

Linux Distributions and Installation

Introduction

Some of the distributions are used as general purpose operating systems while certain others are designed for certain specific applications. Commercial versions of Linux operating system are distributed in different storage media. Free Linux versions can be downloaded from the web and can be installed. A version of Linux operating system runs direct from storage media such as CD, DVD or thumb drive and this media can be used to boot computers from Linux operating system. In this chapter we will be discussing the salient features of some common Linux distributions, followed by a detailed discussion of the different steps for installing Linux operating system.

About Linux Distributions

Depending on the type of installation files of the distribution, Linux distributions are divided into two groups namely rpm based distributions and deb(Debian) based distributions. This type of classification is significant during the installation of Linux when text commands are used for installation, since the two groups use different commands for installation. With the emergence of graphical interfaces, this type of classification lost its significance, since different distributions can be installed using a number of mouse clicks. Red Hat Linux and its derivatives are classified as *rpm* based distributions. Some of the distributions that can be included under this group are Fedora, Mandriva, CentOS, SUSE and the like. Debian distributions and their derivatives namely Ubuntu, Knoppix, Damn Small Linux, Linux Mint belong to the second group.

The working of the system as well as the arrangement of files for both types of distributions is identical. Several icons can be seen on the desktop for both types of distributions. Right clicking on the empty part of the desktop opens up a menu with several options. Different software installed by default in Linux systems are grouped on the basis of their tasks. These different groups are related to applications, games, desktop configuration and so on. Clicking the task name opens up new windows displaying further newer options and finally the required application can be activated by proceeding forward and clicking on the application. In several distributions, the programs displayed as icons can be activated by double clicking the icon. Switching between different

desktops called workspaces-is possible in all Linux distributions. All distributions have File Manager application for managing files, web browser for browsing the Internet, e-mail applications and several other applications for audio, video operations.

RPM Based Distributions

Red Hat Linux operating system is the Linux version distributed by Red Hat. This is available as desktop and server versions. This is a commercial enterprise level distribution. This operating system can work in different types of computers such as desktops, servers as well as in computers having different architectures and processors. Several applications for office productivity, web browsing, mailing operations and games are installed by default, while installing this type of distributions. Applications for photo and image manipulations and networking are also available with this operating system. Encryption facility, firewall, multi language support are the other features available with this type of distribution.

Fedora Linux is an operating system developed under Fedora project sponsored by Red Hat. This is a robust and matured operating system. The installer of Fedora Linux is known as Anaconda. This operating system has several default applications. New versions are released with added features. New release of this distribution comes with different desktop environments namely GNOME, KDE, LXDE and so on. Support for audio, video and other *multimedia* files are also available with this distribution. Support for webcams and wireless networking is also available in new versions.

Another distribution based on *rpm* is Mandriva Linux. Earlier, this distribution was known as Mandrake Linux. This is also based on Red Hat and is commercially backed. It is one of the most common and popular Linux distributions.

SUSE Linux is a commercial Linux version and is very secure. Free version of this distribution is known as OpenSUSE Linux. This is a common and popular operating system and is *rpm* based. The operating system uses yum for resolving dependencies. Upgrades to this distribution are released regularly. Different desktop environments can be selected at the time of installation.

Deb Based Distributions

Debian/GNU Linux is a comprehensive and non-commercial Linux distribution. Debian is a volunteer based Linux distribution. The package is deb based and the dependency resolver is apt-get. This Linux version supports systems of different architecture. It has two desktop environments-Gnu Network Object Model Environment (GNOME) and K Desktop Environment (KDE). Several distributions are derived from Debian. This distribution has regular new releases. */o cost gas instal Python 3*

Ubuntu Linux is an easy to use Linux version. Ubuntu operating system has two versions-the desktop version and the server version. This operating system is derived from Debian Linux. Ubuntu is an African word and it means humanity to others. Two types of graphic user interfaces namely GNOME and KDE are available for Ubuntu. The version in which K desktop environment is used is known as Kubuntu. Kubuntu is also an African word and it means towards humanity. Open office applications, web browser, messaging application, text and graphic editor, mail client and games are installed by default. This operating system also provides support for a number of languages.

Knoppix Linux is one of the first distributions that came with a live CD distribution. Live CD can boot from itself and operate through RAM. This is one of the most popular Linux distributions. This is a deb based operating system. Damn Small Linux is a small Linux distribution having a small size of just 50 MB. The distribution is freely available and the latest version can be downloaded from the web. This distribution can also run from a CD and from within the Windows operating system. To create a live CD, the image file having an extension of .iso is to be downloaded from the web. To install the Windows version, unzip the compressed files by double clicking on it. The decompressed Files are stored in a folder. Double clicking the Windows batch file runs the application. Firefox web browser is available in this distribution. Other applications available in DS Linux are Sylpheed-the e-mail program similar to Outlook Express in the Windows platform, XMMS (XMultimedia System)-cross platform multimedia player, text editors such as Beaver and Vim, graphics application Xpaint. Office productivity tools such as PDFviewer, calculator, calendar, dictionary and so on are also available.

Managing Linux Files and Folders

Linux Files and Folders

Files store information in an electronic form. Files hold different types of information. Files are essential for running the operating system as well as do any meaningful operation in the system. Files in computer systems are identified by their names. While naming computer files it is usual to give a meaningful name to the files so that the content of the file is easily understood from its name itself. Different operating systems have different rules for naming computer files. These rules are related to the maximum number of characters that can be used in the file name, use of special characters in the file name and the like. New versions of Linux operating system allows filenames with several characters with more than one word separated by space character. It is important that the same file name must not be given to more than one file. Linux System treats lower case as well as upper case letters differently. So files with the same name but using different letter cases are considered as different files. However, certain special characters are not allowed in file names.

File names have a set of characters used as file name extension. File name extension is the set of characters appearing after the period (.) character in the file name. Several applications store the created files with file names having a standard file name extension, by default. From the standard file name extension of a file, it is possible to understand some features of the file such as the type of the file, the application used for creating the file and the data contained in the file. For example, a file having the file name extension .odt indicates that the file is in ODF Text Document format. OpenOffice.org Writer is the application used to create the file and the file is a document file. A file saved with the file name extension .jpg indicates that the file contains .image, and it is saved in JPEG format and an image editor application can open the file. Similarly audio files, video files, spreadsheet files, presentation files, text files, compressed files all have standard file name extensions based on the applications used to create such files. Storing all the files in one place in the computer system without any planning or arrangement makes it difficult to locate the required file from the storage. The condition becomes severe when there are hundreds of files to be stored in the

computer system. Presence of files with identical names and similar file name extensions make it difficult to locate the correct file from the heap. Under such conditions, it is better to store the files in different locations. Files are grouped based on their type or use and are stored in different locations. This type of storage helps in locating the required file easily.

The need for storing files in a structure and neat manner led to the emergence of the concept of folders. Folders can be treated as containers for files. Usually different users create their own folders and store the files created by them in their own folders. Depending on the requirements several folders can be created within a folder and files can be stored in these folders also. Such type of arrangement of folders is common in computer systems and this has become a standard storage arrangement for storing related files.

For example, files connected with correspondences are stored in a folder named 'correspondence'. Picture files are stored in another folder named 'picture', audio files are stored separately and so on.

The terms directory and folder mean the same thing and are used interchangeably. Similar to files, folders are also identified by their names. Rules for naming files are applied for naming folders also. A Folder can contain several files or no files at all. Folders can also contain several sub folders or no sub folders. Folders created within a folder are known as *sub folders* or *subdirectories*. The folder in which the user is working is known as the *current directory*. Any directory below the current directory is called *sub folder* or *subdirectory*. The directory above the current directory is called as *parent directory*.

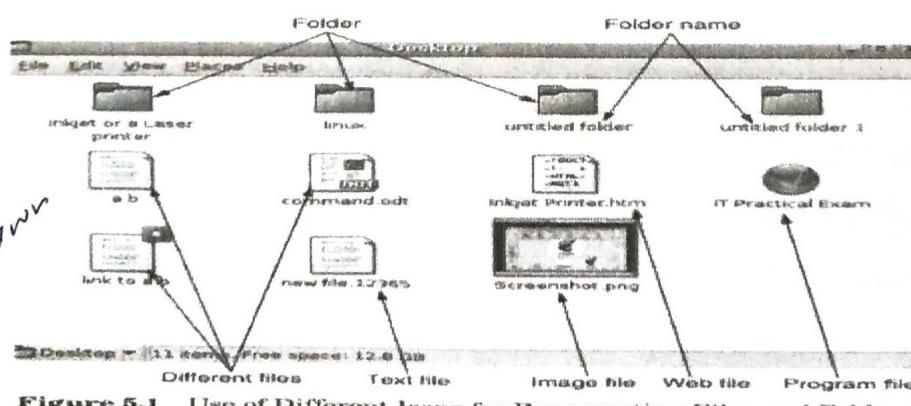


Figure 5.1 Use of Different Icons for Representing Files and Folders.

II BCA Operating System Unit III

Linux operating system treats folders as files. So files and folders within the same folder must have different names. In graphical system used by Linux, files and folders are represented differently using different icons and this different type of representation is essential to distinguish between these two. Also Linux uses different icons to represent different types of files. Thus text files, image files, web files are all represented using different types of icons. The different types of icons used for representation for files and folders are clear from the screen display shown in Figure 5.1.

Paths and Path Names

In a computer system it is possible to find several folders. Each folder may contain several sub folders as well as many files. To locate any file in the system it is necessary to specify the exact path where the file resides in the memory. Simply providing the file name means that the file is located in the directory where the user is located at that time.

The concept of paths and path names will be clearer by considering the entire storage space of the system as a single large storage unit. This large storage unit is usually known as root and this is denoted as a single slash character (/). Several folders can be created in the root folder and these are the storage compartments of the root storage space. Each of the partitions can be partitioned further to get several sub folders. The organization described is illustrated in Figure 5.2 and studying the figure and understanding the explanations below provide better understanding of folders and paths.

As can be seen in the figure, the root is at the top level. The root folder is partitioned into a number of folders namely *letters*, *klj*, *picture*, *home* and *personal*. These folders lie just below the root partition. These folders are represented as *Iletters*, */klj*, *Ipicture*, */home* and */personal*, respectively. The representation indicates the exact paths of the folders and is known as path names. Folders named *klj* and *personal* are having two sub folders beneath each one. Folders named *office* and *personal* lie below the folder *klj*. The exact path names of these two folders are written as */klj/office*, and */klj/personal* respectively. Both the sub folders store one file each and the names of files are written below the folder name. Subfolders to *home* folder are *klj* and *jac* and their exact path names are given as */home/ klj*, and */home/jac* respectively. The names of files

stored in the sub folders are written below the name of the folder. Folders named *friend1* and *friend2* ie as sub folders to the parent folder named *personal* and their exact path names are given as */personal/friend1* and */personal/friend2*. Similarly the exact path names to folders *old* and *new* can be given as */home/klj/old*, and */home/klj/new*. This is a hierarchical representation of files and folders in the storage and this type of representation is known as a file tree, shown here as Figure 5.2.

