Replacing Existing Computer Operating Environment with a Cost Effective One

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ABSTRACT

Sri Lanka's involvement in information technology (IT) has been rapidly increased over the resent years.This has driven Sri Lankan organizations more towards computerized enviornments. However, regulatory laws and intelectual rights are still being established in the country. Now the situation is changed and many large organizations are introducing legal requirements in to Sri Lankan IT industry. This will have an effect in many small and medium businesses which cannot afford high prices for software. Free and Open Source Software (FOSS) is the best solution in this regards.

This research was done in a reputed company related to mid range computer industry. The main problem considered in this research was to find a solution to reduce the cost of buying licensed software. It was designed to figure out problems in current computer operating systems environment and suggest a cost effective solution. This research recomends to find an open source operating system and software to replace the current system to the company of intrest.

The research design has two major parts. First, the survey stage which helped to identify the problems users face when using the current system. Secondly, an experimental stage which to identify the best open source solution to replace the current system. Then the alternative solutions were identified and most suitable was selected with rationale.

Many research opportunities are available combined with open source systems. Some of such useful systems for the organization is highlighted here.

KEYWORDS: Operating Systems, Open Source Software, FOSS, Linux, Licensed Software

INTRODUCTION

The organization of interest in this research was a mid range solution provider of both software and hardware. Most of their PCs were operated on an unlicensed popular commercial operating system. This problem was identified by the manager who was an engineer, but couldnot find an alternative. The company has a good reputation; The fact that they are using unlicensed software was exposed, the reputation of the company will be harmed. Since, this is a hardware and software vender company, it would be very harmful for company's future deals.

Further more, it was obvious that, lot of computers were returned to repairs center due to software crashes So, this had directly affected the whole business processes of the company. After observing all these problems, an open source solution seemed to be the appropriate solution for this organization.

The organization was ready to accept a solution to replace current software which operated smoothly without a big budget need. This wasnot easy because there are some software packages which are needed to be configured in Open Source Environment. If any alternatives for such software packages were not Found, the project would be useless. Also the cost to implement should be minimum. And the system should work in a network environment, and should access network resources. The system should be user friendly and easy to use. While reducing the crashing of PCs. The system should be secured and file sharing is essential. It should facilitate access to AS400 Servers through IBM client access program.

This research would benefits the organization in many ways. Nowadays business processes depend more on computers and software. Problems in computer system such as viruses can reduce performance can effect the organizations business processes. If a back door trogan get in to the system, it could send valuable business information outside. So, to find out alternatives to avoid situations would benefit the organization long term. The cost of the licensing existing software could cost hundreds and thousands of dollars. This research reviles whether that is worth or can there be a more cost effective way to the problem. The final stage of this research is experimental aspect and finds a better open source solution. Big names in the computer industry steps up to support open source revolution and more technologies are quickly evolving . So the organization can also benefit from moving to a new trend.

RELATED LITERATURE

Free and Open Source Software

Free and open source software, also known as F/OSS, FOSS, or FLOSS (for *Free/Libre/Open Source Software*) is software which is liberally licensed to grant the right of users to study, change, and improve its design through the availability of its source code. This approach has gained both momentum and acceptance as the potential benefits have been

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increasingly recognized by both individuals and corporate players.[1]

Free software licenses and Open-source licenses are used by many software packages. The licenses have important differences, which mirror the differences in the ways the two kinds of software can be used and distributed and reflect differences in the philosophy behind the two.[1]

Linux is a popular open source operating system. Therefore, its stable and good implementation many open source operating systems use Linux Kernel as the core.[1]

Introduction to the Linux kernel

The linux kernel is a well designed stable open source kernel which is used in many operating systems.

As shown on figure 1 top is the user, or application, space. This is where the user applications are executed. Below the user space is the kernel space. Here, the Linux kernel exists.[2]

There is also the GNU C Library (glibc). This provides the system call interface that connects to the kernel and provides the mechanism to transition between the user-space application and the kernel. This is important because the kernel and user application occupy different protected address spaces. And while each user-space process occupies its own virtual address space, the kernel occupies a single address space.[2]

The Linux kernel can be further divided into three gross levels. At the top is the system call interface, which implements the basic functions such as read and write. Below the system call interface is the kernel code, which can be more accurately defined as the architecture-independent kernel code. This code is common to all of the processor architectures supported by Linux. Below this is the architecture-dependent code, which forms what is more commonly called a BSP (Board Support Package). This code serves as the processor and platform-specific code for the given architecture.[2]

