MULTI-BOOTING OPERATING SYSTEMS IN A DEVELOPING ECONOMY

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ABSTRACT

Most of the developing countries are heavily indebted and they do not have the money to buy the needed computers to train their young ones. Computer Scientists and mathematicians are graduated from Universities and Polytechnics without much practical knowledge of the computer due to few or lack of computers. However, it is a well-known fact that information technology with the assistance of the brainpower will drive the economy of the 21st century. This paper provides the strategy of using very few computers to perform the function of many computers through the use of multi-booting operating systems.

Keywords: Indebtedness, Brainpower, Multi-booting Operating System

INTRODUCTION

Computer technology is developing at a sporadic rate. New improved version of the older version of hardware and software are brought out every year. Some of these new technologies are not compatible with the peripherals used in the old version of the hardware/software or not compatible with the entire other systems in their operations. For instance not all 16-bit machines are compatible with 32-bit operating systems (OS). Operating systems are software that makes available the resources of a computer system to the computer users. They act as an interface between the application software and the hardware. Operating systems determine the ways computers are used and give rooms for implementing computer configurations.

The developed countries are coping with the frequent advancement in the computer technology either because they have access to trade-in the older systems for new systems or because they have the purchasing power or technology itself or both (Figure 1). The developing countries neither have the purchasing power to purchase the new improved systems, the will to develop technologically nor have access to trade-in the older systems for new ones. Thus they can use a system they purchase for as long as possible. This analogy is depicted in the graph showing the supply of improved technology and the purchasing power of the developed and developing countries.

Although, computer technology is developing at a high speed, the developing countries are still retaining their older systems or getting donation of obsolete systems from the agencies of the developed world while some are not able to buy the needed systems for their economy.
It is now becoming a reality that the 21st century will be ruled by brainpower through the use of computer. It is also pertinent that adequate training should be acquired in the knowledge of computer. Computer and computer technology should be best taught and acquired practically. The developed countries are able to cope with the rate at which computer technology is developing because of their approach to training the young ones. Computer started coming into American Schools in 1979 and by the late 1980s about 85% of secondary schools has at least 20 microcomputers each (Collins, 1987). The first proposal to have computers in secondary schools was adopted in Hungary in 1979 and by 1987; every secondary school has at least two (2) computers (Vari, 1987). There was little use of computers in schools in Japan as at 1983 due to the scarcity of microcomputers with Japanese characters (Nisinosmo, 1987). The Japanese with the setting up of national council on education reform in 1984 got a breakthrough by having very large number of Japanese schools with computers. The French is another example. France had a stage of systematic expansion in 1980, a third stage of widespread introduction in 1985 and a fourth stage of consolidation beginning in 1986 (Dienzeide, 1987).

Since the developing countries have no ability to flood their schools with computers like the developed countries. The best alternative is to device a method of using a single system to provide the resources needed by the new and old systems instead of buying many new ones. More so, a single system can be configured to use many different types of operating systems instead of a system for each operating system, as it is usually the case.

This paper provides the strategies of using very few computers to perform the functions of many computers through the use of multi-booting operating systems. The term “dual-booting” or “dual-boot” system is defined as a computer that enables the user to choose between two operating systems at boot time. Considering this definition, we can rightly define the term “multi-booting” as a way of configuring a computer system that will enable the user to choose between more than two operating systems at boot time (Subhasish, 2003).

There are so many operating systems in use today. Some of the operating systems (OS) have compatibility with one another while others do not. We have the Single user single tasking OS, Single user Multitasking OS, the Multi-User Multitasking OS and the Network OS. Searching through the Internet, we observed that researches were carried out on multi-booting the following operating systems:

Multi-booting Solaris and other operating Systems (Mariuz, 2003)


Multi-booting with Windows XP: Installing Windows XP with MS-DOS, Windows ’95, Windows ’98 or Windows Millennium (Microsoft.Com Home)

The main objectives of this paper are to multi-boot the Linux Operating System (Fedora core 2), MS Windows ’98 Second Edition (Win98SE), Microsoft Windows 2000 Professional Edition, Windows XP Professional operating systems and examine the economic advantage there from.

