

Linux-Based Public Workstations: Issues and Application

Perry Horner

Fletcher Library

Arizona State University at the West campus

p_horner@asu.edu

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Introduction

Deciding to deploy Linux in your library is a bold decision. Using business terminology, you are implementing a disruptive technology in the library marketplace. Disruptive technologies are vital for innovation and advancement. To be successful, you must know when is the right time to introduce that technology in order to gain competitive advantage. If you currently are using Microsoft Windows, you might notice that Microsoft introduced its disruptive technology with Windows 95. Since then it has been extending its product lifecycle ever since. With such a long lifecycle, the operating system has matured to a point where it is now falling slowly down the bell curve. Apple introduced its disruptive technology through OS X. Apple scrapped its old architecture and created a new platform for its future. For libraries, introducing Linux in your environment puts you on the forefront of the product bell curve upswing. As with any first implementation of something new, it will be a bumpy ride. But as it matures, and your organization exploits it, you will have positioned yourself as an early adopter with all its rewards. This article addresses factors that should be included in your library's Linux decision making process. Through diligent research and forecasting, you should be able to identify if Linux has a place in your library's technology roadmap.

Identifying Linux as a Strategic Fit

Strategic Fit is a business term used to describe a company's ability to transfer skills and expertise from one business to another and the ability to combine related activities to reduce cost. The types of strategic fit are market, management, and operation. For Linux to be a strategic fit in your organization it must exist harmoniously in all three types. The outcome of a strategic fit using Linux should be an added value in the form of metrics for cost, service, flexibility, ease of maintenance, and user satisfaction. It should validate the formula $1+1=3$. To determine if Linux is a strategic fit in your organization, you should identify current and future objectives, needs, and goals relating to your computing architecture, services, and budget. After these objectives have been identified, you need to determine whether your current operation or a Linux operation will satisfy the objectives. The results of this exercise should help you in identifying which operating system not only satisfies the objective, but also provides additional value.

Metrics for Linux

The viability for Linux in your organization can be aided by identifying how Linux affects various metrics. The following briefly identifies each metric and how Linux can be related.

Cost

Linux is an operating system published under the GNU GPL (General Public License) and by the stipulations set within the GPL, it is a free operating system. Most institutions acquire Linux through a "distribution" on CDROM or downloaded from the Internet. Distributions contain not only the operating system, but also a suite of applications and software tools to round out a

complete system. Some distributions are from companies who charge for their distribution. Usually these companies supply a packaged disc set which includes paper versions of documentation and technical support. The advantage to using a commercial distribution usually comes in the form of support. This support comes in the forms of online help and downloads, telephone support, third party publications, and subscription services. These distributions have already passed quality assurance and stability tests and therefore they are a good value. On the other hand, some distributions are wholly developed by contributors and tested by end users. Some may even have third party documentation. Unlike the commercial distributions, these tend to be tailored for a specific user or service in mind. These distributions are typically free and only available via download.

The operating system is not the only component to the cost metric. Cost is also reflected in equipment. Linux can accommodate a multitude of hardware types. There are versions for Intel, AMD, Cyrix, Transmeta, and Via x86 CPUs. There are versions for Sun Workstation, Apple Macintosh, DEC Alpha, IBM PC4 and PC5, IBM mainframes and minis, HP PDAs, Motorola celphones, Amigas, and more. Support for add-on hardware is extensive. By and large, Linux should run on just about any system you put it on. All it takes is getting the right distribution for the hardware. This means that your current systems should accommodate Linux without any additional cost for equipment.

Staffing costs are a bit tricky. Your current staff, if they are well adapted technologists who welcome change on a moment's notice, should be able to become experts in Linux in a relatively short timeframe. If your staff are entrenched in your current operating system and resist change, the staffing costs may rise. A rise in staff costs may come from the short term investment in Linux training, the need to hire additional support staff, or the increase in salary to justify the demand for highly technical expertise from existing staff. Commercial operating systems hide a lot of the inner workings of their OS from the end user and technical support staff. Linux is wide open. If you want to customize something, you can. Although, the staff performing the customization truly need to be experts to make it happen. An almost guarantee that a person knows the ins and outs of Linux in a production environment is to get them certified. A certified Linux engineer had to pass a rigorous real-world lab test covering the spectrum of Linux, administration, and troubleshooting. Typically a certified Linux engineer will have the knowledge and skill to tackle just about any Linux issue. If they cannot perform on their own, they know where to get the information necessary to succeed with the task.

