

Linux Administration Basics

Introduction

Linux administration jobs include a lot of operations necessary for carrying out different normal or routine operations. These operations range from some simple tasks to more complex operations. The administration jobs mainly include installing new software, adding new hardware, checking the system, testing different operations, adding new users and groups, downloading software, and so on. These operations are done using different tools that are installed when Linux is installed. In this chapter we will study the basic operations necessary for administering a Linux system and the different tools used for administering.

Administrator Powers

A Linux system will be having several users, and Linux treats different users differently. Out of the different users, the super user is the most powerful user. Super user is also known as the root user or the administrator user. This user is created at the time of installation of the operating system and has a separate password known as the administrator password. Administration operations can be performed only by authentication using the administrator password. Administrator user has access to all parts of the system including different file systems. Different system administration tasks are performed by the administrator user. All the commands can be used by the administrator user, whereas other users can execute only certain commands. depending on the rights granted. Local as well as remote systems can be mounted by the root user. The super user can control the system usage and set different configurations. The super user can modify the essential parts of the system including the setting of different languages for menus and windows. Different log files can be viewed by the administrator user. Superuser can create new users by assigning user names and passwords as well as can change the names and passwords of existing users. Super user can view as well as edit files created by other users of the system. In multi-boot systems, the super user can set the boot operation's term. The root user is having a special terminal window prompt denoted as #. Different administration operations are done from *System menu in GNOME*.

desktop. When opened, this menu displays two *options*-*Preferences* and *Administration*. Different administration options are available by selecting *Administration* option. Different options available for the administrator for GNOME desktop is displayed in Figure 6.1. New Linux versions provide more administration options. Also the options differ with different distributions. When the administrator option is activated, the system prompts the administrator password, since authentication is required to perform administration actions. Proceeding further stages for administration operations is possible only after giving the correct administrator password.

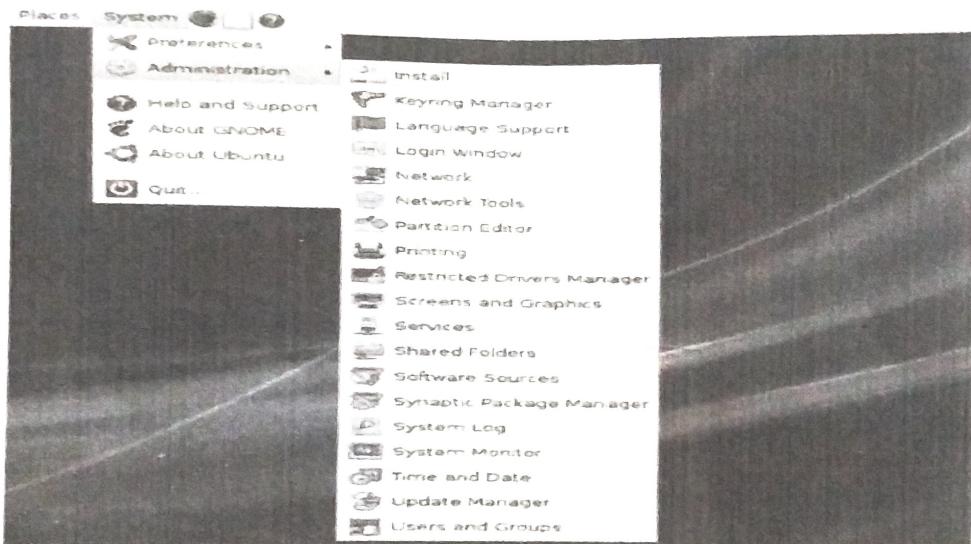


Figure 6.1 Administration Operations in Ubuntu Linux.

Administering Time and Date

The simplest administration operation when using Linux operating system is the administration of time and date. The time administration tool available with Linux distribution allows setting the time date and time zone of the system. This tool also allows setting any time server to synchronize with the local time server. When the *Time and Date* tool is launched, it displays the *Time and Date Settings* window as shown in Figure 6.2 Clicking the *button-Click to make changes-seen* at the bottom of the window helps in making a selection of the date in the calendar and the user can make necessary changes. Using the different options available, the administrator user can set different

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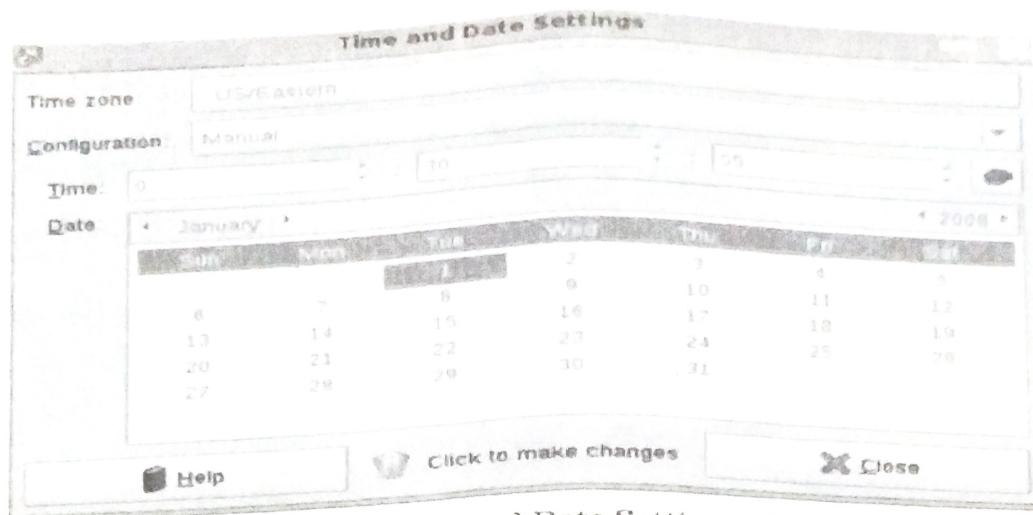


Figure 6.2 Time and Date Settings Window.

Writing to CD/DVD

Writing to a CD or DVD is very useful for backing important documents and files. For this, the computer must have a CD or DVDwriter. Application for writing files to a CD or DVD is available in all Linux distributions. CD or DVDCreator is the application available in several distributions. This is having a graphical interface and can be easily used. When the application is launched, the opening window is displayed as shown in Figure 6.3. [The first step for writing to CD or DVD is to choose the files.] Required files and folders or writing to the media can be selected by navigating along the places listed on the left pane of the window. [Selecting the folder on the left pane displays the contents on the right pane.] The file manager provides a special folder for files and folders to write to a CD or DVD. Drag the files and folders for writing to the CD/DVD Creator folder. After inserting the CD or DVD in the drive click The Write to Disc button or choose the option Write to CD/DVD from File menu. A Write to Disc dialog is displayed. Set values for options such as disk name, write speed and click the button to write to the disk. It is possible to copy a CD or DVD, either to another disc or to an image file stored on the computer. To copy a CD or DVD, first insert the CD or DVD in the drive. Right click on the CD icon and choose the option to copy the disk. This step opens the Write to Disc dialog window. If there is only one drive with write capabilities, the process will first create a disc image file on the computer. It will then eject the original disk, and ask to change it for a blank disk. Writing takes place after inserting the disk.

