

Laboratorio di Amministratore di Sistema

6. Installazione di Linux

[Cisco ITESS II - Chapter 9]

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ver 2.2

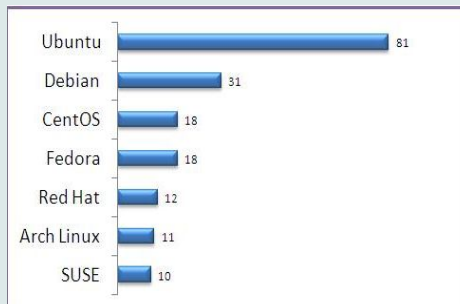
Linux Installation Procedures



- 9.1 Pre-Installation Tasks
- 9.2 Installing and Configuring Linux
- 9.3 X Server
- 9.4 Post-Installation Configuration and Tasks

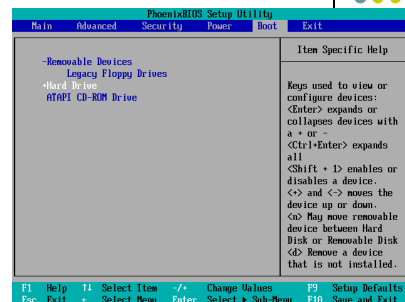
UBUNTU

- **Ubuntu** è un sistema operativo libero e gratuito basato su GNU/Linux. Ci sono varie distribuzioni (*distro*) di Linux: Debian, SuSE, Gentoo, RedHat e Mandriva.
- Ubuntu si basa sulla vecchia Debian e viene proposto in due edizioni: Desktop e Server.



The Boot Method

- There is a configuration setting in the BIOS that will tell the system which medium to boot from.
- Choices are a (*floppy disk*), hard drive, CD-ROM, a network drive that has the files stored on a server, or a high capacity removable drive like a Jaz or Zip drive, a USB device.
- Another way to begin the installation process is by using the existing OS bootstrap method.



- test preliminare con Live CD
- Ubuntu sotto Windows (in una cartella)
- Ubuntu da solo (partizionamento aut.)
- Ubuntu da solo (partizionamento man.)
- Ubuntu e Windows assieme (dual boot) (Linux vede Windows, Windows no Linux)
- Ubuntu su macchina virtuale

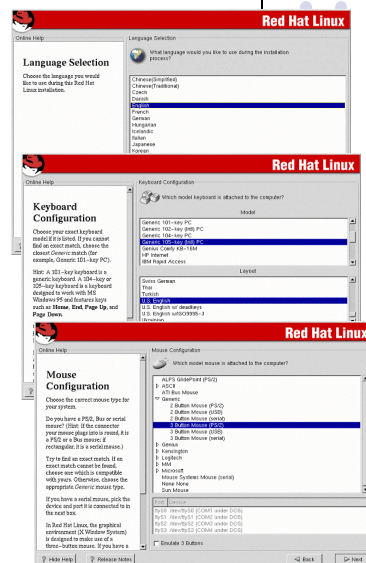
Installation Media

- The easiest and quickest way to do an installation is with the installation CD. Currently every distribution of Linux comes on CD.
- Linux may also be installed from a Network connection and is recommended if there is a fast network connection.
- Linux can be installed from files that are located on a different partition, even if this partition has a different OS running in it.
- This is known as **installing from a hard disk**.



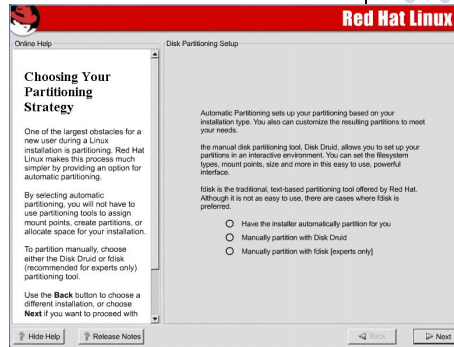
Selecting the Appropriate Parameters for Installation

- One of the first options to be displayed will be the choice of what **language** is to be used.
- **License terms**.
- **Installation class** (workstation, server or custom).
- A window will be displayed to choose the type of **mouse** and **keyboard** that is attached to the computer if it is not auto detected.
- Features like the number of buttons the mouse has and if it has a wheel or not can be selected.