Service

Services can be applications or interfaces that provide a user with a result. Linux, and 99% of the applications that run on Linux, usually provide access to the source code for the application or interface. The term for this type of application is "open source", meaning the source code can be modified and used with little or no restriction. Through modifications and additions to the code, one can change the function, behavior, and results of the application. This ability allows an organization to customize a service to best meet the needs of their customer.

Flexibility

Linux is very flexible in its ability to adapt to custom environments. Gone are the days of saying “we can’t do that, it is not possible.” With applicable talent and time, virtually any solution can be created or adapted for Linux. If a library wants to have a hovering clock on a user’s desktop which is set to flash when the user’s allotted time is about to expire- it can be done. If you want a librarian to remotely connect to the user’s desktop, converse in a two-way chat, and demonstrate a search for the user- it can be done. If there is a Microsoft Windows-only application that absolutely has to be available for the user- it most likely can. Again, the key is knowledge and the application of that knowledge by resourceful staff. More often than not, open source projects are created because of a specific need. When a solution is created, it is shared for others to use. Through this community of sharing, an application matures and finds its home in many places the original developers never thought of. This is a core competency of Linux and open source software.

Ease of Maintenance

Linux makes use of extensive logging services which aid in diagnosing problems. Most system services and many applications allow you to set the level of logging from general to granular. This makes it fairly easy to identify what circumstances and actions occurred to cause the problem, thereby focusing resolution efforts around a specific area. Linux is also very stable, thus, there should never be a reason to reboot Linux less a hardware failure. Unless you are updating the Linux kernel, installing applications and services do not require a reboot. Servers can be turned on and off by a simple command and applications can be terminated without harm to other applications or Linux. Systems administrators can push applications and changes to a client station through a network connection and perform any necessary tasks either through automation or manual intervention. The end user does not need to restart their station or close out of any application. An application that is built for one version of Linux can be recompiled for another version of Linux with just a few simple commands. Portability and flexibility are key elements in the success of Linux. Some automated tools such as Yum, Yast, Red Carpet, apt, and Redhat Update allow trouble-free updating and installation of Linux applications and resources. These behave similar to the Microsoft Update but do not require you to reboot the workstation or server.

User Satisfaction

Measuring user satisfaction is discipline in itself. There are many instruments and methods that can be used to gather useful information from customers. When measuring satisfaction in a Linux environment, try to stay clear of questions referencing Linux or branding. Keep questions relevant to the results of a service, the ease of use of applications, desktop elements, the login process, etc. Users generally are satisfied when they get the results they expected. Formulate your questions to quantify quality-related responses.

Knowledge and Resources for Success

Once you have determined that Linux is a strategic fit for your organization, you still have to identify the resources to make it happen. Unless your technical staff already have Linux or Unix experience, there will be a steep learning curve. A first step would be to purchase or download a Linux distribution that is designed for your hardware architecture. You should also acquire some reference and how-to books on Linux. Each of your staff many have a different learning style,

keep this in mind when planning your training. There are many resources for learning Linux- online tutorials, books, videos, and courses. Some are better than others so do some research in selecting what will work for you. Investigate what serial publications are available for Linux and subscribe to them. Linux Journal, Linux Magazine, Linux Format, and Sys Admin are excellent resources for users, administrators, and developers alike. With the necessary knowledge, aptitude, skills, and a discipline to document, your project has a great chance for success.

The Linux Desktop

A quick way to get your staff acquainted with Linux is to immerse them feet first into using it. In library settings, most staff find that they learn best when they are faced with the experience in a real-world environment. If you have your staff remove their old operating system from their desktop and replace it with Linux, and then give them a couple of weeks to acclimate themselves into using Linux for their daily desktop work, you may find them discovering a wealth of utilities and applications for Linux that allows them to remain productive.

