

Creation of an Information System At the Odessa Oblast Hospital

This report contains the analysis of experience in creation of an information system at the Odessa Oblast Hospital, discussion of the selection criteria for the operating system, comparison of various OS Linux distribution kits, and links to respective English and Russian Internet resources.

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1. BACKGROUND

The Learning Resource Center has been functioning at the Odessa Oblast Hospital since 1996.

Initially, the American International Health Alliance (AIHA) provided a computer equipped with a modem and a laser printer, as well as funding for creation of a communication channel to have access to the Internet.

1.1. Prerequisites

The major factor in the successful development of the project was support of the hospital administration combined with initiative of the medical personnel.

The administration realized that only the search for new treatment methodologies and information about new medications could lead to actual savings of hospital resources. Given the scarcity and high cost of special editions, medical practitioners did and do view the Internet as a real opportunity to promptly receive most recent information and consult with their colleagues.

The chief physician allocated well-guarded premises accessible 12 hours a day. In each unit, there was selected an information coordinator well aware of the unit's needs.

1.2. Designing

The tasks the Center was facing were defined and its organizational structure worked out at a meeting with the hospital administration.

The **chief physician** was to ensure strategic management of the Center's activities.

The **hospital information coordinator** is responsible for:

- personnel training, publicity actions, provision of information about the Center's activities to the personnel, patients, and the medical community;
- development of concepts for the software to be designed (databases, Internet/Intranet server applications), introduction of these concepts in day-to-day practices;
- creation and maintenance of a local network;
- security policy (authorization of access to the Center's resources);
- ensuring antiviral protection;
- coordination of activities of the Standing Committee for designing the internal database;
- development of future directions of the Center's activities.

The **information coordinators of the units**:

- train personnel of the units;
- meet information needs of the unit (search for information, maintenance of the computer equipment).

1.2.1. Tasks to Be Performed by the Center:

- meeting information needs of the hospital personnel;
- dissemination of medical information among the patients and provision of remote consultations;
- introduction of new treatment and diagnostic technologies in day-to-day practices aimed at improvement of quality and reduction of costs;
- automation of routine document management;
- transition to a self-repayment system.

In order to successfully perform these tasks the information coordinators were trained and given time to work at the Center (during the workday) along with an opportunity to multiply materials found in the Internet and on the AIHA-provided CDs.

1.2.2. Selection of a Platform for the Server

At the initial stage of the Center's functioning, the hospital had no local network, so we selected the operating system for the Center's computer based on the following criteria:

- reliability: user's work should have no impact on the overall system efficiency;
- security: authorized access to user resources;
- possibility to install a fully operational Internet server and a mail server;
- free technical support and consultations;
- OS requirements to hardware;
- cost of legal OS and applications.

The two main options when selecting an OS included Linux and Windows NT. The comparative analysis of these two platforms is provided in Table 1 below.

Table 1

Operating System	Linux	Windows NT Server 4.0
Cost	Free FTP download \$20 to \$199 for the delivery of the installation CD-ROM and printed manual	Version for 5 users - \$809; 10 users - \$1,129; Enterprise Edition for 25 users - \$3,999
Free technical support	Y	N
Source kernel codes	Y	N
Web server	Apache Web Server	IIS
FTP server	Y	Y
Telnet server	Y	N
SMTP/POP3 server	Y	N
DNS server	Y	Y
Network	TCP/IP, IPv6, NFS, SMB, IPX/SPX, NCP server (NetWare server), AppleTalk, plus many other protocols	TCP/IP, SMB, IPX/SPX, AppleTalk, plus many other protocols
X-Windows server (for remote launch of graphic applications)	Y	N
Remote control utilities	Y, all utilities	Only User Manager for Domains and Server Manager
News server	Y	N
C and C++ compilers	Y	N
Perl 5.0	Y	N
Backup copying	Y	N
File systems supported	32	3
Disk quotas support	Y	N
Graphic user interfaces	4	1
Server minimal configuration	486 processor, RAM 32MB, HDD 300MB	P133 processor, RAM 64MB, HDD 700MB
Free software support for closed cycle organization	Y	N

In the absence of additional funding, we selected Linux Red Hat 5.0 as an operating system to be installed.

As a result, over the five year Center's operation:

- the server was disconnected only once to replace the hard disk with a larger one and there was no single software failure;
- personal disk space was allocated to all users to store their mail and applications with high-level protection from unauthorized access;
- hospital's Internet server was created (over 10 thousand pages) and domain mednet.odessa.ua registered;

- mail server was installed (all employees were given an opportunity to have personal e-mail accounts).

The server was used for the following purposes:

1. Continuous work as an Internet server and a mail server;
2. Users' search for information and processing of messages with the help of a graphic shell or console applications. Table 2 below provides comparative characteristics of these operating modes.