Creating the Linux file system

- Linux creates the file system, it is formatting the hard drive. This is the process in which the *ext2*, *ext3*, (*ext4*,) or *ReiserFS* file system will be written to the partition.
- One option that is included with most distributions of Linux when formatting is the option to perform a 'bad block check'.
- There are two types of formatting that may be done, **Low-Level** and **High-Level** format.
- **fdformat** command will perform a low-level format and the **mkfs** command will perform a high-level format.



Partizionamento Linux

- In un disco posso creare fino a QUATTRO **partizioni primarie**, di cui UNA può essere una **partizione estesa**.
- Nella partizione estesa posso creare un gran numero di **partizioni logiche**. Sarebbe bene ospitare i sistemi operativi in partizioni primarie e gli archivi in partizioni logiche, ma non è obbligatorio o vincolante.

PRIMARIA	in cui può risiedere il sistema operativo o dati; e' l'unico tipo di partizione "avviabile" ed e' consigliabile averne una sola di questo tipo sull'hard-disk (Volume);
ESTESA	che funge da contenitore per le partizioni "logiche" (può essere visto come una specie di hard-disk che a sua volta deve essere partizionato) per superare il limite di 4;
LOGICA	(meglio chiamata Unità che Partizione) ti permette di "usare" lo spazio assegnato alla partizione estesa (ne possono esistere parecchie all'interno della stessa partizione estesa), possono contenere S.O. Linux (dipende dall'avvio), e/o dati.

Partizionamento Linux



Con l'installazione di Ubuntu si potrebbe avere in un disco:

- una partizione primaria (da 10-25 GB) con punto di *mount* = / (la radice)
- una partizione estesa che copre il resto del disco, con:
 - una partizione logica di *swap* (da 1 GB, o almeno il doppio della RAM) senza punto di *mount*
 - una partizione logica (restante) con punto di *mount* = /home

Ogni partizione è un *filesystem*.

- Vi sono vari tipi di *filesystem*:
 - NTFS (da Windows) - FAT32 (da Win98)
 - ext2, ext3 ed ext4 (da Ubuntu) - Linux-swap
 - JFS ed XFS

Partizionamento Linux



Etichettatura dei dischi: **/dev/hdXN**

- /dev/hdaN IDE master del controller primario
- /dev/hdbN IDE slave del controller primario
- /dev/hdcN IDE master del controller secondario
- /dev/sdaN , /dev/sdbN , dischi SATA
- /dev/scd0 , /dev/scd1 , dispositivi ottici (come IDE oppure)

Etichettatura delle partizioni (ad esempio del disco hda):

- | | |
|-------------------------------|--------------------|
| • /dev/hda1 Primaria o estesa | • /dev/hda5 Logica |
| • /dev/hda2 Primaria o estesa | • /dev/hda6 Logica |
| • /dev/hda3 Primaria o estesa | • /dev/hda7 Logica |
| • /dev/hda4 Primaria o estesa | |

