

# Developing GNU/Linux Distribution for Migration of BPS Computer System

## From Windows Based to GNU/Linux Based

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### 1. INTRODUCTION

#### 1.1 Background

Badan Pusat Statistik (Indonesia's Central Bureau of Statistics, BPS) is a non departmental government institution which responsible for providing statistical data for the government and public. BPS is also acting as a coach for computer related functional job position in Indonesia's government. Implementing best computing technology practices should be an important thing. Still, BPS is using Windows operating system for its daily activities. Whereas this operating system is notorious for many downsides, for example virus threat, and slow performance. This will affect in decreased productivity in which some of working time must be used for repairing. Yet there is an international and national policy to use open sourced operating system and software, which is cheaper and better in term of technology. United Nation Conference on Trade Development in 2003 has recommended using free and open sourced software in developing countries to lower technology gap with the developed countries. Accordingly, on July 1<sup>st</sup> 2004, Minister of Research and Technology, Minister of Communication and Informatics, Minister of Government Apparatus Utilization, Minister of Law and Human Rights, and Minister of National Education has declared national commitment to use open sourced software with Indonesia Go Open Source (IGOS) movement, which could save national government spending up to IDR 20 trillion. [3]

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<sup>1</sup> This paper is a summary of my bachelor thesis, presented at National Conference on System and Information, STIKOM Bali, Denpasar, November 2008 and published in the proceeding of the conference.

## **1.2 Research Objectives**

The objectives of this research is to develop GNU/Linux distribution, which could serve software requirement for daily activities at BPS and reviewing how far we can implement this solution. The detailed objectives of this research are:

- 1) Problem analysis on using Windows operating system at BPS.
- 2) Software requirement analysis in BPS's daily activities
- 3) To design and develop GNU/Linux distribution that will fit BPS needs
- 4) Evaluate and review consequences and impacts of implementing the developed GNU/Linux distribution to meet migration requirement of BPS computer system from Windows based to GNU/Linux based.

## **1.3 Research Problem and Scope**

This research will address following tasks:

- 1) To conduct a survey to collect information on disturbances of using Windows operating system, which then categorized as follow: virus attack, hang, slow/sluggish performance, and whether there are pirated software used.
- 2) Awareness level about GNU/Linux and OpenOffice Suite, and users' consent about migrating BPS computer system from Windows based to GNU/Linux based
- 3) To develop a GNU/Linux distribution which will fit BPS needs for daily activities and to evaluate the implications and consequences so that the migration can be implemented successfully.

## **2. LITERATURE REVIEW**

### **2.1 Operating System**

Main goals of operating system design are to define abstraction, to provide primitive operation, ensure isolation, and manage the hardware. (Tanenbaum 2001: 337) An operating system should be able to define a good abstraction of a primitive operation

provided to the users. Besides, it should be able isolate a process from another. Therefore, when a problem occur in a particular process, it would not affect other processes.

## **2.2 History of Free Software Movement**

In 1984, Richard Stallman started a project called GNU (GNU's Not Unix) in the MIT's Artificial Intelligence lab. He created GNU to fight software commercialization, which UNIX creator's company was doing. Stallman quickly became free software pioneer with GNU project and Free Software Foundation (FSF) establishment. In 1990, the internet helped stimulate free software spreading with emerging free software communities around the world, which interested in the operating system as well as the application. In 1994, GNU became a perfect operating system with the contribution of Linux kernel released by Linus Torvalds. GNU/Linux then quickly become the alternative operating system besides UNIX.

Currently, FOSS (Free or Open Source Software) is growing quickly and becomes alternative solution of using proprietary software. Open sourced software utilization has become primary choice in some countries because of its advantages such as security, reliability and many more. Its openness gives more advantage to developer, since the developer can modify the software as needed. Users whom are also a developer often called as prosumer. In this case casual users can also ask a developer to modify it for them. It is also known that free software is also cheaper in term of budget as opposed by purchasing proprietary software.

## **2.3 GNU/Linux Distribution**

Linux distribution consists of Linux kernel with addition of software packages from GNU project and others, bundled as one, with a goal to ease its distribution. If we imagine Linux as a car, Linux kernel is the main engine. This is what Linus Torvalds has developed. The car company then assembled it with the chassis, wheels, and other parts. Therefore, Linux kernel could only be useful when combined with other software packages such as

hardware driver, desktop manager, office application, and other applications as needed. This packaging job is what RedHat, SuSE, Debian, Mandriva, and others do. They distribute Linux to the users, ready to use out of the box. (Sofyan, 2006)

## **2.4 Discussion**

As a primary software in a computer, operating system should ease how people use their computer and manage hardware resources to the most efficient usage. Nonetheless, Windows operating system used by BPS has several disadvantages. These disadvantages are low reliability and sluggish performance. Besides, its license cost is expensive and its security measure is not good enough. These disadvantages resulted in lower employee productivity that depends on computer utilization. Whereas almost all BPS activities involves computer.

