

Linux Crash Course

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Agenda



- **First Session:**
 - Introduction To Linux
- **Second Session:**
 - Linux from a graphical point of view
- **Third Session:**
 - Linux from a shell point of view



Introduction to Linux

What is Linux ?



- Linux is a free open-source operating system (OS - Similar to Windows or MAC) based on Unix
- Linux was originally created by Linus Torvalds with the assistance of developers from around the globe
- Linux is becoming popular as a powerful, low-cost operating system for running servers
- The source code for Linux is freely available to everyone
- Linux is sometimes referred to as GNU/Linux



Why Linux ? (Users)

- Wide range of applications that run on Linux and with no charge!
- New easy to use user interface (KDE,GNOME)
- It runs Win3x,95,98,etc. Some programs, not all. Your programs will run and look the same as in Windows
- Free upgrades including the programs that you installed and security patches
- Viruses Are Few and Far Between

Why Linux ? (Developers)



- Development tools, such as compilers for the C, C++, Ada, Fortran, Pascal and other languages, are included as well as Perl, PHP and Python interpreters.
- Enhanced stability/Memory management makes it an ultimate developers platform
- Can be incorporated directly into microchips in a process called "embedding" and is increasingly being used this way in appliances and devices.

Why Linux ? (Administrators)



- Very efficient and fast-performing system
- Due to its stability, Linux has gained popularity with ISPs as the OS for hosting Web servers
- Runs on a variety of hardware platforms including x86 PCs, Alpha, PowerPC and IBM's product line
- Linux Is Configurable for system administrators
- Interoperability , Linux includes Samba, software that allows Linux to act as a client on a Microsoft Windows-based network

Linux VS Windows



- Linux is customizable in a way that Windows is not
- Linux provides superior security compared to Windows systems
- Linux drivers are hard to find for some hardware unlike windows , but this has changed in the last period were we are seeing a lot of hardware companies support linux
- Freedom of choice Is rather a great advantage under Linux platform more than windows when it comes to application usage.

Linux VS UNIX



- There are two "main" flavors, BSD, and System V.
- System V is what AT&T developed and sold to people. BSD is the UNIX that came from Berkeley University.
- GNU/Linux has been put together with no specific plan in mind while BSD/System V have always have had guidelines during its development which created complexity

What is Open Source ?



- Open source refers to any program whose source code is made available for use or modification as users or other developers see fit.
- Open source software is usually developed as a public collaboration and made freely available.
- Open source licenses include the GNU General Public License.
- Popular open-source software includes: Apache, PHP, Mozilla Firebird and the Linux kernel.

Open Source VS Free Software

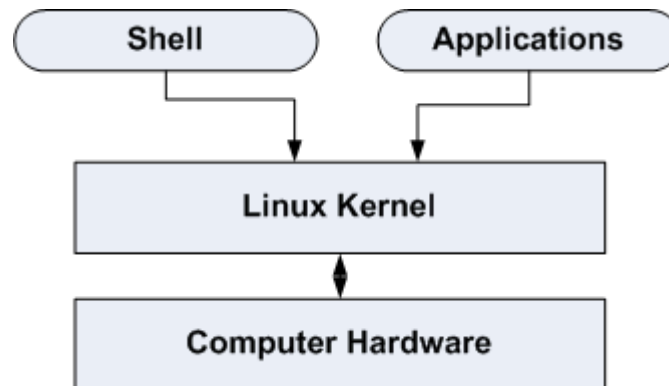


- All free software is open source; free software is a subset of open source software.
- open-source software may or may not be "free," but in practice, nearly all open-source licenses also satisfy the **FSF's** free software definition.
- The free software movement emphasizes the moral and ethical aspects of software, seeing technical excellence as a desirable by-product of its ethical standard.
- The open source movement sees technical excellence as the primary goal, regarding source code sharing as a means to an end.



Linux Building Blocks

- A Kernel (Operating system brain)
- Packages
- A setup mechanism





What is a distribution ?

- A distribution is a Unix-like operating system comprising software components such as the Linux kernel, the GNU tool chain, and assorted free and open source software.
- Distributions are normally segmented into *packages*, each package holding a specific application or service
- Some proprietary software is found in certain distributions and is not free software.
- Examples of Distro's include SuSe , RedHat, Mandriva, Slackware , Debian , Ubuntu and Gentoo

What are the package types ?



