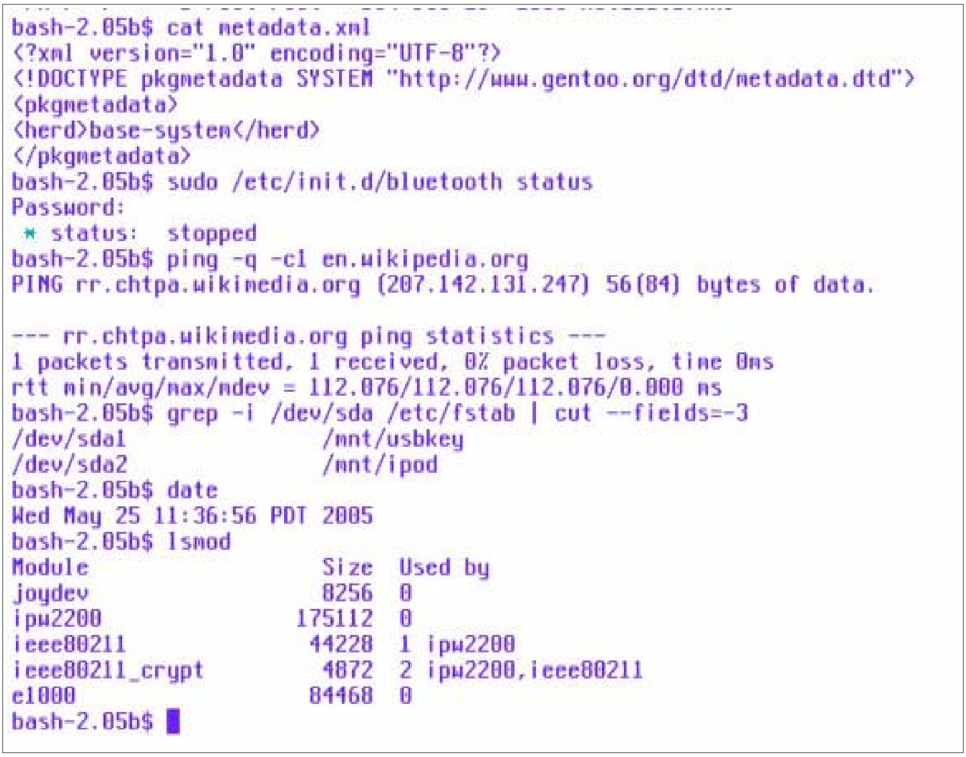
CHAPTER 4 OPERATING SYSTEM



```
bash-2.05b$ cat metadata.xml
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE pkgmetadata SYSTEM "http://www.gentoo.org/dtd/metadata.dtd">
<pkgmetadata>
<herd>base-system</herd>
</pkgmetadata>
bash-2.05b$ sudo /etc/init.d/bluetooth status
Password:
 * status:  stopped
bash-2.05b$ ping -q -c1 en.wikipedia.org
PING rr.chtpa.wikimedia.org (207.142.131.247) 56(84) bytes of data.

--- rr.chtpa.wikimedia.org ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 112.076/112.076/112.076/0.000 ms
bash-2.05b$ grep -i /dev/sda /etc/fstab | cut --fields=-3
/dev/sda1               /mnt/usbkey
/dev/sda2               /mnt/ipod
bash-2.05b$ date
Wed May 25 11:36:56 PDT 2005
bash-2.05b$ lsmod
Module                  Size  Used by
joydev                  8256  0
ipw2200               175112  0
ieee80211              44228  1 ipw2200
ieee80211_crypt         4872  2 ipw2200,ieee80211
e1000                  84468  0
bash-2.05b$ █
```

Figure 4.1. text based operating system.

As we skimmed Figure 4.1, we may ask the meaning of the text in the figure. As we look more closely we may guess that some of the text are the instruction and others are the result as executed by the operating system. In many cases, we likely to ignore text based operating system although in reality it is very important.

This chapter will discuss the standard of competence in operating a text and GUI-based operating system. There are two (2) basic competences in this standard competence, namely, preparing PC operation, operate the PC in network environment and disconnecting network connection. In this book, each basic competence will be elaborated. The summary will be in end of the chapter. Before proceeding with the chapter, please review on the computer system in the previous chapter as well as supporting materials and mathematics.

OBJECTIVES

After reading this chapter, the reader should be able to:

- Explain on an operation system.
- Install and booting an operation system
- Operate a text or GUI operating system.
- Operate a PC in network environment.

4.1. Operating System Concept

As mentioned earlier, operating system is part of the *system software* group that takes care the computer hardware and overall computer system.

Operating system manages resource usage in computer and provides user interface to access those resources.

FUNCTION

General functions of operating system can bee seen in Figure 4.2.

- **User Interface.**

  User interface may be easily recognizable by the user . Through the user interface one may interact with the operating system, hardware as well as other software packages. The operation system is basically waiting for input or instruction from the user and translated these command into language that understood by the computer. User interface is the place where user write or submit these orders.

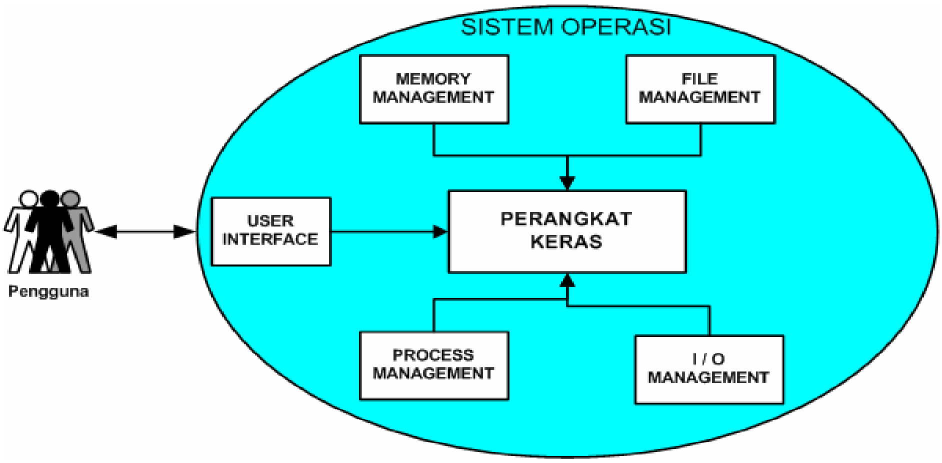


Figure 4.2. Operating system functions

In general there are two (2) interfaces, namely, *Command Line Interface* (CLI) and *Graphical User Interface* (GUI). CLI provides user facilities to submit command in text whereas GUI provides graphical based interface. Most modern operating systems provide GUI interface. Some GUI interfaces are integrated into the operating system kernel, such as, Microsoft Windows and the early version of Apple Mac OS. Others provide modular GUI interface, and not integrated directly into the operating system kernel, such as, Unix, Linux and Mac OS the X version and above.

- **Memory management**

The main memory also known as memory is a large *array* of *word* or *byte*, that reaches hundreds, thousands, or even millions. Every word or byte has its own unique address. The function of main memory is to store instruction / data that being actively used by the CPU and Input / Output devices. The main memory includes the storage of the volatile data that is not permanent and will lost as the computer shuts down.

The operation system is responsible for memory management activities such as:

- Keep track of the usage memory and who use it.
- Choose the program that would load into the memory.

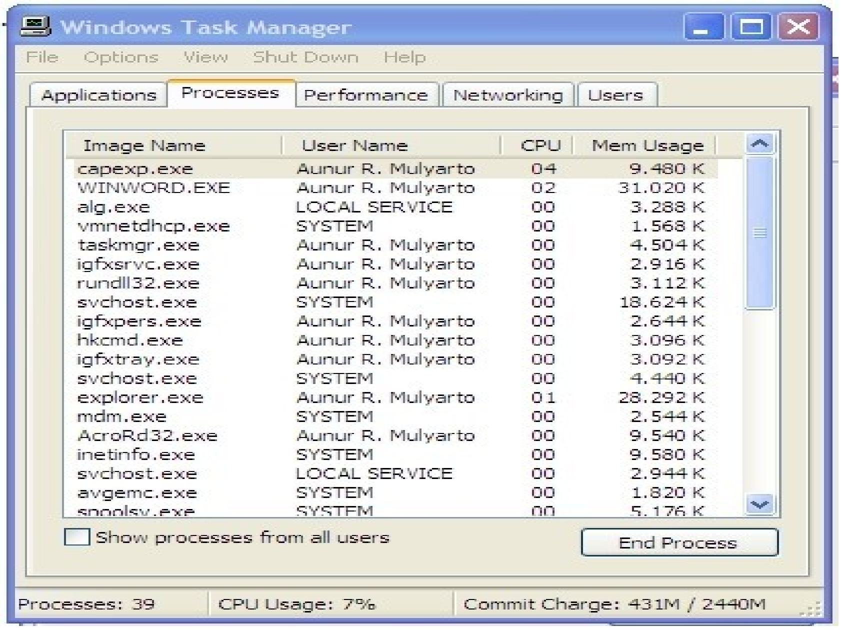


Image Name	User Name	CPU	Mem Usage
capexp.exe	Aunur R. Mulyarto	04	9.480 K
WINWORD.EXE	Aunur R. Mulyarto	02	31.020 K
alg.exe	LOCAL SERVICE	00	3.288 K
vmnetdhcp.exe	SYSTEM	00	1.568 K
taskmgr.exe	Aunur R. Mulyarto	00	4.504 K
igfxsrvc.exe	Aunur R. Mulyarto	00	2.916 K
rundll32.exe	Aunur R. Mulyarto	00	3.112 K
svchost.exe	SYSTEM	00	18.624 K
igfxpers.exe	Aunur R. Mulyarto	00	2.644 K
hkcmd.exe	Aunur R. Mulyarto	00	3.096 K
igfxtray.exe	Aunur R. Mulyarto	00	3.092 K
svchost.exe	SYSTEM	00	4.440 K
explorer.exe	Aunur R. Mulyarto	01	28.292 K
mdm.exe	SYSTEM	00	2.544 K
AcroRd32.exe	Aunur R. Mulyarto	00	9.540 K
inetinfo.exe	SYSTEM	00	9.580 K
svchost.exe	LOCAL SERVICE	00	2.944 K
avgemc.exe	SYSTEM	00	1.820 K
spoolsv.exe	SYSTEM	00	5.176 K

