novell's Brainshare conference and talked to everyone they could including hardware vendors. After a trial installation, comparison of the interfaces, and review of functionality they decided to go with Red Hat Linux Enterprise for servers and Fedora for desktops.

The Learning Curve

Saugus IT group dove right in with a bootstrap approach; they learned by doing. They installed RedHat Fedora on all their laptops and began to find open source solutions for each of their everyday tasks. Their needs included many features such as multimedia, conferencing, instant messaging, and email that would not be needed on a network server. As they got their personal computers working the way they needed they gained confidence in their ability to configure and provision both servers and desktops. Some of their existing applications such as GroupWise and Follett library automation software were already available on Linux. Most of the other applications they needed were found on the distribution disc. They had to locate and test a filesharing and printing utility for Mac (Netatalk <http://netatalk.sourceforge.net/>) which wasn't on the distribution disc.

They quickly accumulated a library of books and other documentation. Online resources such as the Linux Documentation Project (<http://www.tldp.org>) provided How-tos, guides, FAQs etc. They used Google to locate information about each application/project they explored sometimes posting to the discussion boards such as linuxquestions.org. There were lots of sources for free advice. After playing around with the software for a month they signed up for a "boot-camp" style training. Being already familiar with the software and having questions in mind allowed them to get the most out of the training investment. Initially they envisioned using Linux support a few specific services. As their research and due diligence continued they began to see that they could use Linux for everything.

The tech group knew that they had to learn to be efficient in their install process. Fortunately Red Hat provides a "Kickstart" scripting program that automates the install and configuration process. Basically you build one server the way you want it and

Kickstart records the settings so it can perform an identical install on other machines. To gain expertise with the scaling the installation they practiced on a 30 laptops on a wireless cart. Using a flash drive with the Kickstart program and the RedHat install CD they developed a quick and efficient installation procedure.

By late spring a plan was emerging for moving completely to open source. They had identified and tested all the core applications they needed and had a streamline install process. Here is a before and after look at their services architecture.

Service	Old Solution	Open Source Solution
Directory Services	Novell Directory Services	OpenLDAP
Windows File & Print	Novell Netware 6.x	Samba
Macintosh File and Print	Novell Netware 6.x	Netatalk
Web Server	Apache or Netware Enterprise	Apache
Email Server	Novell Groupwise 6.5	Novell Groupwise 6.5
DNS/DHCP Servers	Novell	BIND9 and dhcpd
Web Proxy Server	Novell Border Manager	Squid
Backup	Veritas Backup Exec	Bacula

They decided how the required programs would be allocated to the hardware that was installed in each site. Each of their schools had two servers that were 5 to 8 years old to which they were add a third new server. Varying hardware was fine since Linux runs fine on a wide variety of computers. By grouping servers with standard configurations they were able to speed up the configuration process and reduce the management complexity. The school servers were configured as follows:

Server 1	DHCP, Router, NAT, Web Proxy
Server 2	Email, Library Automation, Web server, Local DNS
Server 3	File/Print, Directory Services, Backup

Communication Strategy

Early in the process Jim Klein recognized the need to get “buy in” for open source at all levels. Even though the impacts on the average user would be small if not imperceptible he wanted to be sure that everybody supported the change. After getting all the answers he presented his plan to the school board during a 90 minute meeting. Once they learned exactly what Open Source meant and heard the benefits there was full support. He distributed copies a collection of 20 open source desktop applications on the OpenCD (<http://www.theopencd.org/>) to faculty and staff. This demystified open source and helped recruit advocates who could testify to the quality and usefulness of this approach. Klein also took advantage of the district website to communicate plans to the community with informational articles explaining open source and open technologies in general.

Rollout process

After rehearsing, testing and revising their installation process the tech group felt they were ready for prime time. They began a sequence of installations beginning with non-essential, edge servers and then working their way to the core. Starting with a single low power web server, they added services such proxy and DHCP servers. They practiced logging in as each user, restoring data to home folders and tested various services for functionality.

In the summer of 2004 they did a full migration of 14 school sites and 42 servers over a period of six weeks. Multiple tape backups of servers were made as well as a backup to FireWire drives on a Macintosh. First they installed and configured one complete site and copied their configuration files so they could script the remaining installations. They removed the old Novell software and joined the new Windows domains using the Samba Servers for three thousand Windows machines in school classrooms. They updated aliases etc on 1000 Macs. Later in the fall they completed the conversion of the core district servers to Linux. That leaves only a few Windows servers that are running legacy database applications which are not Linux ready.

Many of the 800 staff users knew that the district has shifted to Linux but the results were transparent to them. When the district office staff returned to begin their school year they were given new passwords because they were using a different authentication system. Windows users saw what appeared to be Windows servers and the Macs saw Apple servers. There was no need for dedicated staff training for Linux or any of the Open Source products. OpenOffice interface is so similar to Word that users can master the basic functionality in 5-10 minutes. The only recurring tech support issue is answering questions about file format for saving from the OpenOffice word processor. They configured OpenOffice to automatically save in MSWord format by default. In the future they hope to see an Open Document format or Open XML format that will be completely support by OpenOffice and Microsoft.

One notable glitch surfaced when the office staff came back to school and launched their Macs only to find that they were unable to save word documents. This turned out to be due to a bug in the old “stable” version of Netatalk. Thanks to the remote install capabilities they were able to load the new beta version 2 of Netatalk and push the installation down to their users. The problem was solved within 4 hours.

