

## National Distribution Project and Pardus Operating System

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### Abstract

In 2003, the Scientific and Technological Research Council of Turkey (TUBITAK) commissioned the National Research Institute of Electronics and Cryptology (UEKAE) in order to research feasibility of a national operating system for dependence from foreign countries. This project is called as National Distribution (Ulusal Dağıtım). In 2005, the project published its first product, which is called as Pardus 1.0. In this study, Pardus Operating System has been introduced. The current development status, versions, usage, advantages and limitations of the Pardus operating system have been investigated.

**Keywords:** Linux, Pardus, Operating System, Open Source, Free Software

## Ulusal Dağıtım Projesi ve Pardus İşletim Sistemi

### Özet

Türkiye Bilimsel ve Teknik Araştırma Kurumu (TÜBİTAK), 2003 yılında Ulusal Elektronik ve Kriptoloji Araştırma Enstitüsünü (UEKAE) dışa bağımlılıktan kurtulmak için bir milli işletim sisteminin yazılabilirliğini araştırmak üzere görevlendirdi. Bu proje Ulusal Dağıtım diye adlandırıldı. Yapılan çalışmalar sonucu 2005 yılında bu ekip Pardus 1.0 adıyla ilk ürününü piyasaya sürdü. Bu çalışmada işletim sistemleri ile ilgili temel kavramlar verildikten sonra Linux İşletim Sistemi anlatılmakta ve ardından Pardus İşletim Sistemi üzerinde durulmaktadır.

**Anahtar Kelimeler:** Linux, Pardus, İşletim Sistemi, Açık Kaynak, Özgür Yazılım

### 1. Introduction

Computers have spread along every field in our life and without doubt, they made standard life more practical. For example, people, companies, and institutions keep all their information (data) in computers instead of using locked cabinets or dusty note books. Family photos are now stored in social sharing Web sites instead of album books. Bank accounts are reached from anywhere in the World on anytime during the day. Almost everything including even secret information of nations can be given as examples to the mentioned situation nowadays. Because of this, it is a vital issue to store and transfer all this information (data) more safely. In such cases, nations need open source software systems, which do not come with too much economic burden and provides an environment in which background processes can be controlled, national security bugs are not

included and finally national resources can be saved as a result of usage [1].

The essential software of a computer is operating system. All software systems / programs are run over this operating system. Interaction between user and computer are ensured thanks to the operating system. Because of this, some important concepts like security, privacy, and affordability are discussed principally for operating systems.

It is desired for used operating systems that they should be not only open data structured and with affordable price but also should come with a stable kernel and be secure against malicious software by having a strong running performance, which offer fast enough working times requiring no restart for a long time. Otherwise, it is more possible to lose some data. This situation is very risky for especially big companies and state agencies having important data.

Linux was developed in 1991 by Linus Benedict Torvalds, who is a computer department student and makes research on working mechanism of computer operating systems. Briefly, Linux is an alternative operating system to Windows and it is widely preferred because of its features on open source code approach and free distribution. In time, Linux has been modified and improved by computer programmers and so, many different distributions have provided to the market. In addition, some nations have developed their own national operating systems on the kernel of Linux.

In Turkey, the Scientific and Technological Research Council of Turkey (TUBITAK) commissioned the National Research Institute of Electronics and Cryptology (UEKAE) in 2003, in order to research feasibility of a national operating system for dependence from foreign countries and ensuring security for military information / data [1]. By making the Linux kernel full compatible with Turkish and forming a kernel including strong sides of different Linux distributions, an operating system with the name: “*Pardus*” has been developed. In the context the “*National Distribution*” project, a group, which is formed by 5 engineers from abroad and many voluntaries, has developed the Pardus 1.0 in 2005, with the support of Technological Research Council of Turkey (TUBITAK), Ministry of National Defense, and the Premiership [1, 2].

## 2. Operating Systems and Pardus

Operating system is a a group of program / software, which ensures interaction between user and hardware, orders complex processes, shares computer resources like central processing unit, main memory, and input-output units among processes and users, controls data input and output of the system, tracks usage of resources for including in future plans, creates suitable environments for application programs and runs them, and organizes stored document in the computer system [3]. Without an operating system, it is not possible to run computer,

perform processes, and even reach to the stored data.