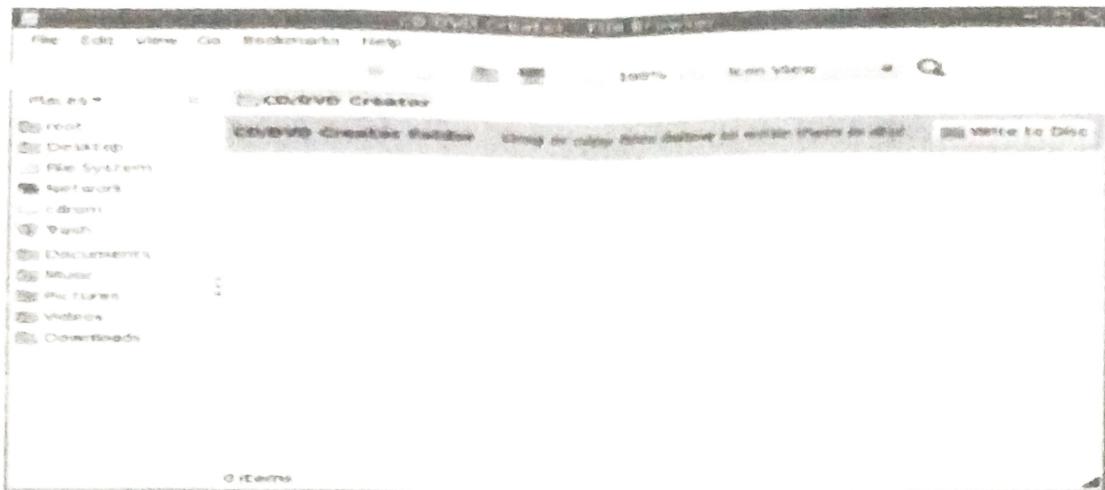


Figure 6.3 CD/DVD Creator Application Window.

Disk Usage Analyzer

Tools for analyzing disk usage are available in several operating systems. A common available tool in several Linux distributions is *Disk Usage Analyzer*. When the application is launched, the opening window is displayed as shown in Figure 6.4.

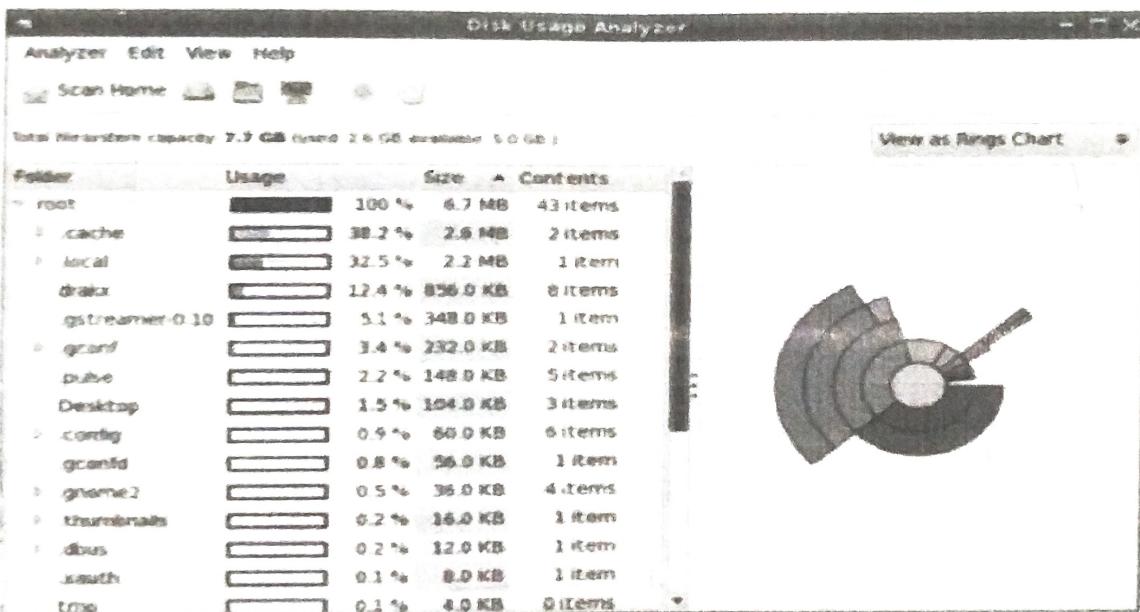


Figure 6.4 Disk Usage Analyzer Window.

Folder and file wise memory usage can be obtained from the list. The details are arranged in a tubular format along with the size occupied by each item. A representation of the usage in a graphical format is also displayed on the right side. By studying the occupied memory, it is possible to get an estimate of memory size that can be reclaimed by deleting some unused applications or outdated files.

Monitoring the system

The *System Monitor* application available with different Linux distributions enables to display the basic information about the system. This application monitors system processes, usage of system resources and file systems. The application can be used to modify the behavior of the system also. When the tool is activated, a window having four tabbed sections named *System*, *processes*, *Resources* and *File Systems* is displayed on the screen. The display is as shown in the Figure 6.5.

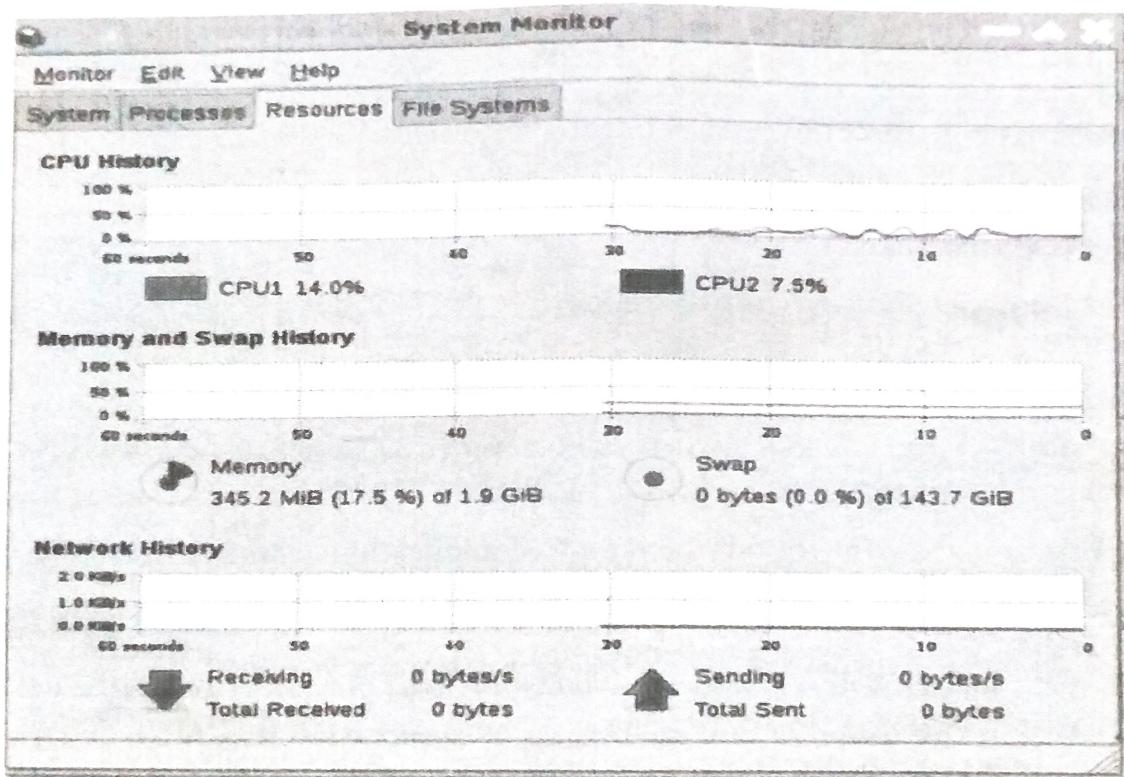


Figure 6.5 System Monitor Window.