- [RPM](#) — **RPM Package Manager**, but originally **Red Hat Package Manager**, originally from Red Hat but now used by many other distributors as well
- [deb](#) — **Debian** package, originally from Debian but also used by others
- [tgz](#) or tar.gz — standard [tar](#) + [gzip](#), possibly with some extra control files — used by [Slackware](#) and others, or sometimes when distributing very simple handmade packages
- [ebuild](#) — the file containing information on how to retrieve, compile, and install a package in [Gentoo's](#) [Portage](#) system using the command [emerge](#).
- src — building the packages from source (often binary packages are provided in parallel on many systems).

What is the best distribution ?



- Some points govern our choice:
 - Install program
 - Package management system (e.g., dpkg for Debian, RPM for Fedora)
 - Desktop environment (e.g., KDE, GNOME, Xfce)
 - Media Localization
 - Customization for a specific application (e.g., firewalls and security, robotics, desktop workstation)
 - Supported microprocessor

Linux File Systems



- A *disk file system* is a file system designed for the storage of files on a data storage device, most commonly a disk drive, which might be directly or indirectly connected to the computer
- Examples of disk file systems include **FAT**, **NTFS**, **HFS**, **ext2**, **ISO 9660**, **ODS-5**, and **UDF** and **REISER FS**
- Linux mostly runs on ext2,ext3 or REISER

What is a Shell/Terminal and why use one ?



- Shell is a user program or it's environment provided for user interaction.
- Shell is an command language interpreter that executes commands read from the standard input device (keyboard) or from a file.
- We use a shell to have access to a system that we don't have physical access to , meaning remote access



Linux File system structure

- **/** - root directory
- **/home** - where directories are contained for each user
- **/usr** - pronounced 'user' and contains Linux commands and utilities
- **/tmp** - temporary work files
- **/etc** - configuration files
- **/bin** - binary executable programs that all users need
- **/dev** - device files that control drives, terminals and any equipment attached to the server
- **/var** - user specific files
- **/proc** - system files
- **/root** - root's home directory
- **/opt** - other options
- **/sbin** - more executable programs and utilities

Linux and I/O (Input/Output)



- Linux is based on the ideology of mapping all devices either input or output on the file system before usage.
- This guarantees less overall IO and system overhead
- The process of mapping IO devices to the system is called ***mounting*** devices

What is X Windows ?



- X Windows is a public domain windowing system that is mainly used on UNIX systems.
- The system includes a standard library of routines that can be used to develop GUI applications.
- Allows applications to be displayed in windows and shared among different workstations and terminals

Desktop Managers VS Windows Managers



Window Managers



Metacity



MWM

wm2



FLUXBOX



Others...

Desktop Managers



Installing a basic Linux distribution from scratch



- Our example OS : **SuSe 10**

Demonstration



Linux from a graphical point of view

Windows Pre-packed OS VS Linux Pre-packed OS



- Windows usually is shipped on 1 CD which seems very convenient but this one CD contains only the windows operating system
- Linux operating system can be installed from a floppy disk.
- The amount of CD's that come with most distributions only reflect the amount of packages that come pre-packed with the distribution

Linux Programs VS Windows Programs



- Office
 - Windows : **Microsoft Office**
 - Linux : **Open Office / KOffice**
 - Microsoft Office : **Outlook**
 - Linux : **Kontakt**
- Graphics
 - Windows : **Adobe Photoshop**
 - Linux: **GIMP**
 - Windows: **Microsoft Visio**
 - Linux: **DIA**
 - Adobe Acrobat available under Win/Linux

Linux Programs VS Windows Programs



- Multimedia
 - Real Audio Available Under Win/Linux
 - Flash Available Under Win/Linux
 - Windows: **Windows Media Player**
 - Linux: **Kaffeine / MPlayer/ Xine**
 - Windows : **Nero Burning ROM**
 - Linux: **K3B**
 - Windows : **Winamp**
 - Linux: **XMMS / amaroK**

Linux Programs VS Windows Programs



- **Web Browsers**

- Windows: Internet Explorer
- Linux: Konqueror
- Firefox available under Win/Linux
- Opera available under Win/Linux

- **Chat Programs**

- Windows: MSN Messenger
- Linux: GAIM (all protocols), AMSN
- Windows : IRC
- Linux: XChat , KIRC

Linux Programs VS Windows Programs



- Emulators
 - VMWare available under Win/Linux
 - WINE : Windows Emulator for Linux
 - CrossOver : Office Emulator for Linux
- System Tools and Utilities
 - Windows : Winzip/ Winrar/Win Ace
 - Linux : Ark
 - Windows : MS Control Panel
 - Linux : YAST for SuSe Linux

YAST VS Windows Control Panel



- YAST is a fully fledged control panel that contains all necessary links to the basic services that the Linux machine offers.
- YAST contains links to the basic configuration files of the most important services like Samba , NFS , Apache , DNS Server and so forth.