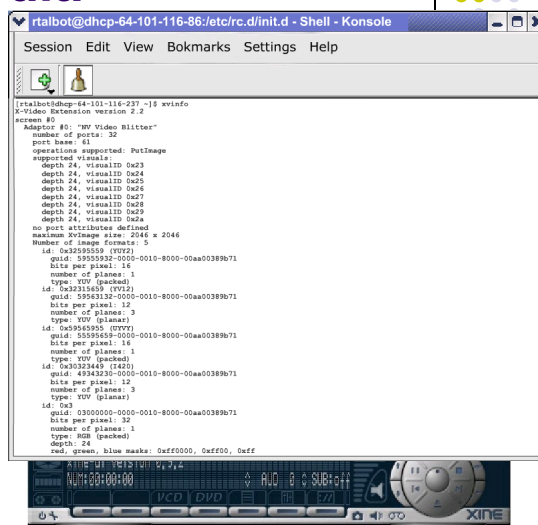
Selecting Packages to Install

- There are many packages to choose from, depending on which distribution is being installed.
- Keep in mind that here is the amount of disk space that is available to work with.
- Installing all of these packages will consume disk space.
- Some distributions will allow the option of selecting all or part of a package (individual features) to install.
- Some features have a dependency: they will need to be installed in order for them to work.



Linux Multimedia

- Most new sound cards have at least basic support in Linux.
- Video is generally the last mile in Linux multimedia.
- Full motion video utilities can display hardware accelerated output through the X-Video (Xv) extensions available in XFree86 4.X.
- To test the Xv available use the **xvinfo** command



X server



- L'interfaccia grafica di Linux è stratificata in TRE sezioni:
 - Gestore del desktop (GNOME, KDE, ...)
 - Window manager (*Windowmaker*)
 - X server (ad esempio Xorg o XF86_schedagrafica) che gestisce la parte hardware
- La tendenza è di integrare i primi due.
- In Ubuntu **X.org** è il software responsabile della gestione di scheda grafica, monitor, tastiera, mouse e altri dispositivi di input e output.



Linux Hardware Requirements



- Linux can be installed on all Pentium class processors.
- There are still systems running on 80386 and 80486 processors, however, this is not recommended.
- A floppy disk or a CD-ROM and a hard drive with at least 900MB of free disk space will be required.
- The minimum requirement for RAM is 16 MB, but 64 MB of RAM minimum is preferred.
- It is always important to test and check hardware compatibility.

Requisiti minimi di Ubuntu



Desktop Edition

- Processore 300 MHz x86
- 64 MB di RAM (sistema)
- Almeno 4 GB di spazio libero su disco per un'installazione completa e per la partizione di swap
- Scheda grafica VGA con una risoluzione minima pari a 640x480
- Lettore CD-ROM

*Esiste una edizione **Alternate** per sistemi con meno di 128 MB di RAM*

Server Edition

- Processore 300 MHz x86;
- 128 MB di RAM (sistema);
- Almeno 1 GB di spazio libero su disco dedicati al solo sistema;
- 1 scheda di rete Ethernet;
- 1 server DHCP che supporti l'ambiente di esecuzione pre-boot PXE
- Scheda video con una risoluzione minima pari a 640x480 pixel;
- Lettore CD-ROM

Starting the Installation



- L'installazione inizierà non appena il CD verrà inserito nel lettore e il BIOS sarà configurato per effettuare il boot da CD.
 - Selezione della lingua e del layout della tastiera
 - Configurazione della rete
 - Partizionamento dei dischi
 - Installazione del sistema di base
 - Impostazione di utenti e password
 - Installazione di software aggiuntivo
 - Installazione del bootloader
 - Terminazione dell'installazione

Configuring Appropriate Security Settings



- In Windows, to log on to a system there must be a user account stored locally or in Active Directory.
- Linux uses the root account, which is similar to the administrator account in Windows.
- During the installation process there will be a prompt to create the root password, and then an option to create user accounts that are to be added to the system.
- Security issues may arise if only the root account is used.



Configuring Appropriate Security Settings



- The **Root account** in Linux is also known as the **superuser** or system administrator account.
- This account is mandatory, during installation the user will be prompted to enter the password twice to protect against typing errors.
- There are advantages and disadvantages in creating user accounts during the installation.
- At least one **user account** should be created during installation, but many of the security options are not available
- Most Linux distributions use either MD5 or DES password encoding methods
- The encrypted passwords are stored in a file called [/etc/passwd](#) accessible by all the users
- The shadow passwords are stored in a different and less accessible file.