Processes: 39 | CPU Usage: 7% | Commit Charge: 431M / 2440M

Figure 4.3. Memory Management in Microsoft Windows Operating System

- **File management**

  File is a collection of information following the objectives of the one who make the file. File is generally representing program or data. File could have a hierarchical structure, such as, directory, volume, etc. The operating system implements abstract concept by locating / putting a file in a mass storage media, such as tape and disk.

  The operation system is responsible for file management activities, such as:

  - Creation and erasing the file.
  - Creation and erasing a directory.
  - Supporting file and directory manipulation.
  - File mapping in *secondary-storage.*
  - **File *back-up* into *non-volatile* media.**

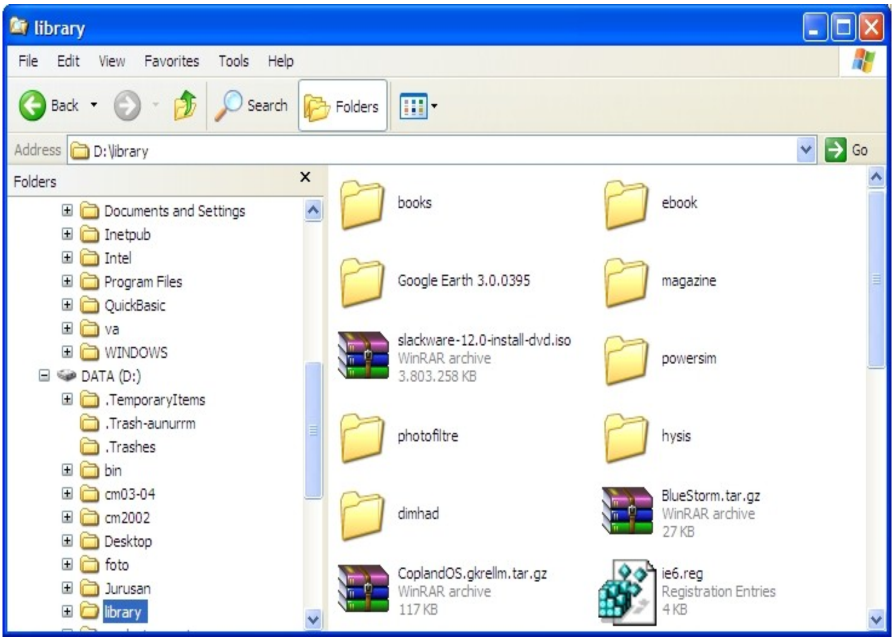


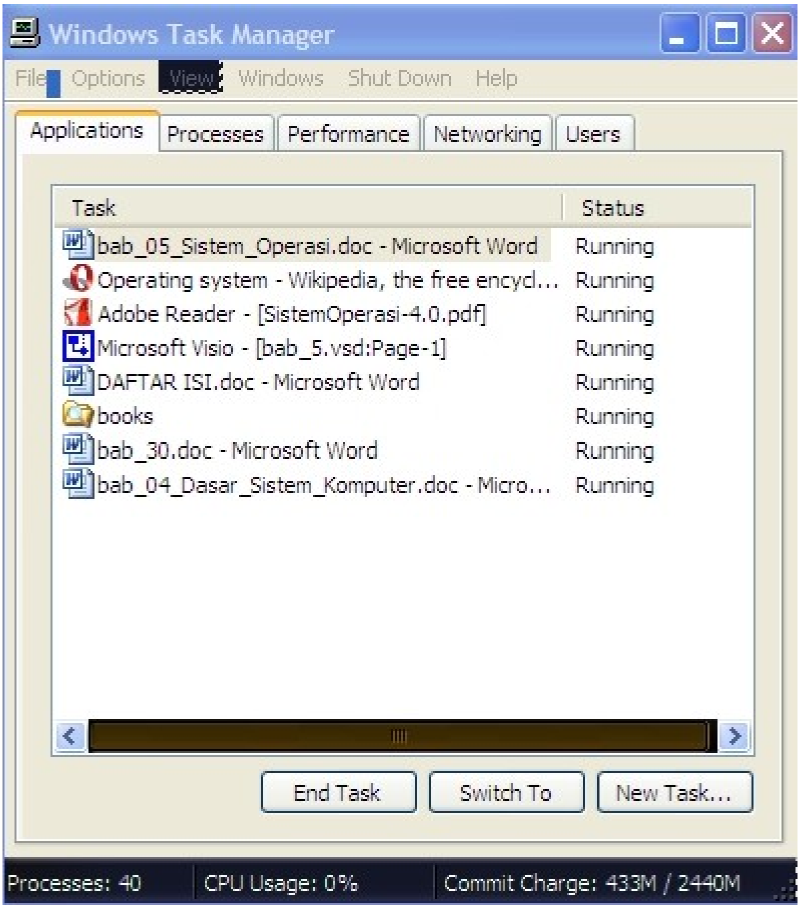
Figure 4.4. Windows Explorer as file management facility.

- **Process Management**

  A process is an executed program. A process needs some resources to complete its task. The allocation of these resources was carried out by the operating system. For example, memory usage by the CPU, file opening, and Input/Output usage. Whenever a process stops, the operating system will reclaim all resources to be used again.

The operation system is responsible for process management activities such as:

- Create and remove user processes and system processes.
- Postponed or continue a process.
- Provided process synchronization mechanisms.
- Provided process communication mechanisms.
- Provided deadlock handling mechanisms.



Task	Status
bab_05_Sistem_Operasi.doc - Microsoft Word	Running
Operating system - Wikipedia, the free encycl...	Running
Adobe Reader - [SistemOperasi-4.0.pdf]	Running
Microsoft Visio - [bab_5.vsd:Page-1]	Running
DAFTAR ISI.doc - Microsoft Word	Running
books	Running
bab_30.doc - Microsoft Word	Running
bab_04_Dasar_Sistem_Komputer.doc - Micro...	Running

Processes: 40 CPU Usage: 0% Commit Charge: 433M / 2440M

Figure 4.5. Process management in Microsoft Windows operating system.

- **Input / Output (I/O) management system**

  Input / Output management system is also known as device manager. The system provides general device driver so that al have uniform input/output operation, in open, read, write, and close. For example: user may use same operation procedure to read a file on hardware, *CD-ROM* and f*loppy disk.*

  Operating system component for Input/Output system:

  - Buffering: temporary cache data from / to Input / Output devices.
  - Spooling: scheduling the usage of system Input / Output to make it more efficient through queuing etc.
  - Provides driver: to enable specific operation for certain Input / Output hardware.