Linux for Developers



- Windows
 - Comes practically with no IDE, compilers or what so ever
- Linux
 - Comes pre-packed with the following
 - GCC (C++ compiler for linux)
 - Perl (Available under Win/Linux)
 - Python (Available under Win/Linux)
 - Java (GNU Java & Comes with Eclipse)
 - PHP (Comes pre-packed with Apache)
 - wxWindows/QT (Toolkit for cross platform development)

Linux for Developers



- .Net Framework for Linux ?
 - Linux can run .Net framework using an environment system called Mono which comes with its IDE similar to VS.Net
- IDE
 - netBeans (Available under Win/Linux)
 - Eclipse (Available under Win/Linux)
 - KDevelop
 - Mono IDE

Version Control Tools



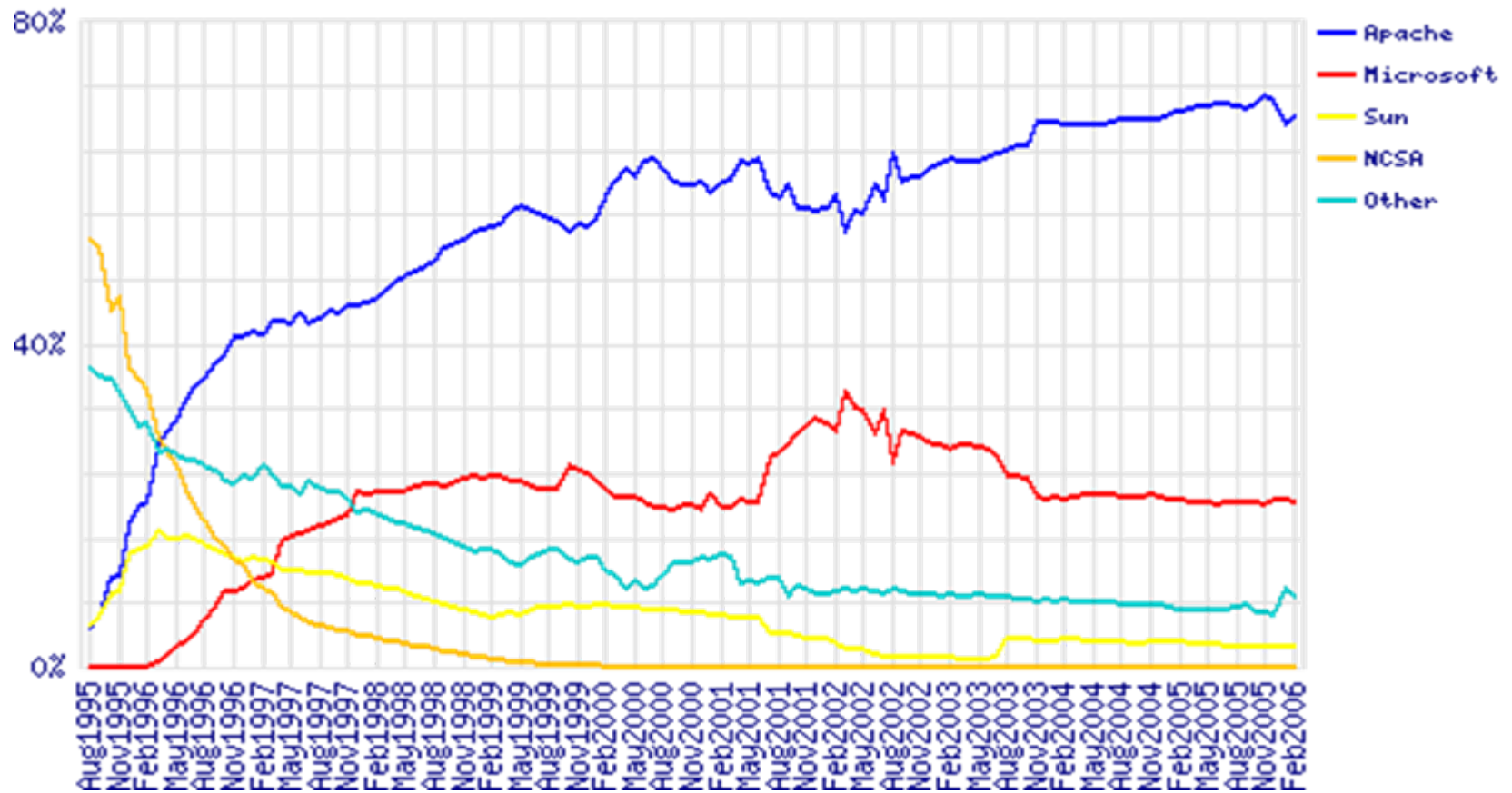
- CVS
 - Version control system, an important component of Source Configuration Management (SCM)
- Subversion
 - The goal of the Subversion project is to build a version control system that is a compelling replacement for CVS in the open source community.