Configuring Appropriate Security Settings

- In a multi-user system is very important to set limits on logins, memory usage and processes.
- The **limits.conf** file located in `/etc/security` allows to specify user and group level limits to system resources.

`linux_user` hard priority 19

`linux_user` hard cpu 10

`@linux_group` – maxlogins 3

The limits.conf File

```
#/etc/security/limits.conf
#
#Each line describes a limit for a user in the form:
#
#<domain>        <type> <item> <value>
#
#Where:
#<domain> can be:
#   - a user name
#   - a group name, with @group syntax
#   - the wildcard *, for default entry
#   - the wildcard %, can be also used with %group syntax,
#     for maxlogin limit
#
#<type> can have the two values:
#   - "soft" for enforcing the soft limits
#   - "hard" for enforcing hard limits
#
#<item> can be one of the following:
#   - core - limits the core file size (KB)
#   - data - max data size (KB)
#   - fsize - maximum filesize (KB)
#   - memlock - max locked-in-memory address space (KB)
#   - nofile - max number of open files
#   - rss - max resident set size (KB)
#   - stack - max stack size (KB)
#   - cpu - max CPU time (MIN)
#   - nproc - max number of processes
#   - as - address space limit
#   - maxlogins - max number of logins for this user
#   - priority - the priority to run user process with
#   - locks - max number of file locks the user can hold
#
#<domain>        <type> <item>        <value>
#
#*                soft core             0
#*                hard rss              10000
#@student         hard nproc            20
#@faculty         soft nproc            20
#@faculty         hard nproc            50
ftp              -   hard nproc            0
#@student         -   maxlogins         4

"limits.conf" [readonly] 45L, 1519C
```

Configuring Appropriate Security Settings

- A good security practice is setting limits on runaway processes of different users.
- This can be done by setting the **ulimit** command in the file `/etc/profile`

`ulimit -[options] [limit]`

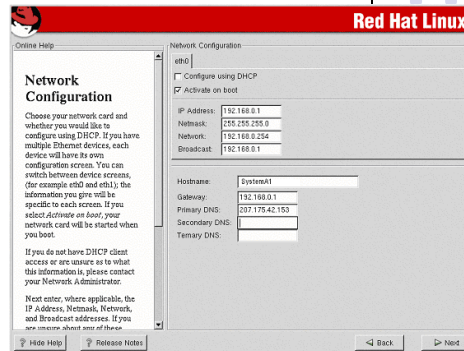
- a All current limits are reported (for shell use).
- m The maximum resident memory set size (in KBytes).
- t The maximum amount of cpu time in seconds.
- u The maximum number of processes available to a single user.
- v The maximum amount of virtual memory available to the user.

Esempi: `ulimit -S -m 1000000`
`ulimit -S -v 500000`

Configuring Network Settings

– auto-detect

- When selecting the option to configure network setting during the installation process, the first choice that will need to be made is, to have the system auto-detect what type of network connection is being used.
- A prompt to configure the network settings (IP address, subnet mask, host name, DNS server, and default gateway) appears.
- If the system is connected to a DHCP server it will provide the information automatically.



Configuring Network Settings

– manually

- The **ifconfig** utility is the tool used to set up and configure the network card.
- Using *ifconfig*, you must save the settings or they will not hold once the system is rebooted

```
#ifconfig eth0 192.168.1.50 netmask 255.255.255.0
#route add default gw 192.168.1.1
```
- To manually stop all network devices:

```
#etc/rc.d/init.d/network stop
```
- To manually start all network devices:

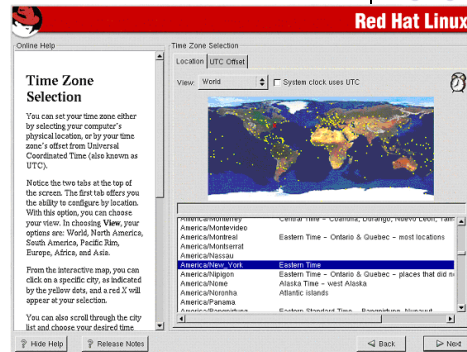
```
#etc/rc.d/init.d/network start
```

Other Configurations and Settings



Time zone

- A screen will appear that will allow the selection of which time zone the system is located.
- Scroll through the different time zones and select the one that fits the location.