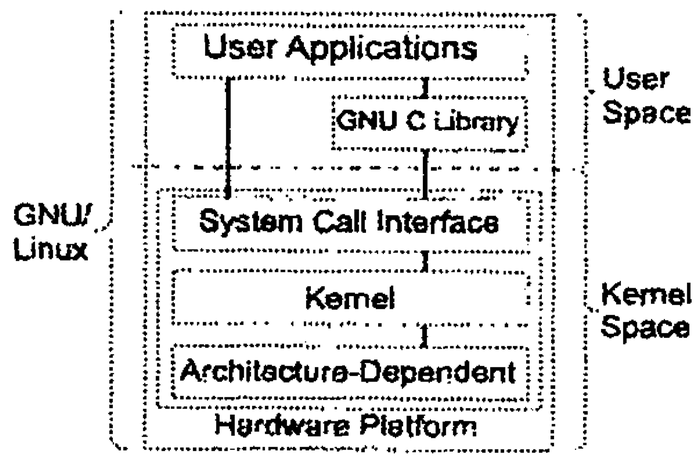

Figure1. The fundamental architecture of the GNU/Linux operating system

When discussing architecture of a large and complex system, you can view the system from many perspectives. One goal of an architectural decomposition is to provide a way to better understand the source, and that's what we'll do here.[2]

The Linux kernel implements a number of important architectural attributes. At a high level, and at lower levels, the kernel is layered into a number of distinct subsystems Linux can also be considered monolithic because it lumps all of the basic services into the kernel. This differs from a microkernel architecture where the kernel provides basic services such as communication, I/O, and memory and process management, and more specific services are plugged in to the microkernel layer. Each has its own advantages. Linux, being a production operating system and open source, is a great test bed for new protocols and advancements of those protocols. Linux supports a large number of networking protocols, including the typical TCP/IP, and also extension for high-speed networking (greater than 1 Gigabit Ethernet [GbE] and 10 GbE). Linux also supports protocols such as the Stream Control Transmission Protocol (SCTP), which provides many advanced features above TCP (as a replacement transport level protocol).[2]

Linux is also a dynamic kernel, supporting the addition and removal of software components on the fly. These are called dynamically loadable kernel modules, and they can be inserted at boot when they are needed (when a particular device is found requiring the module) or at any time by the user. [2]

METHODOLOGY

The topic of this research generates two problems which have to be fulfilled. First, to replace current computer operating environment, beside the cost of licensing and identifying other problems exists in this system. Also what commercial software that are currently used and needed to be replaced have to be identified. Second, a suitable alternative operating system and alternative software to replace the current system have to be identified.

In the primary part of the research, several goals were identified. First was to find out the problems in the current system. The main problem with current computer operating system environment is the cost of licensing, but there could be other problems. Therefore, other problems that were existing in this system were recognized.

Secondly, users awareness about licensing software, and its cost and trend towards free and open source software in the world was figured out with the aid of a questionnaire. The likes and dislikes of people who are familiar with linux was out.

Interview was carried out with the head of repair center of the company to identify required services. Secondary data was analyzed to figure out the cost of licensing the existing software.

Finally, the software used in current system was identified. To find alternative solutions, what exists in current system need to be known. There are many software that all users need, some only few users use. And there are also some product specific software. Alternatives to support all these software wasnot available, but the goal was to cover most of the

software that majority of users need and to reduce the cost of current system.

The second and more critical part of this research was to findout alternative solution to current operating system software. The first part is to find suitable operating system There are many open source operating systems which are freely distributed These operating systems have more stable versions to operate on desktop or server environment. Therefore, most popular operating systems were chosen to be download and checked whether they are suitable to replace the current operating system. Some operating systems were suggested by the individuals in the organization. Nine popular operating systems were selected for this purpose.

As discovered, the operating system should contain most common software used in daily life like word processor, spreadsheet, media player, etc. Also it should support some special software, like IBM Lotus Notes and Client access. It should be user friendly and should use very less of command line.

DATA COLLECTION AND ANALYZING

The questionnaire reviled what other problems other than cost of licensing the current system . All the questionnaires were initially analyzed to findout the problems faced by the users and what software needed by the users.

Head of the repair center was also interviewed. He seemed to be very interested in changing to Linux and open source software.He also extended full support and co-operations from providing a machine for downloading software and providing any necessary requirements. His answers were used to get required services from computerized operating environment.

The next part of data collection was to install all the nine Linux distributions and try to install alternative software as much as possible. The installation of IBM Lotus Notes Client 8 and I-Series access are first indicated by considering all nine Linux distributions because these are definitly needed software.