Linux Web Server (Apache)



- The goal of this project is to provide a secure, efficient and extensible server that provides HTTP services in sync with the current HTTP standards
- Apache has been the most popular web server on the Internet since April 1996
- The November 2005 Netcraft Web Server Survey found that more than 70% of the web sites on the Internet are using Apache, thus making it more widely used than all other web servers combined.

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Samba



- Samba is software that can be run on a platform other than Microsoft Windows, for example, UNIX, Linux, IBM System 390, OpenVMS, and other operating systems.
- Samba uses the TCP/IP protocol that is installed on the host server.
- When correctly configured, it allows that host to interact with a Microsoft Windows client or server as if it is a Windows file and print server.

Software Update Tools



- **APT**

- Is a package management system used by Debian and its derivatives but it has since been modified to work with RPM packages via apt-rpm

- **YUM**

- The **Yellow Dog Updater, Modified** (**yum** for short) acts as a package manager for RPM-compatible Linux computer systems. Its principal advantages over the RPM version of apt are its smaller codebase and better dependency handling.

- **SuSe Watcher**

- Update the system with latest patches and programs that are released by SuSe company



Linux from a shell point of view

Obtaining an Account



- If you are a professional , it's likely that your company already has some UNIX facilities. To access those facilities you will be given a username and password to access that system via a shell account
- The good thing about having your own version of Linux which in our case is to be a super user on your own machine.
- By default the super user “referred to as root” is the only person on the system that has higher privileges than normal users were he is allowed to run services , add/remove users and so forth

Logging In



- In order to use a Linux system you should first log in with a suitable username.
- The username and system password are assigned to you by the system administrator

Login : username

Password: yourpasswd

Shells



- The \$ or % prompt you see when you first log in is displayed by a special kind of a program called a shell.
- A shell is a program that acts as a middleman between you and the raw UNIX/LINUX machine
- Three most popular shells are
 - Bourne Shell
 - Korn Shell
 - C Shell

Command Line tools Examples



- [date](#) Display or change the date & time
- [diff](#) Display the differences between two files
- [grep](#) Search file(s) for lines that match a given pattern
- [info](#) Help info
- [less](#) Display output one screen at a time
- [man](#) Help manual
- [nl](#) Number lines and write files
- [cat](#) Display the contents of a file
- [wc](#) Print byte, word, and line counts

Obtaining On-Line help



- Utility : man

Manual Online help for Linux

Example : `$ man ls`

The manual pages is the core for learning details about linux commands. Always consult the manuals for parameters about what your program takes. The above will return the manual page of the “ls” list command.



Running a Utility

- To run a utility , simply enter its name at the prompt and press Enter keys.

Example: `$ date`

This will return the date with a specific time format. If you want to change it then (`man date`) and see the parameters that you can use in order to show the date in the format you want

Setting your password



- Utility : `passwd`

Sets a password for your user account

Example : `$ passwd`

Use this command when you need to change the current logged in user password. It will re-prompt you again to verify the new password after it takes the old password first.

Exploring the file system



- Utility : `pwd`

Print the current working directory

Example : `$ pwd`

This command is very useful when you want to know where you are in the file system

Absolute and Relative Pathnames



- **Absolute Path** : Full Path starting from the / to your destination
 - Example : /home/amgad
/etc/rc.d
- **Relative Path** : Path that starts from your current directory that you are in till your destination
 - Example : cd amgad/javaprojects



Creating a File

- Utility : cat

Enables creating text files

Example : `$ cat > test`

This is a test

This is another test

This is a third test

`^D` (**press control-D**)

The cat utility takes its input from standard input or from a list of files and displays them to standard output

Listing the contents of directories



- Utility : ls

Lists all the files in the current working directory

Example : `$ ls`

```
test
```

```
$ ls -l test (displays details)
```

```
-rw-r--r-- 1 linux 106 Jan 30 19:46
```

The list command is one of the most basic ones that you will be using intensively when working with the command prompt



Listing a file

- Utility : cat , more , page , head and tail

Example : `$ cat test` (display all file)

This is a test

This is another test

This is a third test

`$ head -1 test` (display first line)