Printer Configuration

- Depending from the distribution: there are two printing systems that Mandrake provides, Common UNIX Printing System (CUPS) or the lpr printing system.
- The installation program will install additional packages from the CD after selecting the printing system.

Other Configurations and Settings

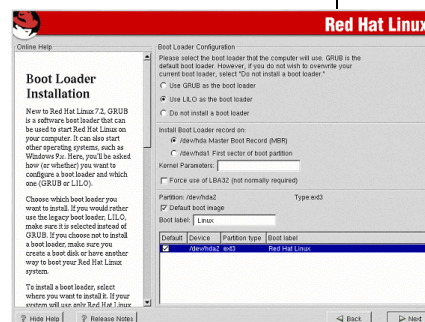


Service Configuration

- Linux systems will have different services running on them. If the system is going to be a workstation, Web server, or mail server the appropriate services will need to be installed on the system.

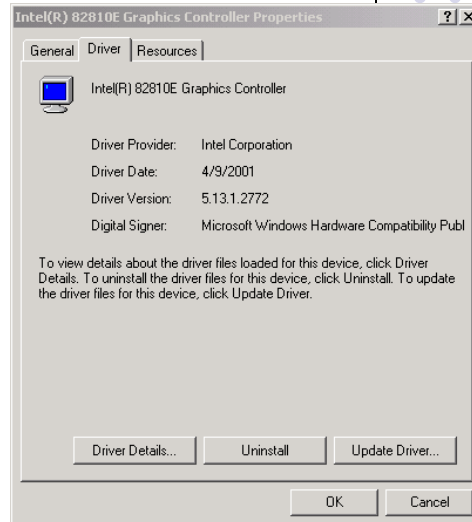
Boot Options

- Select and configure the system to use the proper boot loader
- Linux uses one of two programs:
 - Linux Loader (LILO) or
 - Grand Unified Bootloader (GRUB)
- The system will summarize the boot loader options.



Video Card Chipset

- It can be difficult to find what chipset the video card has, unless a new card is being installed.
- There are ways to get this information:
 - the system automatically detects the video card
 - run the X configuration tool after installation
 - read the products documentation
 - take the video card out of the computer and examine it



X Server Options

- **Xfree86** is the free X server that comes with every major distribution that supports a GUI interface.
- Most Linux distributions that are shipped after the year 2001 come with the 4.0.X version of Xfree86.
- With the growing popularity of Linux, many of the manufactures have made drivers available that will be supported by Xfree86.
- Check the manufacturer's website for the appropriate drivers, and test for accelerated features.



Configuring X Server - installing

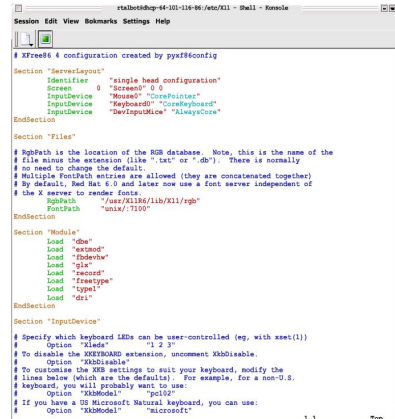
- Configuring X server will be done differently depending in which version of X server is installed.
- If the distribution is using **RPM** (Red Hat Package Manager), to install X server:

`#rpm -Uvh XFree86-server-4.0.2-11.i386.rpm`

- If the distribution is using Debian:

`#dpkg -i -xserver-xfree86_4.0.2-7_i386.deb`

- The server files are stored in:
`/usr/X11R6/bin`
- The driver modules are stored in:
`/usr/X11R6/lib/modules/drivers`
- The configuration file is
`/etc/X11/XF86Config`



The screenshot shows a text editor window titled 'xf86config-4.0.2-11.i386.rpm - Shell - Runside'. The editor displays the contents of the XF86Config file, which is a configuration file for the X Window System. The file is organized into sections: 'ServerLayout', 'Files', 'Module', and 'InputDevice'. The 'ServerLayout' section defines the screen, input devices, and output devices. The 'Files' section defines the location of the X server binary and the font path. The 'Module' section lists the modules to be loaded. The 'InputDevice' section defines the keyboard and mouse. The file is a configuration file for the X Window System, and it is used to configure the X server.

Configuring X Server - configuring

- There are two ways to configure X server, GUI and CLI:
 - First is to use the graphical configuration tools, then the operating system automatically writes changes to the XF86Config text file.
 - Second, is to manually edit the XF86Config file.
- Manual is usually used for adjusting a working configuration to get better performance and not to initially configure.
- The recommended way to test the X server configuration is to switch run levels:
 - run level 5 will start the X server automatically at startup
 - switching to run level 3 (with `telinit 3` command) will shut down the X session launched during startup.
 - run level 3 → manually setting → run level 5
 - run level 3 → telinit 5 → GUI changes → run level 5



Runlevel

GNU/Linux ha la possibilità di “funzionare” in 11 modalità differenti, dette **runlevel**. I *runlevel* non sono altro che dei valori che identificano la modalità di funzionamento del sistema, come riportato di seguito:

- **0** (*halt mode*) è la modalità di preparazione allo spegnimento del sistema;
- **1** (*single-user mode*) è la modalità di funzionamento con un solo utente. Praticamente il sistema permette l'accesso ad un solo utente;
- **2** (*multi-user mode no NFS*) è la modalità di funzionamento in multiutenza (fino a 6 utenti contemporanei sulla stessa macchina fisica), analogo al runlevel 3, ma senza NFS (collegamento di rete)



Runlevel

- **3** (*full multi-user mode*) è la modalità di funzionamento in multiutenza (fino a 6 utenti contemporanei sulla stessa macchina fisica). Praticamente il sistema apre 6 terminali virtuali;
- **4** è una modalità non definita. Può essere utilizzata per definirne una particolare;
- **5** (*full multi-user graphic mode*) è la modalità di funzionamento in multiutenza con avvio automatico dell'interfaccia grafica. Praticamente il sistema apre 6 terminali virtuali ed un terminale grafico;
- **6** (*reboot mode*) è la modalità di preparazione al riavvio del sistema (spegnimento + riavvio);
- **7, 8, 9** non documentati

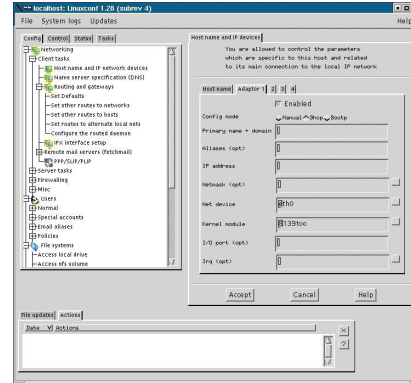


Hardware Configurations

Post-Installation of Applications and Programs



- if using Linux Red-Hat 7.X, the **linuxconf** file is not added to the system by default.
- This file may be added after the installation is complete by loading it.
- There are three types of package managers for Linux: **RPM (x Red-Hat), Debian package** and **Tarballs**.
- They are used to install and remove applications and programs in Linux systems after the installation process has completed.