Table 2

	Command Line Mode	Graphic Mode
Applications		
Internet	Lynx	Netscape
Mail and news	Pine	Netscape
Strengths	High speed Minimal server load	User-friendly graphic interface
Weaknesses	High user qualification requirements	Server operation slows down abruptly

The following software tools were installed on the server:

Apache – well-known Web server installed at a good half of Web sites worldwide. It is an excellent base for a Web site and intranet. A quite good description of configuring can be found in the article *Russian Apache Tribe* by Artem Podstreshny (in “Mir PK” #3, 1999, pp. 70-77).

DNS – domain name system server establishing correlation between IP addresses and domain names within a network. It is a basis for network administration saving from the need for any changes in the network configuration to be reflected at individual workstations. A great help for configuring appeared to be Konstantin Pyanin's article *Configuring DNS Servers* (in “LAN. Zhurnal Setevykh Resheniy” #3, 1997, pp. 86-91).

Mail server

1.3. Creation of Infrastructure

Start-Up Conditions

The server was installed based on the computer having the following configuration: Processor: Pentium-120, RAM – 16MB, HDD – 1.7GB, UPS 500VA, dedicated line using two US Robotics Courier 33600 modems.

With AIHA-provided financial support there were laid communication lines (shown on Figure 1 in bold) that subsequently allowed to increase the number of computers integrated into the network.

The network is being developed owing to initiative of the hospital's medical personnel.

Over the last five years, a network uniting 27 computers has been created at the hospital. Its functioning is ensured by two servers.

Server 1: router, firewall, mail

Pentium-120MHz, RAM – 32MB, HDD – 13.2GB

Linux IPCHAINS – ensures package control and protection from unauthorized access

Sendmail – ensures sending, receiving and rerouting messages from all local and boundary clients and network servers

Server 2: WWW, databases, files, backup copying

Celeron-433MHz, RAM – 128MB, HDD – 13.2GB

Currently, both the hospital's database and units' local databases are in use. MS Access 97 is used for local databases. Development of these databases is viewed on as a task-setting phase. Experience shows that with well-elaborated details in place further integration of applications goes quickly and smoothly.

Local databases of the first type are in fact automated workplaces of chiefs of the units designed to:

- facilitate preparation of statistical reports;
- receive data on the patients that underwent treatment in the unit;
- provide assistance in dispensary examination.

The best example is the chief of the anesthesiology unit's automated workplace:

- the database has a distributed structure (data are stored on the server, whereas client parts – on the computers from which the data are entered) and features strict access authorization by a password and network computer address;
- statistical information can be obtained on the unit as a whole, on each operating room and doctor;
- records are easily retrieved by any of the input parameters.

The hospital's internal database uses a Web interface created using PHP-Nuke technology (a set of PHP scripts) and is based on MySQL. It contains:

- bulletin board;
- personalized news;
- messaging option for communication among doctors;
- internal forums;
- local databases data export option;
- access to the Internet for security reasons is not provided.

1.4. Development Outlook

- Integration of all hospital units into the network
- Introduction of the hospital's common internal database
- Provision of access to the Internet from home computers (as one of the main factors of transition to sustainability)
- Creation of a remote consultation network and provision of services to central district hospitals within the region

2. COMPARISON OF LINUX DISTRIBUTIONS KITS

What is OS Linux?

Linux is a modern POSIX-compatible and Unix-like operating system for personal computers and workstations. It is a multi-user network OS with X Windows System. Linux supports open system standards and Internet protocols and is compatible with Unix, DOS, MS Windows. All system components, including source codes, are distributed with a license for free copying and installation for an unlimited number of users. Linux OS is widely used on Intel PC 386/486/Pentium/Pentium Pro platforms and is gaining a foothold on a series of other platforms (DEC AXP, Power Macintosh, etc.).

Linux was designed by Linus Torvalds from the University of Helsinki and an enormous team of thousands of contributors beyond all calculation, including Internet users, personnel of research centers, foundations, universities, etc. Linux should be pronounced as “li:nuks” with the stress on the first syllable.

Linux Capabilities

- free legal version of a modern OS;
- high operating speed, reliable and steady operation;
- immunity to viruses (there have appeared viruses using certain gaps in software protection, but with timely installation of the latest versions and patches the risk is reduced to a minimum);
- use of all capabilities of modern PCs taking away inherent limitations of DOS and MS Windows regarding the use of memory and processor resources;
- effective management of multiple tasks and priorities, performance of background tasks (long calculations, e-mailing, diskette formatting, etc.) does not hamper operation;
- easy integration of the computer into local and global networks, including the Internet;
- work with Novell and MS Windows-based networks;
- ability to run applications of other OS – various versions of Unix, DOS and MS Windows;
- use of a large number of various software packages accumulated in the world of Unix and freely distributed with source codes;
- comprehensive set of tools for designing applications of any degree of complexity, including client-server, object-oriented, multiwindow text and/or graphic interface systems suitable for work in Linux and other OS alike;
- extensive documentation and source codes for all components, including the OS kernel;
- opportunity for all those who wish to try themselves in the designing to organize, through the Internet, communication and joint work with any Linux designers and make a contribution by having become a co-author of the system.