Linux Servers

By introducing Linux on the desktop first, delving into what goes on behind the desktop becomes much easier. Most major Linux distributions come with a large array of server services- LDAP, Kerberos, HTTPd, FTP, SSH, etc. Almost every server application has at least one published book on its use. Microsoft Windows administrators may find themselves uncomfortable with having to perform tasks using a command line interface. This should be expected. Given some time, they may find this environment much more appealing and useful for server administration. Linux provides a wealth of knowledge, help, and examples in its online documentation. This documentation can be viewed in not only the graphical desktop environment, but also the command line terminal environment. It can be considered your systems administrator's friendly and reliable crutch.

Linux Community

Other Linux users are an excellent resource for information and help. There are many online discussion groups, forums, list-servs, and portals devoted to Linux user support. Repositories of Linux open source projects, such as SourceForge, exist with thousands of applications available for you to download, customize, and use. A great source, if it is available, is your local Linux user group. You might even want to form your own if one does not exist. Participation in a support group also helps in advertising your institution and its technology interests. In general, you will find the Linux community a very responsive and applicable resource for support.

Implications with Users and Library Staff

All other metrics aside, at the end of the day, user satisfaction is your litmus test. Using a structured usability test on your Linux product can provide you with constructive responses which can aid in mitigating dissatisfaction. Remember, Linux is mostly foreign to the average computer user. Your product should provide a user experience that contributes to individual education and research goals. Through interface design, process control, and application offerings, a satisfactory level can be obtained.

Interface Design

Linux itself does not provide you with any interface beyond a command line terminal window. Graphical desktop interfaces for applications to exist in are called “desktop managers.” There are more than a couple handfuls of desktop managers. Two of the most popular are KDE and Gnome. Both offer a familiar look and feel similar to Windows and Mac OS. They are full featured and Linux applications can be written to specifically take advantage of them. You must decide which would provide the best framework for your environment. Both offer thematic solutions for overall layout and eye candy and provide application tools to aid you in customizing the desktop. The placement of icons, background screens, color schemes, etc. all play a role in conditioning the user. The formatting of currency, whether you want to single click or double click with the mouse, allow hover-over to steal focus, etc. you have the capability to make it happen. Unlike Windows, and to some respect Mac OS X, you have complete control over every tiny aspect of the desktop interface. Not only can you customize the visible components, but also the underlying desktop engine. For public workstations, labs, and other controlled environments, this capability makes Linux shine.

Process Control

Process control governs the whole user experience. From the time the user notices the workstation, to the time the user leaves the workstation, the means and methods in between can be described with processes. Do you want your users to be attracted to the workstation? If so, you may want an inviting screen display. If you prompt a user to logon to a workstation, what instructions do you want to convey to complete the action? How should a user start an application? How does a user log out? These are all process questions which identify what actions you need to take in your development of a successful Linux workstation. Linux, its desktop, and applications, can all be modified to meet your specific needs. Linux does not force you into a “one shoe fits all” or “take it or leave it” state. You have the freedom and flexibility to make your workstations unique to your environment. You may wish to create a focus group and present them with a blank slate. Start with having them describe a scene where they enter a library they have never seen and look at a computer screen. What would they see? Take it further by asking how they would identify themselves to the workstation- username/password, smart card, biometrics scan, etc. Present them with questions about applications, tools, storage and printing needs, and services. Finally, ask them how they feel when they have left their imaginary workstation. Their response should be your goal. How you guide them towards that goal is all in process.

Application Offerings

What users and librarians are most concerned with are applications that provide desired results. Unlike Windows and Mac OS, not many commercial applications are available for Linux yet. Open source equivalent applications have been developed to fill this void. A few solutions exist for circumstances which require the use of a non-Linux application. WINE is an open source reverse engineered Microsoft Windows application layer which allows you to run many Windows applications within the native Linux environment. CodeWeavers produces a commercial product called CrossOver Office which extends WINE to provide the ability to run the most popular Windows applications and Web browser plugins. VMWare has a commercial product which creates a virtual Windows machine running on top of Linux. To aid in finding a

solution for your Linux environment, matrix in *Table 1* provides solutions for the most popular desktop application requirements.