When the *System* tab is opened, various basic information about the computer's hardware, software and the system are displayed. Active processes and how various processes are related to one another can be obtained by opening the *Processes* tab. This too also provides detailed information about individual processes, and enables to control the various active processes. It is possible to stop, start or make priority changes to different processes taking place. The current usage of different system resources as CPU, memory, network usage can be obtained from the *Resources* tab. This can be in a graphical form also. *File Systems* tab lists all mounted file systems along with information about each one.

Managing Drives and Media

For managing drives and media, a disk utility application is also installed in Linux operating system. This application provides information about the drive as well as the different storage media connected to the system and provides options for mounting dismounting the volume, checking file system, editing and- deleting partitions as well as for formatting volume. A facility for measuring the performance of the drive is also available in some applications.

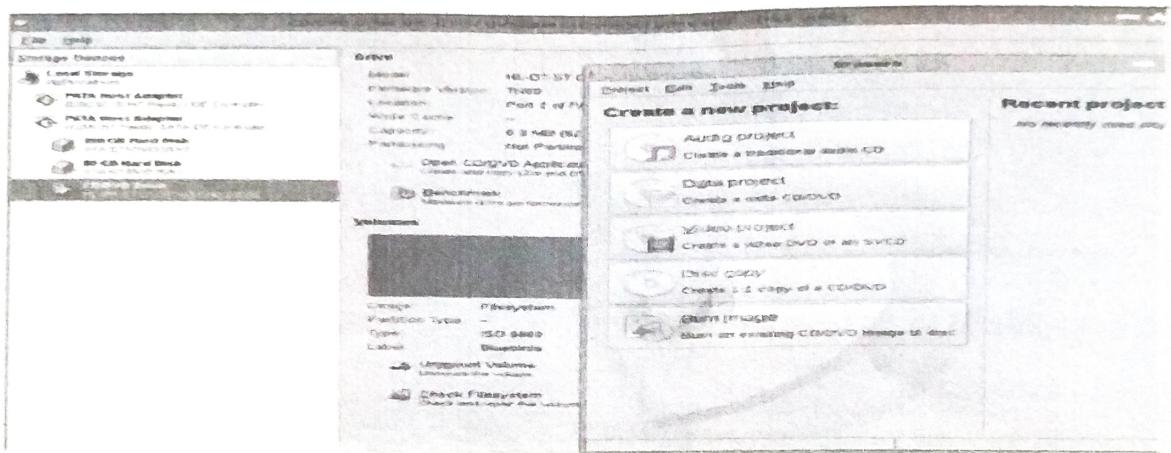


Figure 6.6 Disk Utility Application Window.

Disk Utility is the name of one such type of application available in Ubuntu Linux versions. The typical display of the screen, when launched, is as shown in Figure 6.6. We can see here, the window is divided into two portions. Left portion provides the details of the different storage media available. On selecting any of the media, more details are displayed on the right pane. A number of buttons are provided in the right pane and clicking the button performs the operation stated below the button. The common operation possible includes formatting the drive, checking the file system, benchmarking, editing a deleting partitions and so on. In the figure, the option *CD / DVD Drive* is selected on the pane and the various corresponding options appear on the right pane. Clicking the opt to open the CD/ DVD application activates *Brasero* application. This is the application for creating and copying CD and DVD. The application allows burning data to OD or DVD, audio CD copy CD and DVD create video DVD: create image files, erase CD and check the integrity of discs and disc images. Suitable option can be selected by clicking the required button from the window. To burn data to a CD, click the button for copying data. This step opens another window and the user can select the

required files for writing to a CD. After selecting the files click the button to write to CD and proceed to finish the process. A cover editor for CD and DVD is also available with this application.

Creating and Editing Disk Partitions

An important job for a system administrator is the creation and editing of disk partitions. Different applications are available in different Linux distributions for this purpose. The application available in the GNOME version of Ubuntu distribution is GParted. The name stands for GNOME Partition editor. This partition tool supports many file systems and is having a friendly user interface. This partition editor enables the creation, reorganization and deletion of disk partitions. Also the application enables to change the partition organization on a disk device, while preserving the contents of the partition. Enabling and disabling partition flags such as boot and hidden is also done by this application. Under normal circumstances, editing the partitions can cause loss of data. But this partition application is designed in such a way so as to edit the partitions with reduced risk of data loss. The risk of data loss can be reduced by not mounting partitions outside of the application.

Figure 6.7 shows the display of the GParted opening window. As seen in the figure, this tool displays the details of partitions in the disk. Details of the partitions of the

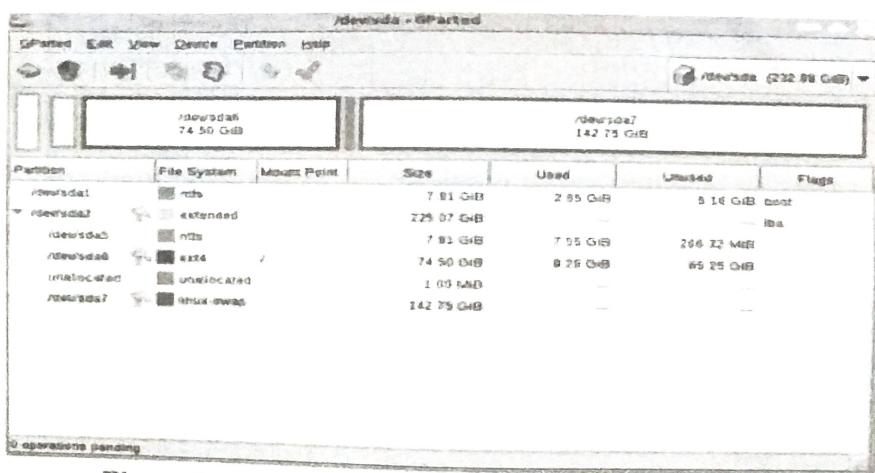


Figure 6.7 Gparted Disk Partition Application in Action.

hard disks displayed include partition name, file system used, mount point, size, used and empty memory sizes and flags. Operations on the selected partition can be done by right clicking the mouse and selecting the option from the pop-up menu or by selecting the

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option from the menu in the menu bar of the application. Another facility available with this application is the error checking of file system. Formatting the partition to any supported file system is also possible using this tool.

System Testing

Linux keeps a database of different hardware components. Applications are installed in Linux to test the system and to give a report, if required. By studying the summary report, it is possible to ensure that the system is working properly. Launching the tool for testing the system opens a new window displaying all the hardware components attached to the system. In Ubuntu distribution the screen display is as shown in Figure 6.8.