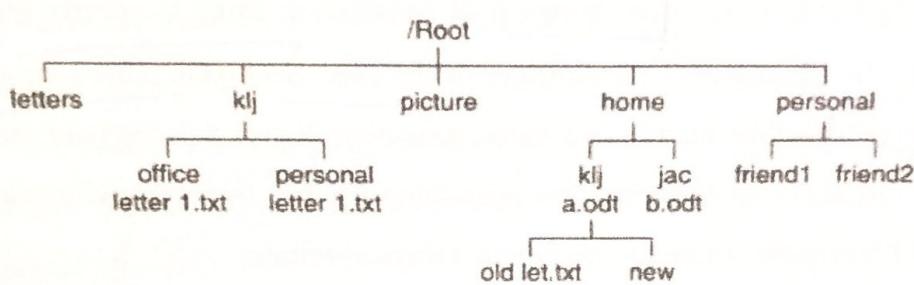


Figure 5.2 A File Tree.

Names given to files and folders located within a folder must be different. Also different sub folders of a folder must be named differently. But sub folders of different parent folders can use the same name. As stated earlier, files can be stored in any of the folders in the storage space. Files in different folders can use the same file name. For example, as can be seen in the figure, the same file *letter1.txt* is stored in two different folders. This is possible since different folders represent different storage locations. The concept is clear from their exact path names. The exact path names of these two files are

/klj /office / letter 1.txt

and */klj/personal/letter1.txt*

When a user logs into the system, the user is automatically placed in the home folder of the user. Home folder of any user is located as the sub folder to the */home* folder. For example, when the user *klj* logs into the system, the user is placed in the folder */home /klj*. During this time */home/klj* is the current directory of the user *klj*. The user *klj* can address the file in *jac* folder as */home/jac/b.odt*. When the user *jac* logs into the system, the user is placed in */home /jac* folder. During this time */home /jac* is the

current directory of the user jac. The user jac specifies the file in klj directory as `/home/klj/a.odt`.

Exact path names denote the exact locations where files are stored. Such path names are also known as absolute path names. In path names, the first slash indicate the root folder. Following slashes separate the names of different sub folders. File name appears as the last item in path names. Using the exact path names to identify the file requires typing long path names. To shorten path names, it is usual to specify the path names relative to the current working directory of the user. Such path names are called relative path names. Consider the file tree shown already in Figure 5.2. Suppose the user working in the directory `/home/klj` requires specifying the file `let.txt` stored in the sub folder named `old`. The path can be specified in two ways as follows:

`/home / klj /old\let. txt`

And `./old\let.txt`

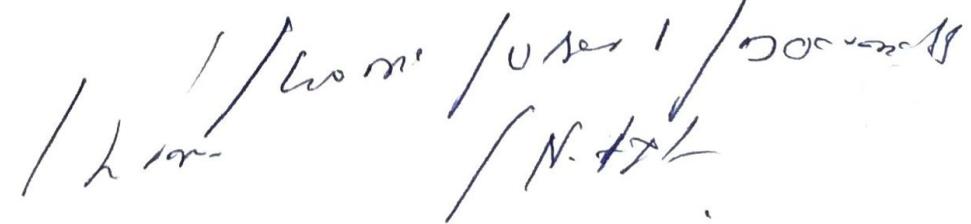
Both the path names identify the same file. The first path name is the absolute path name whereas the second path name is the relative path name. In the relative path name a dot character is used to indicate the current position of the user and the path name begins with a dot. In a similar manner, to refer to a parent directory above the current directory, a user uses two dot characters in relative path names.

Linux System File Structure

Files in Linux-operating system are classified as ordinary files, regular files, directory files and special files. Ordinary files include a variety of file types like application files, data files, document files etc. Application files are usually executable files and using these files different applications are executed. There are applications for performing tasks like word processing, doing calculations, browsing the Internet, managing mails, doing image manipulations and so on. Data files store different types of data and these files can be image files, audio files, video files or simply text files. Document files store multiple types of information such as text, drawings, images and so on. Directory files are related to different directories of the system and these store information related to different

directories. Linux special files are device driver files, link files or similar other types of files. Different physical entities are also represented as files in Linux. Thus, printers, Modems and other devices are represented as files. Using special files, the operating system can control different devices connected to the system. Such special files used to control devices are known as device driver files. Device driver files are essential for proper communication between the operating system and the connected devices. Links are the second names given to a file. Creating links to files enables different users to use the same file thereby preventing the creation of multiple copies of the file for use by different users.

Different files used by Linux operating system are also arranged in hierarchical manner. Files in the operating system are arranged in different folders. Depending on the number of applications installed and the configuration of the computer, each of the folders can contain several files and many sub folders. Root folder is at the top in the hierarchy. All the files and folders of Linux system are included in this folder. Root directory has several sub folders named as bin boot, dev, etc, temp, home and so on. Each folder stores some particular types of files intended for a particular use. The folder named bin stores all binary files. Bin is the short form for binary. For storing boot files, boot folder is used. Device files necessary for the proper working of attached peripherals are stored in the folder named dev. The folder named etc stores different files for configuring the system and devices. The folder named temp is a temporary folder and this folder stores temporary files. Files stored in this folder are deleted after use. Different users of the system are included in the home folder. Depending on the number of users, the home folder has several sub folders. Files created by a user are stored in different sub folders of the folder of the user. Library files required for running the system are stored in the lib folder. Besides the above discussed sub folders there are several other sub folders also. Folder arrangement of Linux files is clear from Figure 5.3. To get a better understanding of the hierarchical arrangement of Linux files, this line diagram is more helpful.



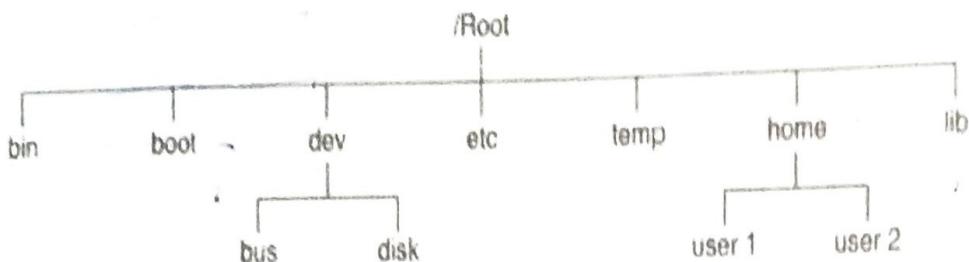


Figure 5.3 Hierarchical Files Arrangement in Linux.

Files and Folders Properties

A general idea about files or folders in Linux system can be obtained from the icon and studying the file name extension. More information regarding the file or folder is obtained by right clicking on the file or the folder icon and selecting the option *Properties* from the pop-up menu displayed on the screen. Selecting this option displays the *Properties* window as shown in Figure 5.4. Properties window has a

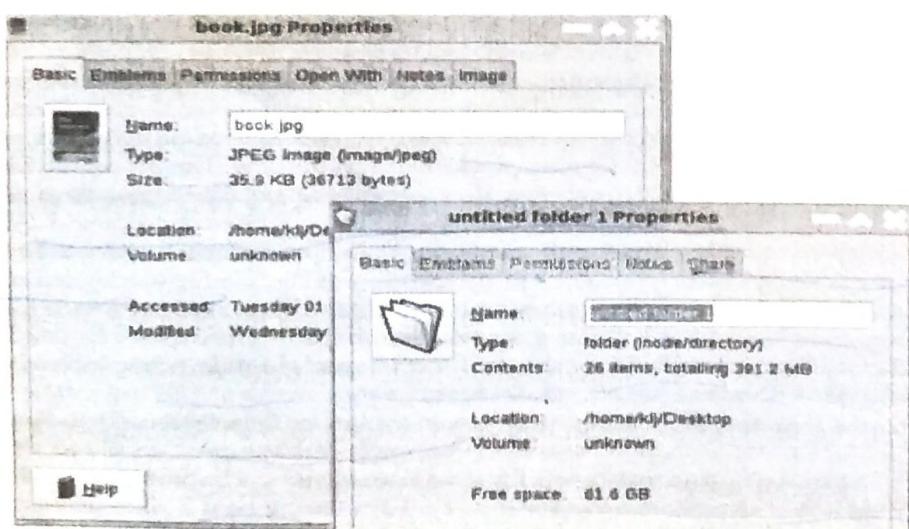


Figure 5.4 Properties Window of (i) File, and (ii) Folder.

title bar containing the name of the file. This window has six tabs named *Basic*, *Emblems*, *Permissions*, *Open With*, *Notes* and *Image*. For a folder, the *properties* window displays different tabs named as *Basic*, *Emblems*, *Permissions*, *Notes* and *Share*. Opening the first tab named as *Basic* displays a general description of the properties of the selected file or the folder. Name of the file or folder, type of the file, its content, size, exact location in the system where the file is stored, and the like can be obtained by opening

this tab Selecting the Emblems tab displays a number of emblems and the user can select an appropriate emblem from the list to represent the file or folder.

Permissions to use the file or the folder are the important properties associate with them. There are three kinds of permissions that a user can have for files or folder These are the permissions to read the file, write or edit the file and to execute the file For directories, the different permissions are for listing the contents of the directory creating and removing files in the directory and for accessing files from the directory. Since Linux is a multi user operating system, this type of access permission is essential to control the access and use of files by different users logged into the system. There are additional permissions available to Linux files and folders. But these are required only for power users. Opening the tab named *Permissions* displays the details of permissions available to the file or folder. The display is as shown in Figure 5.5.

Users of Linux operating system are divided into three categories namely **owner** of the file, other user including the **group** of the owner and all other **users**. Each Linux file is assigned to an owner and a group when the file is created. Usually, by default, the owner is the creator or the current user and the group is the group of the directory in which the files created. But this varies with the operating system and the way of creating files. Different Linux users have different powers or abilities and opening this tab gives provision to set different access permission options.

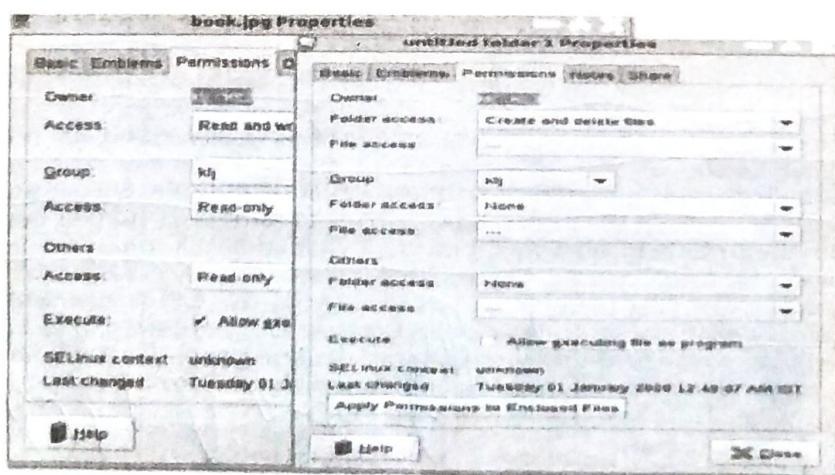


Figure 5.5 Permission Options for (i) File and (ii) Folder.

