Design GNU/Linux Live CD Distribution for Education

Novri Auliansyah[1], Nia Kusniawati[2]

STMIK Raharja, Jl. Jendral Sudirman No. 40, Tangerang 15117, Indonesia
[1]auliansyah@raharja.info, [2]niakusniawati@raharja.info

Abstract – Today, involvement of computer software with educational system has been widely known, but this involvement has a problem because most teachers and professors bind the pupils and students on proprietary software. That is not suitable, because they do not have money to buy all of this software for work at home and so we have a lot of piracy. Fortunately we have open source software with a lot of free of charge software tools and give the same results as proprietary software. In this paper we describe a project to help address illegal software issues by building a prototype of GNU/Linux Live CD based on Slax distribution that can be used by installing or not installing anything into hard drive for use both on-campus as well as off-campus.

Index Terms: GNU/Linux, Live CD, Education, Open source software**.**

1. Introduction

At present, the presence of Linux in the world of information technology is not only as an alternative operation system, but even further it is the trigger of revolution of thought in the software industry [1]. Linux operating system is becoming more and more important in the industry and commercial world [2] because it is an open source operation system that give users the freedom to run the program for any purpose, to study and modify the program, and then to redistribute copies of either the original or modified program without paying royalties to the previous developers. Linux has grown into a full-fledged operating system, which is known for its stability, scalability, configurability and most of all reliability for mission critical jobs. Present day Linux is built and supported by a large international community of developers and users that dedicated to Free and Open Source Software. A hundreds of Linux based operating systems are available for free today. GNU/Linux can be an alternative way out for students on developing countries, because one of the disadvantages for those students are the required cost to obtain a commercial operation system was very expensive. This situation has been making pirated software widespread in developing countries. The presence of Linux is expected to remove the dependency on commercial operation systems and reduce the gap in the field of information technology between developing countries and the developed countries.

2. GNU/Linux

The GNU (recursive acronym for GNU is Not Unix) project was born in January 1984 and created a variety of critical tools that formed a portion of the operating system. However, until 1991, the GNU project had not yet produce a totally free software system [3] because GNU Project's own kernel, GNU Hurd, was incomplete and unavailable. This is an important problem because kernel is the heart of the operating system. Kernel is a fundamental part of a modern computer's operating system that manages input/output requests from software and translates them into data processing instructions for the central processing unit and other electronic components of a computer [Figure 1]. Fortunately, in 1991, Linus Torvalds, who at the time was a second year graduate student at the University of Helsinki, wrote and distributed a Unix-like kernel called Linux Kernel. The kernel that put together with GNU applications or another programs called Linux Distribution (Distro). In the manner of Free / Open Source Software (FOSS) development, it was distributed widely then improved upon and soon adapted to become the core of the GNU/Linux operating system [4]. The basic idea behind open source is very simple: When programmers can read, redistribute, and modify the source code for a piece of software, the software evolves. People improve it, people adapt it, and people fix bugs.
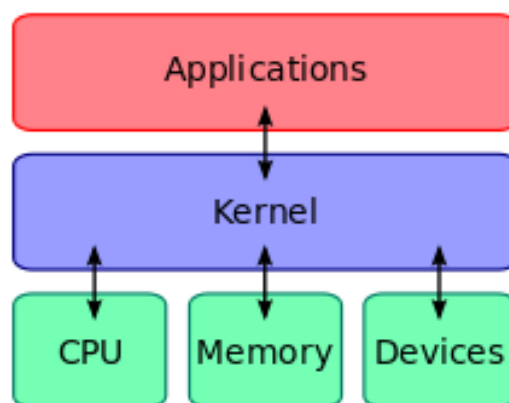