Specific Features of Linux as an OS

- performance of multiple tasks: possibility to run several applications at the same time;
- multi-user mode: many users work simultaneously on one and the same PC;
- 386 protected mode;
- processor memory protection;
- program failure does not result in system hang-up;
- economical loading: Linux loads from the disk only actually used parts of an application;

- allocation of pages among the copies of the application run. This means that application processes-copies, when running, can use the same memory. When such a process tries to save data, the recorded 4KB page is copied in free space. This increases the operating speed and saves memory;
- virtual memory pagination (i.e., only the required page is paged-out from the memory to the disk rather than the entire inactive process);
- virtual memory in independent sectors and/or files of the file system;
- virtual memory up to 2GB;
- change of virtual memory size when running programs;
- shared program and disk cache memory: all free memory is used for disk exchange buffering;
- dynamic loadable shared libraries;
- national alphabets and conventions support, including support for the Russian language, add-new option;
- multiple virtual consoles: several simultaneous independent keyboard-switchable sessions per one display;
- own advanced file system up to 4TB with file names up to 255 symbols;
- transparent access to DOS sectors (or OS/2 FAT): DOS sector looks like a part of the Linux file system, VFAT support (WNT, Windows 98);
- special file system UMSDOS allowing to install Linux in the DOS file system;
- possibility to create “thin clients” by importing the graphic shell into diskless computers.

LINUX RUSSIFIED DISTRIBUTIONS

Black Cat

Is being created based on the current Red Hat Linux version by the members of the Donbass group of users, Leon Kanter and Alexander Kanevsky. They are in close cooperation with RedHat and are the authors of many patches and translations included into this American distribution. But before those appear in Black Cat. The main purpose of the project is to create a universal distribution easy to use as both an Internet/intranet server and a workplace or home multimedia system. Special attention is focused on the support of the Russian and Ukrainian languages and compatibility with commercial software of third producers.

Black Cat Linux 6.2. made its appearance in June 2000. It is commendable for all Red Hat devotees that would like to see it reliable, russified and user-friendly. BlackCat also cannot complain of the penury of applications, although their major part determining the specific character of this distribution is intended for server applications. In addition, this kit provides support of exotic devices –TV and radio tuners, video capture cards, etc.

By now, this project has united with

ASPLinux

(URL: <http://www.asplinux.ru/ru/>)

According to the authors, “ASPLinux is the easiest to install and use, 100% Red Hat Linux-compatible distribution kit. It includes a utility to work with ASPDiskManager sections, graphic ASPLoader, EspressoDownload as an independent utility and a part of

the network installation. ASPLinux being designed by the Russian specialists provides best Russian language support". Version 7.1 is available.

Linux Mandrake 7.0 Russian Edition

(URL: <http://www.iplabs.ru/Linux/>)

Linux Mandrake is one of the most popular distribution kits, revised and extended clone of Red Hat, fully compatible with the latter. Mandrake creator, Mandrakesoft president Gael Duval makes it his aim to produce a simple desktop distribution to be enjoyed by newcomers and amateurs. IPLabs Linux Team had supported Gael's undertaking even before Mandrakesoft was created.

Linux Mandrake 7.0 Spring 2001 Russian Edition is a result of IPLabs Linux Team's joint work with the French. In the Russian version, over 50 packages have been redesigned and added along with documentation in Russian. You won't have any problems with russification – it has already been done. On the second disk, in addition to the source codes, you will find an IPLabs-prepared collection of tools to design applications. The booklet included into the kit describes the installation procedure, gives setting and working tips. This distribution includes Midgard – a set of software tools for fast Web site building. I particularly enjoyed a special utility to update software packages. Linux-Mandrake is available for residents of Russia and NIS via the Internet shop Mistral (<http://www.mistral.ru>).

Russian Linux Krasnaya Shapochka

Krasnaya Shapochka is a Russian Linux distribution kit based on RedHat and having a set of russified applications. It hasn't been updated for a long time.

Otkrytoye Yadro

Is an almost complete clone of the current RedHat distribution with russification packages added and a large amount of documentation (including in Russian).

KSI Linux 2.0

(URL: www.ksi-linux.com)

This distribution kit is made based on and using Red Hat Linux ideology, so that those who dealt with Red Hat will find here many familiar things. This is the first distribution kit using the kernel from the new stable 2.2. series. KSI Linux was created in Ukraine and thus contains a good deal of russified software. Russian language support is designed correctly, i.e., using correct locale in koi8-r coding. The installation procedure is in Russian. The kit includes K Desktop Environment. *This distribution kit can be recommended to all those who need a powerful and user-friendly Unix desktop, as well as to beginners. The authors focused it on the server sector.* I appreciated the fact that the Apache-MySQL-PHP set started immediately after the installation and required no additional fine-tuning.