Linux makes use of two ways for viewing the contents of files and folders. One way is to double click the file or folder icon. When the folder icon is double clicked, the

folder is opened in a file browser window and the content of the folder is displayed in the opened window. As stated earlier, folders can remain empty or may contain one or more files or sub folders. Different icons are used to represent different types of files and folders and this help to distinguish between files and folders in the folder. A second way of viewing the folder content is to right click on the folder icon and then choosing the open option from the displayed pop-up menu. In a similar way, to view the contents of a file, its icon is double clicked. The selected file is opened using the default application configured for opening the selected file type. It is possible to set the default application for opening any file in Linux system. For example, consider a text file. Linux provides option to configure the system such that all text files can be opened using a text editor like *gedit* or using a word processor application like *OpenOffice.org Writer* application. The *Open with* option available in the file properties window helps to configure the system, as discussed above. Opening this tab displays the list of installed applications using which the file can be opened. Select the ideal application from this list. This step makes all files of the same type to use the selected application for opening them.

Instead of double clicking the icon, right clicking the file icon also provides an option to select an application for opening the file. The list of options available when the file or folder icon is right clicked, is displayed in Figure 5.8, later in this chapter. Here two menus can be seen. The first pop-up menu is the menu displayed when a text file is right clicked. In this case, text files are configured to open with *gedit* application and this is the first option displayed on the pop-up menu. Selecting the option to *Open with Other Application* displays the list of installed applications and the user can select the required one from the list. Similarly, for a folder, the first option is the default one and this simply opens the folder. If another application is to be selected for opening the folder the same is done by selecting the option from the menu.

Creating Files and Folders

Empty files can be created in the desktop or in any folder by right clicking on the free space in the desktop or in the folder. When this is done in GNOME, a pop-up menu is displayed on the desktop as shown in Figure 5.6. The menu has several elements.

Select the option *Create Document*. This opens another window. From the newly displayed sub menu option, select the option *Empty File*. This option creates a new text file and the file icon appears with the default file name *new file*. To add content to the file, double click the file icon. The created file is opened in the default text editor. Additions or modifications to the contents can be made and finally the file can be saved. To create a folder below the current folder, select the first option *Create Folder* from the list. A new folder is created and an icon appears with the default folder named as *untitled folder*. The folder name written in a text box and the user can give a new name to the folder at this instant, if required, by typing the new name. Folders can be renamed later also at any time.

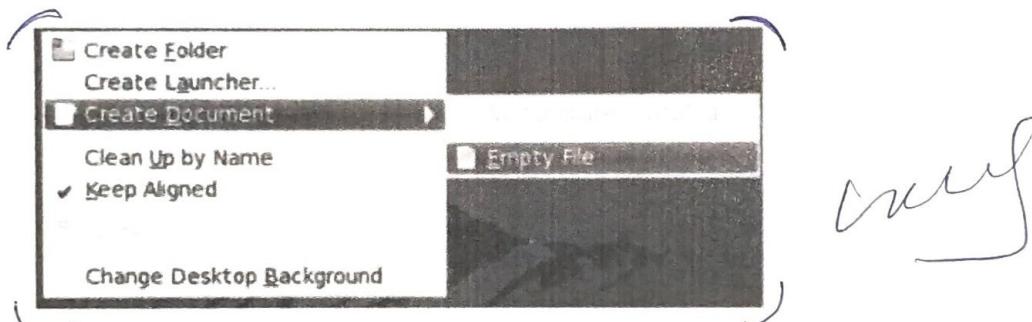


Figure 5.6 Creating Files in GNOME.

When working in KDE, right clicking on the empty space displays a pop-up window as shown in Figure 5.7. Select the option *Create New* from the list. This displays another window. Here more options are available. A folder can be created by selecting the first option *Folder* from the list. A list of different file types are listed in the menu and depending on the type of file to be created, the user can choose any option from the list.

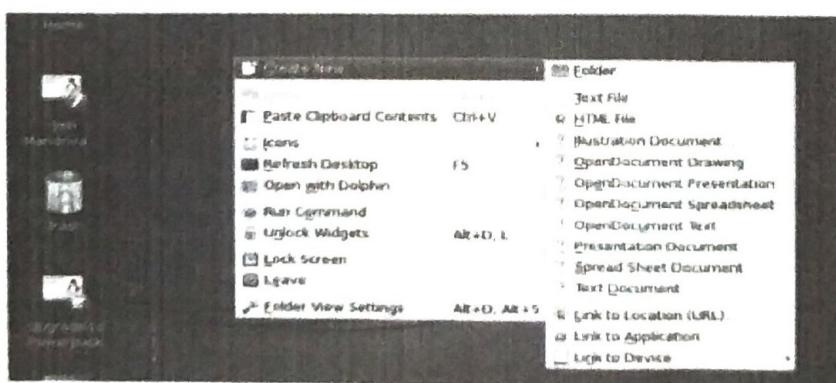


Figure 5.7 Creating Files in KDE.

Managing Files and Folders

There are several management operations associated with files and folders in Linux operating system. These are opening, moving, copying, deleting, and renaming files. Since folders are also special types of files, different management operations applicable to Linux files are also applicable to folders also. All the operations on files and folders are done by choosing the required option from the pop-up menu, when the file or folder icon is right clicked. The pop-up menu displayed when the file icon and the folder icon are right clicked is slightly different and these two pop-up menus are as shown in Figure 5.8. The first options of this menu are related to the opening of the selected files or folders. Files can be opened using the default application or a using another application. To open with the default application, select the first option. To use another application from the displayed list of applications, select the option *Open with Other Application*. A list of applications is displayed. Select the application from the list and proceed to finish the process.

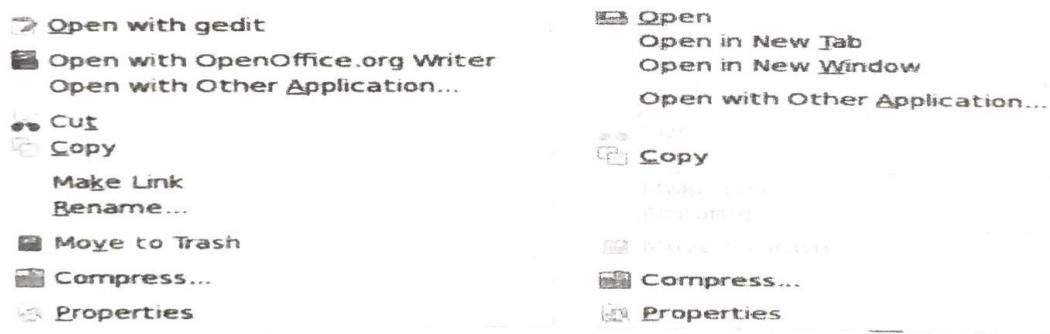


Figure 5.8 Right Click Pop-up Menu for a (i) Text file and a (ii) Folder.

Using the copying process, a file or folder can be copied from one location to another location. To copy a file or folder, first right click the file or folder icon and select the option *Copy* from the pop-up menu. When this is done, the selected file is copied by the mouse. After copying the file, move to the target location and open the target folder. Right click on the empty space in the target folder and select the option *Paste* from the pop-up menu to paste the copied file in the target location. Some Linux versions show the option as *Paste URL*, as shown in Figure 5.9. The shortcut keys **ctrl+v** can be used for pasting the object.

Working in a similar way, any file or folder can be copied from one location to another location. To move a file from one location to the target location, select the option *Cut* instead of *Copy* in the first step. Copy operation creates a copy of the file in the new location whereas cut operation moves the file from the original location to the new location. If a file or folder having the same name as the copied one is remaining in the target location, a window appears on the screen asking for overwriting the existing files or merging folders. Copying or moving takes place if a confirmation is given. Pasting several objects to the folder makes the folder surface cluttered and unordered. Clicking the option *icons* from the window provides option to arrange the objects in an ordered manner sorted based on the different parameters.



Figure 5.9 Selecting Option for Pasting File or Folder.

A new name can be given to a file or folder by the renaming process. To rename the file or folder, select the option *Rename* from the displayed pop-up menu. When this is done, the name of the selected file or folder is displayed in a text box and the user can type the new name in the text box. After typing the new name, click the mouse button. The name of the selected object is changed to the given new name. Renaming process can also be done by right clicking the file icon and selecting the *Properties* option. In the new window displayed, a new name to the file can be given by selecting the tab named *Basic* and typing the new name in the text box. After typing the new name, close the window the file is renamed. In a similar way folders can also be renamed.

To delete a file or folder, select the file or folder and press the *Delete* key of the keyboard. The same thing can be achieved by right clicking the icon and choosing the

option *Move to Trash* from the options. The deleted files are moved to the trash folder. The contents of this folder can be viewed by opening the trash folder icon. In several Linux distribution trash folder can be seen on the desktop. Moving the file to the trash folder does not delete the object permanently. Files available in trash folder can be restored to their previous state and to the previous location by the restore option. Restore option can be selected from the list displayed when the deleted object icon is right clicked. For permanent deleting the deleted files, select the option to *empty trash* or *delete permanently*. Select in this option displays a conformation window as shown in Figure 5.10. Clicking the *Empt J Trash* button removes the deleted files permanently from the computer storage.

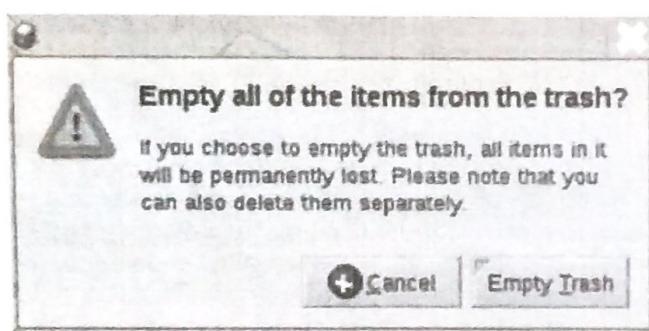


Figure 5.10 Confirmation Window for Emptying Trash Folder.

Linking files for different users is another basic file operation done in Linux. Linking files helps in making multiple copies of a file for use by different users. This is a major advantage. By linking, the same file can be used by several users and the changes made by each can be viewed in the same file. To link a file, right click on the file name and select the option *Make Link*. Executing this option creates another file and it will be marked as a linked file. A linked file is represented by an icon with an arrow mark and hence linked files can be easily identified from the icons.

Compress option available in the menu helps to compress the selected file or folder in a suitable compression format. Different compression formats such as ar, jar, zip and the like can be used for compressing. The option can be selected from the drop-down list as can be seen in Figure 5.11. Compressed file name and the location for its storage

can be typed in the text boxes. The other options provide facility to set password for the compressed file and to encrypt the file content. After giving the required details, click the *Create* button to compress the selected file.