Fig. 1. A kernel connects the application software to the hardware of a computer

Many are accustomed to the idea that software is a product just like any other: it is purchased and it cannot be modified according to the need. In short, software is perceived to be a closed system like a home appliance, such as a toaster, microwave oven or dishwasher. The challenge to this traditional idea is Free Software/Open Source Software (FS/OSS). Unlike proprietary software, FS/OSS is (often) distributed free of charge and, most importantly, entails the free/open access to the source code for purposes of study or modification. The fact that FS/OSS can be modified or studied by anyone who has the interest and the ability to do so has spawned a large community of programmers sharing not only FS/OSS, but also the capabilities to do so [5]. Even though GNU/Linux and FS/OSS has been around for some time and we believe that GNU/Linux can be served as a method, technology to teach and learn computer science that can provide us with free or lower-cost technology in the classroom and permitting us to use technology that we

might otherwise be unable to afford. But, GNU/Linux still cannot be the most favorite operation system for education. Most of the problems that hinders are that GNU/Linux cannot be a user-friendly operating system to the user during the installation process. We believe the best way for learning Linux is to install the Linux operation system in a computer personally, and the author believes that this practical experience will be helpful to learning of this course. But most novice users never have to load an operating system – this is normally bundled with the machine and pre-setup for the particular hardware arrangement. In the event of a major fault, most users would reach for their 'recovery CD' rather than get themselves dirty trying to install a new operating system [6].

So, the goal of this paper is to achieve a GNU/Linux CD that includes free and open source software for education by remastering Slax Live CD that can run without installation. Students can run it on almost any machine without disrupting or changing any data, partitions, etc. on their machine. The system uses the CD as hard drive without needing to store any information on the real hard drive and without destroying the underlying disk file system.

3. GNU/Linux Live CD

Problem of installation was to be our context to investigate the use and distribution of the Live CD. We just need a bootable CD, which contains pre-configured software that allows the user to be productive without accessing any other hard drives. This is an advantage of Live CD that allows users to run Linux software on almost any machine without disrupting or changing any data, partitions, etc. on their host machine. The system uses the CD as its hard drive without needing to store any information on the real hard drive. Live CD is a disk of CD that contains the Linux operating system, and users can use this disk of CD to boot the computer. The merit of using a live-CD is that the users need not install the Linux operating system. This means the computer hard disk will not be changed after the use of a live-CD. Although the live-CD will not alter the data in the current hard disk, users can still store their data in the floppy disk or the flash disk.

First GNU/Linux live CD is Yggdrasil that was released in beta form 1992-1993 though in practice its functionality was hampered due to the low through put of contemporary CD-ROM drives. In 2003 Live CD more popular since Knoppix Debian-derived Linux distribution was released. Since 2003, the popularity of Live CD has increased substantially. Partly due to Linux Live scripts and remastersys which made it very easy to build customized live systems. Most of the popular Linux distributions now include a Live CD variant which in some cases is also the preferred installation medium

Alternatives to the Live CD were explored such as VMWare and Virtual PC, these are very useful alternatives in an education environment. They allow the concept of "guest" operating systems to exist on a host system without destroying the underlying disk file system and appearing only as a large file to the host system. Both types of systems have advantages and disadvantages, however one key difference is that Education Live CD such as Edubuntu are

available on free download, where VMWare and Virtual PC are commercial products with related licensing issues.

4. Remastering Live CD

As mentioned in previous section, Linux is not an operating system. Although kernel is the most important part of an operating system, it is not the only available part. It can be a based operating system through combining Linux (as the kernel of an operating system) and other tools such as compilers, connectors, assemblers, and higher level tools such as text editors and graphic intermediates [7]. Figure 2 shows a simple and general scheme of the Linux based operating system. We can see how the kernel is put together with other applications and programs to create a GNU/Linux Distribution or called Distro. Those things make every distro variable and different structures and applications in each part.
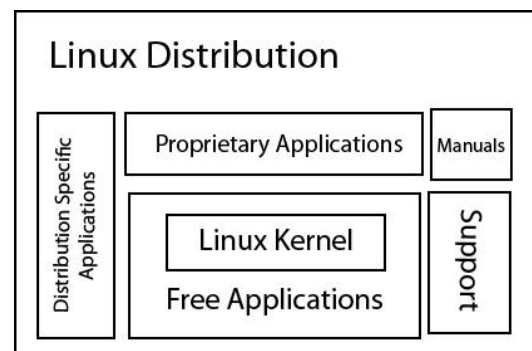

Fig. 2. Linux-based operating system structure.