### 2.1. Linux and the concept of open software

In 1991, the time that Turkey has not met with the Internet yet, a master student from Finland Helsinki University, who is focused on working mechanism of operating systems, has send a message to the comp.os.minix news group:

The subject of the message dated with 25th August was typed as: “What do you want the most in the Minix?”. In the message, it was mentioned by this student, whose name is Linus Benedict Torvalds, that he has developed a new and free operating system for i386 systems. Additionally, he has also mentioned that the operating system was not as big and professional as GNU (GNU is not UNIX) and supported only AT hard drives as being unmovable. Finally, he wondered people’s expectations about an operating system and wanted them to share their suggestions [4, 5].

This project, which was started by Torvalds as a research and hobby on developing an operating system, has collected too many interests after the send message and after one year of the first version, a newer version with more features added with the support of many developers has been announced.

Source of the Linux is totally open. While Linux oriented operating systems can be downloaded over Internet, it is also possible to obtain such operating systems via CD/DVD, modify them and distribute again such modified versions as free or paid. Not only operating systems, but also programs and documents included in them can be distributed in the same way. The only condition is to meet with requirements of GNU/GPL license.

The GNU (GNU is not UNIX) project, which was started by Richard Stallman, has made it possible to appear such philosophy. With GNU project ([www.gnu.org](http://www.gnu.org)), the operating system: GNU HURD has been started to be developed and both source code of this operating system and its components (like compilers, debuggers, editors...etc.) have been distributed over the Internet as free. Another innovation that came with the GNU project is GNU/GPL

(GNU/General Public License). GNU/GPL allows developers to modify program by protecting the first programmer's rights as long as sources codes of the program is distributed and the related changes / modifications are reported. According to this approach, which is reverse of the *Copyright*, distribution of a program is not prevented; rather is it allowed to use the program by more people. Because of this, the GNU/GPL license is called as "*Copyleft*" [6, 7].

Because the meaning of the word "free" in "Free Software" means both "free" and "independent", there have been false believes like independent software should be free. In fact, such software / programs can be sold as paid. In the GNU/GPL license, there is no item preventing these software / programs to be sold as paid [7].

Icon of the Linux is Tux, who is a penguin with belly fully of fish. Because Torvalds likes penguins. It is often mentioned that the name Tux comes from the English word: tuxedo. But it is also claimed that Tux comes from words: Torwalds and uniX [8].

## 2.2. Linux in Turkey

In 1996, the Web site: [www.linux.org.tr](http://www.linux.org.tr) was opened and after that the FTP service: [ftp.linux.org.tr](ftp://ftp.linux.org.tr), which keeps the Linux distributions, was activated. In the Conference on Internet in Turkey, it has been the first time to provide seminars on Linux operating system and a Linux laboratory has been established for the first time. For the first time, a full of conference session has been formed in Conference on Internet in Turkey (in 1997) for the subject of Linux, also some Linux distributions and Turkish books on Linux have been given to visitors. In 1998, the first Turkish Linux distribution called as Turkuaz GNU/Linux has been given to visitors along with Turkish user manual. With the Academic Informatics Conference, which was started first in 1999, the tradition of special sessions on free and open source software has been continued and just before the conference, some courses on Linux for data processing staff of universities have

been done. In 2000 May, the "Group of Linux Users" has become the "Association of Linux Users" by becoming a legal entity. In addition, the e-mail list has been taken to the address of [linux@linux.org.tr](mailto:linux@linux.org.tr). In 2000 May, some seminars in Ankara and İstanbul have been done and after that another seminar in İzmir and finally regular seminars in every two weeks and every month have been started to be organized. Such works have been done for more than five years. In 2002, first "mobile" seminars have been done during the Week of Internet, with a 6 city tour. In 2002, the first "Linux and Free Software Festival" has been done and such events have become traditional as annually. In 2004, "Linux Planet", which keeps Web dailies on Linux, has been opened. After that some magazines and documents have been published and also additional seminars for developing free software have been done [9].

## 3. National Distribution Project and Pardus

Announcing happenings over social sharing sites to our all friends, performing all banking operations just as we are sitting, buying tickets and doing shopping, applying to examinations and getting their results, communicating with our friends in a far place on the world by using voice or/and visually supported environments, applying to an open job position, taking part in an examination or online course from our homes, saving photos or videos in a small device, editing these photos or videos, playing video games, making our homework without needing any paper or pen...etc. are all activities that appeared rapidly after computers had an important role in our lives. Being humankind's almost all life connected to computers directly or indirectly may cause also some risks, anxieties, and troubles. As it was indicated under the Introduction section, some countries take some precautions in order to ensure security for both their and citizens' information. While performing such tasks, it is necessary to use an independent operating system, which allows financial savings, ensures security for critical applications, supports an open and standard data structure, employs an open source with active

security control and finally can be expended easily without any financial burden [10].