Best Linux 2000 R2-Moscow

(<http://bestlinux.net>)

SOT, Linux producer from Finland, issued a Best Linux distribution kit with Russian fonts support. It includes new XFREE 4.0, kernel of the 2.2.14 version and the

integrated Star Office (tm) from Sun Microsystems. “Best Linux-integrated Star Office (tm) supporting Russian fonts makes the new version user-friendly for ordinary and business customers alike. The new version is easy to use and much more advanced. Now, one can configure printers, sound cards and usb-mice during installation. All previously known shortcomings have been thoroughly reviewed and emended”, - commented on Mr. Anton Anisimov, SOT project manager.

The Best Linux 2000 distribution kit includes some new features previously non-available in Linux, such as provision of technical support up to the appearance of the next version. The kit also contains 400-page user manual, installation CD, CDs with source codes, Linux games and applications.

RosLinux

(URL: <http://www.roslinux.com>, <http://frigate.roslinux.com>, <http://www.ruslinux.spb.ru>)

The ROSLINUX project is aimed to create a distribution kit intended for workstations and home computers in Russia. The designers set the following objectives:

- Availability of all applications needed for full-fledged operation;
- Maximum possible Russian language support;
- Compatibility with main Linux distributions;
- Ease of use for newcomers;
- Exclusive use of software meeting SOPOdR requirements;
- Promotion of OpenSource principles in Russia.

The first version (1.0) was launched on December 12, 2000.

NON-RUSSIFIED LINUX DISTRIBUTIONS

Red Hat (7.1)

(<http://www.redhat.com/>)

The most popular distribution to date. It features user-friendly administration tools and installation procedure, thus making itself suitable for both beginners and specialists. It can be installed by overwriting an old RedHat Linux version. This distribution is ideal for servers and desktops alike. RedHat 7.0 is supplied with two graphic user environments – Gnome and KDE. More details about the kit can be found at the Red Hat Web site: <http://store.redhat.com/>.

The Moscow firm IPLabs offers a genuine Red Hat 7.0: in a box, with two manuals and 90-day support. The distribution disk includes binaries for the Intel platform, source kernel codes, latest updates, documentation in Russian.

Mandrake Linux (8.0)

(<http://www.linux-mandrake.com/>)

The original Linux Mandrake 7.1 version in our country can be FTP-downloaded in the form of iso-images (two disks, the first – installation disk, the second – additional packages) from numerous servers. The first disk is a boot disk, so no installation diskettes are required.

The innovation starts already at the splash screen stage and is emphasized with multicolored wallpaper: one can select blue, lilac, mossy yellow, green and grey tones.

The setup screen is divided into three parts:

- Left – installation stages marked with small light bulbs (version 7.0) or stars (7.1). They replace the Back button in other distributions: one can go back at any time by clicking an appropriate item without tedious flicking back through the screens;
- Top right – description of actions at a given stage and respective control tools;
- Bottom right – explanation, more or less distinct, of actions at the current stage, which obviates the need for the Help button of other distributions.

The installation starts with the choice of a language, Russian being an equal member among them (even in the original version). After that, selection of the installation type (or update) – automatic, custom, expert, and its purpose – standard, designer, server, followed by a question about SCSI devices and keyboard selection (including the Russian one). Additional questions concern disk optimization, security level (one of six available), removable carriers automatic mounting, etc.

Also noteworthy is another critical moment – selection of packages. First, one can find the usual groups of packages for installation – office applications, multimedia, games, etc. Second, there is an individual package selection option in the expert mode.

All main settings take place only after copying of packages is completed. These include: configuring the network and dial-up connections, cryptographic protection level (with a respective legal warning in the Russian edition), selection of a time zone, services when loading, configuring of a printer.

Then configuring is followed by entering a password for the root and identification of users.

The composition of windows managers in both Linux Mandrake versions is extremely rich. At the installation stage, it is proposed, in addition to KDE, to install GNOME and Other user environments including AfterStep and Blackbox, Enlightenment, FVWM2 and FVWM95, WindowMaker – the mix varies depending on the version and edition.

The system of mounting removable devices (CD, diskettes, etc.) is very efficient. It allows not only automatic mounting at access but also dismounting on exit. The choice of word processors is extensive: kedit and kwrite, fte, lyx and klyx, ted, gnotepad, bluefish as an html-editor. For work with graphics, in addition to GIMP, also available are vector editors KIllustrator, Tgif, sketch. There are many multimedia applications – video-, mpeg-, CD, MIDI- and Audio-players.