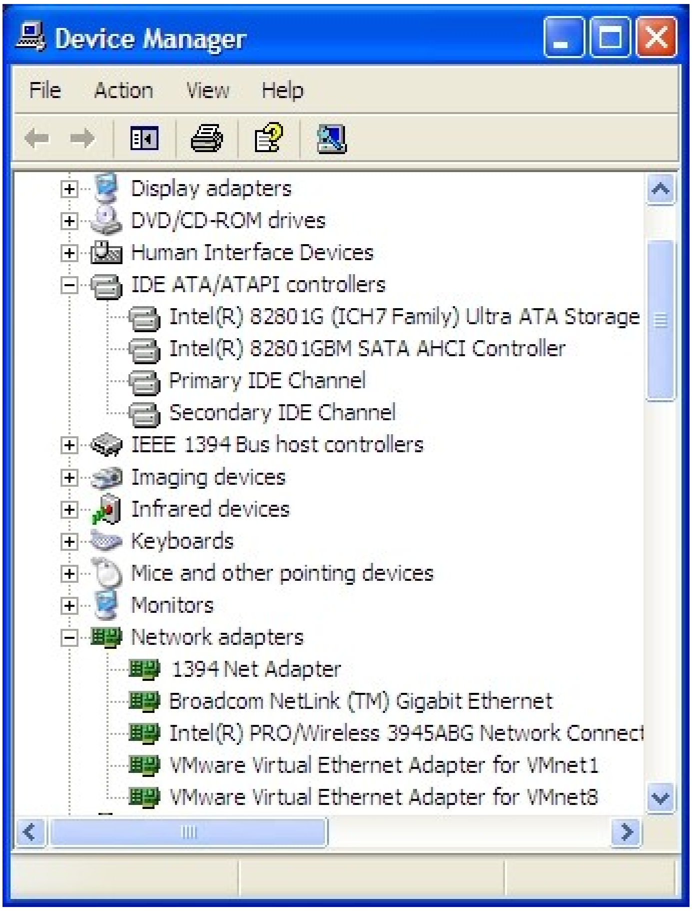

Device Manager
File
Action
View
Help
Display adapters
DVD/CD-ROM drives
Human Interface Devices
IDE ATA/ATAPI controllers
Intel(R) 82801G (ICH7 Family) Ultra ATA Storage
Intel(R) 82801GBM SATA AHCI Controller
Primary IDE Channel
Secondary IDE Channel
IEEE 1394 Bus host controllers
Imaging devices
Infrared devices
Keyboards
Mice and other pointing devices
Monitors
Network adapters
1394 Net Adapter
Broadcom NetLink (TM) Gigabit Ethernet
Intel(R) PRO/Wireless 3945ABG Network Connect
VMware Virtual Ethernet Adapter for VMnet1
VMware Virtual Ethernet Adapter for VMnet8

Figure 4.6. I/O Management in Microsoft Windows operating system.

- **BIOS**

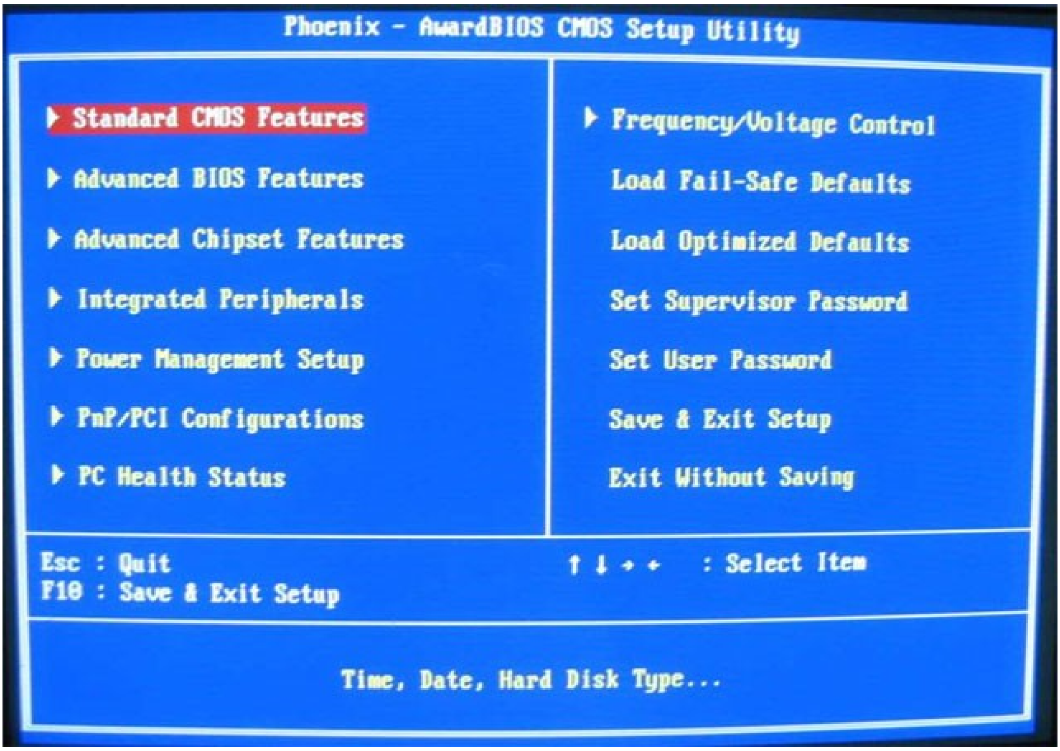
BIOS is a short for *Basic Input / Output System*. BIOS is the program that will be executed in the early booting process of the computer. The main BIOS function is to identify computer hardware. BIOS is usually kept in ROM (*Read Only Memory*) on computer motherboard.

When the computer starts BIOS will try to identify the installed components / hardware in the computer, such as:

- *Clock generator.*
- *Processors and caches.*
- *Chipset (memory controller and I/O controller).*
- *System memory.*
- *All PCI cards.*
- *Primary graphics controller.*
- *Mass storage controllers, such as, SATA and the IDEA controllers.*
- *Various I/O controllers, such as, keyboard / mouse and USB.*

After being recognized, BIOS will call the *boot loader* to boot the operating system.

BIOS can be configured through its built-in configuration facility. It can usually be accessed by pressing Del or F2 button (depends on motherboard type) when the computer just turned on. When we are able to enter the BIOS configuration facility, we will see something like Figure 4.7, we can do various configuration on computer hardware.



```
              Phoenix - AwardBIOS CMOS Setup Utility

 ▶ Standard CMOS Features           ▶ Frequency/Voltage Control
 ▶ Advanced BIOS Features             Load Fail-Safe Defaults
 ▶ Advanced Chipset Features          Load Optimized Defaults
 ▶ Integrated Peripherals             Set Supervisor Password
 ▶ Power Management Setup             Set User Password
 ▶ PnP/PCI Configurations             Save & Exit Setup
 ▶ PC Health Status                   Exit Without Saving

 Esc : Quit                         ↑ ↓ → ←   : Select Item
 F10 : Save & Exit Setup

                   Time, Date, Hard Disk Type...
```

Figure 4.7. BIOS utility.

4.2. TYPES OF OPERATING SYSTEM

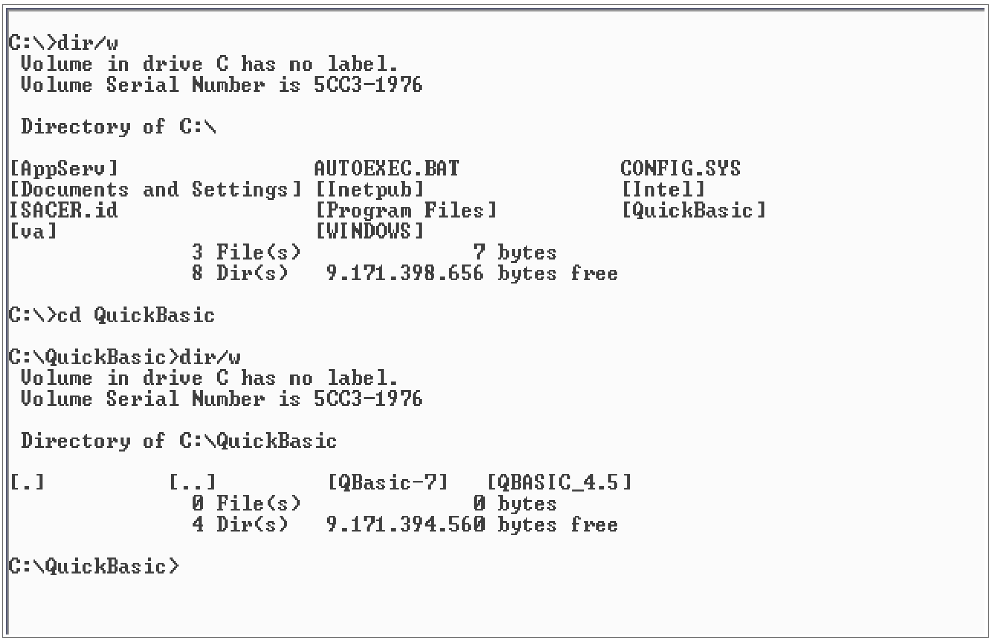
The operation system has been developed for a long time. From its simple form in the past into its today modern form. Each has its strengths and weaknesses especially in its built-in functions. In this section, we will discuss several operating systems that being used by many computer users.

4.2.1. DOS

DOS stands from *Disk Operating System*. DOS refers operating system that being used in many computer to provide abstraction and management of secondary storage devices as well as its information. For example the usage of file system to management files in storage equipment. DOS may be run from one or two diskettes as storage media capacity during DOS era is fairly limited to about 1.4Mbyte maximum.

There were many DOS, such as, Apple DOS, Commodore DOS, Atari DOS etc. DOS is fairly dependent on the type of computer. The most famous DOS is the one that runs on IBM *Personal Computer* or its compatible.

To execute operating system command, DOS uses text based command or Command Line Interface (CLI). We must press ENTER after typing the command. DOS operation example can be seen in Figure 4.8.



```
C:\>dir/w
 Volume in drive C has no label.
 Volume Serial Number is 5CC3-1976

 Directory of C:\

[AppServ]                AUTOEXEC.BAT             CONFIG.SYS
[Documents and Settings] [Inetpub]                [Intel]
ISACER.id                [Program Files]          [QuickBasic]
[va]                     [WINDOWS]
               3 File(s)              7 bytes
               8 Dir(s)   9.171.398.656 bytes free

C:\>cd QuickBasic

C:\QuickBasic>dir/w
 Volume in drive C has no label.
 Volume Serial Number is 5CC3-1976

 Directory of C:\QuickBasic

[.]          [..]         [QBasic-7]   [QBASIC_4.5]
               0 File(s)              0 bytes
               4 Dir(s)   9.171.394.560 bytes free

C:\QuickBasic>
```

Figure 4.8. Example of DOS usage.