In 2003, the Scientific and Technological Research Council of Turkey (TUBITAK) commissioned the National Research Institute of Electronics and Cryptology (UEKAE) in order to research feasibility of a national operating system thus the “National Distribution” project was started officially. Actually, this project was about a research on feasibility of a national operating system but it has been the cause of a time period leading to “Pardus 2011”. Icon of the Pardus operating system is shown in Figure 1.



**Figure 1.** Icon of the Pardus operating system.

Along most part of 2003, need for a national distribution, similar applications in rest of the world, recent status and interests of the software industry were all taken into consideration and human resources of the nation in information technology field, abilities or local software industry and also competitive factors were examined. With the obtained findings, it has been decided in 2003 summer that it was a good approach to develop / create a national operating system distribution. After that concrete planning processes have been started.

Current operating systems, –including especially Linux– have been examined and also methodology and philosophy of open source software have been studied in detail. Because

another objective was to form an organizational structure that can keep this distribution always alive, work models that can be employed in an open source framework have been examined. After the related examinations and studies, it has been decided in 2003 autumn to develop an operating system distribution, which is based on Linux and uses the GPL license approach [1].

On 16th October 2004, “Project Main Agreement”, which was created during previously done studies, has been announced officially [11]. Thanks to this agreement, it has been officially accepted that all products coming from this project will be on GPL license (which means all software will be open source and independent ones) and Pardus will be a project, which is totally open to the society and developed for the society.

In order to ensure flexibility and better management, the “National Distribution” has been divided into sub-projects and scope of each sub-project has been determined. Necessary infrastructure for forming distribution workflow has been planned and establishment of this infrastructure has been started as stepwise. Locally developed, essential components of the National Distribution have been determined and necessary solution approaches for these components have been started to be applied. As the start of 2004, design process was just started with the end of plan process.

On 1st December 2004, Pardus, which was designed and structured over the developing system called as “Pardus Root File System 0.0.1” with no easy-to-install or use features, has been started to be used within office environments with the first version number as 0.0.1 [10].

On 2nd February 2005, first running CD version of Pardus was distributed. Although providing a running CD version was not included in the Project flow, this version made it possible for users to understand more about Pardus without installing it totally and enabled developers to track development process of the Pardus operating system. On 5th May 2005, version 1.1 of the running CD was distributed. After that, Pardus has been more and more popular in time [12]

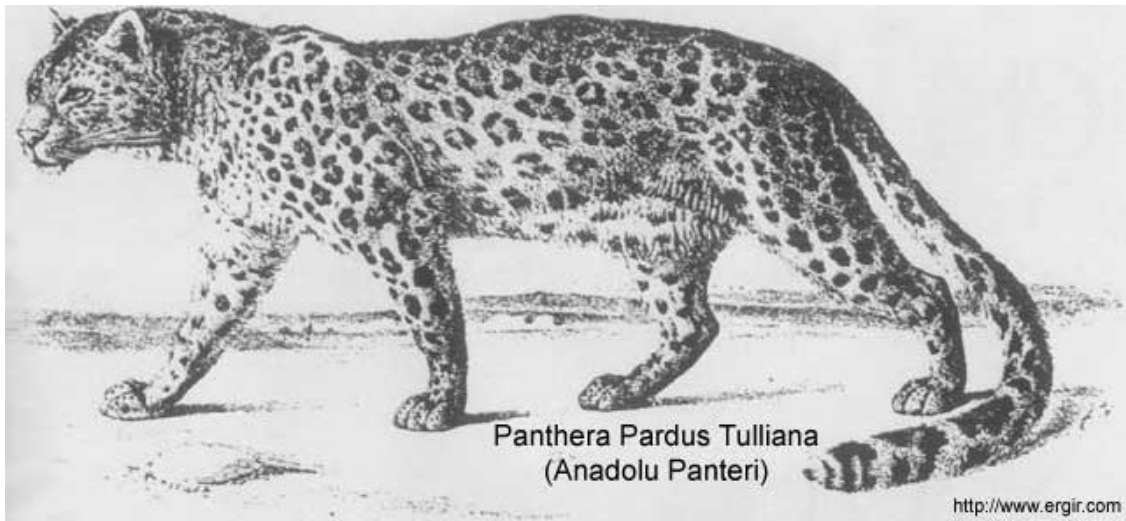
### **3.1. Pardus operating system**

The name of Pardus; –Latin– comes from the felines called as Panthera Pardus Tulliana (Anatolian Panther). The last panther was killed at Ankara Ankara – Beypazari in 1974. Although

it is claimed that it still exists, no one has seen it yet (Figure 2, Figure 3) [13].