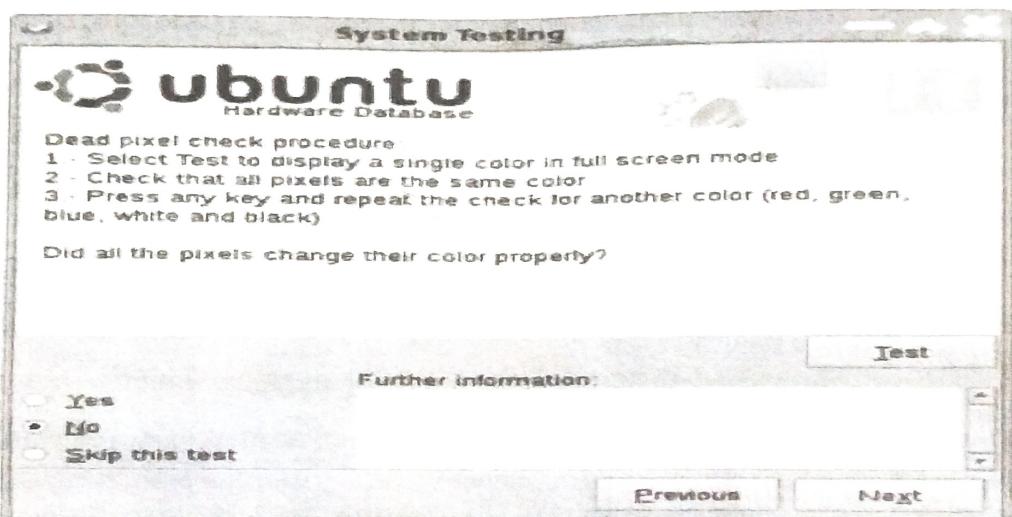


Figure 6.8 System Testing Window in Ubuntu Linux.

The tool tests each component one after another in a continuous manner. Procedure for testing the component is stated in the window. Clicking the button to test the component performs a testing of the selected component. Moving to next screens provides facility to test other hardware components also. Working in a similar manner all hardware components can be tested for their working.

Boot-Up Manager

Several services are started during the booting up of Linux operating system. These services help in managing different activities such as live CD installer, update virus database, X Window system infrastructure, bluetooth services, hard drive temperature monitoring facility, scanner service, print job management and many other services.

These services are very essential for carrying out normal computer activities. There are several other services available in the system that is not activated automatically during the booting time. These services need to be activated, only if required. In certain circumstances it also becomes necessary to deactivate some of the running services. Boot-Up Manager is a graphical tool that provides facilities for starting or stopping services as well as for configuring applications to start at boot time. When this tool is activated, it displays the graphical window as shown in Figure 6.9.

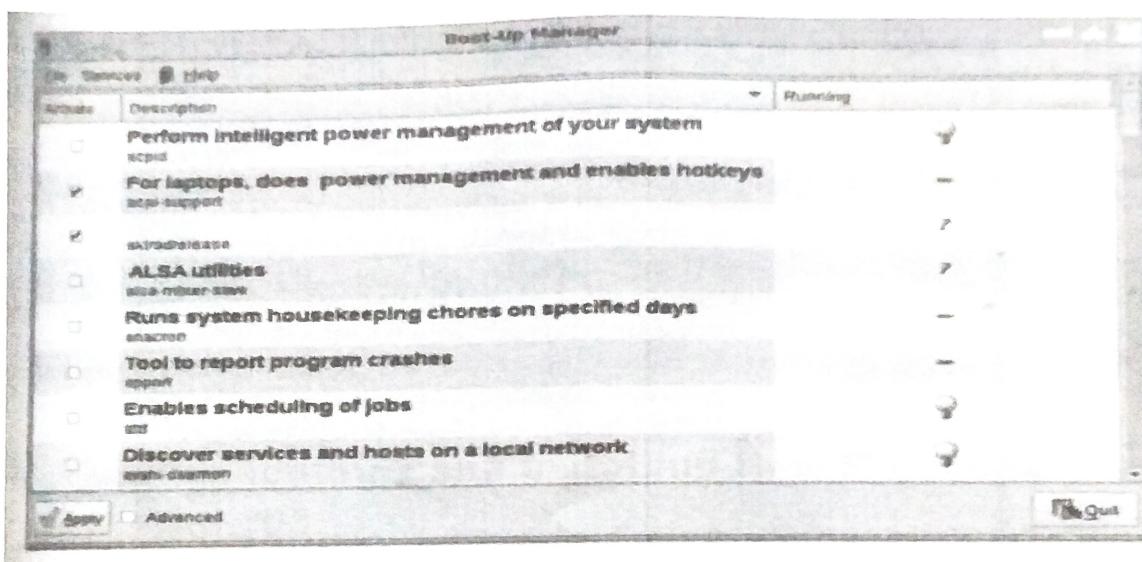


Figure 6.9 Boot-Up Manager Window.

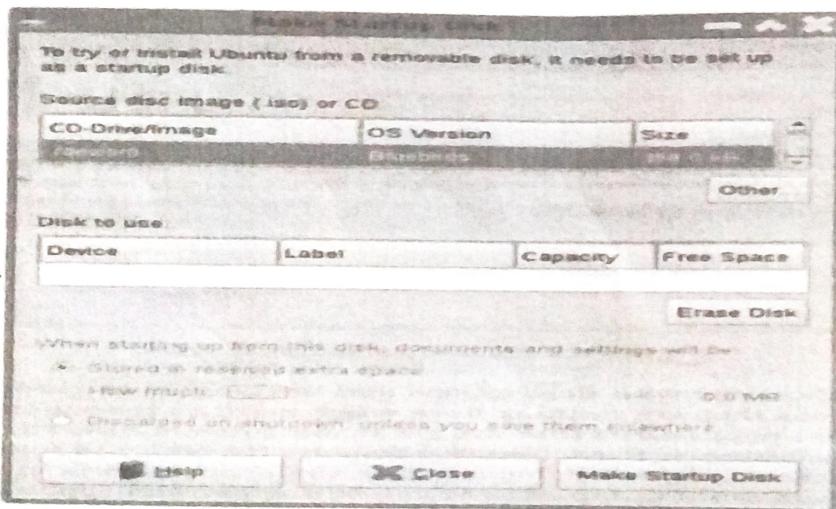
A list of applications with descriptions and working status are displayed in this window. Applications that are running have a tick mark in the square box seen on the left side while those applications that are yet to start do not have a tick mark in the square box. Right clicking on the application displays the option to activate or deactivate the selected application, depending on whether the application is in deactivated or in activated state. Thus running applications can be stopped and applications that are yet to start can be activated.

Making Startup USB Disk

USB Startup Disk Creator is an utility available in several Linux versions. This utility creates an image of the operating system in an USB medium. This image is known as a Live USB. Live USB can be used to install Linux on the computer for running Linux without affecting the system hardware. There are several advantages of using live versions. Less wastage is one advantage, as a live USB disk can be overwritten easily.

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Changes to the USB disk are saved, unlike a Live CD and hence there is persistence. It provides a safe computing environment as it is possible to boot the computer from a live USB disk to protect the system when accessing unsecured public networks or testing unstable functionality. To make a live USB disk, plug the device to the USB drive of the system and make sure that the system recognizes the disk. Launch the application from menu. This opens a new window as shown in Figure 6.10. Under the source disc image option, specify the image. The image from a CD can also be used for creating the live disk. After setting different options, click *Make Startup Disk* button. This step creates required startup disk. The USB can be safely removed and can be used as a live USB booting the system. To boot from the live USB disk, set the boot option to the disk power on the computer. The system boots from the USB disk.