This is a test

`$ tail -1 test` (display last line)

This is a third test



Renaming a File

- Utility : `mv [oldfilename] [newfilename]`
`mv [filename] [directoryname]`
`mv [olddirectoryname] [newdirectoryname]`

The first form of `mv` renames `oldfilename` to `newfilename`. The second form moves a filename to a `directoryname`. The third form renames `olddirectoryname` to `newdirectoryname`

Example: `$ mv myfile mydirectory`

Moves the `myfile` inside the `mydirectory` directory



Making a directory

- Utility : mkdir

Allows creation of a new directory that the user specifies

Example: `$ mkdir hello`

This command creates a directory in the current location of the shell. To know your current location before creating the directory use the “pwd” command mentioned before. If the directory name already exists , an error message is displayed and the existing file is not altered in any way.



Moving to a directory

- Utility : `cd [directoryname]`

The `cd` shell command changes a shell's current working directory to be `directoryname`. If the `directoryname` argument is omitted , the shell is moved to its owner's home directory

```
Example : $ cd /usr/bin
          $ pwd
          /usr/bin
          $ cd
          $pwd
          /home/amgad
```



Copying a file

- Utility: `cp [oldfilename] [newfilename]`
`cp [filename] [directoryname]`

The first form of `cp` copies the content of the `oldfilename` to the new filename. If the `newfilename` already exists, its contents are replaced by the contents of the `oldfilename`. The second form of `cp` copies a list of files into `directoryname`. Consult the man for important parameter options for this command

Example: `$ cp hello hellonew`



Editing a file

- Utility : vi , pico , emacs

Use those shell based editors to modify any text file that you want to edit

Example : `$ pico hellotextfile`

This will open an editor so that you can write/edit what you want in the file. When you need to exit the editor , or save just follow the commands that are listed on the bottom of the window.



Deleting a directory

- Utility : `rmdir [dirname]`

This utility removes all of the directories in the list of directory names provided in the command. A directory must be empty before it can be removed. To recursively remove a directory and all of its contents , use the `rm` utility with the `-r` option.

Example : `$ rmdir directory`

Deleting a file



- Utility : `rm [filename]`

This utility removes a file from the directory hierarchy. If the filename doesn't exist, an error message is displayed.

Example : `$ rm hellofile`

Counting the words in a file



- Utility : `wc [filename]`

The utility counts the number of lines, words and or characters in a list of files. If no files are specified , standard input is used instead. The `-l` option requests a line count, the `-w` option requests a word count , and the `-c` option requests a character count.

Example : `$ wc tobeCountedfile`



File Attributes

- It is important to understand the file attributes of our system

Example :`$ ls -al hello.txt`

```
1 -rw-r - -r - - 1 amgad cs 213 Jan 31 00:12 hello.txt
```

Field#	Field Value	Meaning
1	1	Number of blocks of physical storage
2	-rw-r- -r- -	Permission mode of the file
3	1	Hard link count (not important)
4	amgad	The username of the owner of the file
5	cs	The group name
6	213	The size of the file
7	Jan 31 00:12	The time that the file was last modified
8	Hello	The name of the file



File Attributes .. Continued

- Permission mode : Divided into 3
 - User Mode : read, write, execute for user
 - Group Mode: read, write, execute for group
 - Others Mode: read, write, execute for others
 - Example : `rwxr-x—x`
 - User: all perm , Group: r and x , Others: x only



Changing a file's permission

- Utility : chmod

The chmod utility changes the modes of the specified files according to the change parameters , which may take the following forms.

cs+nP (add permission)

cs-nP (subtract permission)

cs=nP (assign permission absolutely)

Where cs is any combination of

u (user) , g (group), o (other) , a (all)

And nP is any combination of

r (read), w (write), x (execute)



Redirection

- The shell redirection facility allows you to:
 - Store the output of a process to a file
 - Use the contents of a file as input to a process
- I/O redirection
 - Example :
\$ cat > alice (output) \$ mail amgad < hello (input)

cat command alone starts taking input from the user but using the > redirection I say I want the output in a file were :

> writes

>> appends

Pipes



- Shells allow you to use the standard output of one process by connecting the process together using the pipe “| “ symbol

Example: `$ ls -al | more`

Will display the output of the “ls -al” command page by page because of the more command utility. The output of the first command is the input to the second one. This differs from redirection where the output or input is redirected to a file not to a utility or process



References

- Unix for Programmers and Users
- Visit my website at

<http://amgadmakour.pioneersawg.com>

In my Web Links section for some useful
Linux Links ...