4.2.2. UNIX

UNIX is an operation system that was initially developed by a group at AT&T Bell Laboratories.. Unix is used in server as well as workstation. Unix environment and client-server model shows that Unix aims toward a strong computer network operating system rather than personal computer operating system.

UNIX is designed to be *portable, multi-tasking*, and *multi-user.* Unix uses plain text to keep data, system files, treated devices as file, and many small programs that executes through CLI combined with pipeline sign (|). In the above Figure 4.1, several Unix commands are combined with pipeline. Solid and stable concept of Unix often used as foundation of modern operation system. Figure 4.9. shows how Unix becoming the foundation of today's many modern operating systems.

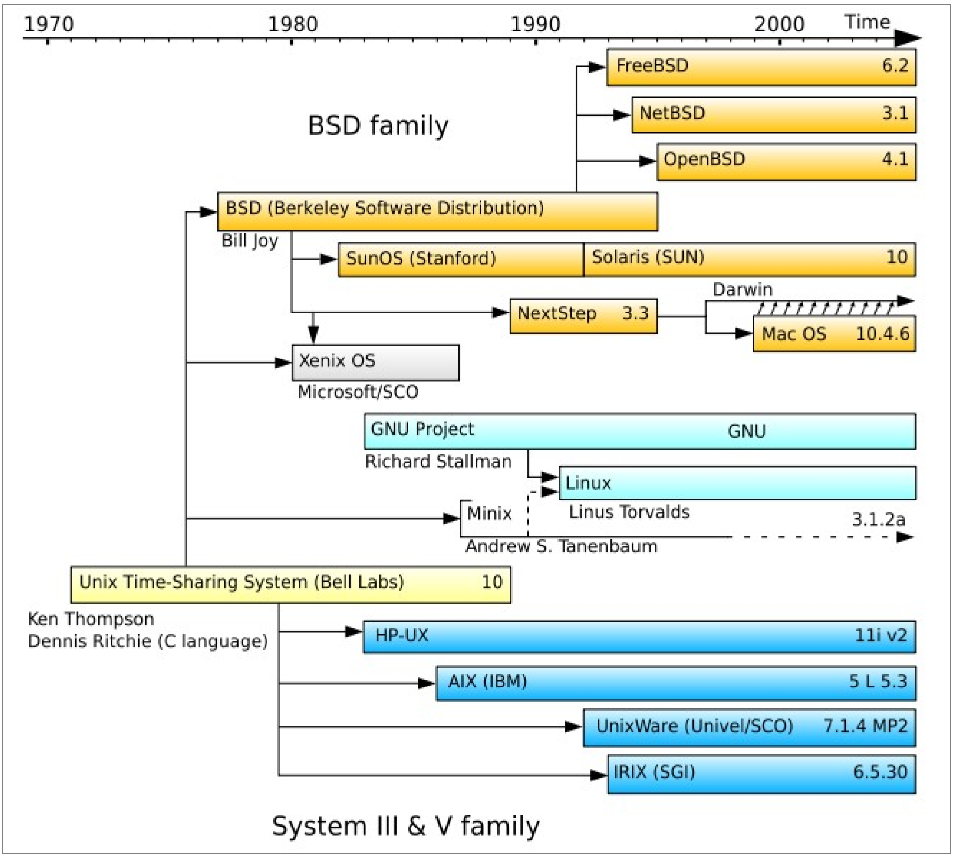
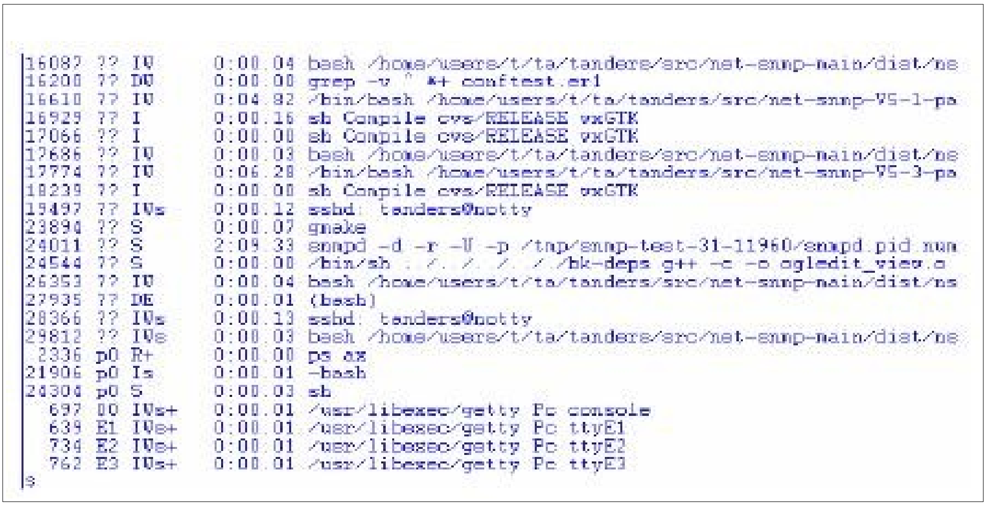


Figure 4.9. Unix and its derivative operating systems.

UNIX system consists of several components that usually bind together. These package is generally as follows:

- *Kernel* with sub the component such as:
  - *conf* — configuration file.
  - *dev* — driver hardware
  - *sys* — operating system kernel, memory management, process scheduling, system calls etc.
  - *h* — header files, defined the key structure in the system.

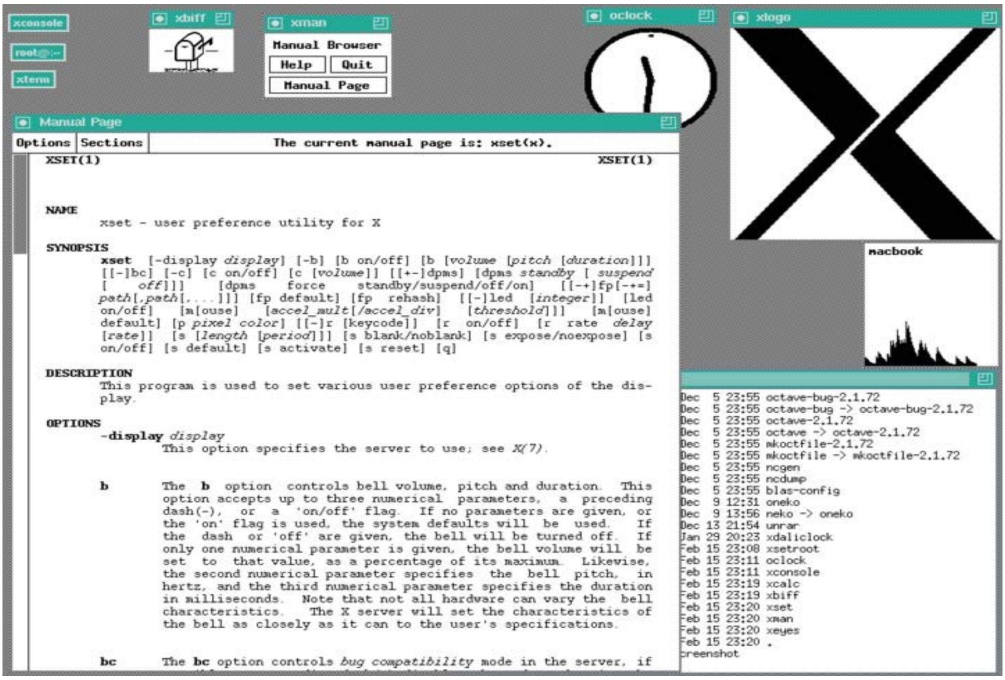


```
16087 ?? IW     0:00.04 bash /home/users/t/ta/tanders/src/net-snmp-main/dist/ns
16200 ?? DW     0:00.00 grep -v ^ *+ conftest.er1
16610 ?? IW     0:04.92 /bin/bash /home/users/t/ta/tanders/src/net-snmp-V5-1-pa
16929 ?? I      0:00.16 sh Compile cvs/RELEASE wxGTK
17066 ?? I      0:00.00 sh Compile cvs/RELEASE wxGTK
17686 ?? IW     0:00.03 bash /home/users/t/ta/tanders/src/net-snmp-main/dist/ns
17774 ?? IW     0:06.28 /bin/bash /home/users/t/ta/tanders/src/net-snmp-V5-3-pa
18239 ?? I      0:00.00 sh Compile cvs/RELEASE wxGTK
19497 ?? IWs    0:00.12 sshd: tanders@notty
23894 ?? S      0:00.07 gmake
24011 ?? S      2:09.33 snmpd -d -r -U -p /tmp/snmp-test-31-11960/snmpd.pid num
24544 ?? S      0:00.00 /bin/sh ../../../../bk-deps g++ -c -o ogledit_view.o
26353 ?? IW     0:00.04 bash /home/users/t/ta/tanders/src/net-snmp-main/dist/ns
27935 ?? DE     0:00.01 (bash)
28366 ?? IWs    0:00.13 sshd: tanders@notty
29812 ?? IWs    0:00.03 bash /home/users/t/ta/tanders/src/net-snmp-main/dist/ns
 2336 p0 R+     0:00.00 ps ax
21906 p0 Is     0:00.01 -bash
24304 p0 S      0:00.03 sh
  697 00 IWs+   0:00.01 /usr/libexec/getty Pc console
  639 E1 IWs+   0:00.01 /usr/libexec/getty Pc ttyE1
  734 E2 IWs+   0:00.01 /usr/libexec/getty Pc ttyE2
  762 E3 IWs+   0:00.01 /usr/libexec/getty Pc ttyE3
$
```

Figure 4.10. Memory management on proses scheduling in Unix.