Viewing log Files

Log viewer applications are available in all Linux distributions. One of the log viewer applications available in several Linux versions is *System Log Viewer*. This is a graphical and menu-driven viewer and can view and monitor different system logs. *System Log Viewer* is useful because it provides an easier, more user-friendly display of different event logs. With the help of a monitoring mechanism, this application continuously monitors crucial logs. Also *System Log Viewer* comes with functions that can be used to manage the logs, including a log monitor and log statistics display.

When the application is launched for the first time, the application displays several log files by default. Opened logs are listed on the left side of the application window.

Details of the log selected in this list are displayed on the right side window. By default, *System Log Viewer* monitors every opened log. Log information is displayed in the status bar and this includes the number of lines in the log, size of the log in bytes, date the log was last modified. The log can be copied if required and pasted to another editor.

Installing New languages

During the installation of the operating system, a language is selected for installation purpose. The availability of translations or writing helps can differ between languages. If a new language support is required later, this can be added by the administrator user. The administrator can select a language from the list of available languages in the list. It is also possible to remove an installed language from the system. The advantage of installing different languages is that different users can choose the required language in their language settings. Installing more languages helps to set the required language for displaying menus and windows in the system. Languages for startup and login screens can also be set using suitably. Display for numbers, dates and currency amounts can be set using the new language. The changes take effect only after the next logging in to the system.

Downloading Applications and Installing New Releases

Several Linux application software are available for downloading from the Internet. The software available is of different types. These are available as community supported or canonical supported open source, in the form of proprietary software or in the form of licensed software. These different software are stored in different servers located at different places. Also several *http* and *ftp* servers archive Linux resources, which can be downloaded and can be used freely.

Ubuntu Linux distribution provides a tool for software downloading from websites and for checking whether the installed software has new releases available. Software Sources is the tool used for this purpose. When this tool is launched, it displays a window as shown in Figure 6.11. Different options can be set for software downloading by opening different tabs appearing in this window.

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New and updated Linux versions are released regularly. To use new Linux versions the system is to be updated. System updating involves the downloading and installation of the latest updates of the applications and packages used in the Linux version. Different updates are available from different sources. Using the above tool it is possible to configure the system such that updating takes place automatically at the set time intervals such as daily, on alternate days, weekly updates and so on. If the system is working in online mode, the updating takes place at the set time intervals automatically. If new Linux releases are available in a CD or DVD medium, the updating process can be also using the medium instead of downloading from website.

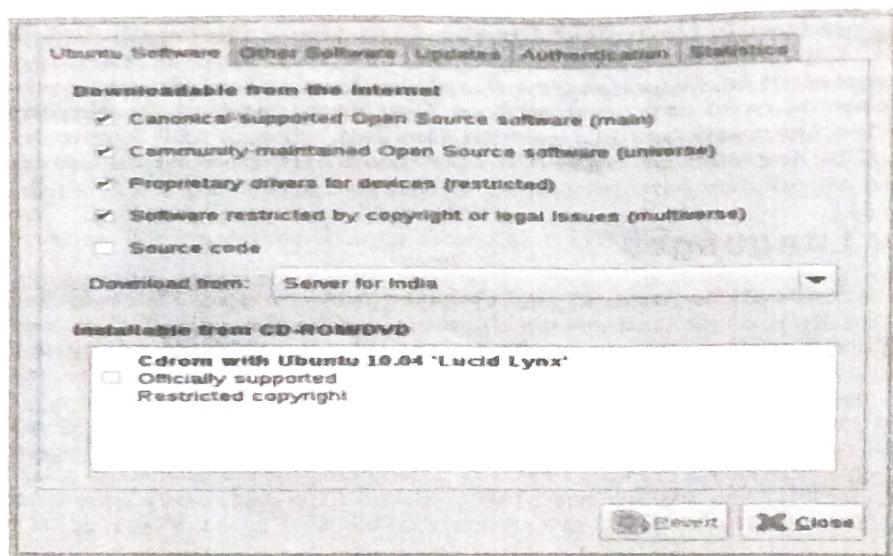


Figure 6.11 Software Sources Window.

A virtual catalog of several free applications suited for Ubuntu distribution is available in *Ubuntu Software Center*. When launching this tool, a window as shown in Figure 6.12 is displayed.

Clicking the link *Installed Software* appearing on the left pane of the window displays the list of installed software in the system. Selecting *Get Free Software* on the left pane displays a list of departments on the right pane. Here different software are grouped under different departments or categories. Double clicking the icons of departments displays a list of available applications under the selected category. Suitable application can be selected from the list. The selected application can be installed with the click of a mouse button. An Internet connection is necessary to install an application available in this list. To install a particular application available in the list, first locate the application using the *search* option. Click the application and then click the arrow button

to go to the screen of the program. Click the button for installing the software. The time taken for installation depends on the size of the software and the speed of Internet connection. Once installed its name appears in the *Applications* menu in the same category in which the application is listed in the Software Center. Working in this way, applications under different categories can be installed. To remove an installed application, first locate the application in the list. Select the application and then click the *Remove* button appearing in the window.

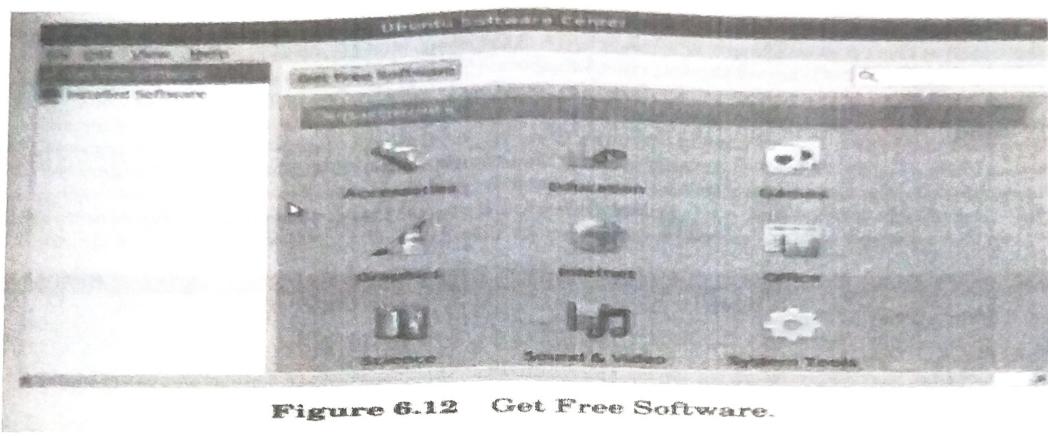


Figure 6.12 Get Free Software.

Installing Packages

Several Linux software applications are bundled as packages. A single application can even exist in several packages. Package manager applications available in Linux operating system enables the installation, upgrading and removal of software from computers as well as the management of already installed software. The advantage of using the package installation is that all the required files will be available and it is required only to place the files in correct locations. All applications reuse the functionality of other applications or libraries and hence most packages depend on other packages. So it is necessary to install the packages in an ordered manner. Package manager application resolves dependencies automatically.