Product	Price(USD)	Price(SLR)
The price for Microsoft Windows XP Professional with Service Pack2b(According oNexTag.com)	$145.00.	16,466.20
The price for Microsoft Office 2007 Small Business (according to office.microsoft.com)	$449.95	51,096.32
The price for Kaspersky Internet Security 2009 (according to www.computer.lk)	-	1,870.00
Total Price For 1 computer		**69,432.52**

Table 1: Problems with Current OS

Test Machine

These are the configurations of the test machine. It was a hp machine.

Reason	No of Responses (%)
It Is Infected With Viruses	95.83
It Is Slow	37.5
The Machine got Stuck. When Using It	16.67
It Has Less Security	45.83
The Source Code Is Not Available	0
Other	4.16

Table 2. Usage of Computer

Processor 3.0 MHz HT, RAM 512 MB, Hard Disk Drive 80GB SATA,VGA 128MB on board, 15" LCD Monitor, CD ROM and External DVD writer, Onboard Network Connector.

When analyzing questionnaire data, a percentage value was taken to reflect the amount of effect the problem is on users. Table 1 indicates the user responses about problems with current operating environment.

Table 2 indicates the usage of computer according to users. Most of them use computers to most common tasks like word processing, E-mailing and spreadsheet applications.

Service	Software	License
Word processor	Ms Word 2003/2007	No
Spreadsheet	Ms Excel 2003/2007	No
Presentations	Ms Power Point 2003/2007	No
Diagramming	Ms Visio 2003	No
PDF Reader	Adobe Acrobat 8.0	Free
Internet Browsing	IE 6/ Mozilla	Free
E-mails	IBM Lotus Notes 7	Licensed
Audio/Video	Windows Media Player 11	Free
CD/DVD burning	Nero Burner	No

Table 3. State of Licensed software in the Organization

Table 3 indicated the current services they use in the organization and the software they used with current state of licensed software.

The analysis indicated that two software are used by all of the users in the organization. They are

1. IBM Lotus Notes
2. I-Series Access(Client Access)

IBM Lotus Notes is used to send E-mails and leave management. I-Series access is used to connect to AS400 Machines.

Service	No of Responses (%)
Word Processing	95.83333
Spreadsheet	87.5
Presentations	41.66667
Programming	12.5
Surf Internet	83.33333
Emailing	91.66667
Listen To Music	54.16667
Watch Movies	45.83333
Others	4.166667

Table 4: Price calculated for a PC to buy minimum required licensed software

Table 4 indicates an analysis of minimum price required to buy licensed software for a PC. It has only considered mostly used services and minimum price possible in the market.

OS	IBM Lotus Notes	i-Series access
UBUNTU 8.04	Yes	Yes
PC Linux 2007	Yes	Yes
Fedora 9	Yes	Yes
Mandriva 2008	Yes	No
Open Suse 11.0	Yes	Yes
Cent OS 5.2	Yes	Yes
Red Hat Linux 4.5	No	-
Debian	No	-
Linux Mint 6.0	Yes	Yes

Table 5. Installation of Required Software in Linux Distributions

Table 5 indicates the required software that was identified in first analysis and installation of them in nine operating systems identified. Other services required also implemented in all nine systems identified here.

RESULTS AND DISCUSSION

Majority of users suggested that current system is vulnerable to viruses. The organization doesnot have an official virus guard. This is most likely the reason for many users to be threatened by viruses. These viruses directly affect the user's day today work and cause fatal loss of user data. This could directly affect the overall performance of the organization.

Most users feel their current computer operating environment has less security. This may be due to that most of them suffer from virus attacks frequently. Some had virus guards, yet they had virus problems. Most of the time, users logged in to the system as Administrator in windows XP. This gives automated scripts and programs to come through any media and execute without a problem. This causes Windows less secured.

Lesser speed could have caused by many reasons. It could be a hardware fault like the space of RAM . It could be cause by viruses, trogans, malware, adware programs or by virtual memory. Also be another reason installing too many software in the PC.

When asked about software licensing, about 92% knew that software had to be licensed. 58% knew that the cost of the licensing software is high. And 45% was aware about legal state regarding non licensed software. This indicates that majority is aware about software licensing and cost of it.

Since laws of software licensing is new to our country the knowledge about them remains low among users.