Of course, the original 7.1 version, from the point of view of applications, is more relevant than the Russian 7.0 edition. However, the difference between them can be leveled out with the help of Appendix to Linux Mandrake 7.0/RE. This disk recently issued by the IPLabs Linux Team contains the kernel updated to the 2.2.15 version (supporting, among others, the 810 chipset from Intel), XFree86 of the 4.0 version, KDE2 beta and many other innovations. So, by having updated the Russian edition of the seventh version one can get an even more modern system than original Mandrake 7.1.

Debian GNU/Linux (2.2)

(<http://www.debian.org/>)

By the moment, Debian is the largest distribution kit including over two thousand packages. Its creators are very squeamish about licensing, therefore Debian is the most “untainted” distribution. Testing of the end product receives great attention. Debian is the second popular distribution after RedHat. It is reliable, convenient for administration, suitable for servers and desktops alike. Debian is issued for platforms i386, m86k (amiga, atari, macs), Alpha and Sparc. It is recommended for those who wish to seriously study and work with Linux, as well as those who take to heart the ideas of free software. In view of some complexity of the installation procedure, beginners are disadvised to start acquaintance with Linux from this distribution.

[Debian](#) claims its distribution to be independent from the kernel. Currently, it works on the Linux kernel, but a version is being designed that would be capable of working on other kernels using Hurd.

Slackware Linux

(<http://www.slackware.com/>)

The simplicity and logic of this distribution will allow you to grasp Linux organization. Most of configuring is done “directly”, without additional configurators and other “layering”. This makes this distribution somewhat complicated for beginners, but it enjoys well-earned popularity among the users.

Its advantage is the lack of files with long names, so Slackware can be installed from the DOS disk section, transferred on diskettes and hard disks with fat16. Using the Unix standard tar.gz format in the installation packages is also quite handy. Packages updates appear on a regular basis. *This distribution is commendable for all those who wish to gain an understanding of Linux.* Slackware Linux was one of the first Linux distributions. Patrick Volkerding heard about Linux from one of his friends and became interested because he had been looking long before for a Unix version that could run on his computer. Thus, he started to develop this version, which resulted in the Slackware distribution.

A full installation of Slackware, as regards completeness of applications, approaches that of Mandrake. The set of applications is largely traditional. One’s attention is attracted by the abundance of word processors, file managers, complete TeX publication preparation system support. I was surprised to find out even GRASS – one of the developed geographic information systems for Linux – in one edition of this distribution on an ftp-server (though not in the form of an iso-image).

SuSE Linux

(<http://www.suse.com/>)

(Russian translation on the iplabs server – http://www.iplabs.ru/Linux/suse_www/r/)

One of the most popular distributions in Europe, designed in Germany. The mother tongue is German, translated into English (along with a detailed manual), French, Italian and Spanish. The SuSe Company is one of the main designers of X-servers for XFree86 – Linux graphic system. New video cards support often appears in S.u.S.E. distributions and only some time later – in XFree86 and others. This distribution has a very good installation and administration program – YaST and includes over 800 packages.

S.u.S.E. Linux can be installed on FAT16 using the live file system, and 450-page manual included into the kit is the best of the kind. S.u.S.E. contains 10 windows managers and KDE 1.0. S.u.S.E Linux will satisfy newcomers and old Linux fans alike, though it is largely intended for professionals: programmers and system administrators. Therefore, it can be recommended for important tasks to those who want to have their system in order and those wishing to study Linux by a thorough book, as noted before, the only of the kind (so far in English).

SuSE Linux 6.2 is supplied with 1,300 applications and utilities! These comprise SIX CD-ROMs of software gathered into one package. SuSE Linux offers most of Linux applications as one package. It is an encyclopedic set of software with each application selected based on the criteria of value and utility. Applications are grouped by sections, thus allowing to easily find and install the needed one.

3. OVERVIEW OF THE SERVER SOFTWARE

Apache, currently the most widely used HTTP-server worldwide, is used as a www-server. It left behind all commercial and freely distributed market competitors and provides a great deal of opportunities.

Samba, as it seemed to me, is an excellent tool for integration of Windows clients into the network. From the client's point of view, the Samba server looks like a Windows NT server. The client is switched into the network in a natural way receiving, if necessary, all needed services (file server, print server).

Database Administration System MySQL

MySQL is a fairly small and fast-operating relational database based on Hughes Technologies Mini SQL (mSQL) traditions.

The most recent MySQL version can be downloaded from www.tcx.se.