MATERIALS AND METHODS

A Pentium IV system with 1.8 Megahertz (Mhz) processor speed, 256 Megabytes(MB) random access memory (RAM), 60 Gigabyte (GB) hard disk space, SVGA Colour Monitor, Network card and multimedia facilities was acquired for the purpose of this study. The 60 GB hard disk space was partitioned using the disk partition utility of Linux operating system. This made it possible for us to create Linux and use GRUB (Grand Unified boot Loader) Linux boot loader to accomplish the multi-booting of the four OS. The study was carried out in Iya Abubakar Computer Center (IACC), Ahmadu Bello University, Zaria for easy access to internet facilities. Easy accessibility to internet facility gave us the opportunity to search for similar research in the field and test the result of our experimentation.

The literatures were reviewed on Linux Operating Systems (LOS) and Windows Operating Systems (WOS). The Fedora core 2 (Linux OS) used was donated for this research by Pradip Tirmare of India Institute of Technology, Bombay, India. The Windows XP Professional OS and Windows 2000 Professional OS and Windows ’98 OS were received from IACC. A NEC phone camera was borrowed for the purpose of taking the needed pictures.

This study did not include Windows ’95 OS because the facilities needed in Windows ’95 OS are in Windows ’98 OS. All the peripherals we used are also compatible with Windows ’98. More so, the Disk Operating System (DOS) compatibility in Windows ’98 is as high as that of Windows ’95. Windows ’98SE that was installed has support for multithreaded monitors and other nifty device features that the first version of Windows ’98 does not have. More so, windows 9X (Windows ’95, Windows ’98 and Windows Me) use the same boot image; hence they cannot dual boot or multi-boot together. Windows 2000 professional edition that we installed was built to improve Windows NT technology. Hence Windows NT was not installed.

Installation Order

The operating systems in the following order:
1. Linux Operating System (Fedora core 2)
4. Windows XP Professional

The first Microsoft (MS) OS to be installed after the Fedora core 2 was Win98SE because it is the least tolerant of the three Windows operating systems under consideration. It also has the tendency of
overwriting the Master Boot Record (MBR) of the other MS windows (Windows 2000 professionals and Windows XP).

Procedure for Installation

The first step in the installation procedure is to configure the system in such a way that it will boot from the Compact Disk Read Only Memory (CDROM) as the first boot device. Enter the Basic Input Output System (BIOS) the set up program stored in the Complimentary Metal-Oxide Semiconductor (CMOS) to configure the PC.

On the first configuration screen, select the advance setup and set the first boot device to CDROM in order to boot from the CDROM as shown in Figure 2. The system now boots from the Fedora core 2 disk 1.

There are two methods for installing the Linux Operating System (LOS). These are:

1. Installation in graphic mode
2. Installation in text mode

The text mode was chosen to install the LOS in text mode by typing Linux text hda=7297,255,63 at the batch prompt and pressing the Enter key since installing in the text mode is faster. However, to install in graphic mode, all we need is to press the Enter key after booting from the setup disk 1 and follow the installation steps. The 7297, 255, 63 in the installation in the text mode stands for the drive geometry, that is, the number of the cylinders, heads and sectors (CHS). This is important in order to allow the installation program to work with consistent drive geometry.

Figure 2. The CMOS setup

These parameters could be obtained if not known by typing Linux rescue at the command prompt to boot to the rescue mode. Following the steps will take us to the Linux shell where we can type the Linux command. Shells are command interface. The Linux like any UNIX based OS has Borne Again Shell (BASH), Korn Shell (KSH), Tenex Cshell (TCSH), C Shell (CSH) and the Z-Shell. In the case of this research, we used the bash shell which is the default shell.