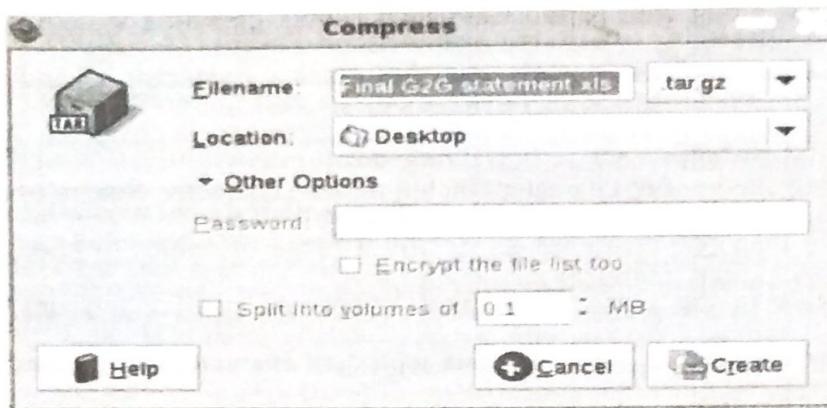


Figure 5.11 Compress window.

Searching for Files

The search option is available in the *Places* menu at the Linux desktop. Selecting this option opens a new window. In the new window, type the name of the folder, file or document to be located, in the text box provided for this purpose. The searching operation can be done on the entire system or in specific folders or selected devices only. This option can be selected in the folder name box. Facilities for using further options for more specificity are also available. After typing the details, click the *Find* button to start searching for the required items. Search for files is made in the specified directory as well as in the subdirectories of the directory. The details of located files are displayed in the *Search results* text box appearing at the bottom of the window, as displayed in Figure 5.12.

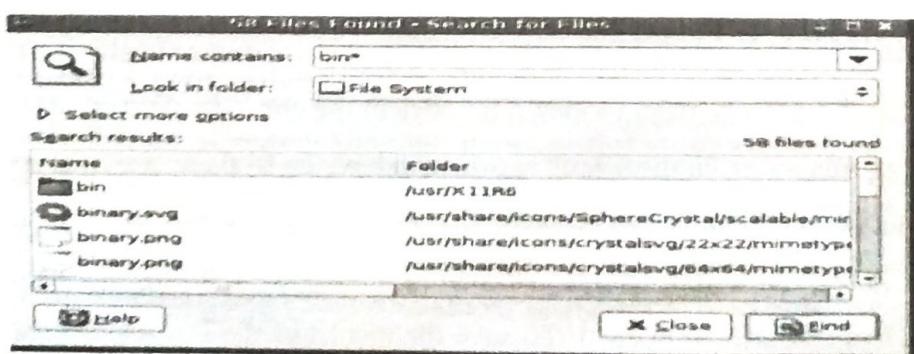


Figure 5.12 Search for Files Window.

Use of wild cards in search name text provides an easy way to search for files or folders having identical names. Also, if the correct file or folder name for searching is not known use of wild card characters helps in displaying files with the same or similar names. Wild card characters are used along with partial file names. Linux operating system supports the use of three wild card characters namely **question mark - ?**, **asterisk - *** and **square brackets - []**. The question mark character is used to indicate a single character. Asterisk character is used to indicate a set of characters including zero character. Square bracket is used to indicate more than one character, especially a range of values to choose. The search is case sensitive in the sense that capital letters and small letters are treated differently for making the search. More than one wild card character can be used in the search string. Results of the search are displayed in the *Search results* list box. If the search does not find any files that match the search criteria, the application displays the message *No files found* in the results list box.

Suppose in the name box, the search name *test?* is typed and the *Find* button is clicked. The system searches for items having names beginning with *test* and having one more additional character after *test*. Using the above mentioned search option locates items with names like *testl*, *test5*, *testp*, *tests* and so on are displayed, if available. But the command will not search for item having the name *test*. If the search is made for *test**, all items having names beginning with *test* are located and displayed. This search option searches also for files with the name *test*. Using the search string **.[ch]* in the name box searches for all files that are having an extension of *.c* or *.h*. If the search string is given as **.[a-g]*, the system searches for files having names ending with *.a*, *.b*, *.c*, *.d*, *.e*, *.f* and *.g*. Thus a range can be specified.

As can be seen in Figure 5.12, a search for items having names beginning with *bin* is made. The search option is made to locate for files in the entire file system. The details of located files are displayed in the search results window. To stop the search at any time, click the *Stop* button. To open a file displayed in the search results box, right click on the file name and choose the option to open or simply double click on the file name. In a similar way folders can also be opened. To save the results of the last search, right click

in the results list and choose *Save Results As*. Type the name of the file to which the results is to be saved and then click *Save* button.

By default, searching for files will perform a quick search using the *locate* command followed by a more thorough second search using the *find* command. The *locate* command is faster because it uses a database of information about files. Additional options for searching files on the system can be set by selecting more options text and adding more information for the search option. Using the options help to locate files that are modified within a time period and having a specified file size. Different options also searches for files that are owned by the user or group, having names that do not contain the string that is entered.

Linux File System

Different operating systems use different types of file system formats. Extended file system, reiser file system, high performance file system, virtual file system, NTFS, XFS, FAT, LVM and so on are some of the common file systems used by different operating systems. Extended family of file systems is the most commonly used Linux file system. Current versions of Linux operating system uses a file system known as ext4 or the fourth extended file system. This is the improved version of the previous file system known as third extended file system or ext3 file system. The major characteristics of this file system are bigger file system size, larger file size, faster file system checking and the like.

ext4 file system makes use of 48 bit block addressing scheme. So this file system can address 2^{48} (2 raised to 48) blocks. So this file system can have a maximum file system size of 1 EB (Exa Byte) and a maximum file size of 16 TB (Tera Byte). Ext3 file system allowed a maximum of 32,000 sub folders in a single folder. But in ext4 file system there is no restriction on the number of sub directories. So theoretically an unlimited number of sub directories can be created in a single folder. But this is limited by the size of the storage disk. Large files are stored in computer in several blocks. A mapping is necessary to address files stored in several blocks. If the size of the block is less, the number of blocks will be large and hence a large meta data is required for

mapping. Extents is a way to reduce the meta data necessary to address large files. Extents reduce the meta data by efficiently representing the blocks and combining them. When using *ext4* file system, large files can be represented by using two extents. This helps in reducing file system overheads also. Multi-block allocation of blocks for writing files is another feature of fourth extended file system. In the *ext3* file system only one block is allocated per call. The improved allocation feature of *ext4* helps in reducing fragmentation and saving CPU cycles. Thus a lot of overhead is avoided thereby improving the performance. File system checking process of *ext4* is fast since unused parts of the disks are skipped from the checking process.

Linux File Managers

File managers in Linux operating system provide simple and integrated ways in managing files and applications of Linux system. File managers can be used to perform a variety of activities such as creating folders and documents, organizing files into folders, displaying files and folders, searching and managing files, running scripts and launching applications, customizing the appearance of files and folders, opening locations in the computer, writing data to CD or DVD, installing and removing fonts, managing the desktop etc. File managers control different file activities, control hardware, switch between users and keep flow of data between users.

File managers always run when working the system. If required, file manager applications can be activated either from the menu appearing at the top panel in GNOME desktop or by double clicking any folder icon on the Linux desktop. Different Linux distributions have different file manager programs. In GNOME, file manager application is available in the list of tools displayed when *System Tools* is selected from the list appearing on opening *Applications* menu. File manager available in majority GNOME versions is known as Nautilus and for KDE it is either Konqueror or Dolphin. Dolphin aims to improve usability at the user interface level. Dolphin focuses only on being a file manager whereas Konqueror is a universal viewer of many file types. The display of Nautilus File Manager window is shown in Figure 5.13.

II BCA Operating System Unit III

File manager window is similar to the file browser window. The default interface of the file manager window is made up of title bar, menu bar, *tool bar*, location bar, workspace, information panel, status bar etc. This layout varies with the distributions and the versions installed. The location bar displays the path to the current folder. Workspace shows the contents of the current folder. Status bar shows the data related to the status of the selected file or the selected folder. When no file is selected, the status bar shows the number of files and folders in the current folder. The bar also shows the amount of used storage space as well as the maximum storage space available on the mount point.

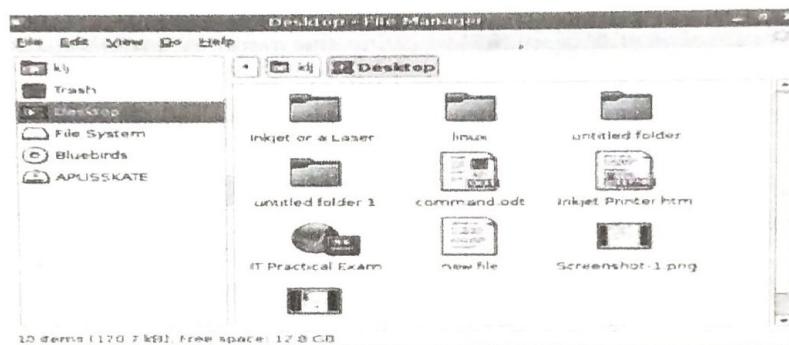
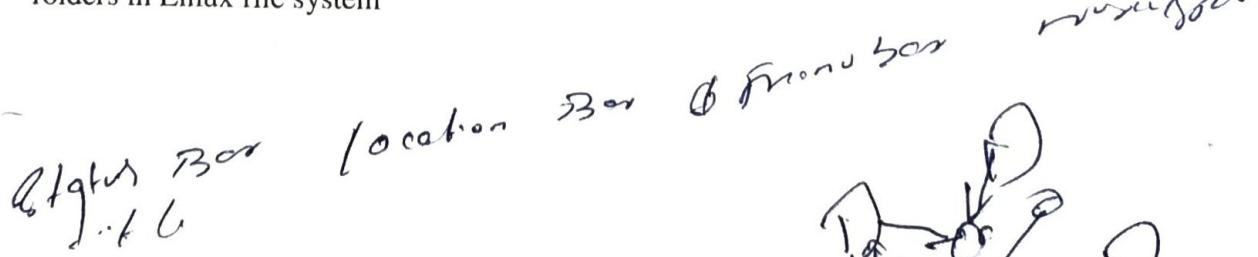


Figure 5.13 Nautilus File Manager Window.