Next Steps

Maintenance

The school site servers and central district servers are registered with the RedHat Network which provides them the status of all their machines, what patches are needed, and the ability to schedule automated, district-wide updates. Installations and upgrades to other applications can be performed by opening machine remotely through Linux. Student Linux desktops update themselves automatically using Cron scripts which check a home server for updates and then automatically download and installs them. They use an open source VNC program.

Expansion

Linux compatibility is fast becoming another requisite for educational providers. Klein and his staff working with vendors to encourage them to make sure their programs runs on Linux. They worked out a way to run java based Quartermile Math on a Linux box and then, in the spirit of “openness”, sent the how-to information to the vendor. Currently they’re working on installing the Scholastic Reading Counts enterprise on their Linux server. Although it had been written for Windows networks is uses JBoss with a MySQL backend. These enabling applications also run on Linux.

Virtualization

They are in the process of virtualizing the district data center by consolidating several poorly utilized servers into a series of blade servers. Running five or six virtual machines using the Open Source program XEN will allow them to quickly increase capacity and shift their server resources where they are need. They can add blades servers at any time without service interruption or additional installations.

Linux on Student Desktop

Saugus plans to continue to gradually add Linux student workstations (currently there are only about 50) though there is not a compelling reason to shift to Linux for new purchases. The bundled OS and low cost student licenses for proprietary office programs are hard to compete with. They will use Linux to help extend the life of computers as their original operating systems cease to be supported. They also plan to set up a complete computer lab with Linux machines installed on older machines using the Linux Terminal Server Project (LTSP). Any aging machine in the district will have the options of retirement or conversion to Linux.

Building an Open District

Every new teacher is given a copy of the OpenCD at the beginning of the school year with encouragement to freely duplicate it for students to take home. All new machines are automatically configured with the OpenOffice suite. The staff and students continue to join in the “Open Community” of content development, sharing and locating low cost resources that meet their needs. Klein has launched a new collaboration environment using open source ELGG solution which is called “Teacher Community”. This provides a kind of “MySpace” for teachers. It’s a place for Saugus teachers to exchange ideas, and share the open content and instructional materials they are creating. The system allows teachers can control who sees what and establish mini-communities to work on projects together.

Learning Management

Klein would like to experiment with Moodle as a Learning Content Management System but he is proceeding cautiously. He is frustrated with a lack of standards and doesn’t want his staff wasting time or being frustrated by developing content on systems that might end up going away.

Benefits

- Administration: The remote desktop administration features of Linux are a boon to technical support. They are solving 30% of tech support issues within a day. Klein says “*We have been thrilled with the dramatic increase in performance, reliability, and fault tolerance of the cluster over the original Win2K version*”

(which required a reboot every other month or so to keep alive.) Not a minute of downtime since we completed the move. Perhaps more importantly, we have found that we now have a good deal more time for other projects, as the time required for district-wide systems maintenance has been reduced.”

- Customizability: They were able to modify their idealx-smbldap perl scripts for editing Samba accounts on the LDAP directory. With reasonable programming experience they added additional attributes to the perl scripts such as user first name and title. This allowed their system to exchange information with other web applications they were using.
- Time savings: They report improved manageability and flexibility of the servers and the ability to modify solutions for their needs. For example they are able to install software even if it has a custom GUI installer remotely, saving a tremendous amount of time. They have a single server management and configuration tool which has simplified their workflow.
- Cost savings: They have saved \$54,000 per year in recurring licensing costs for their Novell operating system. In addition using OpenOffice and other open source software for the desktop they estimate saving anywhere between \$50 and \$200 per desktop workstation deployed to end users. The open source approach allows them to move into new solution such as virtual servers which might have been cost prohibitive otherwise.
- Open applications: Classroom Technology specialist Arlene Anderson reports that spirit of the “Open Community” is beginning to catch on. While most teachers are reluctant to give up their favorite proprietary office applications they do see the advantage for students to be able open the same documents at home using a standard document format. Several teachers are beginning to make use of the Teachers Community posting and sharing lesson plans and resources for each other. A 6th grade teacher prepared a Lesson plan on “The Family of Zeus” and shared it with peers around the district. A science teacher uses Audacity from the OpenCD to record podcasts of class review material. These are stored on the teacher site and then linked to for student access from the class Blog site. Some teachers are experimenting with Class BlogMeister from Davie Warlick. Anderson is preparing regular podcasts for staff training on Internet Safety and I-safe program.

Summary and Lessons Learned

The entire conversion process at Saugus really went very smoothly. To be sure, the summer was extremely busy as they needed to touch every workstation and server if only to install the scripts. They succeeded because of conscientious research and planning, by building staff capacity through early experimenting and problem solving, defining a uniform server configurations, and time-saving install scripting. When asked what he would do differently Klein said he “would not be so cautious next time”. He would try the newest beta releases of software such as Netatalk, instead of sticking with the older “stable” versions.

Through the process of due diligence and research Klein and the IT group discovered that Open Source is ready for prime time. Every time they looked for an open source alternative they found one. Most projects provided adequate documentation and often had a supportive user group with helpful information. The Saugus success story is not so much a tale of innovation as it is one of discovery and integration of existing applications made by the open source community. Hopefully as Klein shares the details of the Saugus effort through his website and various professional meetings it will make it that much easier for other CTOs to implement enterprise open source.