The command typed to get the disk parameters is: fdisk -l /dev/ hda

The partition table is printed on the screen as in Figure 3.
Disk Parameters

The anaconda–fedora core 2 system installer program was run. English was chosen as the correspondence language. The US keyboard was selected as the keyboard to be used. In the monitor configuration, unprobed monitor was selected to allow the subsequent use of any monitor by the system. Hence select no specific monitor in the monitor unspecified; this leads us to the next setup interface:

1. Personal desktop
2. Workstation
3. Server
4. Custom

Custom was selected to enable us explore and install all the available features of Fedora core 2. At the disk partitioning stage the following options are presented:

1. Auto partition
2. Disk druid

The manual partitioning with disk druid was selected to give the flexibility of partitioning the hard disk to our taste since we are installing four operating systems. From experience, the installation of the OS began by installing Linux first to use a Linux boot loader–GRUB (Grand Unified Boot Loader) to boot the other operating systems. There are many boot loaders available today. These are:

1. Grand Unified boot Loader (GRUB)
2. Boot Manager
3. Linux Loader (LILO)
4. Windows NT Loader

GRUB was selected because of its enhancement over LILO which was being used previously. The hard disk was partitioned as displayed in Figure 4.
With the completion of the disk partitioning and the acceptance of GRUB as the boot loader, leave blank the step of passing special options to the kernel at the boot time and select OK to continue the installation. The next screen (boot loader configuration) gave the possibility of preventing users from passing arbitrary options to the kernel by setting a password for security reasons. We did not set a password since password is not necessary for the purpose of this research. The next boot loader configuration gave us the option of selecting what partition to boot from and what label to use for each of them. Windows was typed in place of others. Master boot record (MBR) was chosen as where to install the boot loader.

The network was configured for eth0—the default network card. Enter the Internet protocol (IP) address and the subnet mask for the network. The dynamic host configuration protocol (DHCP) server which was given as a default server was deselected. In its place, the ‘activate boot on’ was activated and entered the gateway address and the domain name service (DNS) server. Hence, type in the hostname. A firewall was not selected despite the warning given because it will not allow us to configure the machine to our research specification. The firewall will be configured later. The language US was selected, the time zone was also selected, and the root password was typed in and confirmed.

The next OS to be installed after the Linux OS was Windows ‘98 OS before other MS Windows (Windows 200 Professional and Windows XP). If you install Windows 2000 or Windows XP first their boot files will be overwritten by that of Windows ‘98. The virtual file allocation table (Vfat) partitions created under Linux, was used for Windows as drives C, D and E.

Windows 98 was installed from the Windows CD, after formatting the drives. Run fdisk to display the partition information and set C active. Format the drives. Then, type setup to enable the setup program check all the drives for error. Continuing the installation to reboot stage gives the following errors: Booting ‘Windows’ Rootnoverify (hd0,1), Chainloader +1, Press any key to continue

To correct this problem, the system was rebooted to Linux rescue mode from the
disk 1 of Linux and then the following was typed in:
Sfdisk -d/dev/hda | sfdisk - no-reread-h255/dev/had
Sfdisk -d/dev/hda > Myparttable.txt
Edit with Emacs (a linux text editor) the resulting text file, Myparttable.txt, remove the unwanted statements and type the following on the shell prompt:
Cat Myparttable.txt | sfdisk - no - reread-h255/dev/had

Hence the computer responds by writing on the screen that you have successfully written the new partition table. After all this, the system was booted again with Windows '98 CD and type fdisk, set C: 2 partition active, Hence restart with windows '98 to continue and finish the installation.

Next, the Windows 2000 Professionals was installed and finally Windows XP. On finishing the installation, the drivers and the application software were installed.

RESULTS AND DISCUSSION

After the installation of the four OS, we tested each of the OS in turn and found they worked fine. All we need to do is select which OS we are interested in and start working. We configured each OS to connect to the internet through our internet gateway computer and we could browse the internet successfully in any of the OS. It was discovered that some application software that would not install and run under Windows XP like PC Study Bible run successfully under Windows 98. An old scanner that could not work under XP is now working under Win98. Any time we needed to research more on Linux configuration and operating we boot to Fedora Core 2. By mounting the windows partition we could have access to word documents and open them in Office Suite under Linux Fedora Core 2.