The selected folder name is displayed on the title bar. The file manager window has two panes-**left pane** displaying different folders, and the **right pane** showing the contents of the folders selected on the left pane. Home folder of the user, Trash, File System and different removable media are displayed as folders in the file manager window. The desktop is also displayed as a folder. Selecting this folder displays the contents of the desktop on the right pane. In the file manager window, the root folder is indicated as a square button. When *File System* is selected on the left pane of the file manager window, details of the hierarchical arrangement of files in the file system is displayed on the right pane. The display is as shown in Figure 5.14. The hierarchical arrangement of files and folders in Linux file system



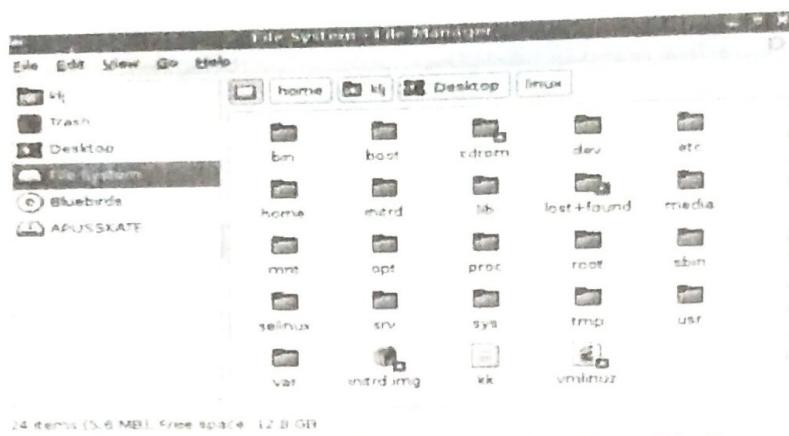


Figure 5.14 Hierarchical File Arrangement of Linux File System.

Several options are available on clicking the menu in the menu bar and the option help in the management of files and folders. Options are also available in the *File* men for creating empty files and folders. The different options available for the Dolphin File Manager is shown in Figure 5.15.

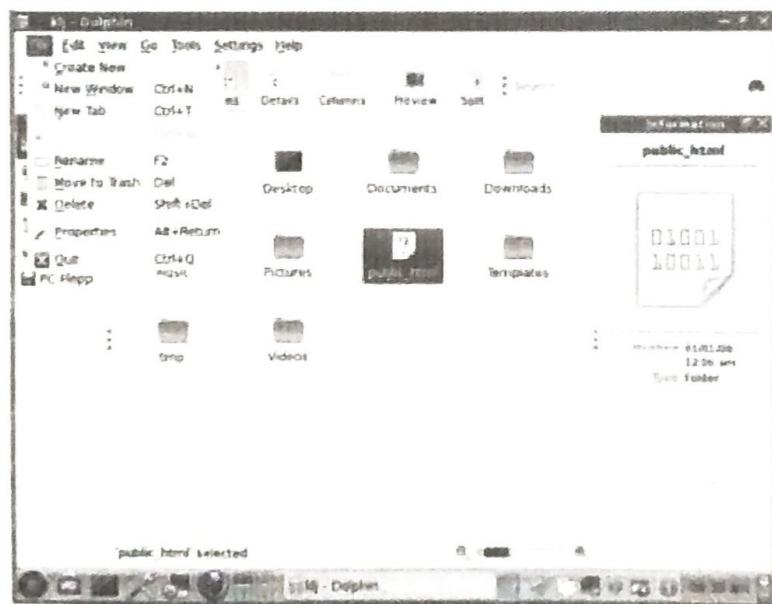


Figure 5.15 Menu options in Dolphin File Manager.

New folders and files can be created, files and folders can be renamed and can be deleted by selecting the appropriate menu options. Instead of selecting the menu option keyboard shortcut can also be used. Creating folder option creates a folder below the current folder. By default, Linux assigns the name *untitled folder* to the newly create, folder. Subsequent folders are named *untitled folder 1*, *untitled folder 2* and so on.

Several view options can be set using the options available when opening *View* menu usually, there are three viewing modes such as icons, details, and columns. The *Icons* view shows the contents of the folder by representing files with different file icons and folders by folder icons. The typical display is as shown in Figure 5.16. The folder icon is defined by the icon theme currently used and this can be changed. Selecting *Details* view lists the contents along with additional information. The additional information for the default Dolphin configuration is the size of the file and the date it was last modified. Additional information can be displayed by right clicking on the column header and selecting the required information to be displayed. *Columns* view allows multiple levels of the folder structure to be viewed. *Preview* view is similar to the *Icons* view. The difference is that in the *Preview* view, wherever possible previews of the files are shown.



Figure 5.16 Viewing the Folder Contents as Icons in Dolphin File Manager.

By default, Linux displays the contents in a systematic sorted style. First, folders are arranged in the alphabetic order. After this, the files appear sorted in an alphabetic style. But users can arrange the display of the contents in different styles. This is possible by selecting the option *View* from the menu and choosing the option *Arrange Items*. This action displays a new window which has the option to set the arrangement style as based on name, size, type, manually and so on. An option is also available to arrange the contents in the reverse alphabetic style as well as in a compact form. When viewing the

details as a list, sorting arrangement can be varied by clicking the column headings. Different file as well as folder attributes can also be changed.

File managers are capable of displaying hidden files and folders available in the selected folder. Hidden files and folders can be distinguished from other files and folders by the colour used. Usually hidden files and folders are fainter than normal files and folders. Hidden files and folders are displayed by selecting the option to view hidden files. File managers can sort the contents of the current folder in a number of ways such as by name, date, size and in descending order. For sorting process select the option from the *View* menu. The process is clear from Figure 5.17. The *Information* panel shows extended information about the selected file. The details are listed just below the large preview of the file.

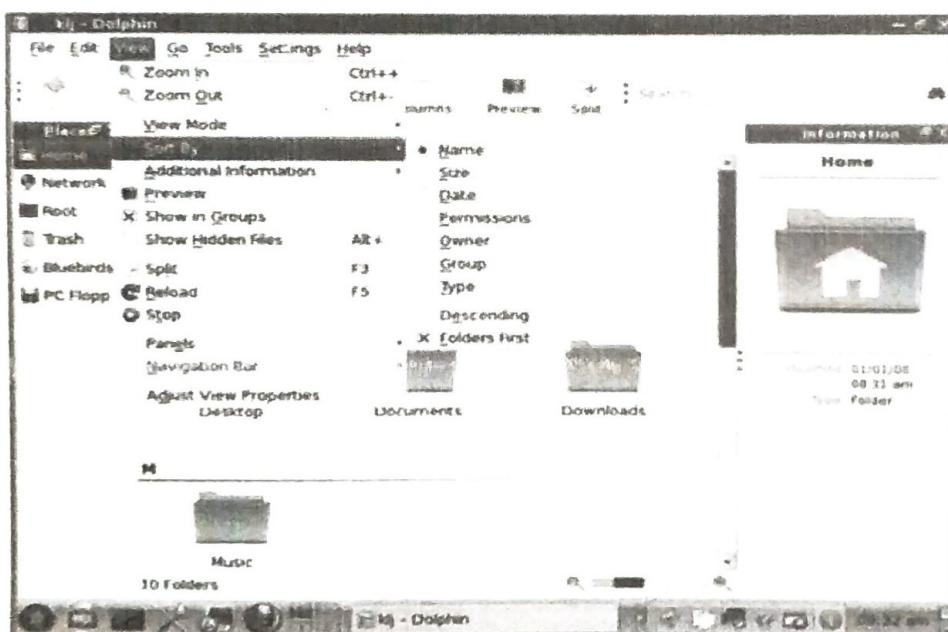
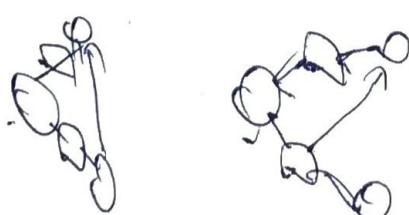


Figure 5.17 Sorting Options in Dolphin File Manager.



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. The 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. 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.

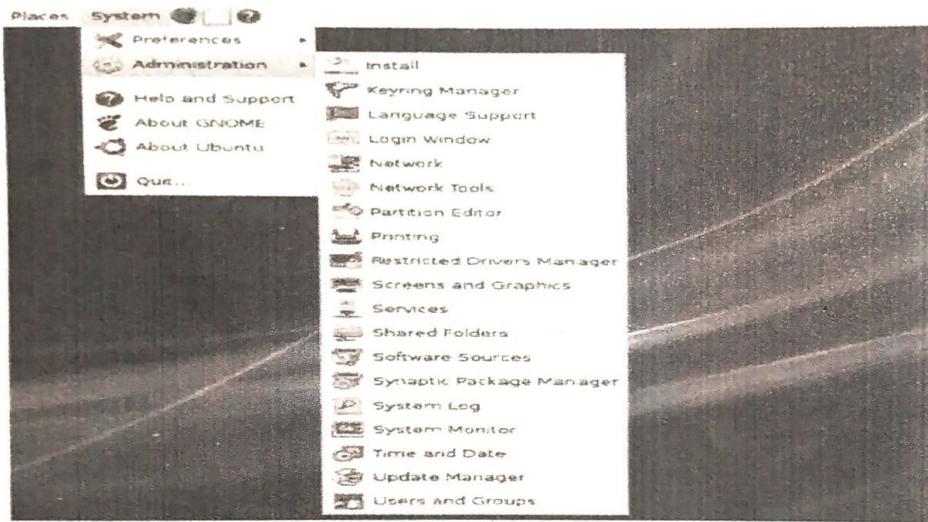


Figure 6.1 Administration Operations in Ubuntu Linux.

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 changes.

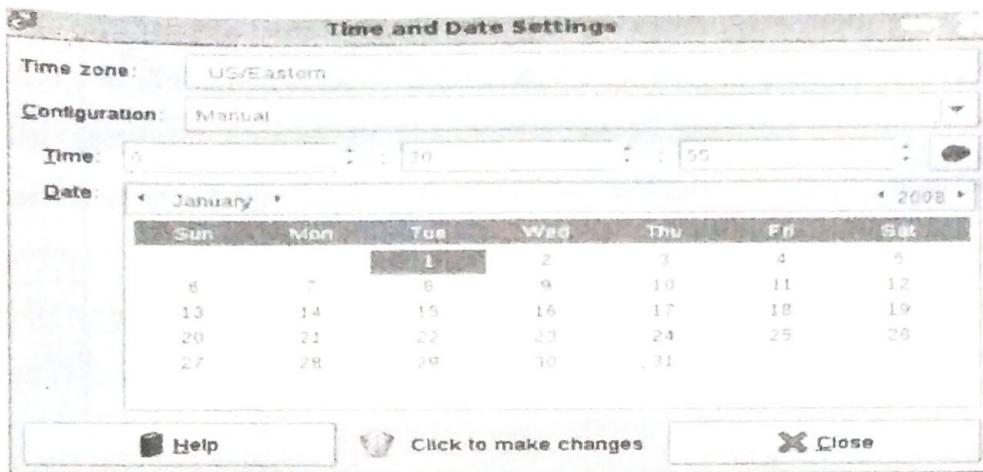


Figure 6.2 Time and Date Settings Window.

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.