Generally, there are tow methods to remastering a Linux based operating system. First, LFS (Linux from Scratch) that means design a distro using a host system and the resource code. And the second method is remaster by Distro base. The Live CD of this prototype used the second method and it is remastered by Slax Linux distribution as distro base. We choose Slax because it is a small and fast Linux operating system that provides a wide collection of pre-installed software for daily use, including a well-organized graphical user interface, useful recovery tools for system administrators and we believe everybody can built Live CD by Slax according to their need because Slax is easy to remaster. In Slax website there is a menu to build own Slax Live CD or working with a common application such MySLAX Creator. In this paper we remaster Slax Live CD by copy all core application to hard drive then modification display, add packages modules education we need, and build to be a burning file (.iso).

5. Starting up

To starting up this Live CD just put the disc into CD rom drive of the personal computer. In BIOS or in start-up menu chose "boot from CD/DVD drive". After booting from CD, in splash screen choose Graphic mode (KDE) or Graphic VESA.

Fig. 3. Live CD KDE Desktop

The Desktop in this Live CD is KDE desktop environment. We choose KDE desktop, because this is quite similar to the desktop in Windows as given in Figure 3. For access to programs click on Kmenu at left corner of the frame just like use Microsoft windows. We also installing a few programs that needed to work with the computer. Some popular programs that installed in this Live CD are:

Mozilla Firefox - Web Browser
A free and open source web browser that very popular.

XMMS - Multimedia player
It is similar to winamp and has many same function and look like winamp.

6.   Advanced programs

We installed few advanced programs besides the standard user programs that need by students. But if users need more other programs, the users can install programs that they want. To install software in this Live CD we need to be super user, the way to be super user is go to terminal and type "su". User name and password to be super user in this Live CD is root/toor.

Unlike Windows, GNU/Linux commands are context sensitive. This is an important distinction as, for example, the command to login as root or super user –su. If the user type 'su', GNU/Linux will ask username and password, but if user were to use a capital 'S' as in 'Su', files would be sorted alphabetically by file extension. Both show the same data, it is the sorting order that changes. This ability to customize, as mentioned earlier, allows for fine control of the output from the majority of Linux commands but must be managed carefully.

These are some short descriptions of the education programs that come with this Live CD:

Mathematics:

Octave – alternative to MATLAB
This program is a high-level language, primarily intended for numerical computations. (gnu.org/software/octve/about.html).

Compass and Ruler
This program is for support of classes in basis geometry in primary school and high school. It can be used to draw geometric sketches which can be later used in publications and presentations.

Project Planning

Planner
A program for plan project and time management.

Drawing and modeling

Blender
A free and open source 3D animation suite. It supports the entirety of the 3D pipeline - modeling, rigging, animation, simulation, rendering, compositing and motion tracking, even video editing and game creation.

Inkscape
Inkscape is professional quality vector graphic software. It uses the W3C open standard Scalable Vector Graphic (SVG) as its native format. It can import and export various file formats, including SVG, AI, EPS, PDF, PS and PNG.

Gimp
GNU Image Manipulation Program (GIMP), it is a program for image manipulation or photo retouching just like Adobe Photoshop.

Web Design and Programming

Bluefish
Bluefish is an editor for making website, it is a powerful editor targeted towards programmers and web developers, with many options to write website, scripts and programming code. (bluefish.openoffice.nl)

GCC
The GNU Compiler Collection (GCC) includes front end for C, C++, Objective-C, Fortran, Java, Ada, and Go, as well as libralies for these languages.

Xampp

Xampp is an open source cross-platform web server. It includes Apache, mysql, filezilla and Pear.

7.   Conclusion

With the design and prototype explained in this paper we showed that we can use free and open source software application for education. Of course, the developed system is still in its first steps and it must pass a long way to be completed and be proper for public usage. We hope that this prototype of Live CD will be implemented in some campuses as an Open Source Software in education in the future.

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