A Brief Review of the Kernel and the Various Distributions of Linux

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INTRODUCTION

The open source software in our days is going through a period of prosperity and innovation by having a great contribution in the computer science industry. Many devices and complex systems choose open source software for its consistency, adaptability and unlimited power. Despite the obstacles that the open source community faced during the previous years and general efforts of the major technological companies to make the software industry profitable by charging their products, open source software continued to maintain its main strength which is freeware availability and now it's growing even larger. One of the most popular and prominent open source software is the Linux.

Linux is a UNIX – like operating system that is assembled based on the open source software development and distribution (linux.com, 2009). As open source software can be defined the software that its source code and design is free to the public and anyone can take it as it is and used it in whichever way wants without any limit, copyright issues and legal problems (gnu.org, 2010).

Linux was firstly developed to run in the Intel 32-bit personal computers but later was expanded to various platforms and devices becoming the most adaptable operating system. During the recent years became the dominant operating system in many super computers and servers which are included in the list with the fastest platforms in the world (Vaughan-Nichols, 2013). According to recent surveys, Linux is used by 90% of the 500 fastest supercomputers including the top 10 ten (top500.org, 2013).

Recently Linux began to be used to run in embedded systems like tablets, televisions, smartphones, routers and even in video game devices (Sony, 2011). The wide spread showed that the use of open source software benefited many sub sectors of the technological industry by providing various solutions in any kind of device or platform that was used.

This article's aim is to present the Linux as an example of a success story regarding the adaptability of the open source software in the modern industries, providing a brief presentation of the features, the different categories that are included and off course to answer to the question if Linux and the other open source software can make the difference in a society where consumption and the profit are the main goals.

BACKGROUND

The first attempts to create an open source software system was made by Richard Stallman in 1983 with the establishment of the GNU project which had as a goal to create a free UNIX – like operating system that could be used widely by the users(gnu.org, 2013). During the following years after finding the necessary software he managed in 1990 to create a fully functional operating system the "Hurd" which didn't had a great

DOI: 10.4018/978-1-4666-5888-2.ch396

impact in the industry and due to the lack of interest was abandoned (gnu.org, 2013).

A similar attempt was also made some years before Stallman's project by the University of California, Berkley which created the BSD (Berkeley Software Distribution) in 1977 based on the 6th version of UNIX that was published by AT&T. This attempt also failed to make a difference in the industry due to the fact that the company that owned the copyright of UNIX (AT&T) filled a lawsuit in 1990 against the use of their system by the UC Berkley limiting this way the adoption that BSD would have (McKusick, M, K., 2000).

In 1987 Andrew S. Tanenbaum released a UNIX – based system named MINIX which was going to be used for academic purposes. The characteristics of MINIX that made it related to the open source software was the fact that the source code was available but not for redistribution or further modification (minix3.org, 2005).

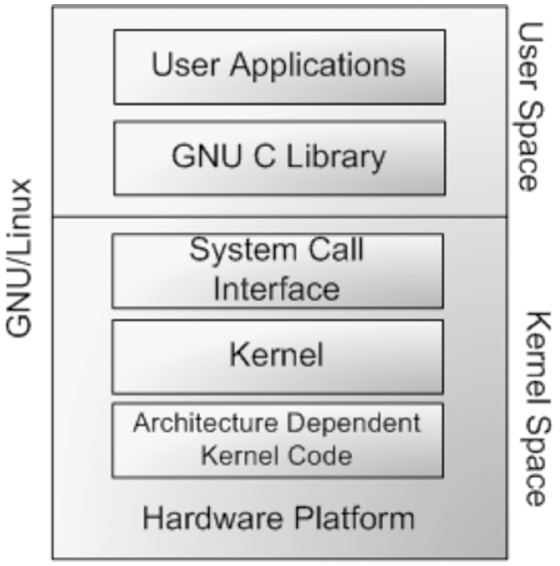
Those attempts that were made and the lack of a widely adopted free kernel made Linus Torvalds to start the development of a project that would be known later as Linux (gondwanaland.com, 1993). The project began in 1991 at Helsinki where Torvalds with the use of the university servers created a terminal emulator specifically written for the hardware that he was using independently of the operating system. The development was done in MINIX environment with the use of the GNU C compiler which is still the main option to compile Linux source code even these days (groups.google.com, 1991). The initial release of Linux was made by Torvalds on the august of 1991 in the Usenet newsgroup when he posted that he created a new free operating system for the 386(486) AT clones (Torvalds, Diamond, 2001). The name that was given to the operating system came from Torvalds name Linus and the official publish release under the GNU General Public License was done in 1992 (kernel.org, 2007).

TECHNICAL CHARACTERISTICS

Architecture

Linux is considered a monolithic kernel due to the fact that it runs all the basic system services like the memory management, the interrupt handling, the I/O communication and the file system in the kernel space.

Figure 1. The fundamental architecture of the GNU/ Linux operating system (Jones, 2007)



Based on this theory the Linux kernel structure could be represented with Figure 1.

On the top of the architecture is located the user space which contains the application space where all the applications are executed. Below is located the GNU C library (glibc) which provides the transition between the user space and the kernel space via the system call interface.

In the kernel space the operations are divided into three separate categories which include the system call interface which implements different read and write functions, the kernel code which defines the independed architecture kernel code and finally the last component is the architecture – dependent kernel code which serves as the processor and platform specific code for the given architecture (Jones, 2007).

The Linux kernel is designed to implement a number of important architectural attributes at a higher level and a lower level, also is layered into a number of distinct subsystems. The major subsystems that are known are shown in Figure 2.

Regarding the efficiency over the architecture, Linux has become very efficient in terms of CPU usage and quite stable. Also important is the fact that the Linux kernel is considered very portable and adaptable by being able to run in various kinds of platforms with different architectural constraints, despite the fact that its architecture is complex and quite big regarding the size(Jones, 2007).