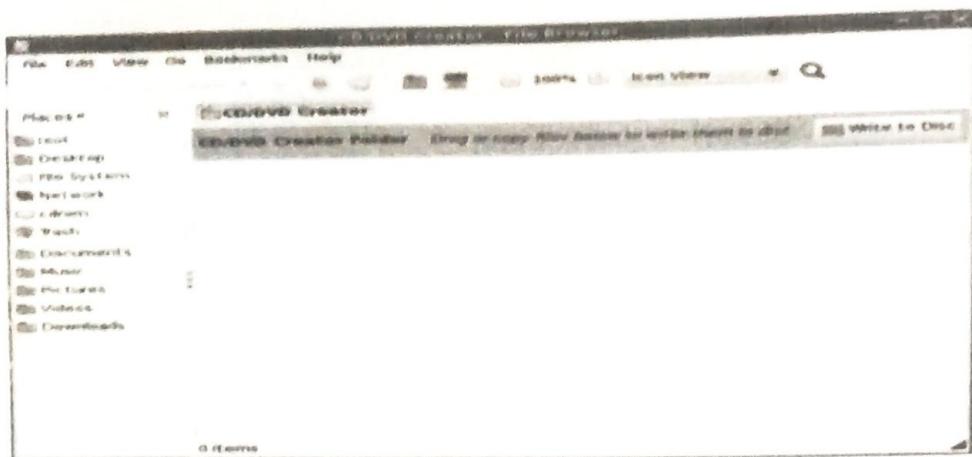


Figure 6.3 CD/DVD Creator Application Window.

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.

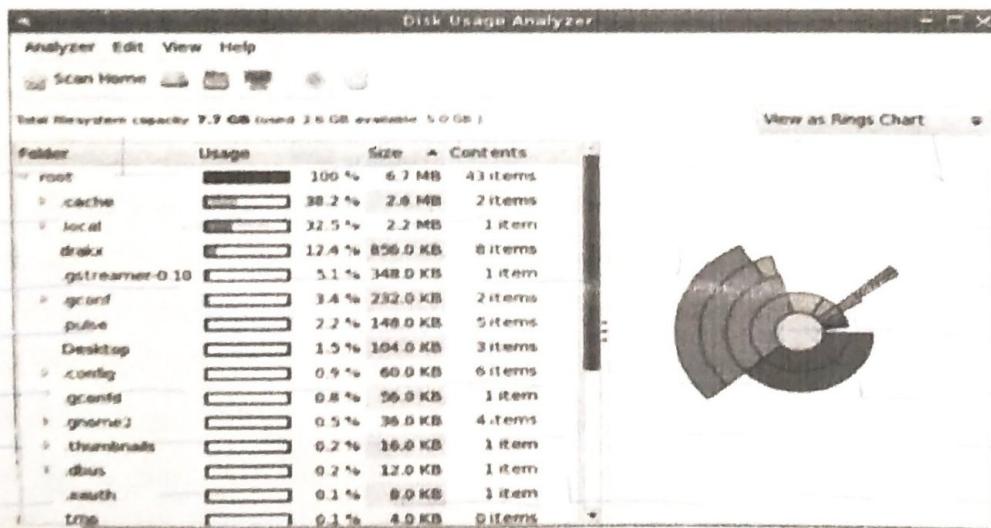


Figure 6.4 Disk Usage Analyzer Window.

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.

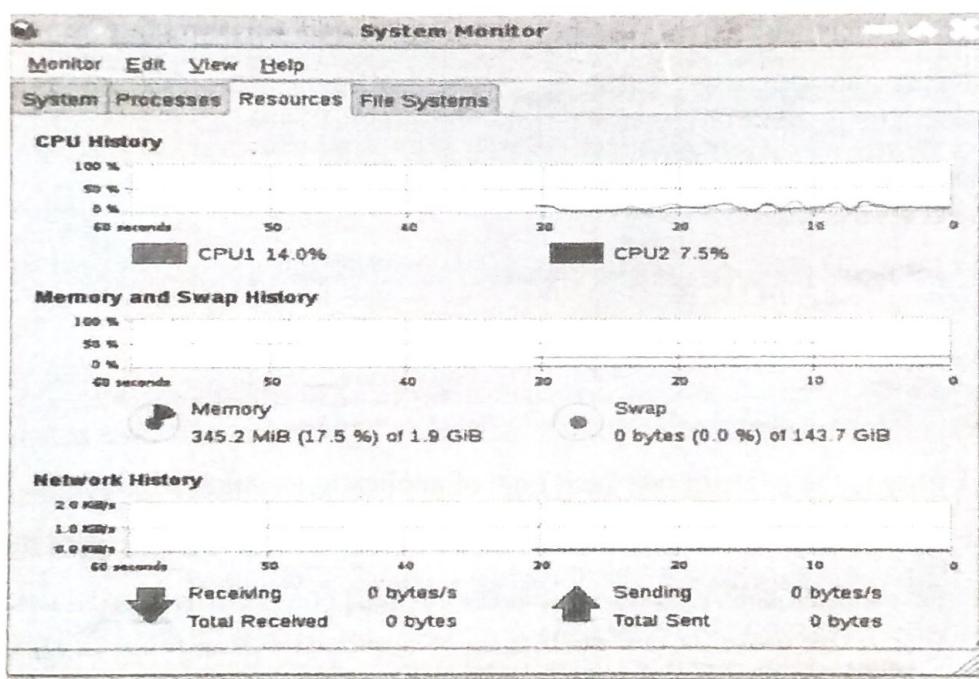


Figure 6.5 System Monitor Window.

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.

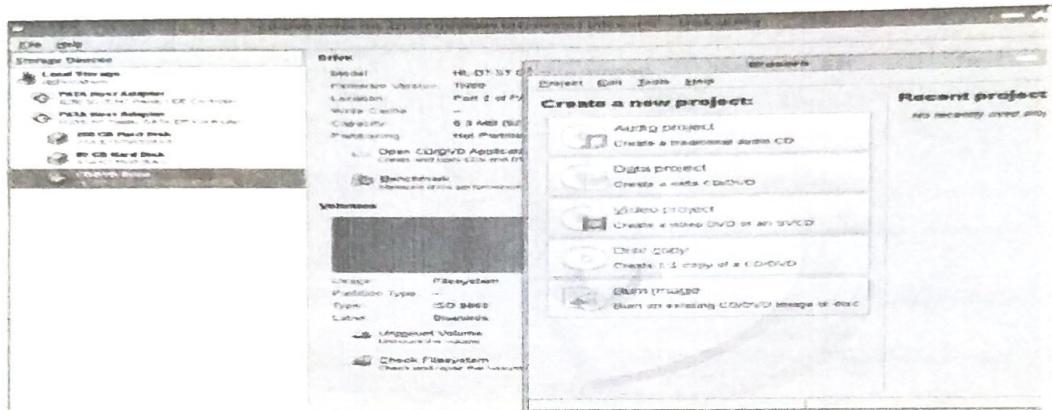


Figure 6.6 Disk Utility Application Window.

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

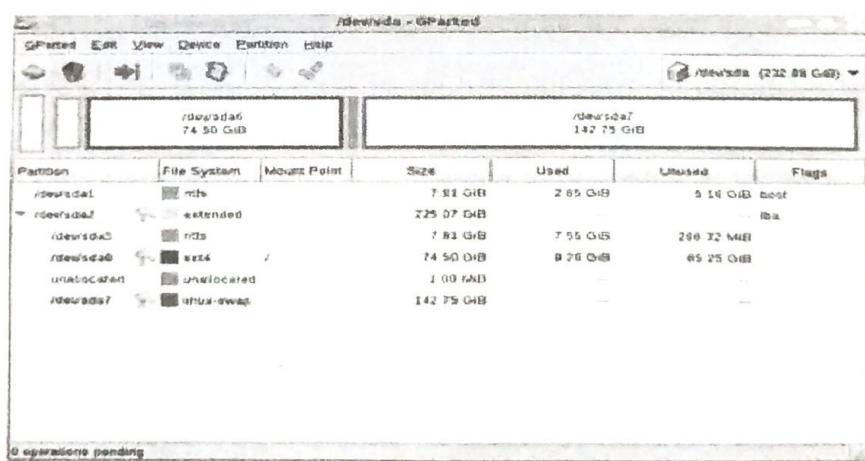


Figure 6.7 Gparted Disk Partition Application in Action.

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

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.

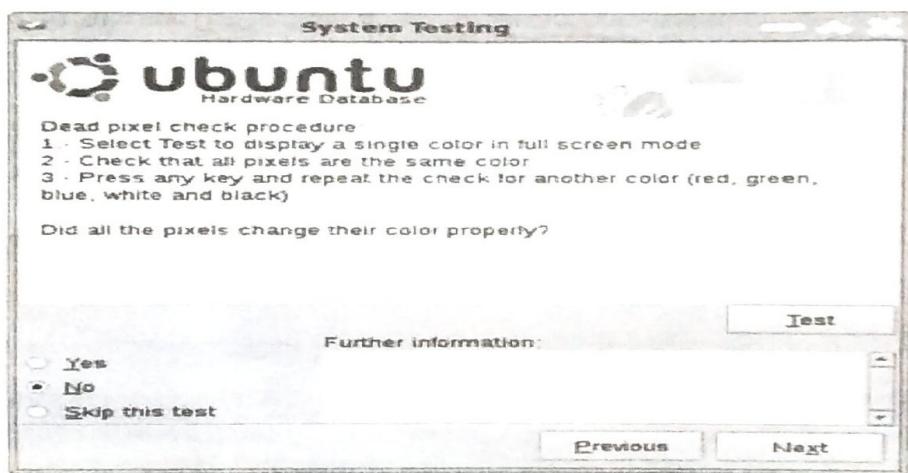


Figure 6.8 System Testing Window in Ubuntu Linux.

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 a 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.