- **Development Environment:**
  - *cc* —C language compiler
  - *as* — machine-language assembler
  - *ld* — linker, to combine object files
  - *lib* — object-code libraries (installed in folder /lib or /usr/lib) *libc*, C language libraries.
  - *make* – program to compile the source code.
  - *include* — header files for software development and to o determine the standard interface
  - *Other languages* — other programming languages such as Fortran-77, Free Pascal, etc.

- **Commands:**
  - *sh* —"Shell” to carry out CLI based programming or to execute certain commands.
  - *Utilities* — A collection CLI commands that are useful for various functions, such as:
    - *System utilities* — programs for the system management such as mkfs, fsck, etc.
    - *User utilities* — programs for environment management such as passwd, kill, etc.
  - *Document formatting* — program for document preparation such as nroff, troff, tbl, eqn, refer, and pic. Several modern Unix systems uses applications such as TeX and Ghostscript.
  - *Graphics* — Modern Unix System provides X11 as standard windowing system and GUI.



The current manual page is: xset(x).

```
XSET(1)                                                        XSET(1)


NAME
       xset - user preference utility for X

SYNOPSIS
       xset  [-display display] [-b] [b on/off] [b [volume [pitch [duration]]]
       [[-]bc] [-c] [c on/off] [c [volume]] [[+-]dpms] [dpms standby [ suspend
       [    off]]]    [dpms    force    standby/suspend/off/on]    [[-+]fp[-+=]
       path[,path[,...]]] [fp default] [fp  rehash]  [[-]led  [integer]]  [led
       on/off]   [m[ouse]   [accel_mult[/accel_div]   [threshold]]]   [m[ouse]
       default] [p pixel color] [[-]r [keycode]]  [r  on/off]  [r  rate  delay
       [rate]]  [s [length [period]]] [s blank/noblank] [s expose/noexpose] [s
       on/off] [s default] [s activate] [s reset] [q]

DESCRIPTION
       This program is used to set various user preference options of the dis-
       play.

OPTIONS
       -display display
               This option specifies the server to use; see X(7).


       b       The  b  option  controls bell volume, pitch and duration.  This
               option accepts up to three numerical  parameters,  a  preceding
               dash(-),  or  a  'on/off' flag.  If no parameters are given, or
               the 'on' flag is used, the system defaults will  be  used.   If
               the  dash  or 'off' are given, the bell will be turned off.  If
               only one numerical parameter is given, the bell volume will  be
               set  to  that value, as a percentage of its maximum.  Likewise,
               the second numerical parameter specifies  the  bell  pitch,  in
               hertz, and the third numerical parameter specifies the duration
               in milliseconds.  Note that not all hardware can vary the  bell
               characteristics.   The X server will set the characteristics of
               the bell as closely as it can to the user's specifications.


       bc      The bc option controls bug compatibility mode in the server, if
```

```
Dec  5 23:55 octave-bug-2.1.72
Dec  5 23:55 octave-bug -> octave-bug-2.1.72
Dec  5 23:55 octave-2.1.72
Dec  5 23:55 octave -> octave-2.1.72
Dec  5 23:55 mkoctfile-2.1.72
Dec  5 23:55 mkoctfile -> mkoctfile-2.1.72
Dec  5 23:55 ncgen
Dec  5 23:55 ncdump
Dec  5 23:55 blas-config
Dec  9 12:31 oneko
Dec  9 13:56 neko -> oneko
Dec 13 21:54 unrar
Jan 29 20:23 xdaliclock
Feb 15 23:08 xsetroot
Feb 15 23:11 oclock
Feb 15 23:11 xconsole
Feb 15 23:19 xcalc
Feb 15 23:19 xbiff
Feb 15 23:20 xset
Feb 15 23:20 xman
Feb 15 23:20 xeyes
Feb 15 23:20 .
creenshot
```

Figure 4.11. X windows system in UNIX.

4.2.3. Microsoft Windows

Microsoft Windows also known as Windows was initially only an add-on for MS-DOS since there was a high demand on GUI operating system. Early version of Windows run on top of MS-DOS. The early version of Windows shows several general function of operating system, such as, executable file type, its own hardware driver, etc.

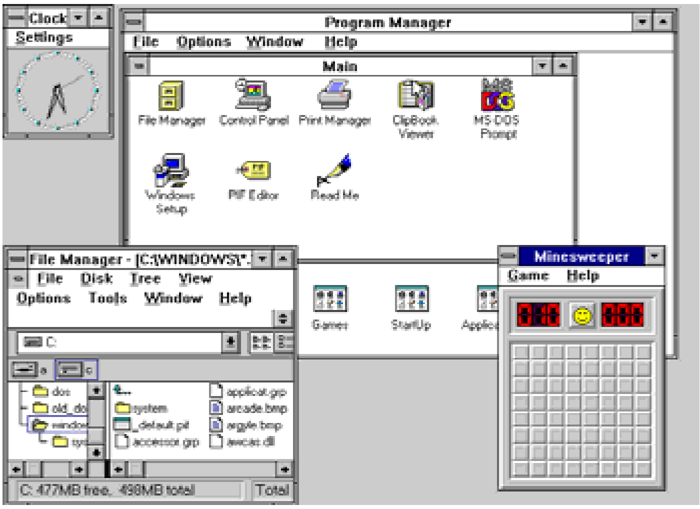


Figure 4.12. Windows version 3.11.

Windows conceptually aim for personal computer. Windows did not initially support multi-tasking and multi-user concepts. Accommodation towards the network or functions client-server also was not as strong as UNIX families. Thus, security is a common problem in Windows operating system as connected to the network. However Windows advantage especially in the ease use. In the latest version (Windows Vista), the multi- user and multi-tasking implementations are more mature. Moreover, the GUI is changed and uses the three dimensional effects.

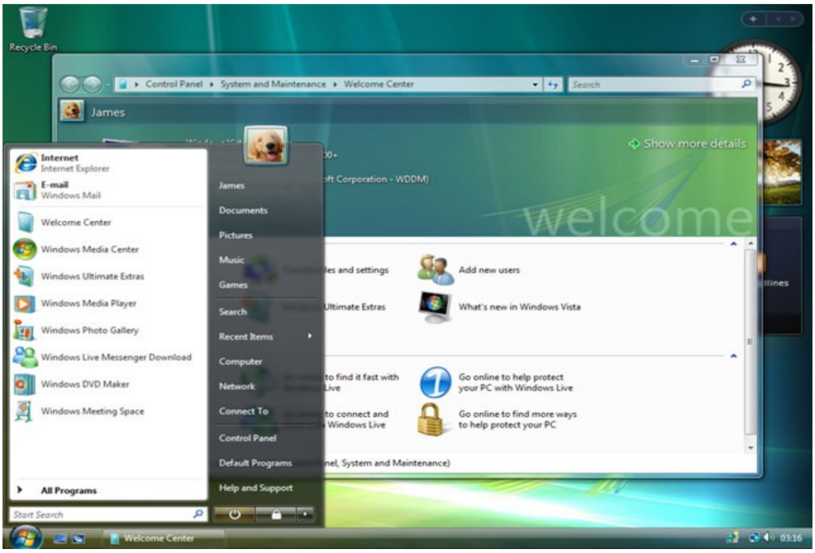


Figure 4.13. Windows Vista.

4.2.4. Apple Mac OS

As shown in Figure 5.10, Apple Mac OS is a descendant from UNIX through the BSD route (Berkeley Software Distribution). Thus, *multi-tasking, multi-user, networking* capabilities available to UNIX is also owned by Mac OS. Mac OS is a GUI based operating system. Apple is the pioneer in GUI based operating system. The use of icon, mouse and several GUI components were an extraordinary contribution towards the development of GUI based operating system.

The early version of Mac OS almost fully relies on its GUI capabilities and very limited CLI usage (Figure 5.15). Despite its ease there are several weaknesses, such as, multi-tasking is not perfectly working, limited memory management, and conflict in several programs. Improving the Mac OS is not an easy job.