Below listed are the key features of the MySQL package:

- Multithreading. Support of several simultaneous queries;
- Optimization of links with attachment of many data per one pass;
- Fixed and variable length records;
- ODBC driver available with the source;
- Flexible system of preferences and passwords;
- Up to 16 keys in a table. Each key can have up to 15 fields;
- Support of key fields and special fields in the CREATE operator;
- Support of 1 to 4 byte-long numbers (ints, float, double, fixed), strings of variable length and time labels;
- Interface with C and Perl languages, PHP;
- Flow-based fast memory system;
- Table check and repair utility (isamchk);
- All data stored in the ISO8859_1 format;
- All operations with strings disregard character register in processed strings;
- Aliases are applicable both to tables and separate columns;
- All fields have default values. INSERT can be used at any field subset;
- Ease of table control, including adding and removing keys and fields.

For designing applications, I use PHP

PHP is an HTML-embedded server scripting language that is interpreted and executed on the server. PHP is an HTML preprocessor.

Before the server “passes” a file to the browser, the file is reviewed by a preprocessor-interpreter. To ensure this, the files that are processed by the preprocessor should have a certain extension (.phtml or .php3) and contain (optional requirement) a code for the preprocessor. Before sending a page, the PHP-code is processed on the server and, as a result, provided to the browser as an HTML-page that may significantly differ from that stored on the server. As for ordinary pages with .html/.htm extension, the Web server will send them to the browser without any processing.

The main distinction from CGI-scripts written in other languages like Perl or C is that in CGI you write an output HTML-code yourself, whereas with the help of PHP you embed your program in a ready-made HTML-page using opening and closing tags (e.g., `<?php and ?>`).

PHP is called a *server script* language unlike JavaScript/Jscript/VBScript that are *client script* languages. This means that the PHP-script is executed on the server and the client receives the result of this work, whereas in JavaScript the code is sent to the client machine and executed there by the browser.

The PHP-APACHE-MySQL set can run on Windows and Linux platforms alike. I create and test applications on a Windows 2000-based workstation and transfer them to a server based on Linux Black Cat 6.2.

Installation

Linux can be installed using one of the following methods:

- from local CD-ROM;
- from a hard disk already having a Linux distribution;
- from a local network file-server via the NFS;
- through FTP or SMB from a remote computer (including from the Internet).

In my view, the most convenient and practical is the local CD-ROM option, the more so as to buy the required CD now is not a problem (at the so-called radio markets in any regional center) – it is easier and less expensive than downloading from the Internet (for it takes 500-600MB). Better if it is indicated that the distribution is russified, at least in part.

Antiviruses

AntiViral Toolkit Pro for Linux

AVP for Linux is a powerful antiviral system for Linux-based workstations and servers. The program uses the same antiviral base as other AVP products, thereby providing the users with protection of the same level as that for other platforms.

AntiViral Toolkit Pro Daemon for Linux

AVP Daemon is a resident antiviral filter for Linux. Unlike the existing AVP antiviral scanner for Linux, this product is capable of significantly saving the time of scanning as it loads the antiviral base into the memory only once, at launching. It is exactly this feature of AVP Daemon that determines the product's main destination – Linux-based Web servers and mail systems. These systems require continuous testing of new objects so that the use of the resident filter has a clear advantage.

AVP Monitor for Linux

AVP Monitor for Linux is a client program for AVP Daemon intercepting file operations (modules launching, opening and initialization) and checking for viruses.

General characteristics of AVP and AVP Daemon for Linux include:

- on-the-fly virus trapping (AVP monitor);
- detection and elimination of viruses and harmful codes of all known types;
- detection and elimination of viruses from files and sectors at local and network disks;
- scanning of local mail databases;
- scanning of files in e-mail messages;
- high-performance heuristic code analyzer capable of detecting up to 92% of unknown viruses;
- search and elimination of viruses from compressed and archived files;
- possibility for users to design custom applications using the program;
- Intel platform work based on Linux.

AMaViS 0.2.0-pre6. Virus scanner designed to search for viruses in e-mails.

AntiVir. Antivirus.

WMailScanner 0.0.2. Another antivirus intended for scanning attachments to letters.

4. LINKS TO THE INTERNET RESOURCES

4.1. Documentation

[UNIX & GNU Documentation Library](http://cclib.nsu.ru/projects/gnudocs/) (<http://cclib.nsu.ru/projects/gnudocs/>) on the Novosibirsk State University's server

[M. Moshkov's Library](http://www.ras.ru/~moshkov) (<http://www.ras.ru/~moshkov>) – one of the best known electronic libraries, contains a large amount of documentation on Unix and Linux in Russian (has a special section “To Unixoids of All Countries”). (See list of mirrors, e.g., at <http://www.alkar.net/~moshkov/>.)

<http://citforum.ru/> – the largest selection of articles and documentation dedicated to Unix-like systems.

[Russian Documents](http://rusdoc.df.ru/) (<http://rusdoc.df.ru/>) – collection of technical documentation in Russian. Topics: Operating Systems, Programming Languages, To a Hacker, Hardware, Networks, etc. An excellent library.

www.compulink.ru/cdrom/unix/ Many documents on Linux. Sale of CD-ROM. Links.