**Figure 2.** The last Anatolian Panther [14].



**Figure 3.** The Anatolian Panther [14].

According to the Pardus naming policy, Latin names of living creatures in Anatolian, which are in risk of extinction, are sued for next versions of the operating system.

Root system except from the kernel, package management (PISI), configuration manager (COMAR), desktop management (Captain Desktop), device manager (Tasma) and

many other applications have been totally developed from scratch. Some user applications have been developed by a special team and most of other ones have been chosen from open source programs (Firefox, Open Office, Konqueror, Media programs...etc.) [10].

After alpha and beta versions, the first stable version: Pardus 1.0 has been distributed on 27<sup>th</sup> December 2005. It has been downloaded by a total of 25 thousand people within first month.

Pardus, which has a total of 5 demo versions including 3 alpha and 2 beta, has been translated into Dutch, in 2006, following its English and Turkish versions. Unique applications of Pardus had an important role on this progress. The related unique components and features are explained under the next sub-section.

Pardus is a GNU/Linux distribution, which is GPL licensed and provides wide opportunities on usability, hardware compatibility, stability, and security [13].

The Pardus project has been improved at Informatics and Data Security Advanced Technologies Research Center (BILGEM) under the Technological Research Council of Turkey (TUBITAK).

Pardus aims to provide an effective, stable, easy, and secure computer using experience by employing famous open source programs. Additionally, the development team works on making such programs to be run on a wide spectrum of hardware devices.

In November 2006, Ministry of National Defense Recruitment Agency (ASAL), which is also a unit of the Turkish army, has decided to use Pardus in their 625 servers and 4500 clients in Turkey. With this agreement, Pardus has been started to be used officially in state agencies [15].

On 18th December 2007, Pardus 2007 running CD has been announced (after 19 months following the Pardus 1.1 running CD) and at the same night, also installing CD has been started to be distributed. In this version, more than 1700 errors have been eliminated and more than 700 programs were added to the Pardus storage. During 2007, a total of 3 update versions have been distributed. These are called as Felis Chaus (Reeds Cat), Caracal Caracal (Blackear), and Lynx Lynx (Vulgar Lynx) respectively. Felis Chaus (2007.1) was distributed first on 16th March 2007. Its name comes from the Latin name of Reeds Cat, which is in risk of extinction. On the other hand, Caracal Caracal (2007.2) came with the KDE 3.5.7 desktop environment including around 700 updates and error corrections. In this version, many improvements regarding to Turkish

translation and management / viewing of PDF tools have been done. Furthermore, Network Management application, which was weak in the first version, has been improved. Caracal caracal also provided a new opening manager, which can be used for adding, editing or deleting GRUB inputs seen along the opening process. Lynx lynx (2007.3) was announced on 19th November 2007. The most remarkable feature of this version, which came with around 300 updates, KDE 3.5.8 desktop environment, and Open Office 2.3, is having a network manager, which can detect active networks in your profile automatically and pass to the related profile. The stable version, which was distributed on 27th June 2008, was called as Pardus 2008. A total of 2 updating versions were distributed for the Pardus 2008. These are called as Hyaena hyaena (Striped Hyena), and Canis aureus (Golden Jackal) respectively. The most remarkable feature of the Hyaena hyaena (2008.1) is making it possible to share an Internet connection made one of the related network connections with other networks. Canis aureus (2008.2) has been the second updating version of the Pardus 2008, as distributed in January 2009. The stable Pardus version announced on 17th July 2009 is called as Pardus 2009. As different from previous versions, Pardus 2009 has used the KDE 4 desktop environment. Updating versions of the Pardus 2009 are called as Anthropoides virgo (Demoiselle), and Geronticus eremita (Bald Ibis) respectively. Anthropoides virgo (2009.1) was announced on 15th January 2010. Some of new features came with this version are rapid install, easy pass through networks, new icon sets and KDE 4.3.4, which allows preview for folder contents without needing to open them. Geronticus eremita (2009.2) is a version, which was announced on 3rd June 2010 as more stable than the Pardus 2009.1 version. It was distributed with new kernel and KDE desktop, along with new versions of FireFox, Python, ThunderBird, Gimp, and Open Office. As the file explorer, *Dolphin* has been started to be used in this version, instead of the *Konqueror*. 2011 version of Pardus was announced in January 2011. It is the first Pardus version, which provides support for both 32 bit and 64 bit. Its updating versions are called as Dama Dama (Scarlet Deer), and Cervus elaphus (Red Deer) respectively. Dama Dama (2011.1)