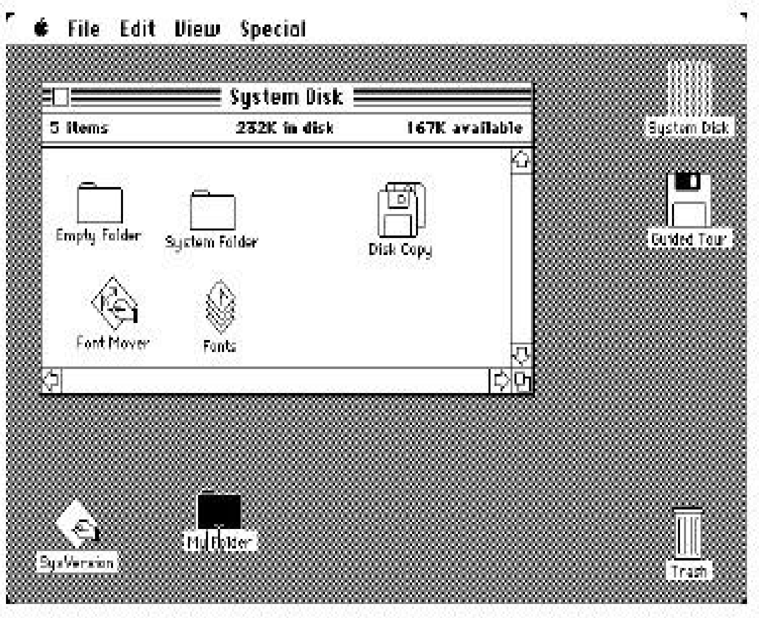
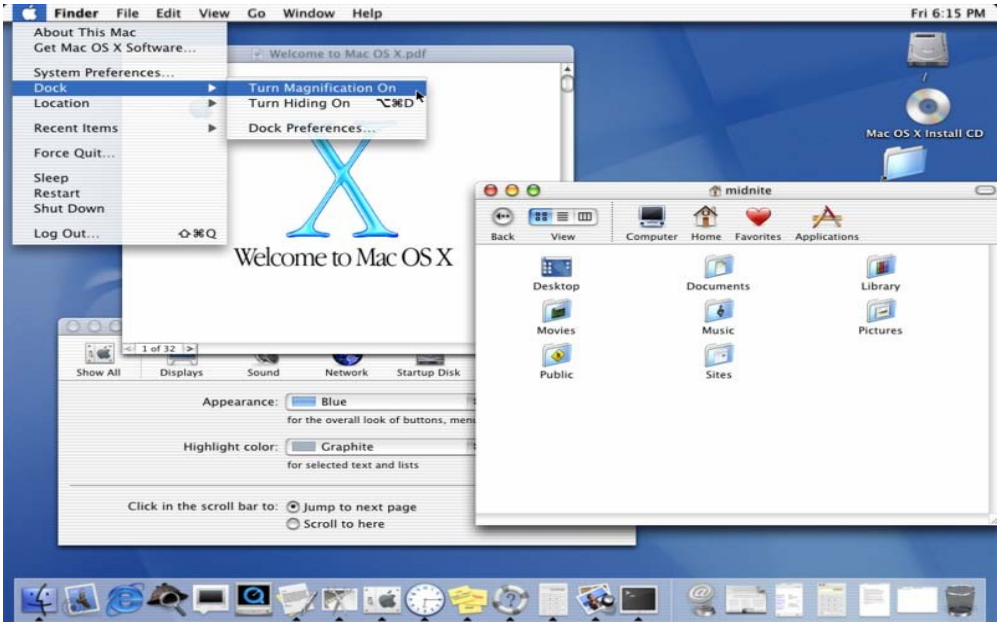


Figure 4.14. Early version of Mac OS.

In Mac OS X (the latest version), most of the weaknesses in the early version have been removed. Multi-tasking runs well and the memory management is far better. Moreover, Mac OS X GUI is known to be the best among existing operating systems.



Appearance: Blue
for the overall look of buttons, menu

Highlight color: Graphite
for selected text and lists

Click in the scroll bar to: ● Jump to next page
○ Scroll to here

Figure 4.15. Mac OS X

4.2.5. Linux

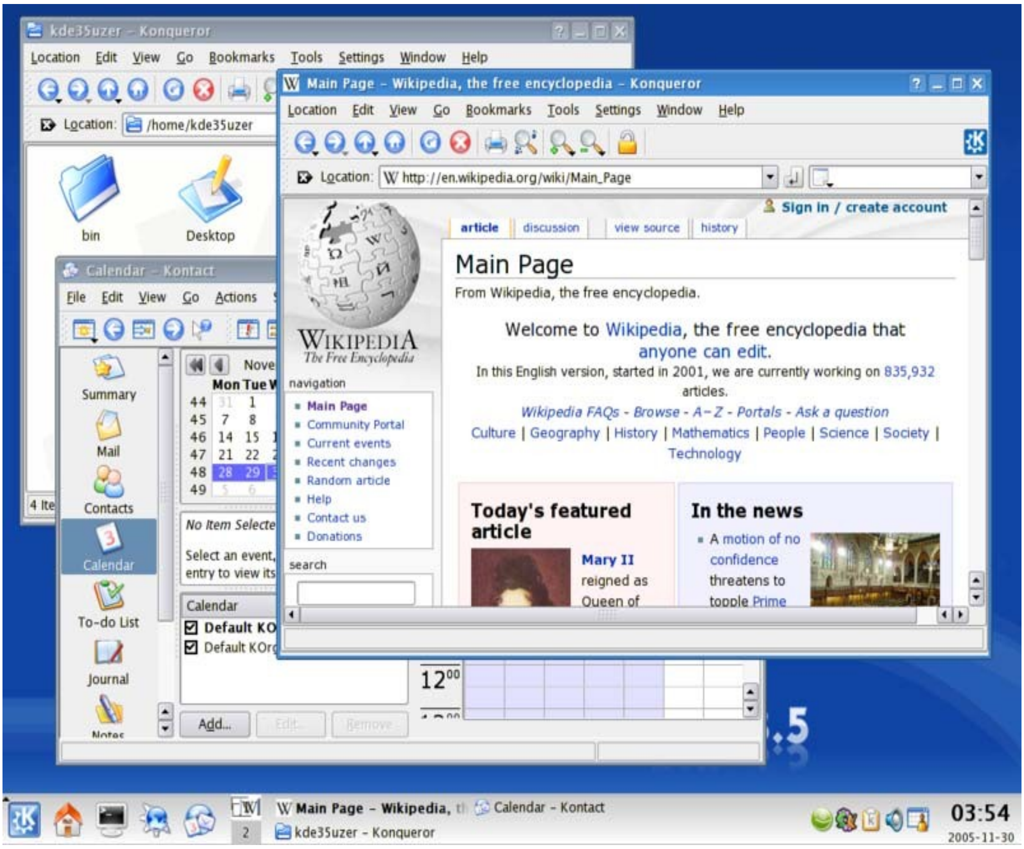
Linux resembled UNIX systems, as main objective of Linux project is to be compatible with UNIX. Linux development was begun in 1991, when a Finnish student named Linus Torvalds wrote Linux, a *kernel* for 80386 processor, the first 32-bit Intel processor suitable for PC.

In many ways, Linux kernel is the core of Linux project, with additional components it forms a complete Linux operation system. Source code of Linux kernel is specially made for Linux project. However, its supporting softwares are not exclusively made for Linux,
but normally used in several UNIX like operating systems, such as, BSD operating system from Berkeley, *X Window System* from MIT, and the GNU project from *Free Software Foundation.*

Tool sharing works both directions. The main Linux library is originally started from GNU project. The library improvement is through community contributions, especially in addressing, inefficiency, and bugs. Other components, such as, GNU C Compiler, gcc, has a good enough quality to be directly used in Linux. The Linux's administrative network tool is using the code originally developed for 4.3BSD. Interestingly, the newer BSD, such as FreeBSD, borrow the code from Linux, for example Intel mathematics library for *floating-point-emulation.*

Today, Linux is one of the most rapidly developed operating system. The world wide developers groups are enhancing its features and help pushing the Linux operating system forward. Moreover, many developers are working to port applications into Linux.

The main problem for Linux users in the past is the text based interface. It prevents layman in using Linux, as It requires a thorough study of the not user-friendly commands prior to use it. However, today, the situation is changed with the presence of KDE and GNOME. Both have a good desktop GUI interface that change the perception of the world on Linux.



kde35uzer - Konqueror

Location: /home/kde35uzer

Main Page - Wikipedia, the free encyclopedia - Konqueror

Location: http://en.wikipedia.org/wiki/Main_Page

Main Page

From Wikipedia, the free encyclopedia.

Welcome to Wikipedia, the free encyclopedia that anyone can edit.

In this English version, started in 2001, we are currently working on 835,932 articles.

Today's featured article

Mary II reigned as Queen of

In the news

A motion of no confidence threatens to topple Prime

Calendar - Kontact

No Item Selected

Select an event, entry to view its

Figure 4.16. Linux with KDE desktop.

4.3. PREPARING AND OPERATING AN OPERATING SYSTEM

Knowing information system is not enough. Those who like to work in programming must understand thoroughly on how install, boot and operate the operating system, more deeply than normal users.