Linux packages are mainly available in two types namely RPM packages and DEB packages. RPM stands for Red Hat Package Manager and DEB stands for Debian. These packages can be identified by their file names extensions. These files are executable files for Linux operating system. Several of these packages can be downloaded from the Internet. The packages are also distributed through different storage media. To install a packaged file, the first step is to copy the files in the local folder. After copying the files,

double click the file for installation of the package. Necessary permission to execute the file must be available for installing the package. The installation takes place only if all the dependencies are satisfied. Otherwise an error window will appear. Usually, packages are tested for a particular Linux distribution for dependency management for the effective working of the application. Dependency management in one distribution does not indicate the effective dependency management in another distribution or in another version. Installation of RPM based packages in Debian based distributions is not simple as it requires some additional packages for conversion from one type package to another type.

Another method for installing Linux packages is the use of Linux Package Manager Applications for installing packages. Package Managers install, remove, configure, upgrade and downgrade single and multiple packages. They also manage package repositories search packages using different attributes, select packages by status, sort packages and so on. RPM based and Debian based distributions use two different package managers for package installation. But both package managers appear identical and work in a similar manner. In Mandriva Linux distribution, the package manager is launched by selecting the *Install & Remove Software* option displayed in the list when *Applications menu* is opened. The option is also available by navigating through *System > Administration*. When the option is selected, a new window is displayed, as shown in Figure 6.13.

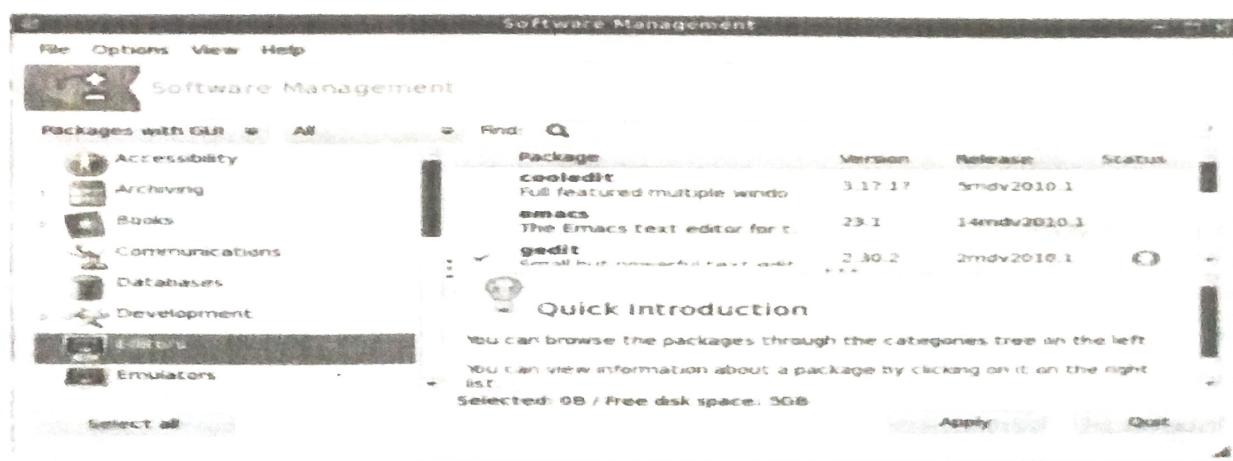


Figure 6.13 Software Management Window of Mandriva Linux.

is the Software Management window and this window lists all the installed applications, categorized under different groups. Browse the group to get the list of applications

available under the group. Installed applications are indicated with a tick mark on the square box at the beginning of the package name. Right clicking on the application displays more details about the selected package in the description box. To install a new package, click on the square box. This step opens a new window which displays a summary of additional memory needed. Click the *OK* button for confirmation of installation. Installation process starts and asks for inserting the medium on the drive. Insert the medium and click *OK* button. The package is installed and the name of the application appears under a group in the *Applications* menu, in which the package was displayed.

To remove the installed software, first locate the software in the package list in the *Software Management* window. Remove the tick mark in the square box appearing on the left of the name of the application by clicking on the square box. Click the *Apply* button appearing on the bottom of the window. This step opens a new window in which a summary is displayed. Proceed by clicking the *OK* button to remove the software.

Ubuntu Linux distribution makes use of *Synaptic Package Manager*, as the package manager for installing packages. To install packages using this package manager, activate the application by selecting *System* from the menu bar and choosing *Administration* option and then *Synaptic Package Manager*. The opening window of the package manager looks like the one shown in Figure 6.14.

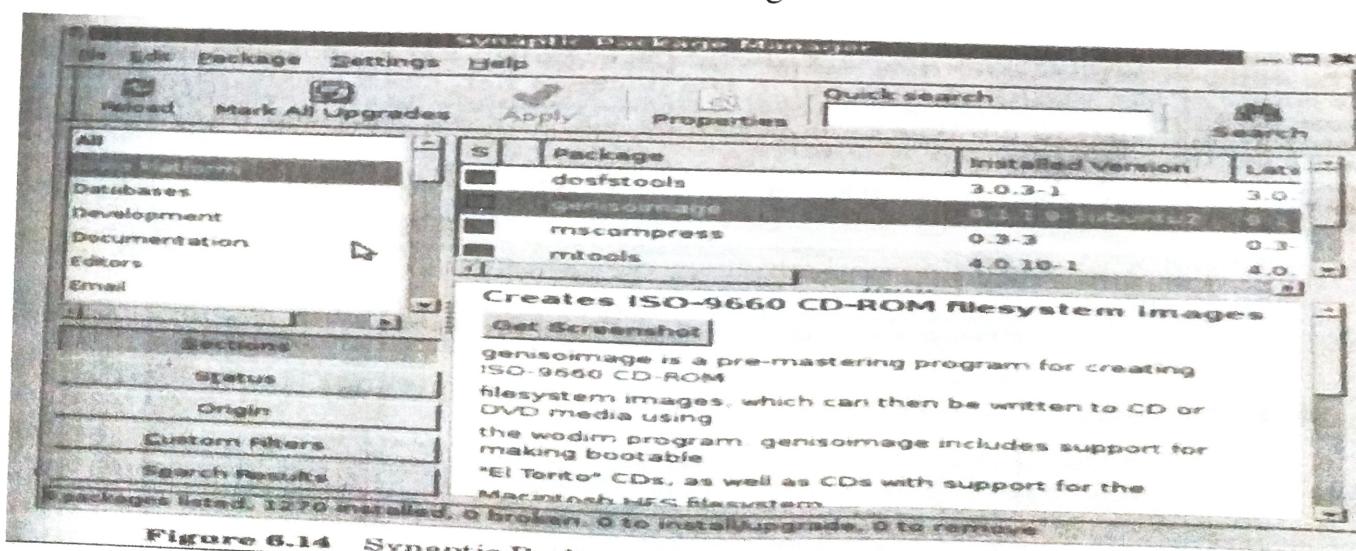


Figure 6.14 Synaptic Package Manager Window in Ubuntu Linux.

Similar to any window, this window has a title bar, menu bar, tool bar and so on. Opening the ...

Depending on the selection of category made on the left pane (category selector window), the corresponding details of available and known packages will be displayed on the right pane. The installed packages are indicated by a dark square at the beginning of their names whereas packages that are yet to be installed are indicated by a white square at the beginning of their names. Right click on the name of the package. A short description of the selected package will be displayed in the bottom right pane (description field).