Table 1.

	Purpose	Windows	Linux	Notes
Spreadsheet	Viewing and calculating data	Microsoft Excel	OpenOffice Spreadsheet or Microsoft Excel using CrossOver Office	Both read and write to MS Office XP format OpenOffice can save as a PDF or OASIS XML format also.
Word Processing	Users can view, modify, print, and save documents for later use	Microsoft Word	OpenOffice Writer or Microsoft Word using CrossOver Office	Both read and write to MS Office XP format OpenOffice can save as a PDF or OASIS XML format also.
Presentation	Users can view and print presentations	Microsoft PowerPoint	OpenOffice Presenter or Microsoft PowerPoint using CrossOver Office	Both read and write to MS Office XP format OpenOffice can save as a PDF or OASIS XML format also
PDF Viewer	Viewing and printing PDF encoded documents	Adobe Acrobat	Adobe Acrobat, Kpdf, Kghostscript, xpdf, GPdf, ggv	Adobe provides the purest form of PDF viewing, although the Linux version does not integrate well with the desktop environment. KPDF does integrate well and looks promising. XPDF is fast but uses a minimalist interface that is not very user-friendly.

Table 1. continued

	Purpose	Windows	Linux	Notes
Ability to emulate Internet Explorer	Some sites require IE only	Native	Firefox/Mozilla using User Agent Switcher extension	User agent switching tells the remote server the browser is of a particular type
Audio/video capability – Flash,, Shockwave, Real, Quicktime, ebrary, Djvu, etc.	Need to view and interact with various Web delivered content and multimedia	All available native	Some available native or all available using CrossOver Office	If there is not a native Linux version of the application, the use of CrossOver can allow the Windows application to run on Linux

With applications, a best practice to follow is if the application exists for Linux, use the Linux version. While CrossOver and WINE do a fairly decent job at running Windows applications, they are not foolproof. Applications designed for Linux will perform faster and integrate better into the underlying Linux architecture. Extremely cost-conscious libraries may want to explore OpenOffice as an alternative to Microsoft Office applications. If you library does not require production software, the Microsoft viewer applications can be implemented using WINE or CrossOver with little effort.

Specialized Linux Environments

Because of the flexibility of Linux, there are many ways in which to provide Linux on a desktop. Linux terminal servers can be used to provide server-based sessions to workstations. The Linux Terminal Server Project (LTSP) offers a graphical desktop environment with full application suites to diskless workstations. Live CD versions of Linux exist on a bootable CDROM disc. There is no need for a hard drive with a Live CD. The operating system and applications exist on the CD and only require RAM memory on the workstation. Network image booted Linux workstations boot from the network, download the disk image, and makes it available. The Evolution 3 hybrid solution uses diskless workstations with a 2GB RAMdisk. The workstation is network booted and the image is downloaded completely into RAM- no hard drive, no Live CD, no terminal server. Again, Linux can adapt to your unique computing needs.

Conclusion

Hopefully this article has provided you with a springboard for questions and discussion around the possibility for Linux existing in your library. Using and developing for Linux can be a rewarding and fulfilling experience. It enables freedom in application design and development, operating system behavior, presentation design, and removes the umbilical cord to a commercial operating system's company product roadmap. When leading multi-million dollar technology companies convert their operations to Linux, as with IBM, Oracle, Akamai, Amazon, Etrade, and major retailers convert their operations, as with Just Sports, Burlington Coat Factory, Toyota Motor Sales, Sherwin-Williams, and major financial institutions rely on Linux, as with NASDAQ, Morgan Stanley, Citigroup, and Merrill Lynch- their million dollar feasibility

analysis reports must have told them that Linux was a strategic fit. With commercial adoption of Linux accelerating at a phenomenal rate, Linux friendly offerings by library vendors, and the computer industry at large, is just around the corner. Is your organization ready?

Links

Evolution 3: wlibinfo.westlib.asu.edu/projects/past/2002/e3/e3main.htm

Linux Terminal Server Project: www.ltsp.org

SourceForge: www.sourceforge.net