4.3.1. Installation

Installation is normally referred to installation of software package in a computer. Whereas operating system installation is installation of the operating system into the computer. An operating system must be firstly installed prior to other software. The operating system must be correctly installed before any application software can be run.

As previously explained, each operating system has its own characteristics. This includes the installation process of the operating system. Installation process is highly depend on the type of operating system. Based on its interface it can be categorized into two (2) main categories, namely, GUI based and CLI based. GUI based installation process can be found in Microsoft Windows operation system (full GUI in Vista version), Apple Mac OS X and above, several Linux versions, such as, Ubuntu and his descendants (Xubuntu, Kubuntu, Edubuntu, etc), Mandriva and his descendants (PC Linux OS), and newest version of Fedora. Whereas CLI based can be found in Linux Slackware version, Gentoo etc.

Installation process can also be categorized based on the installation source, namely, media sources, such as, CD, DVD or hard disk, or network sources. In general, CD or DVD is used as installation media. In this section, we will describe installation based on CD / DVD source.

Installation stages can be seen in Figure 4.16. These installation stages possibly varied between operating systems. However in general, the stages are not too much different between operating systems.

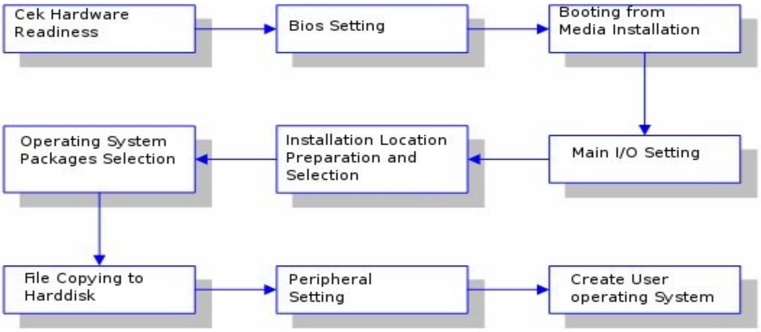
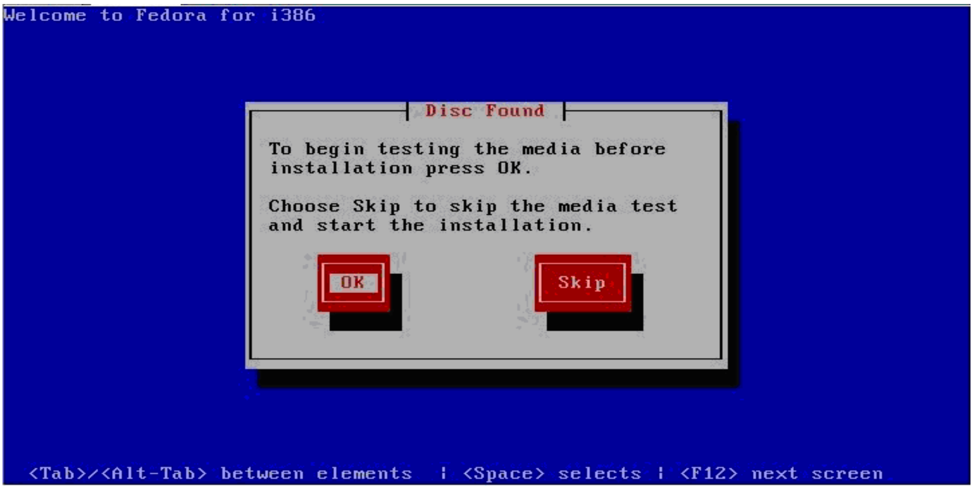

Cek Hardware Readiness
Bios Setting
Booting from Media Installation
Main I/O Setting
Installation Location Preparation and Selection
Operating System Packages Selection
File Copying to Harddisk
Peripheral Setting
Create User operating System

Figure 4.16. Operating system installation stages.

- Check hardware readiness. This stage confirms all hardware and its peripherals are correctly installed. Moreover, check the computer hardware specification whether it is supported by the operating system.

- Configure BIOS. This stage is to configure BIOS to give the first booting priority to the installation media, usually CD / DVD.

- Booting from the installation media. If BIOS configuration went well, then the computer should boot from the installation media. Figure 4.17 is the screen-shot from the early stages of booting process.

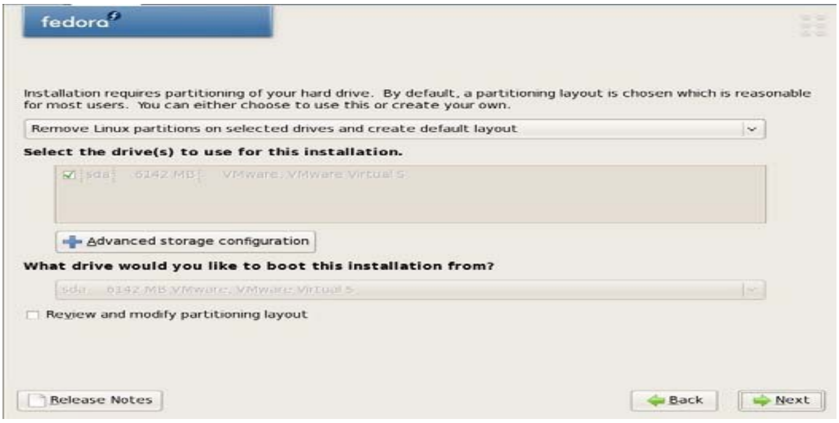


```
Welcome to Fedora for i386

Disc Found

To begin testing the media before
installation press OK.

Choose Skip to skip the media test
and start the installation.

<Tab>/<Alt-Tab> between elements  | <Space> selects | <F12> next screen
```

Figure 4.17. Testing of installation media.

- Configuration of main I/O. This stage is to arrange so that main Input / Output devices, namely, mouse, keyboard and the video, would correctly run and the installation process can be carried out.

- Preparation and determination of the location of the installation. Most installation is aimed for hard disk as its target. We must prepare the hard disk to be written. Preparation includes hard disk partitioning, including setting the volume size for each partition, and formating of the partition as required by the operating system. Microsoft Windows may use either NTFS or FAT32 file system. While Linux may use ext2, ext3, ReiserFS, and XFS file system. Apple Mac OS X usually uses HFS+. Figure 4.18 shows the snap shot during setup of the installation location in Fedora Core 8 installation process.



Installation requires partitioning of your hard drive. By default, a partitioning layout is chosen which is reasonable for most users. You can either choose to use this or create your own.

Remove Linux partitions on selected drives and create default layout

Select the drive(s) to use for this installation.

☑ sda 6142 MB VMware, VMware Virtual S

What drive would you like to boot this installation from?

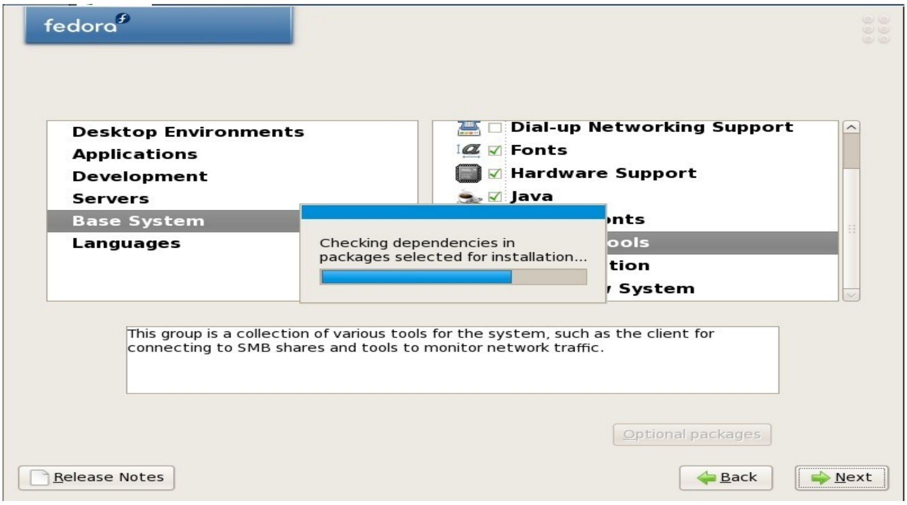
sda 6142 MB VMware, VMware Virtual S

□ Review and modify partitioning layout

Figure 4.18. Process in determining the installation target.

- Configuration of application softwares to be installed. This stage may be skipped if *default* is chosen. For those who need to customized its operating system, it can be done by doing a *custom installation.* CD or DVD installation source has normally carried several applications to be selected during or after installation process.

- Write / copy to hard disk. After application selection process, application & operating system files will be written to hard disk. Figure 4.19 shows an example of screen shots during copy file process.



Checking dependencies in packages selected for installation...

This group is a collection of various tools for the system, such as the client for connecting to SMB shares and tools to monitor network traffic.

Figure 4.19. Copy file process in Fedora.

- Configuration of other peripherals. The objective of this stage is tio install the needed driver for peripheral, such as, VGA card, sound card, *motherboard chip set,* etc to enable the computer in recognizing the peripheral. This stage is normally needed for Microsoft Windows operating system. It is not needed for those who use Linux as all drivers are normally built-in Linux kernel.