Installed applications can be marked for removal or upgrading, while those are to be installed can be marked for installation, from the options displayed on the pop-up window. Options can also be set by opening *Edit* menu of the application. Different menu options are for reloading the packages as well as for marking upgrades of packages. After making changes, save the changes by clicking the *Apply* button on the tool bar. Clicking the *Reload* button on the tool bar reloads the packages from Internet sites, if the computer is working online. Otherwise a downloading error will appear on the screen and the process will come to a halt. Packages are made available through so called *repositories*. Repositories can be located on different media such as *CD/DVD*, local hard disk, the Web ([http](http://), [ftp](ftp://)) or in remote file systems. A repository contains the packages and along with them, an index that provides basic information about the packages, such as the required dependencies and short description.

To remove a package, first mark the package for removal. For this, double click on the name of the installed package in the package list. Click on the status icon of the package and choose the option for removing the package. Save and apply the changes. This step opens another window as shown in Figure 6.15. This is the confirmation window and asks for the confirmation of selected packages. A summary of packages removed and the memory that can be reclaimed are also displayed in this window. Clicking the *Apply* button removes the selected packages from the system.

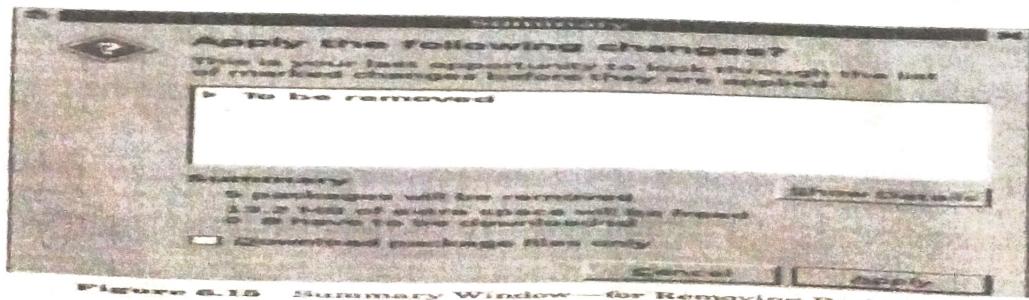


Figure 6.15 Summary Window—For Removing Packages

Source codes of several applications can be downloaded from the Internet and the source code can be compiled to get the binary form of the application. Several applications for Linux operating system are available in different Internet sites as well as distributed in different storage media. Many of the applications are available in compressed or zipped formats. These are the common methods of distributing open source software. Such types of software work on different platforms as well as in different distributions. The normal way of installing such Linux applications is to download the application to the local folder and to double click the compressed or zipped file to extract the component files and to install them in the system. These files will be having a file name extension *ar*, which means that it is an archived file. Depending on the application used for compressing the file, the files can also have name extensions like *.gz*, indicating that it is a zipped file. Double clicking the compressed file opens the archive manager, which helps to extract the compressed files. The typical display of the window is shown in Figure 6.16.

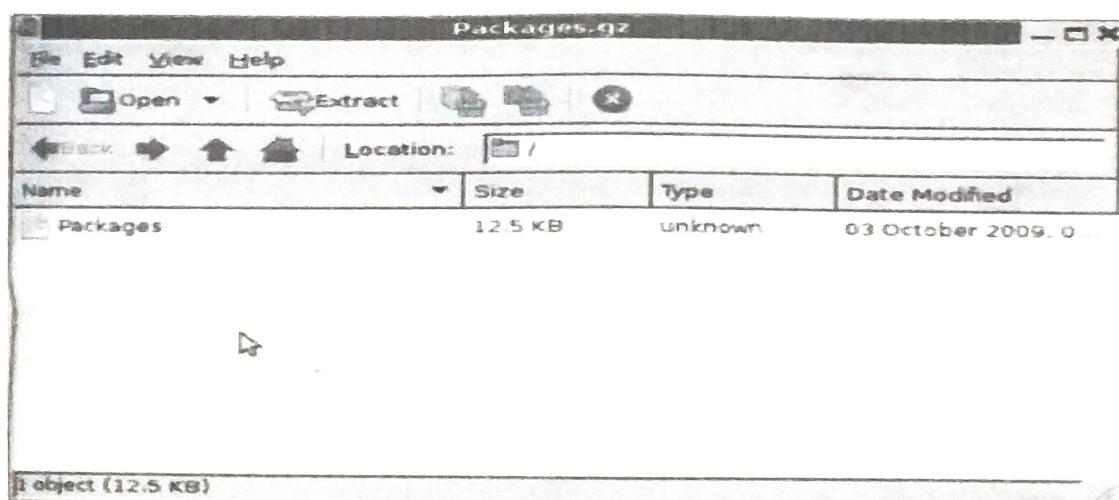


Figure 6.16 Archive Manager Window—for Extracting Compressed Files.

As seen in the figure, the name of the location or the folder to which the unpacking of the compressed file is to be done is specified in the text box. After typing the location, click *The Extract* button, to extract the compressed files to the named folder. After extracting the file, the application can be executed by double clicking the executable file. Usually a *readme* file is created in the folder and this file guides in the further installation of the software. Apart from the above types of installation methods, the packages can be

installed Executing different Linux commands at the Linux prompt. This will be discussed later.

Setting Up and Managing Computer Networks

Configuring computer networks and their management are important Linux administration functions. Several tools for configuring and managing computer networks are installed by default during the installation of Linux operating system. Using the different tools it is possible to set up a new network, edit network connections as well as remove a network connection. In GNOME desktops a network icon is displayed on the top panel. Right click on this icon and select the option *Configure Network* from the displayed list. This operation starts the *Network & Internet Configuration* wizard. The first screen displays the list of different connections available for configuring (See Figure 6.17).

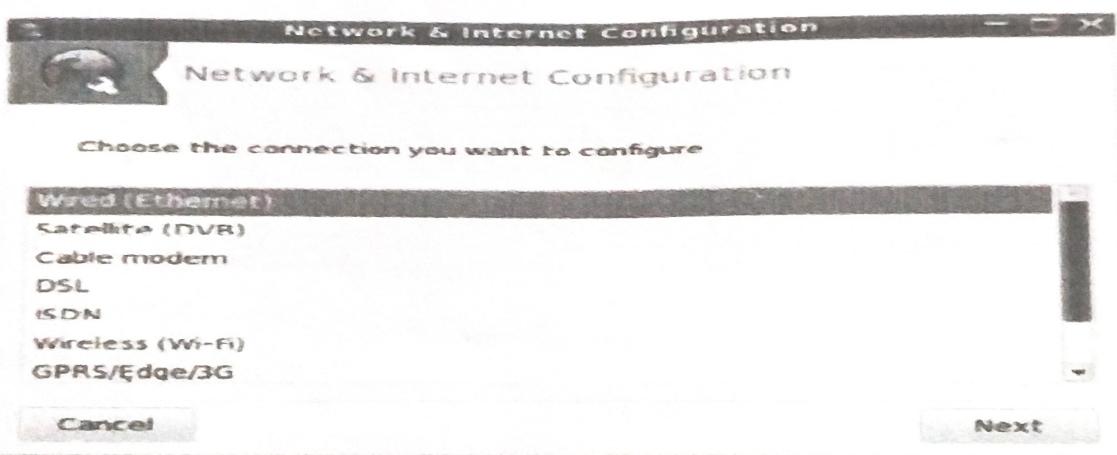


Figure 6.17 Network & Internet Configuration Wizard in Action.