Post-Installation of Applications and Programs



- **RPM** is the most popular type of package.
- It provides the necessary tools such as package databases that are needed to install and remove programs, however, not all applications or programs use RPM.
- The database provides features such as:
 - Package information (date, description, version, ...)
 - File information (all the file installed, permissions, ...)
 - Dependencies
 - Provision Information
- Pay attention to the compatibility using RPM packages across multiple distributions.

Post-Installation of Applications and Programs



- Once the installation of Linux is complete, the RPMs may be installed using the `rpm` command:

```
mount /mnt/cdrom  
cd /mnt/cdrom/RedHat/RPMS  
rpm -UvH gimp-1.0.4-3.i386.rpm
```

- RPM uses a built-in GPG signature and MD5 checksum to check the package integrity
- To verify them:

```
#rpm -checksig <package>.rpm
```

Post-Installation of Applications and Programs



- The difference between **Debian** and RPM packages is that they are not interchangeable.
- Debian contains a package database that has the same features as the RPM database, however, the Debian database is stored in the `/var/lib/dpkg` directory.
- The command to install a Debian package is

```
dpkg -i samba-common_2.0.7-3.deb
```

Post-Installation of Applications and Programs



- **Tarballs** are by far the most widely supported type of package available with Linux. *(un volta)*
 - Tarballs are a collection of compressed files that can be uncompressed and installed on a Linux system (using **qzip** utility)
 - Every distribution can use tarballs to install or remove applications and programs, but
 - tarballs do not maintain a package database (removing file more difficult)
 - tarballs has no dependency information
- tar -xvzf samba-2.0.7.tar.gz**
- *tipicamente contengono file sorgente da compilare*

Creating Archives and Basic makefile changes



- Installing software without RPM package may be difficult.
- Typically it is in the form of a compressed tar file
- If the archive name ends with a .gz, it was compressed and will be decompressed with the program **gzip**.

gzip -d test.tar.gz

The **cpio** command manipulates files called *cpio archives*

- A **cpio** copies files into or out of a cpio or tar archive.
- With **cpio** you can create a new archive, extract the content of an existing archive, list archive contents, and copy files from one directory to another
 - **cpio -i** → reads an existing archive from the standard input
 - **cpio -o** → writes a new archive to the standard output
 - **cpio -p** → copies a list of files to a specified directory

Creating Achieves and Basic makefile changes



- **makefiles** are used for compiling programs and packages, putting together the binaries and the library files.
- The **make** file let you automatically compile all of the source files. There are four basic types of statements in a Makefile
 - **Comments** – line beginning with **#**
 - **Macros** – using the form: *name = data*
 - **Explicit rules** – Explicit rules tell **make** which files depend on the compilation of other files, and the commands required to compile a particular file → *targetfile: sourcefiles*
 - **Implicit rules** – Implicit rules are just like explicit rules, except listed without commands.

Installing and Reconfiguring the Boot Loader



- The **bootloader** is initially done during the installation process, but sometimes it will need to be reconfigured.
- Linux provides more than one bootloader, the most diffused are GRUB (now) and LILO (times ago).
- The bootloader program resides on a Master Boot Record (MBR), located on the first sector of a hard disk (or an USB drive)
- The Linux Loader (**LILO**) is the program that control the boot process.

Installing and Reconfiguring the Boot Loader



- The first thing about configuring the LILO bootloader is to know the **lilo.conf** file.
- **prompt** the LILO will prompt the user to select an OS
- **timeout=50** delay in tenth of seconds until LILO boots the default OS
- **default=linux** the default OS
- **boot=/dev/hda** name of the device where LILO is installed (containing the bootsector)
- **lba32** LILO can boot kernels located past the 1024th cylinder on the hard disk

```
prompt
timeout=50
default=linux
boot=/dev/hda
map=/boot/map
install=/boot/boot.b
message=/boot/message
lba32

image=/boot/vmlinuz-2.4.7.10
label=linux
initrd=/boot/initrd-2.4.7-0.img
read-only
root=/dev/hda2
append="hdc=ide-scsi"
```

Installing and Reconfiguring the Boot Loader



- There are two things to consider when adding or installing another operating system.
 - It is a good idea to use LILO because LILO can be used to boot the other operating system.
 - Consider if another Linux OS or another OS like Windows is going to be added.
- Configuring LILO for a second OS is not difficult.
- Installing a New Boot Loader is easy to do when using the LILO boot loader and replacing it with another boot loader like GRUB.