[On the server](http://opensystems.ru/linux/os.htm) (<http://opensystems.ru/linux/os.htm>) of the Open Systems publishing house one can find several periodicals on computer subjects. Recently introduced is a special

section dedicated to Linux – with a selection of articles about Linux rather than documentation, interesting still.

BOOKS FOR A SYSTEM ADMINISTRATOR (<http://lib.inorg.chem.msu.ru/cs-books/>). One can find here around 300 books on programming, operating systems, etc. (Operating Systems, Networking, C/C++ Programming, Perl Programming, Java Programming, Web Design and Management, Databases, Cisco). Unfortunately, the comments leave much to be desired.

[Webclub-a Library](http://www.webclub.ru/library/index.html) (<http://www.webclub.ru/library/index.html>). An excellent library with fast access.

[Online Documentation Server](http://www.ods.com.ua/) (<http://www.ods.com.ua/>). Collected documents on programming, network technologies, Unix, security, Web technologies, databases. An excellent library.

www.tion.ru/~gcc/ A quite good selection of documentation on Linux in Russian.

<http://www.banknet.kz/~info/> Many collected documents, including on Linux.

d1.ifmo.ru/library/unix/linuxins.htm Microprocessor technology lab. Technical information.

<http://www.ospu.odessa.ua/users/archiv.html> Interesting. Original materials available (Frolovs' CD-ROM, Linux-Yes installation).

[FAQRu.Linux](http://www.vpti.vladimir.ru/rus/archives/software/ru.l.faq.html) (<http://www.vpti.vladimir.ru/rus/archives/software/ru.l.faq.html>). How to install, russify and administer Linux. FIDO materials.

<http://rtfm.da.ru> Collection of documents in Russian on programming, installation and configuring of computer systems and networks.

<http://ns1.mgul.ac.ru/~t-alex/Linux> Collected Russian documentation on Linux. As written on the title page, the server has only documentation and only in Russian.

[Online books on Linux](http://docs.rinet.ru/) (<http://docs.rinet.ru/>). Many books on UNIX in html.

<http://aelita.renet.ru/net/linux/> Four articles: *Installing Linux* by P Jenkins; *Linux Is Acquiring New Face* by T. Yager; *Linux, FreeBSD and Others* by Pyanzin, and; *Linux is Entering a Wide Road* by A. Karve.

www.atlas.net.ru Network Atlas. Selection of news and journal publications about Linux in Russian. There is a section on security on the Internet.

Many documents (<ftp://ftp.uatel.net/pub/doc/>) (including in Russian) – FTP-archive.

4.2. Links, Software

<ftp://sunsite.unc.edu/pub/Linux/> the main software archive for Linux. Has several mirrors.

<ftp://ftp.chg.ru/pub/Linux> very rich archives also stored on two Russian ftp-servers.

<ftp://ftp.nc.orc.ru/>

<http://www.freshmeat.net> Freshmeat is a very interesting and useful Web site. Keeps track of new software for Linux, new patches, etc.

<http://www.xnet.com/~blatura> collection of applications and utilities for Linux systematized by categories.

<http://sal.kachinatech.com/> SAL – Scientific Application for Linux, lists of products for Linux classified by categories. Includes information about free and commercial software.

<http://ftp.kiae.su/pub/linux/>

<kiarchive.relcom.ru:/pub/linux/>

<http://kiarchive.relcom.ru:8090/pub/linux/>

<http://www.kiarchive.ru/pub/linux/>

<ftp.kiarchive.ru/pub/linux/>

<arch.relcom.ru:/pub/linux/misc> -Miscellaneous

<http://www.linuxberg.org> very handy site with a software archive arranged by categories.

[Rpmfind.Net WWW Server \(http://www.rpmfind.net\)](http://www.rpmfind.net) the most helpful server in the Internet for searching rpm-archives. It has a search system allowing to arrange the list of packages in a most desirable way by:

- package names;
- distributions;
- application groups;
- date;
- software suppliers (producers).

Total rpm-packages archive volume at the site is over 66GB. (A similar system is available on the server of the Donetsk group of Linux users.)

<ftp://tsx-11.mit.edu/pub/linux> rpm packages and compressed archives.

<http://www.linuxsoft.da.ru> free Software for Linux. It's hard to look around the site, the design is somewhat poor.

<ftp://ftp.mplik.ru/pub/books/Docs/> (in Russian).

<ftp://ftp.park.ru/pub/Linux/> FTP archive.

[Linux System Labs \(http://www.lsl.com/\)](http://www.lsl.com/) is another good Linux vendor, providing lots of software and related items to do with Linux.

<http://www.linuxnow.com> Linux Now! site – rich file archive, descriptions of programs, documentation.