was provided to use on 12nd July 2011. In addition to new 64 bit programs, it was distributed with the Libre Office instead of Open Office. Cervus elaphus (2011.2) was announced on 19th September 2011. Along with many program updates, it also included error corrections.

Pardus also has five enterprise versions, of which first one was distributed in 2007. While the enterprise 1 version has been developed specially for Ministry of National Defense, other enterprise versions can be used by all corporations [12, 16].

According to the developers, Pardus has been developed to “meet with IT literate users’ desktop needs, use advantages of current Linux distributions as concept, architecture or code and provide easy installing, configuration and using experience via tools and configuration framework, which are structured as able to evolve a autonomous system” [1].

### **3.2. Essential Pardus concepts and components special to Pardus**

**Director:** A starting frame program, which was developed specially for Pardus. Because the Director makes starting process of the operating system faster, it has been an inspiration for other Linux distributions.

**Captain Desktop:** A supportive program that is viewed at the desktop immediately after the installing process. Captain Desktop provides essential information about Pardus and adjusts some configuration options in order to provide better desktop using experience.

Captain Desktop is some kind of “first use wizard”, which enables users to make mouse configurations (left/right hand, wheel settings...etc.), set wallpaper and adjust other settings regarding to panel and style choices easily.

**PISI (Packages Installed aS Intended):** A package management program specially developed for Pardus. Package is an archive format, which includes all data, libraries and plug-ins necessary for running a program. It is possible to view or create such archive file types via some archive programs like WinRAR, ARK or 7Zip.

**YALI (Yet Another Linux Installer):** An installing interface special for Pardus. It has a more easy-to-use interface according to other

operating systems including Windows. Thanks to the YALI, it is very easy to install Pardus just by only 6 clicks at all. It asks for all settings and information before the installing process. After the installing process is started, it ends in about half an hour.

**COMAR (COntfiguration MAnageR):** It is the management environment for configuration. It is a program that prevents users from adjusting installed programs manually. It was designed in order to maintain stability of the system and solve settings problems causing some programs not to run well.

As different from other Linux distributions, installing and configuration programs (PISI and COMAR) are separately included in Pardus. They also have a common interface, which can be used when they need to work collaboratively. COMAR is something like the Registry in Windows operating system.

**Zemberek:** It is the name used for Turkish language package regarding to Open Office. It supports Turkish with a total rate of 100%. It performs grammar check in Turkish and complete the related words that are included (or saved later) in the dictionary.

**Knazar:** It is a firewall application running over Pardus. It is disabled as default, after the first installing process. It can give authorities to users on all chosen protocols. There are also some other firewall components employed over Knazar.

**Migration tool:** It is a tool, which users encounter with after installing of Pardus. It allows time saving by transferring settings and files in other installed operating systems to the Pardus.

**Ahenk:** It is distance control infrastructure of the COMAR.

It allows transferring documents and desktop of all other operating systems including Windows to the Pardus. It also enables users to reach their documents folder in other operating systems by creating a bridge over the desktop. It makes it easier to perform some tasks like changing background, creating e-mail account or transferring bookmarks if a user want to use Pardus along with his/her other operating system.

**Tasma:** It is the management console designed for Pardus. Regional settings, device management, adjustments on visual features and

themes, editing user accounts, desktop and window settings, accessibility of PISI and all other adjustments regarding to services can be done by using Tasma. Tasma comes with a user friendly interface.

Install Now tool: It is a program allows other packages to be installed on Pardus. Install Now, which is supported by volunteers, is still in alpha distribution status [12, 16, 17].