Installazione e configurazione del bootloader



- Il file di configurazione di Grub è `/boot/grub/menu.lst`
- Una semplice configurazione esemplificativa è la seguente:

```
default      0
title        Linux
root          (hd0,0)
kernel        /boot/vmlinuz root=/dev/sda3
```

- In questo modo verrà avviata in modo predefinito la prima opzione, il titolo nel menu d'avvio sarà "Linux", la partizione dove si trova il kernel sarà la prima, mentre quella di root la terza.

Kernel Issues



- An operating system's **kernel** provides functions such as memory management, low-level hardware drivers (excluding X video drivers and printer drivers), scheduling when specific processes get access to the CPU, allow programs to access the network, and controls access to the file system on a hard drive.
- An administrator must make sure that the kernel version is up-to-date.
- A typical Linux Kernel version might look something like Linux 2.4.3.
 - 1st number is the **major number**
 - 2nd number indicates if the version is a stable (even, 0-2-4-6) or experimental version (odd, 1-3-5-7)
 - 3rd number represents any small or minor fixes usually done to an already stable kernel version



Kernel Issues

- Some Linux administrators prefer to compile their own kernel from source code, to obtain several advantages:
 - Optimizing the kernel for maximum performance compiling for the system specific CPU
 - Individual driver configuration, selecting what drivers are to be added
 - Ability to apply patch



Environment Variables

- The Environmental Variables in a Linux system contain information such as the user's home directory, disk space, hostname, the name of the current shell, or resources available on the system.
- There are many different types of environmental variables that can be set for a Linux system.
- To see a list, type the **env** command at the prompt.

```
PATH=/bin:/usr/bin:/usr/X11R6/bin:/usr/local/bin:/sbin:/home/guest/bin
TERM=xterm
DISPLAY=:0.0
PWD=/home/guest
USER=guest
HOSTNAME=PC_UniVe
LD_LIBRARY_PATH=/home/guest/adabas/lib
PS1="@"
```

Environment Variables



- Suppose you have just installed Netscape in the folder `/usr/local/netscape`
- To run this program you would have to type
`#!/usr/local/netscape`
- To add the directory `/usr/local/netscape` to your PATH:
 - edit the file `.bash_profile` located in your home directory
 - find the line defining the PATH variable, such as
`PATH=/optional/bin:$PATH:$HOME/bin`
 - modify the line adding your new path
`PATH=/usr/local/netscape:/optional/bin:$PATH:$HOME/bin`
 - save the file and execute it with: `.$HOME/.bash_profile`

Verifying Proper Application Functioning and Performance



- The final stage of the installation process consists of **testing** and **verifying** that the programs, applications, and operating system in functioning properly.
- Install the operating system first in a test network.
- Then install all the programs and applications onto the system and verify that everything will work properly.
- Testing and evaluating the new software on a test system helps reduce problems.
- To set up a proper test environment, recreate as close as possible the existing system or systems.

Verifying Proper Application Functioning and Performance



- Install the software in the production system after everything has been tested.
- Backup everything on the destination system first in the event that something does go wrong.
- Establish performance benchmarks prior to the upgrade.
- These can be compared after the upgrade is complete to test if the system can effectively handle the new software.
- The production system will most likely need to be taken offline to do the upgrade or installation.
- Keep the test system available to temporarily replace the production system while it is being upgraded.
- Notify users of the work being done so they are aware and can prepare for the server downtime in advance.