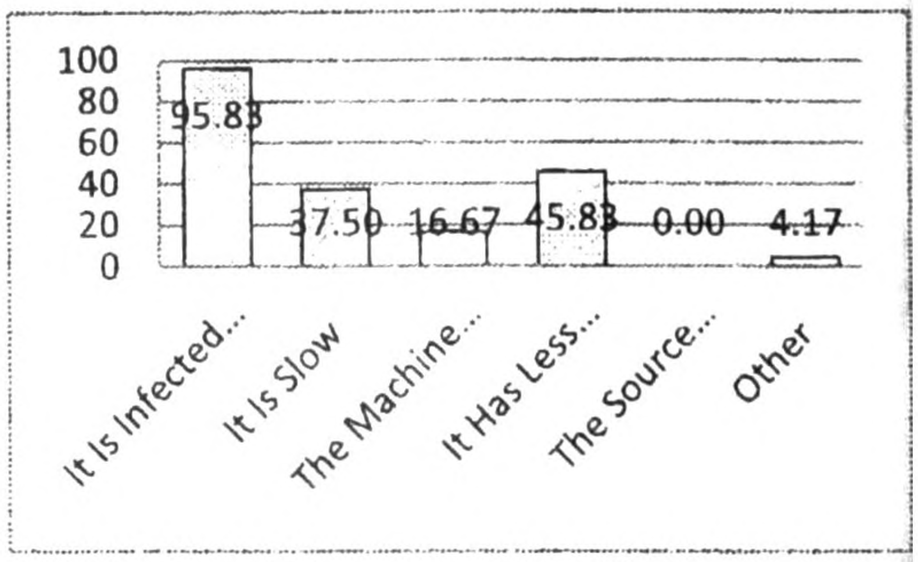

Figure 2: Problems with current operating environment

About only 20% of the currently using software were licensed. Most of them are used in laptop PCs since they came with licensed version of OS with them. About 55% wasnot licensed and another 25% was unknown. Assuming they are also not licensed 80% of the currently using operating systems could be considered as not licensed.

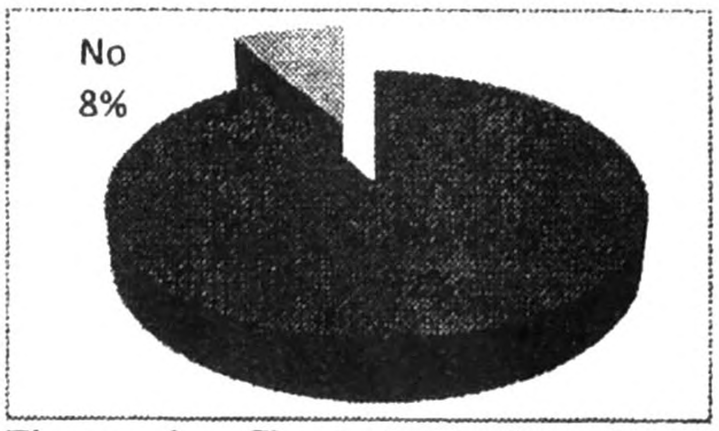

Figure 3: Chart indicating knowledge about software licensing

So this indicated majority of computers do not have licensed operating systems. That ultimately shows that many of application software are non-licensed too.

The Table 4 indicates a(ccording to data taken from internet) licensing of a single PC could take up to 69,500/= Rupees. Assuming there are 30 PCs the cost would be about 2,083,000/= Rupees. That's a huge sum of money.

Alternative Solutions

First solution is to keep the existing computer operating system environment. This is the cheapest and easiest solution. They can avoid the huge sum of money needed for licensing And as the business operates normally the users are used to current environment. But they should find solution for other

problems. They should buy a virus guard and make sure all users update it regularly.

Thus this method is cheap and easy there is a potential threat associated with it. Above suggestions will reduce other problems. But the critical problem of licensing will be still there. If a validating company comes and discover that the organization has non-licensed Operating Systems, leagal actions would be taken against the organization. They will have to buy the licenses. Yet their reputation will be compromised. So this alternative is not best to choosed

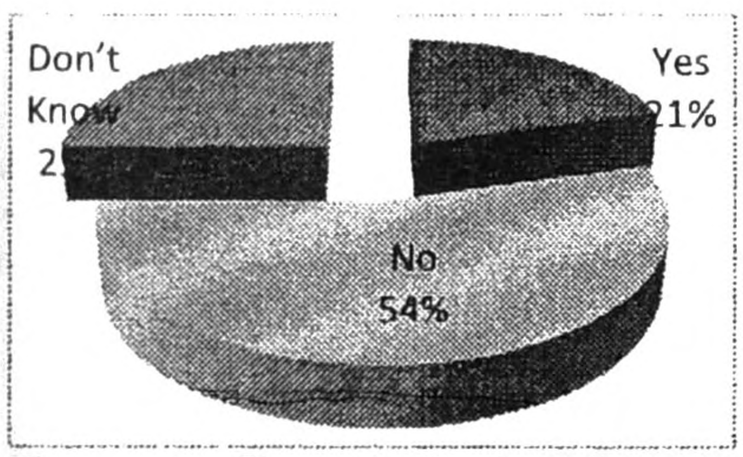

Figure 4: Chart indicating licensed Operating Systems in the Organization

Second solution is to buy the license to necessary software and keep current computer operating environment. Here also its easier because there is no conversion. However, as shown in the calculation to license sum of 30 computers, it will cost about 2 million rupees. This could be lesser since, Microsoft has special license method for organizations. This indicates the minimum required software but it could be increased with every addition of software to the list. So the cost could very likely still be millions of rupees. Specially, considering the state of global economic crisis the last thing anybody wants to spend on is information systems. So this option is good but it costs too much.