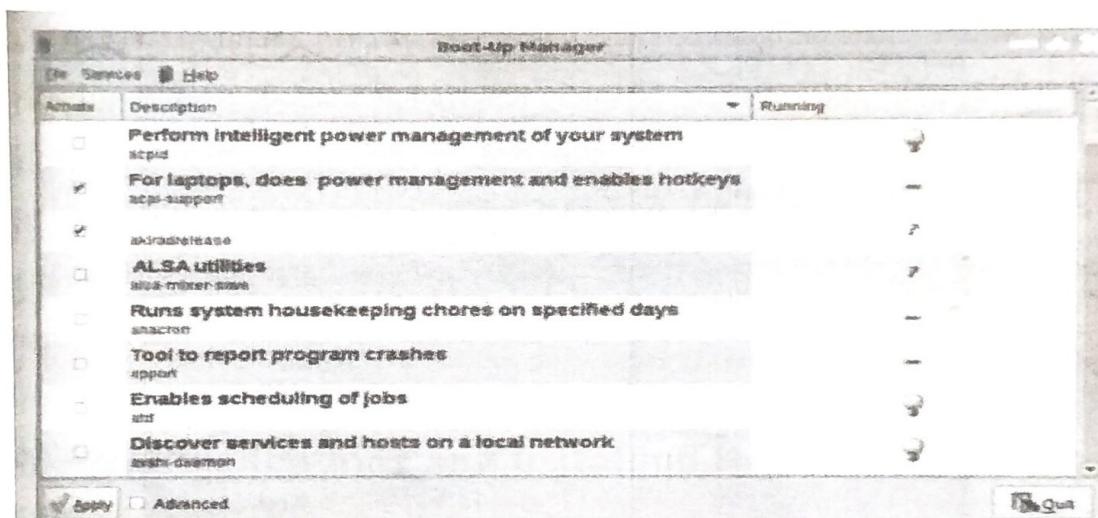


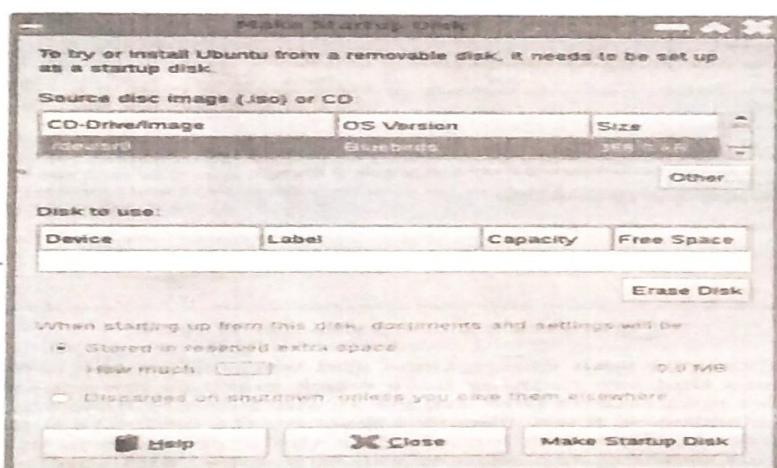
Figure 6.9 Boot-Up Manager Window.

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 application 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.

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.

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.

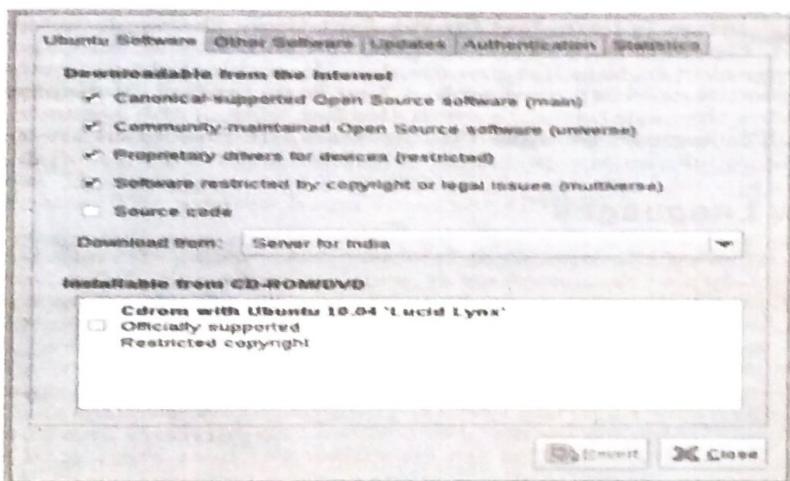


Figure 6.11 Software Sources Window.

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.

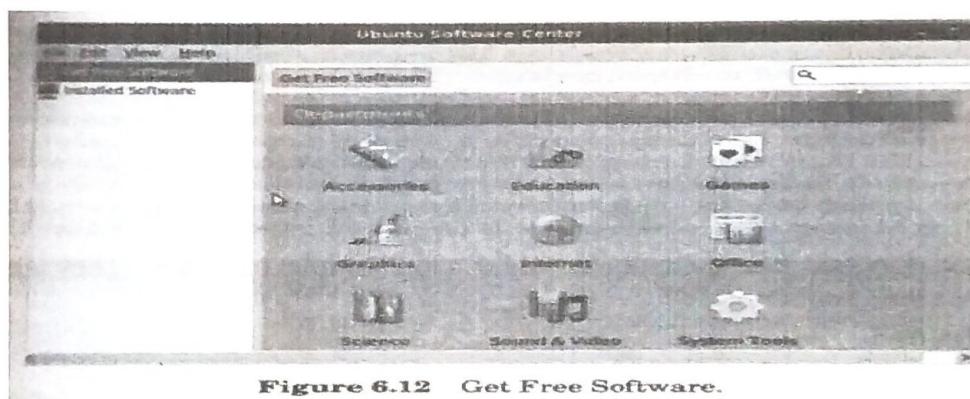


Figure 6.12 Get Free Software.

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.

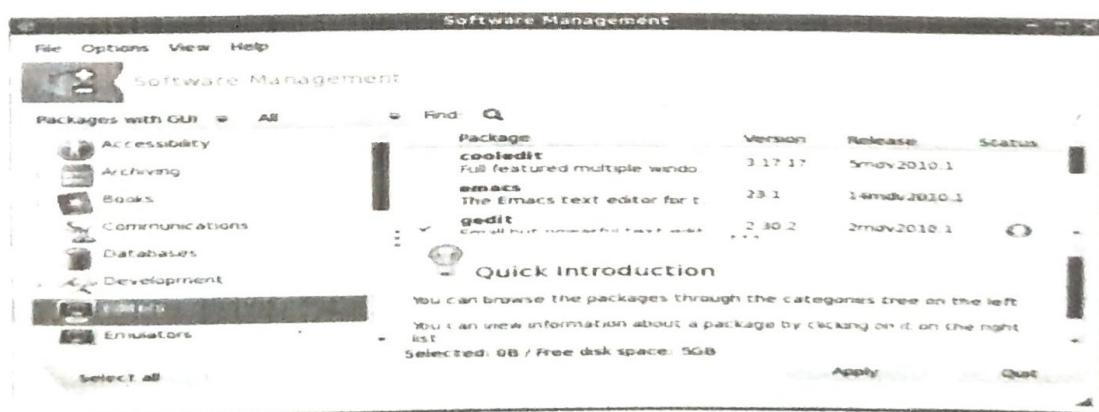


Figure 6.13 Software Management Window of Mandriva Linux

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.

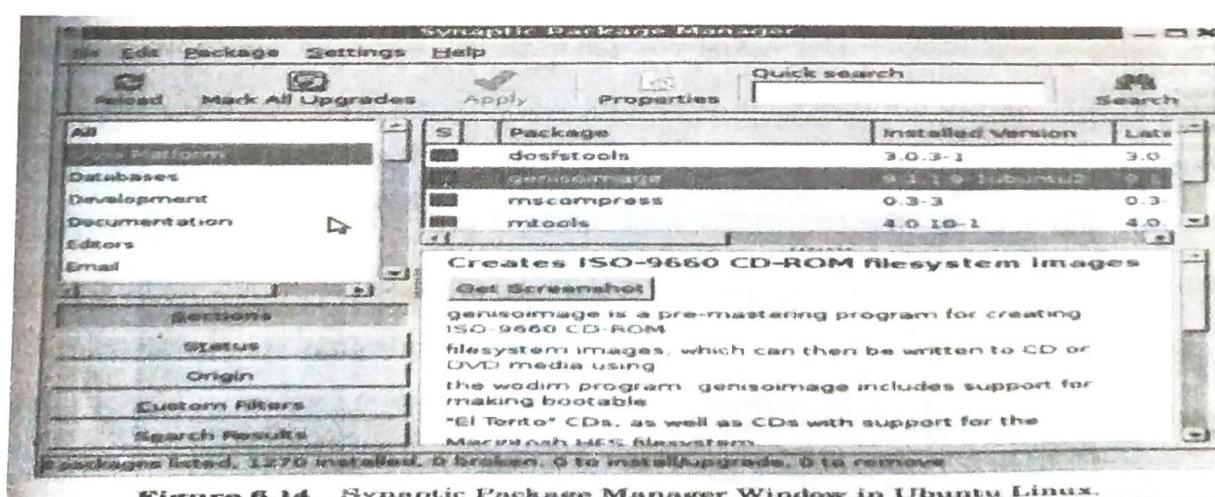


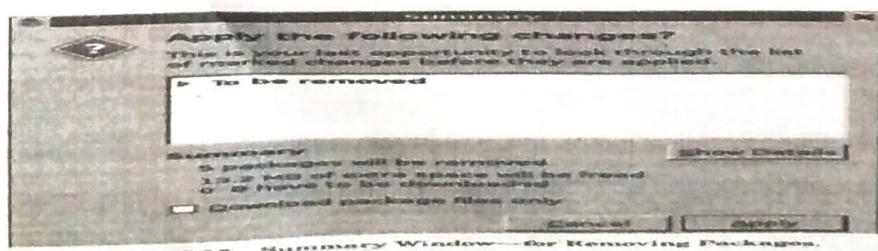
Figure 6.14. Synaptic Package Manager Window in Ubuntu Linux.

Similar to any window, this window has a title bar, menu bar, tool bar and so on. Opening the menu bar displays a set of options. Toolbar displays a number of icons for providing main actions. The window is mainly divided into a left pane and a right pane.

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*, *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.



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.

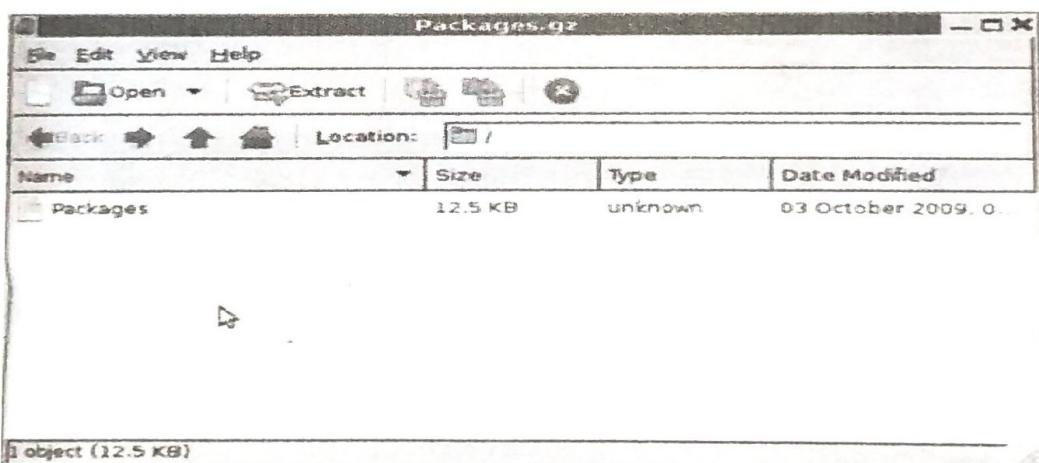


Figure 6.16 Archive Manager Window—for Extracting Compressed Files.

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).