### 3.3. Pardus usage in Turkey and the World

In Turkey, first corporations and institutions that used Pardus can be expressed as follows: Ministry of National Defense Recruitment Agency (ASAL) is the first institution that used Pardus in their servers and clients. Ministry of National Defense is already one of the first institutions that supported the Ulu-Dag project. On the other hand, Radio and Television Supreme Council (RTUK) has used Pardus in some of their server and client computers. For Ministry of Finance, some customized Pardus PISI packages were developed in order to be used on some finance accounts. These packages are stored in servers of the Ministry of Finance as requested by them. Also, these packages are open source and on GPL license. They are free to use for everybody. Canakkale 18 March University has supported the National Distribution Project by installing Pardus to their computers in the library and computer laboratories of the Department of Computer Engineering. Canakkale 18 March University (COMU) has been always supportive of the Pardus Project as having an active informatics community on Linux and free / open source programs. A customized version of Pardus is installed in a total of 85 thousand intelligent whiteboards given to schools in the context of FATIİH project. A brief list of all corporations and institutions in Turkey that are using Pardus is given as follows [18, 19]:

Ankara University, Adiyaman University, Ankara Directorate of Police, Antalya Provincial Directorate of Health, Ministry of National Defense Recruitment Agency (ASAL), Batman University, Bergama Municipality, Bilkent University, Bogazici University, Ceyhan Municipality, Canakkale 18 March University

(COMU), State Planning Organization, Ministry of Foreign Affairs (partially), Police Organization (partially), Energy Park, Energy Market Regulatory Authority (EPDK), Evet (Yes) Insurance, Galatasaray University, Istanbul Water and Sewerage Administration (ISKI), Istanbul Technical University, Istanbul Trade University, Istanbul University, Isler Dental Products, Kastamonu University, Kecioren Education and Research Hospital, Manisa Provincial Directorate of Health, Marmara University, Mersin University, Ministry of National Defense, Neziroglu Automotive, Okan University, Middle East Technical University (ODTU-METU), Petrol-Is Union, Radio and Television Supreme Council (RTUK), Social Security (Insurance) Agency, Turkish Armed Forces, Scientific and Technological Research Council of Turkey (TUBITAK).

Except from Turkish, Pardus 2011.2 version can be installed as English, German, Spanish, French, Hungarian, Italian, Dutch, Russian and Swedish via CD and also it supports more than 60 languages. Because it provides a full support on Turkish and it is own character, it is used in Turkic republics and also in many different countries [17].

During Readers' Choice Awards 2010 given by Linux Journal, Pardus has been in top 5 under three separate categories by leaving about 300 Linux distributions behind. It has been in top 5 under the related categories: “the best program developed with open software”, “the best Linux distribution”, and finally, “package management system”, which is given for performance in program install, un-install and update; with its unique program design: PISI [20].

### 3.4. Pardus today

The last version of Pardus operating system that was developed for individual users by the Technological Research Council of Turkey (TUBITAK) Informatics and Data Security Advanced Technologies Research Center (BILGEM) is 2011.2. After the next period, BILGEM has developed enterprise versions and individual versions have been developed by volunteers. Although this situation has continued till 2013, a Home version was announced for



individual users with the announcement of Enterprise version 5. With the 2013 version, the largest software / program support base: Debian has been started to be used. In this way, it was aimed to eliminate waste of time on development of PISI packages [18].

#### 4. Conclusions and Suggestions

Pardus has become very popular and been successful at providing new components to the Linux operating system.

Since 2005, use of Pardus in corporations has been improving.

Number of Pardus developers and volunteers has been increasing.

Except from professional users, Pardus operating system is still not known well enough by computer users.

After passing to DVD distributions, hardware support / scope of Pardus has improved.

Pardus is still distributed over the Internet and DVD distribution is not performed on a large scale.

Ways for obtaining Pardus from alternative sources (except from the Internet) should be improved.

Promotion of Pardus performed via Internet and visual media should be improved. More conferences on Pardus should be performed.

In promotions done for Pardus, a list of programs coming with the distribution and also supported hardware can be provided.

Computer supported engineering tools should be added to the Pardus.

Console use in Pardus should be lowered. Some widely done settings should be provided over visual interface rather than the console.

Turkish translation works on Help files and other open source programs should be improved / increased.

In order to improve using rates of Pardus in schools and state agencies, more educational events should be organized.

Some works for improving popularity of Pardus in different countries can be done.

Unique components included in only Pardus can be introduced in such works.

By creating Web based forum environments and Web sites, it can be easier and more effective to provide solutions for problems encountered over Pardus.

In order to run Pardus as server (not only as desktop), the related deficiencies can be detected and necessary improvements can be done in order to eliminate them. Promotion of enterprise versions should be improved / increased.

More multimedia components should be developed for Pardus. Additionally, more descriptive Turkish documentation should be done for some multimedia programs / components like Amarok and Kaffein.

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