The first benefit of multi boot operating system is the fact that it affords a user the opportunity of moving with the advancement in information technology without hardware replacement or duplication. More so, the use of few computers to do the work of many system guides against room congestion and saves space.

The printers, scanners and other facilities that use the older operating systems can still be maintained without the need to buy new peripherals that are compatible with the operating systems in vogue. Students can be taught the new and the old version of a brand of operating system without the need to have two computer systems. Comparative studies of the OS can easily be made. Many of us in this part of the world (Nigeria) are used to the MSDOS and MS Windows OS. With the multi-booting facilities, users, more especially researchers can now afford themselves of the opportunity of being acquainted with such OS like the Linux and other Unix OS.

Linux OS can be downloaded free from the Internet; the Windows OS is downloaded with high cost attached to it. Either of them can easily be used as platform for networking and Internet connectivity. The problem of developing economy is insufficient finance for their operations. In this case, Linux OS will go a long way in easing/solving their problem. The debian website pointed out that GNU/Linux provides more than 3,950 packages of precompiled software bundled for easy installation (http://www.debian.org/). The Linux operating system and many applications for it are designed to provide seamless access to MS Office files. The Intel version of Linux can directly mount and
access any Windows partition and its files (Richard P. 2001). Microsoft allows a single copy of Windows to be used on only one computer. Starting with Windows XP, they use software to enforce this rule. In contrast, once you have purchased Linux, you can run it on any number of computers for no additional charge (Horowitz, 2004). The enforcement of this rule will further hinder the ability of the developing countries to have access to such software, since not many organizations or people can afford purchasing one.

The Fedora Core 2 Linux we installed also has a lot of free precompiled packages attached to it. Virtually all known programming languages such as BASIC, FORTRAN, C/C++, PERL, JAVA are all available for the use of both learners and researchers alike. Word processing, desktop, spreadsheet, and other packages are also made available on the Linux operating system.

It is not commonly heard of that a virus attacked a Linux operating system, thus in case of virus attack on the Windows operating system, Linux OS can serve as an alternative until the windows OS is rectified. More so Linux OS accommodate similar applications that operate on Windows OS.

It is observed that when one operating system out of the operating systems crashed, it does not affect the other operating systems. This will afford the user the opportunity to use the system non-stop before getting help from those that will repair the system. The user created files from the crash OS can be retrieved through the other working compatible OS.

Multi-booting OS allow users to enjoy the beauty of different Windows environments in Microsoft and the diversity of improvements in the different versions of the Windows. On the other hand, it will also enable the users to appreciate the Linux desktop environment (Gnome, KDE) and the windows manager which makes it easy for Windows XP users to use Linux.

The users can also appreciate the use of text editors in LOS and line editor in Disk Operating system (DOS) and notepad in WOS. The text editor in Linux and DOS run faster than the graphical user interface (GUI). Users can adequately make use of them in areas where they provide the facilities needed when they are in a hurry.

Multibooting OS give the user the opportunity of using journaled and non-journaled file systems (Horowitz, 2004). All FAT variants and ext2 file systems are non-journaled. Non-journaled file systems need to be examined by scandisk or chkdsk or fscck after a crash where as in a journaled file system such as NTFS, ext3, reisefs and jfs file systems; recovery is automatic at the next reboot after an abrupt stoppage of the system.

RECOMMENDATION AND CONCLUSION

The exposure of students and researchers alike to multi-booting operating systems will increase their moral since they will be exposed to different operating platforms. Linux OS on its own which is an open system will enable the developing world to acquire programming skill by studying the way the programs are written and learning how to improve on them. The exposure to the many packages that accompany the Linux OS will enable researchers to have a taste of programs and packages that would have eluded them if not for the multi-booting OS. In all, the developing worlds are advice to use the multi-booting option
to solve their problems of inadequate access to computing equipment.

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