As Linux and open sourced software concept explained before, we can conclude that BPS can use Linux operating system to replace Windows operating system in its daily activities. The process of replacing Windows is often called migration. Migrating BPS computer system from Windows based to Linux based is a feasible action. Since many Windows based applications often used in BPS daily activities have equivalent Linux based applications to replace them. Besides, Linux usability has improved greatly these days. To prepare for the migration process, we could develop Linux distribution which is tailored to meet application requirement for BPS daily activities with similar yet easy to use Windows like user interface.

Linux operating system utilization will increase employee productivity for computer related job. Because Linux has better reliability and performance on the same piece of hardware. Besides, most open sourced software does not ask for licensing cost and also has better security. Therefore, operating system goals to ease computer use and manage hardware resources efficiently could be achieved in a better manner. Employee productivity will also increase because there are no more wasted working time which was previously caused by viruses attacks, hang, slow performance, and others. Moreover, there is Live

CD/DVD technology that enables BPS employees to try Linux in pre-migration term without worrying about the installed Windows operating system.

### **3. RESEARCH METHODOLOGY**

#### **3.1 Conducting Survey for Current System Analysis**

The researcher conducted a census to analyze current Windows based system. The researcher collected information from all 56 directorates in BPS headquarter office. The researcher then interviewed either the Head of Sub directorate or the head of Section. The researcher collected information as follows: what application/software used daily in a particular sub directorate, hardware specification of every computer, problems or disturbance while using Windows operating system, and awareness level about using GNU/Linux operating system.

#### **3.2 Development Method**

There are several methods in developing a GNU/Linux distribution. First, Linux from Scratch or develop everything from nothing. The first method is suitable to explore the inside out of Linux but requires more effort to make it easily distributed. Therefore, this method is more suitable for personal use. Second, develop a distribution based on a well-established distribution. This research will use the second method since it needs less effort in distributing the modified version. Besides, maintenance of application packages is easier. Because it is already done by the base distribution. Then the developer can focus more on the differentiating features.

### **4. SURVEY RESULT**

#### **4.1 Current System Analysis**

Current system analysis survey conducted on May until June 2008 successfully collected information from 38 sub directorates (67,85 %). While the other 18 sub

directorates cannot be interviewed because the respondents are away on duty. Generally the researcher has revisited these sub directorates twice for minimum. Nevertheless, the application requirement information has been met. Because if we estimated using stratified sampling, each sub directorate category has been interviewed. Then the software requirement information can reflect every directorate. While the information about Windows operating system problems, hardware specification, awareness level, and perception on using GNU/Linux can only represent the 38 sub directorates as samples.

#### **4.1.1 Problem on Using Windows Operating System**

The survey result showed that number one problem with Windows operating system in the last three months was virus attacks. Every sub directorate encountered the virus attack. While only 30 sub directorates experienced hang/freeze problem and 31 of them underwent slow performance problem. Then there are only 13 sub directorates sustained a not booting problem.

In addition, if we categorized the impact of these problems, most of them can continue working despite having a problem. However, there are 24 sub directorates which need outside help to solve the problem. Seven of them cannot use the computer for a day or more when the problem happens.

Moreover, we can see the problems by the number of computers. There are 16 sub directorates which whenever there is virus attack, it only affected less than 25% of the sub directorate's computers. While there are 6 sub directorates which whenever there is virus attack, it affected more than 75% of the sub directorate's computers. Therefore, we can conclude there is significant urgency to migrate to GNU/Linux operating system. Because viruses and other problems will always happen if we continue using Windows operating system. Because Microsoft never repair Windows system's core, but only patched it here and there. Even John C. Dvorak believed that Windows' source codes are like spaghetti-

mess, which no one at Microsoft really knows them all. Therefore, it is not surprising if a virus which crashed Windows XP could still crash Windows Vista.

#### **4.1.2 Requirement Analysis**

Application requirement based on the survey result are: office suites (word processor, spreadsheet, presentation), database management application, statistical analysis software, and mapping application (GIS, Geographic Information System). Every sub directorate was using an Office Suite. While database management application was used by 27 sub directorates. There are 35 sub directorates, which uses statistical analysis package. Then 10 of them uses web-authoring application. Moreover, there are 10 sub directorates that uses software development package.

In word processor category, most of them (23 sub directorates and 155 people) are using Microsoft Word 2003. However, the use of other than Word 2000 and OpenOfficeWriter are allegedly pirated software. Because BPS only purchased the license of Word 2000. We can derived same circumstances in other category. Because the respondents do not know about the license price of the software they were using.