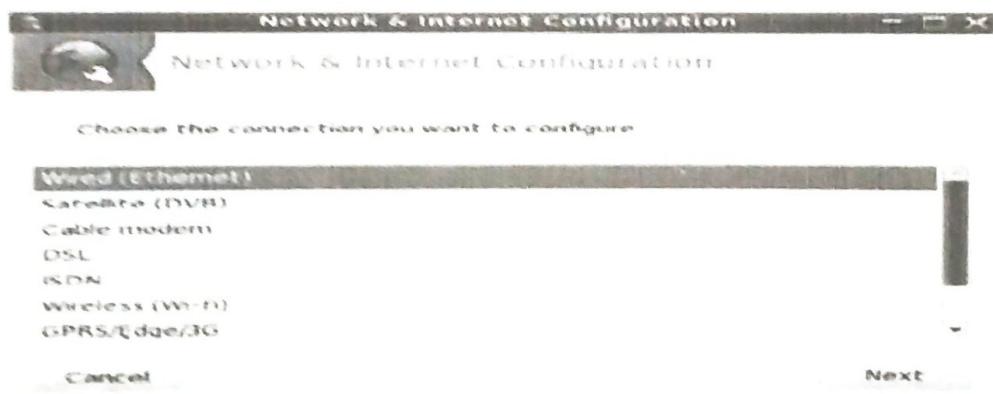


Figure 6.17 Network & Internet Configuration Wizard in Action.

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 must be like 192.168.4.3, 192.168.4.4, and so on. The netmask used must be 255.255.255.0 in all the member computers in the network. Once the

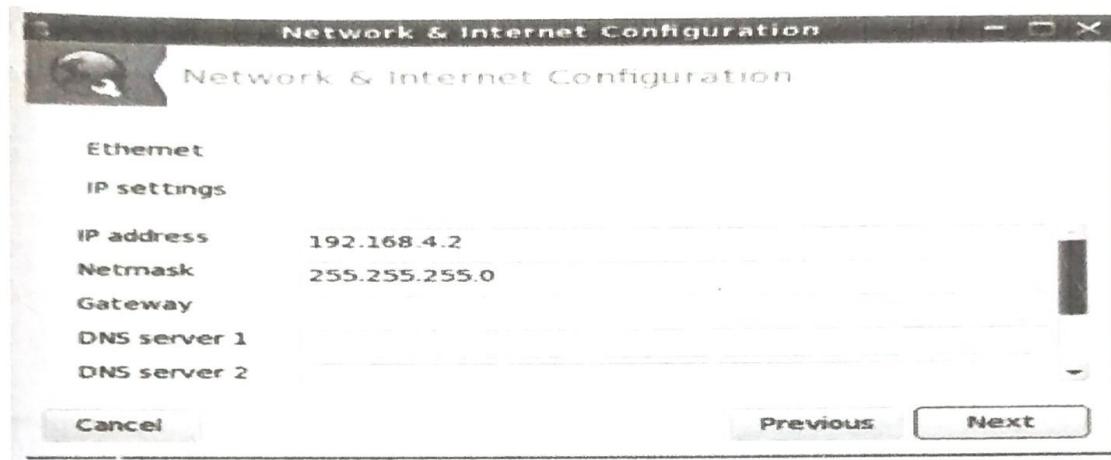


Figure 6.18 Setting IP Address for Networking.

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. Pres 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

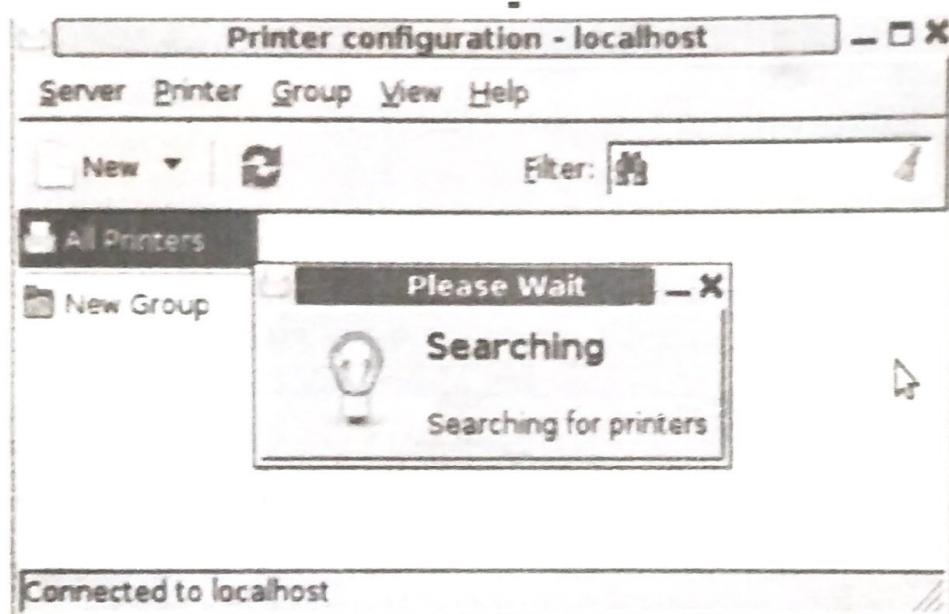


Figure 6.19 Printer Configuration Window.

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.

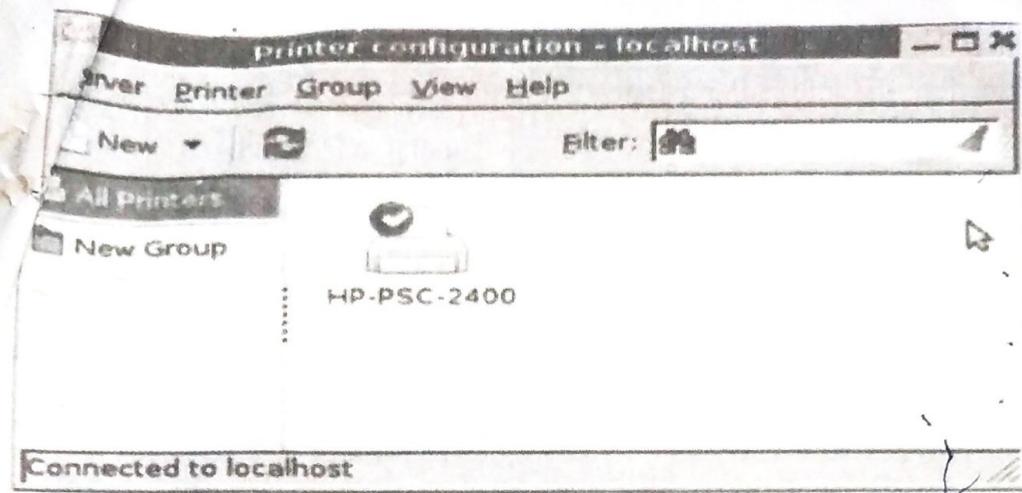


Figure 6.20 Successful Printer Installation.

BackingUp Files

Backing up of files is an important administrator function. The backed up files are used for restoring the system to the previous state whenever the system fails. Linux Installs tools for simple backups of the system. Tools for restoration of the system are also installed by default. When the system backup tool is launched, the window as shown in Figure 6.21 appears on the screen.

As seen from Figure 6.21, it is possible to set different options for availing system backups. Certain files can be excluded and some can be included. Location for storing backup files can also be specified. For regular backups, time also can be set. All the options are set from the options available by opening different tabs of the window. To backup the system manually, click the button for backing up files. This step backs up the files in the selected location. The backed up files can be used to restore the system.

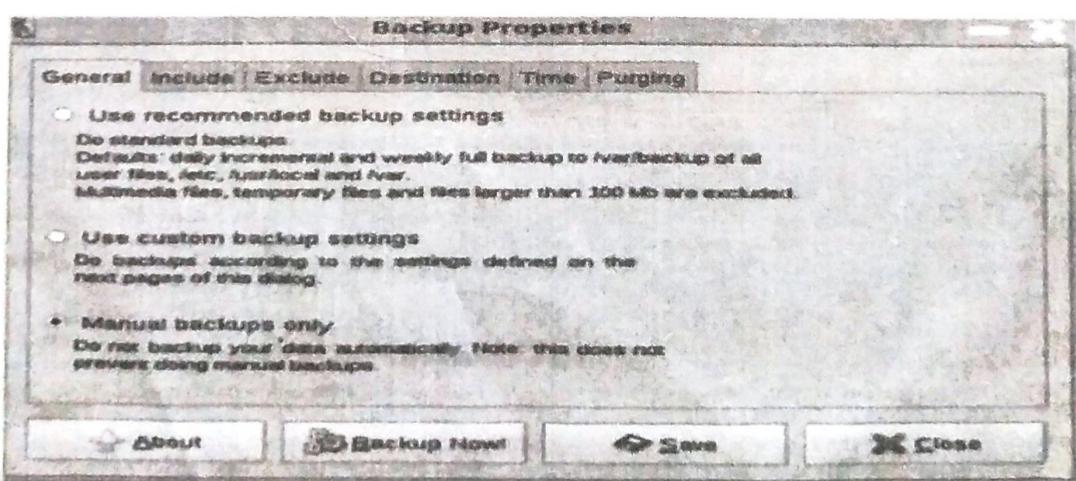


Figure 6.21 Configuring for Backing Up the System.

Managing Users and Groups

A major function of Linux administrator is the management of users and groups of the system. User and group management jobs involve adding and deleting users and groups. During the installation of Linux, the administrator user is created. Other users are created and the passwords are assigned by the administrator user. When the tool for managing users and groups is launched, it opens a window titled *Users Settings* and this window displays the details of current users and groups.

To add a new user, click the button *Add User* displayed on the right side. This step opens a new window titled *New user account*, above the previous window, as shown Figure 6.22.

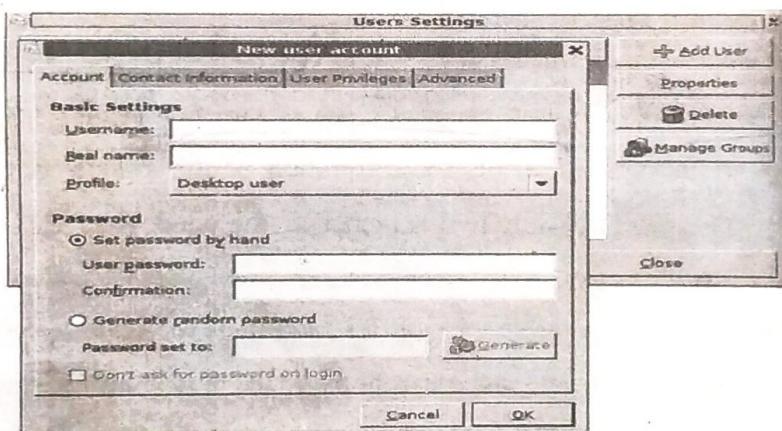


Figure 6.22 Users Settings Window in Ubuntu Linux.

The window has a number of tabs and opening each tab displays a set of options for user configuring. Opening the first displays a number of text boxes for typing the details of the new user. After typing the details, click the *OK* button to add the new user. A user can be deleted by selecting the user from the list and then clicking the *Delete* button. Several other user configuration options can also be set using this tool. Users are added to different groups. Users belonging to different groups have different powers and abilities. Managing user groups involve adding new groups, adding users to groups, deleting groups and so on. All the operations are menu driven and can be easily completed with some mouse clicks.