<http://www.soft.ru> SOFT.ru – catalogue. Enormous collection of applications and games for Windows 95/98/NT/CE, Macintosh, Java, Linux. This is according to the advert, in reality, however, applications for Linux are so far non-available.

<ftp://eugene.mplik.ru/> Eugeny Shakhtarin's collection of software.

<http://linux.freeware.ru/> free applications for Linux.

<ftp://ftp.demos.su/pub/os/linux>

<ftp://www.orgland.ru/pub/unix/Linux/>

<ftp://ftp.funet.fi/pub/Linux/PEOPLE/Linus/>

4.3. Separate Software Packages

kernel.org kernel, information about new versions, detected errors, patches.

[WindowManagers \(http://www.plig.org/xwinman/\)](http://www.plig.org/xwinman/)

[XFree86 \(http://www.xfree86.org/\)](http://www.xfree86.org/) official site of a graphic shell project (mirror at <http://www.linux-ink.ru/>)

<ftp://ftp.x.org/> compressed archives for X Windows

<http://www.kde.org/> KDE

<http://afterstep.org/> AfterStep

<http://www.enlightenment.org/> Enlightenment

<http://www.gnome.org/> Gnome

<http://linux.wiw.org/blackbox/> BlackBox

www.windowmaker.org WindowMaker

[Scwm \(http://huis-clos.mit.edu/scwm/\)](http://huis-clos.mit.edu/scwm/)

[GGI \(http://synergy.foo.net/~ggi/\)](http://synergy.foo.net/~ggi/)

[BlackBox \(http://blackbox.wiw.org/\)](http://blackbox.wiw.org/)

[ICEwm \(http://www.kiss.uni-lj.si/~k4fr0235/icewm/\)](http://www.kiss.uni-lj.si/~k4fr0235/icewm/)

[Fvwm95 \(http://www.terraware.net/ftp/pub/Mirrors/FVWM95/fvwm95.html\)](http://www.terraware.net/ftp/pub/Mirrors/FVWM95/fvwm95.html)

[Gvwm \(http://www-masuda.is.s.u-tokyo.ac.jp/~kourai/qvwm/qvwm-e.html\)](http://www-masuda.is.s.u-tokyo.ac.jp/~kourai/qvwm/qvwm-e.html)

<http://koffice.kde.org/> Koffice

<http://linux.corel.com> Corel Word Perfect 8

<http://www.caldera.com/>

4.4. Office

<http://www.stardivision.com/> StarOffice

<http://www.applix.com/> ApplixWare 4.4.1

<http://www.suse.com/> SuSe Linux Office Suite 99

<http://www.edu.stockholm.se/siag/> Siag Office

[LyX](http://www.lyx.org/index.html) (<http://www.lyx.org/index.html>) Graphical interface for TeX/LaTeX.

[kLyX](http://www.devel.lyx.org/ettrich/klyx.html) (<http://www.devel.lyx.org/ettrich/klyx.html>) KDE version of LyX

[KDE Studio](http://www.chat.ru/~kdestudio/) (<http://www.chat.ru/~kdestudio/>) IDE (Integrated Development Environment) for Linux

4.5. Graphics

[Killustrator](http://www.iti.cx.uni-magdeburg.de/%7Esattler/killustrator.html) (<http://www.iti.cx.uni-magdeburg.de/%7Esattler/killustrator.html>)

[3D Graphics](http://www.gnu.org/software/panorama/panorama.html) (<http://www.gnu.org/software/panorama/panorama.html>)

<http://www.calcaphon.com/qdraw.html> QDraw - 3D-Engine for Windows, Linux with source codes. Links.

4.6. DOS and Windows Emulators

[DOSEMU](http://www.suse.com/~dosemu) (<http://www.suse.com/~dosemu>) is a DOS Emulator for Linux. It can run most applications seamlessly on a Linux environment, either remotely or locally in a terminal or an X-Term.

[WINE](http://www.winehq.com/) (<http://www.winehq.com/>) people are working towards a Windows emulator for Linux/X. So far, it can run Solitaire, Winword and lots of applications, although more work needs to be done. Eventually it will support 32-bit Windows applications as well.

4.7. All for Servers

[Apache](http://www.apache.org/index.html) (<http://www.apache.org/index.html>) Home page of the most popular Web server worldwide.

[Russian Apache](http://apache.lexa.ru/) (<http://apache.lexa.ru/>) Home page of the popular Web server Apache Russian version.

<http://http://www.openssh.com> OpenSSH – free ssh 1.2.x substitute. Developed by OpenBSD producers.

[The SANE Home Page](http://www.mostang.com/sane/index.html) (<http://www.mostang.com/sane/index.html>) “Intrusions” scanner.

www.sendmail.org

Games

www.linuxgames.com LinuxGames

www.linuxquake.com LinuxQuake

www.happypenguin.org Game

Internal Network of the Odessa Oblast Clinical Hospital