#### **4.1.3 Respondents Awareness Level**

Respondents Awareness Level about using GNU/Linux are very low. Most of them have ever seen this operating system yet. Nevertheless, around 60% of them have heard the news about this operating system. While awareness level of OpenOffice was better. About 60% of them have used OpenOffice. This is the result of computer procurement policy in BPS that since 2007 every new computer were bundled with OpenOffice to replace MicrosoftOffice. However, the OpenOffice Suite still run on Windows operating system.

#### **4.1.4 Respondents Approval**

There are 42% of the sub directorates samples approved the migration plan. They told the researcher various reasons: to follow Indonesia Go Open Source Movement, free software, virus proof, and technology independence. Others said about reallocating budget from buying software licenses to buying computer hardware and enhancing human resources quality. While some of them asked for more time to learn and adapt to the new system. Some more said wanted to try first, because they are not familiar with Linux. Some others do not respond with a reason, it depends on BPS policy. Some of them do not approved the migration plan and said: the Linux operating system was not provided by BPS, questioned compatibility, and coworkers or colleagues data format, which are still Windows based.

#### **4.2 Distribution Packaging Design**

According to the survey result, most of the hardware will be able to run the developed system. Distribution packaging will be based on established GNU/Linux distribution. The researcher chose Ubuntu 8.04 desktop edition. Ubuntu has some advantages such as Debian base, which has many application pools. Ubuntu is also fully supported by Canonical, Ltd. For this LTS (Long Term Support) version, Canonical will support Ubuntu 8.04 until three years after release.

Besides, according to distrowatch.com since 2006, Ubuntu is the most popular and most used Linux distribution. Ubuntu also has better compatibility with build-for-Windows machines. In addition, Ubuntu has an option to be installed inside Windows called Wubi.

The distribution will be packaged as LiveDVD so it can boot directly from DVDROM without installation. However, they can install it afterwards. It will ease the new users to try the distribution. The LiveDVD feature addresses the survey result, which most of the respondents have not seen the GNU/Linux operating system yet. The distribution will be



packed with KDE desktop, which is known for its beauty and ease of use. Moreover, it will features beautiful Compiz-Fusion 3D desktop.

### 4.3 Distribution Packaging Result

GNU/Linux Dynamix distribution was implemented with Ubuntu as base distribution and KDE desktop (Kubuntu). This distribution is packed with all application needed for BPS daily activities.

**Table 1. List of Application Packaged in GNU/Linux Dynamix**

No	Category	Previous Windows Based Application	Equivalent Linux Based Application
1	Software Development Tools	Visual Basic 6.0	Gambas2
		Visual Studio .NET	Monodevelop
		Macromedia Dreamweaver	NVU (Read: n-view, new view)
		Java IDE / NetBeans	NetBeans, Eclipse
2	Diagram, Flowchart	Visio	Kivio, Dia, Umbrello
3	Database	Microsoft Access	OpenOffice Base, MySQL, PostgreSQL
4	Image Manipulation Software	Photoshop	GIMP
		Corel Draw	Inkscape
		Pagemaker	Scribus
5	GIS	ArcView	ArcView for Linux (non-free), Grass, QuantumGIS
		Visual Basic + MapObject	Mapserver, MapLab, Postgis, Chameleon = WebGIS
6	Office Suite	Microsoft Word	OpenOfficeWriter, Abiword
		Microsoft Excel	OpenOfficeCalc, Gnumeric
		Microsoft Powerpoint	OpenOfficeImpress
		Microsoft Access	OpenOffice Base
		Acrobat Reader	Ebook Reader, Evince
7	Statistical Packages	SPSS	R, Rkward, Gretl
		Stata	Stata for Linux (non-free)
		CSPRO	Wine + CSPRO
		EpiData	Wine + EpiData

There is some consequences to the migration plan. The researcher will provide an autorun user manual, about how to start each application and short explanation of the application purpose. In addition, the researcher also provided comparison table of each

application features. Which feature works the same in Windows and Linux. Which feature only available on Windows. And which feature only available on Linux.

Implementation of the GNU/Linux Dynamix distribution from this research could have these impacts:

- 1) Budget for purchasing software license could be reallocated to purchase more hardware and human resources development
- 2) BPS management could see better productivity level, because of wasted time for repairing was minimized
- 3) BPS programmer could see some tools transition and development time at first, but it will not take much time because the tools are similar with the equivalent software in Windows
- 4) End users will see some software transition for a while. It will also not take much time because the tools are similar with the equivalent software in Windows

## 5. CONSLUSION

The survey successfully collected the problems with Windows operating system. It also collected application requirement for BPS daily activities. Development of GNU/Linux Dynamix has addressed both the problems with Windows operating system and application requirement. GNU/Linux Dynamix is more stable and secure than the previous Windows based system. It is also ready to use as it could export and import data from and to previous Windows based system. Besides, it can run directly from the DVD without installation. Users can install it afterwards.