Best Solution

Third solution is move to more cost effective and secure Computer Operating Environment.

It is the best solution when thinking about short term and long term benefits. First the solution is simply converting the current computer operating environment to Free and Open Source system That means moving to a Linux Operating System. And replace currently using software to alternative free software.

Most global businesses are moving in to developing FOSS and this is the newest trend in software world. Linux has started to become a mainstream operating system in all sizes of organizations, in all markets, worldwide (Javed Tapia, 2003, Exploiting the benefits of Linux).

How does this transition will help to solve current problems? First the license problem will be solved. Linux distributions come under General Public License(GPL). They are distributed feely. So the cost of licensing will drop drastically. All software support these distributions also come under GPL. And there are thousands of freely distributed software packages. Also their source code is available. If anyone is interested they can download and modify as they wish. Even the kernel of Linux has its source code downloadable and compiled as users wish. So the cost of licensing the OS and other software will almost be zero.

About virus trogons and other malware, they canot work in Linux environment because Linux is too secure operating system. It reduces the spread of viruses. So it will definitely increase the speed and security of the machine.

Linux is much secured. It only allows root user to execute commands and protect many untrusted scripts from running. Also Linux can recover well. So the security problems are very much reduced. This will avoid the necessity for a virus guard. So the cost of that also will be reduced.

Implementing New System

When implementing the suggested solution, a very careful approach was needed. Otherwise the users might reject the system. Interesting discovery was that 88% of users liked to use dual boot. This is mostly because they will still have the old system so it will be risk free

Testing the System

Three test machines were established to test the system with three users. They gave mixed reviews. The OS tested on all three machines were CentOS. One machine in repair center the users required to change since they don't understand the OS. This indicates that some training program is needed to be created if changing to Linux. Others were happy with. the performance. But a user in software said it hard to continue working since IBM navigator isnot available for Linux. However it is available through web and that could be used by those users. These incidents indicate that minor issues will arise among individuals when converting to a new system. First it would be hard. Eventually, users will adopt and there will be long term benefits.

Recommondations

To avoid the conflict which could arise a plan to convert the system was recommended. The following paragraph indicates the suggested implimentation plan.

First change all desktops in to dual boot machines. This can cause less harm because most of them have non-licensed software. When selecting the OS organizations management can use any recommended OSs. Or they can give users to select their favorite. A training program should be created to give basic knowledge about Linux to users. This should highlight the positive side of Linux and encourage users to explore more. Give users time to try the OS. Encourage them only to use Linux for two weeks (even a month). Then tell them to inform all the

problems faced when keep using it. After the feedback try to find answers to those problem. This could be lack of training. So increase the knowledge given. Some software requirements can be fulfilled through searching through internet or contact local vendors. By continuing this users will get familiarized with the system and gradually convert well familiarized users PC to Linux. Then continue this for all the machines are converted. When selecting a Linux version as mention earlier user friendly and close to windows is very important. That's why PC Linux, Linux Mint or even Ubuntu is more suited.

CONCLUSION

The research was to replace existing computer operating environment to a cost effective one started with a preposition by head of engineering indicating necessity to reduce the cost of licensing current Operating Environment and related software. The research begun to find problems in current Operating Environment and found few problems. Also the cost calculated for licensing was a large sum of money.

After considering all these facts a decision was taken to convert the current Computer Operating Environment to cost effective one. So to achieve this an open source sloution was suggested. Also some alternatives for major required software was sggested.

There are many further research opportunities available for the organization and they can find answer to do minor adjustments of individual requests. There will always be an answer in open source world and it's always going to be less cost and reliable.

The world is moving toward new era of software. Free and Open Source software are now enjoy the funding of big names in the industry. This research helps the organization where the training was carried out to join this new trend. It costs very less. It is secure. And it grows rapidly.

Finally, this research was a success and the systems can be converted to Ubuntu, PC Linux 2007, Linux Mint or CentOS. However transition will not be easy and users will take time to adjust. Finally, the best solution is provided it is organizations decision whether to implement it or not.

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