The different connections can be wired network, wireless network, using cable modem etc. For setting up a wired network, choose the option *Wired (Ethernet)* from the list and click the *Next* button. The computer detects the Ethernet interface available and its name is displayed in the next window. Configuring the protocol for connection can be made either automatically or manually. Select the manual configuration option and move to the next window. The new window displayed as shown in Figure 6.18. The IP settings are done in this new window. Set the IP address and netmask for the computer. In this window the IP address is given as 192.168.4.2 and netmask as 255.255.255.0. Click the *Next* button and proceed further and finish the processes. The same step is to be done in

all the computers connected in the network. The IP addresses used in different computers will be like 192.168.4.3, 192.168.4.4, and so on. The netmask used must be 255.255.0 in all the member computers in the network. Once the

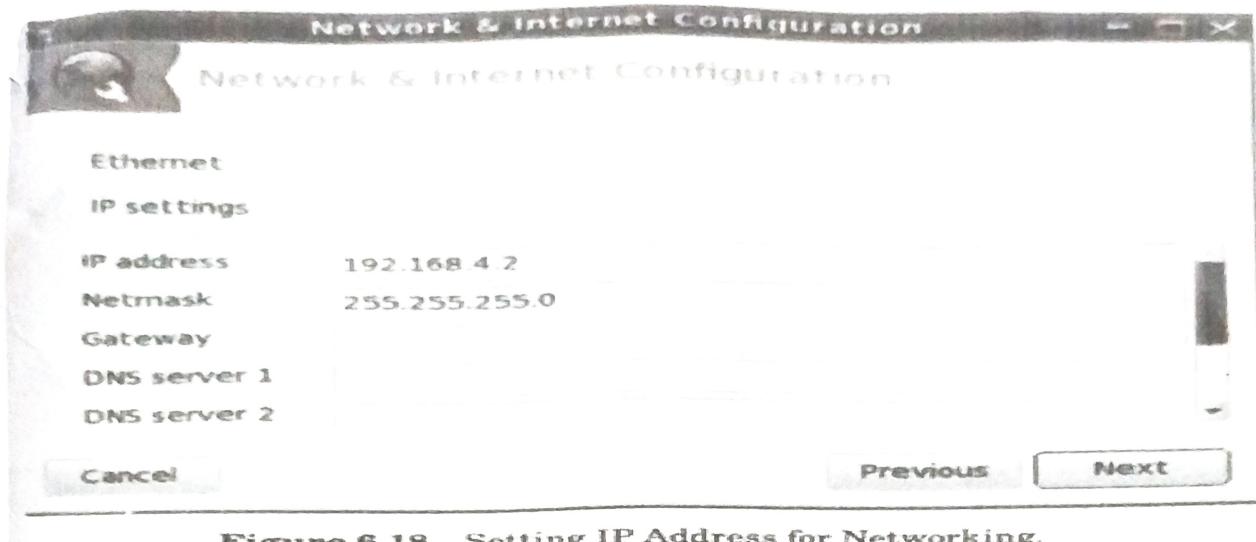


Figure 6.18 Setting IP Address for Networking.

Configuration is finished a connection is established between the networked computers by clicking the button for establishing connection. Using suitable tools or text commands it is possible to check whether a connection is established between the computers. For Ubuntu Linux also, the same steps are to be followed for setting up a network.

Adding printers

Linux operating system allows adding new hardware to the system. Using this facility, it is possible to add printers, modems, scanners and the like. For a successful hardware installation it is necessary to install the required software as well as to set different configuration parameters of the hardware. Configuring the devices is done with the help of Device drivers files. Installing device driver files adds new features. Linux operating system configures most of the devices automatically. But certain devices require proprietary Drivers to be installed for their working. This is because the drivers for those devices are not freely available, as the manufacturers of the devices have not released the hardware details. Device drivers for any device are usually provided by the manufacturer and this is available along with the device. To add a new driver, locate the device driver file from the list displayed in the window when the hardware driver tool is launched from the menu. Press the *activate* button to enable the driver. The driver may have to be

downloaded From the Internet. The computer is required to be restarted for the changes to take effect.

To install the printer software in the system, select the option *Printing*. This opens the printer configuration window as shown in Figure 6.19. To add a printer, connect the

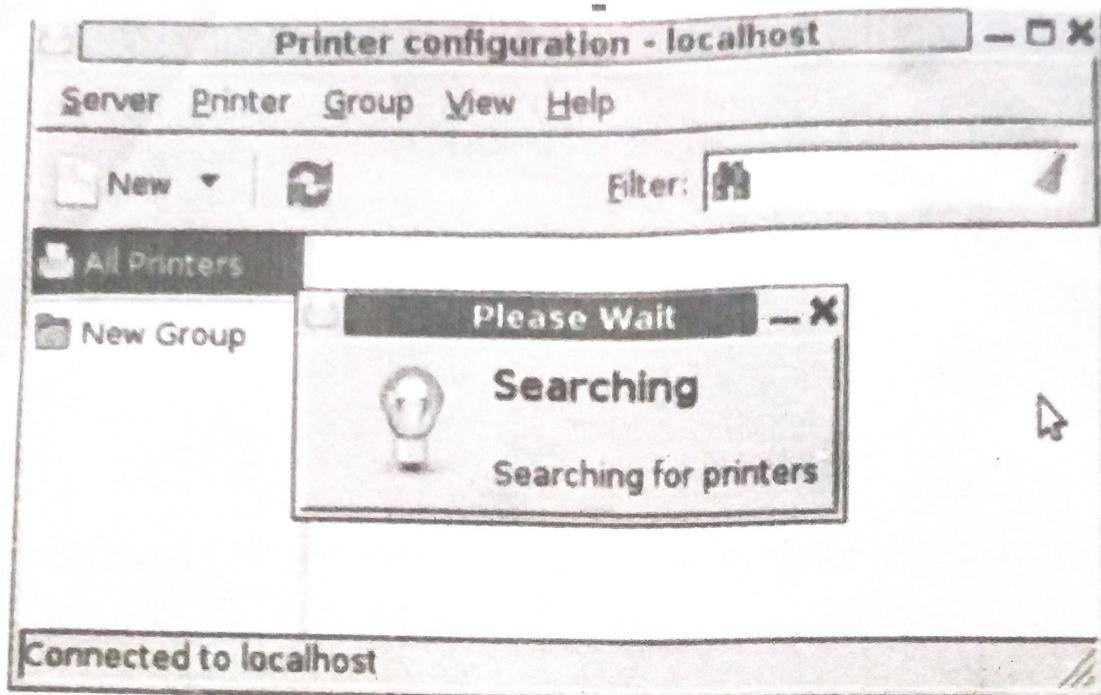


Figure 6.19 Printer Configuration Window.

printer to the computer and switch on the device. Click the *New* button in the configuration window. The system checks for new printers connected to the computer and installs the necessary printer software.

Manual intervention is necessary to identify the printer and for setting different parameters. Different configuration steps for a printer involve assigning port, setting time limits and the like. After selecting the parameters, proceed to install the printer by clicking the *OK* button. If the printer is successfully installed, its icon appears in the window as shown in Figure 6.20. In this way more printers can be added to the system. Right clicking on the printer icon displays a pop-up window and the user can select different options for setting different printer configurations. Double clicking the icon displays the printer properties window and it is possible to set different configuration options for the printer, in this window.