- Creating user. We need to create the user of the operating system. The user creation will provide username and password for each user. In general, there are two (2) level of user, namely, administrator and ordinary user. Administrator has the highest right to all section of operating system while ordinary user has a more limited right determined by the the administrator.

4.3.2. Booting

Booting is the earliest process when the computer turns on. The booting process is shown in Figure 4.20. In the early booting process is executing a small program resides in computer's ROM with setup data as stored in CMOS. This stage is known as POST (*Power On Self Test*), after a successful completion of POST, BIOS code from ROM and BIOS of various adapters, such as, VGA adapter, will be loaded into the main memory (RAM). After loading all BIOS into the memory, computer starts reading the program starts up located in hard disk boot sector. At this stage, operating system will be loaded into RAM from hard disk.

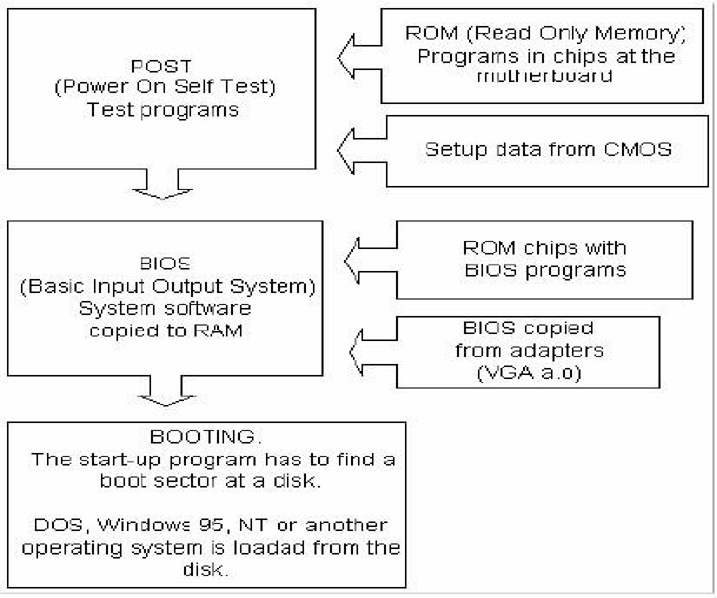
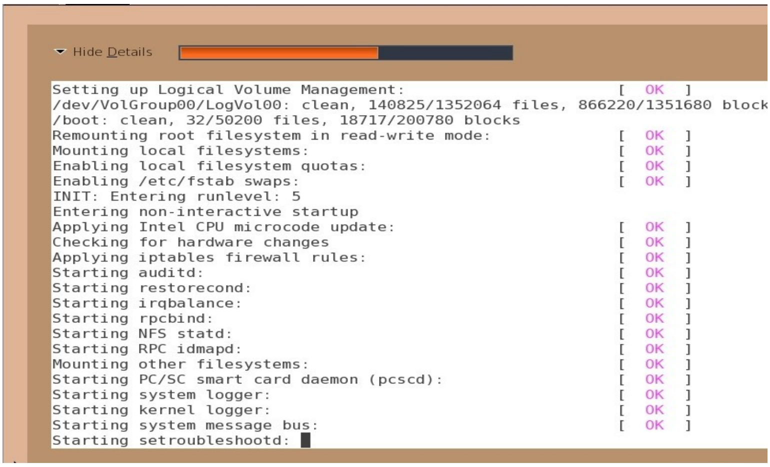


Figure 4.20. Early process of Booting.

In Microsoft Windows, a boot-splash usually Windows Logo is usually shown during boot process. No detail information to the users. In contrast, in Linux family, user may choose whether to show the detail information on booting process or put it behind a splash screen usually by using LILO or Grub. Figure 4.21 shows the booting process in Fedora Linux.



```
Setting up Logical Volume Management:                          [  OK  ]
/dev/VolGroup00/LogVol00: clean, 140825/1352064 files, 866220/1351680 block
/boot: clean, 32/50200 files, 18717/200780 blocks
Remounting root filesystem in read-write mode:                 [  OK  ]
Mounting local filesystems:                                    [  OK  ]
Enabling local filesystem quotas:                              [  OK  ]
Enabling /etc/fstab swaps:                                     [  OK  ]
INIT: Entering runlevel: 5
Entering non-interactive startup
Applying Intel CPU microcode update:                           [  OK  ]
Checking for hardware changes                                  [  OK  ]
Applying iptables firewall rules:                              [  OK  ]
Starting auditd:                                               [  OK  ]
Starting restorecond:                                          [  OK  ]
Starting irqbalance:                                           [  OK  ]
Starting rpcbind:                                              [  OK  ]
Starting NFS statd:                                            [  OK  ]
Starting RPC idmapd:                                           [  OK  ]
Mounting other filesystems:                                    [  OK  ]
Starting PC/SC smart card daemon (pcscd):                      [  OK  ]
Starting system logger:                                        [  OK  ]
Starting kernel logger:                                        [  OK  ]
Starting system message bus:                                   [  OK  ]
Starting setroubleshootd: █
```

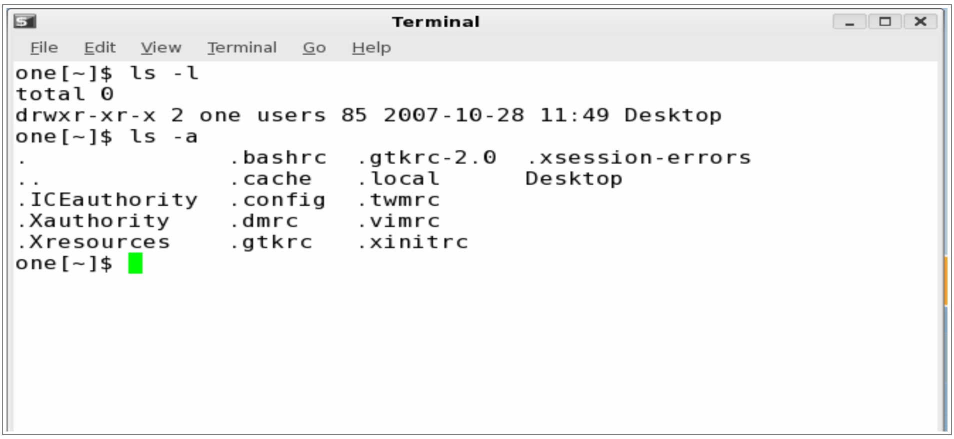
Figure 4.21 Booting process in Fedora Linux.

4.3.3. Text based commands

For some command line interface (CLI) is a nightmare, as one has to memorize all the command and not user friendly. There are several advantages with text based interface, such as:

- Faster execution.
- Less demanding on CPU and memory.
- No need for high performance hardware. No high resolution VGA card and monitor is needed.

CLI mode may be rarely used in GUI based operating systems, such as, Microsoft Windows or Apple Mac OS X. However, in Linux and Unix family, CLI mode is still being used especially for system and network administration. In this section, we will learn some of the frequently used CLI command that can be access through console, such as, Console*, xterm, aterm* etc in Linux as shown in Figure 4.22.



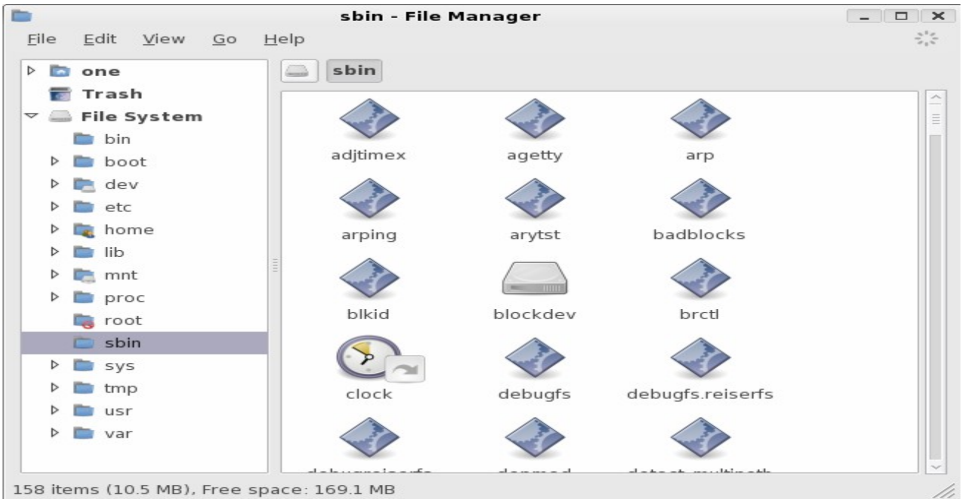
```
one[~]$ ls -l
total 0
drwxr-xr-x 2 one users 85 2007-10-28 11:49 Desktop
one[~]$ ls -a
.               .bashrc   .gtkrc-2.0  .xsession-errors
..              .cache    .local      Desktop
.ICEauthority   .config   .twmrc
.Xauthority     .dmrc     .vimrc
.Xresources     .gtkrc    .xinitrc
one[~]$ 
```

Figure 4.22. A terminal for CLI mode.

There are two (2) main groups of commands in CLI mode, namely:

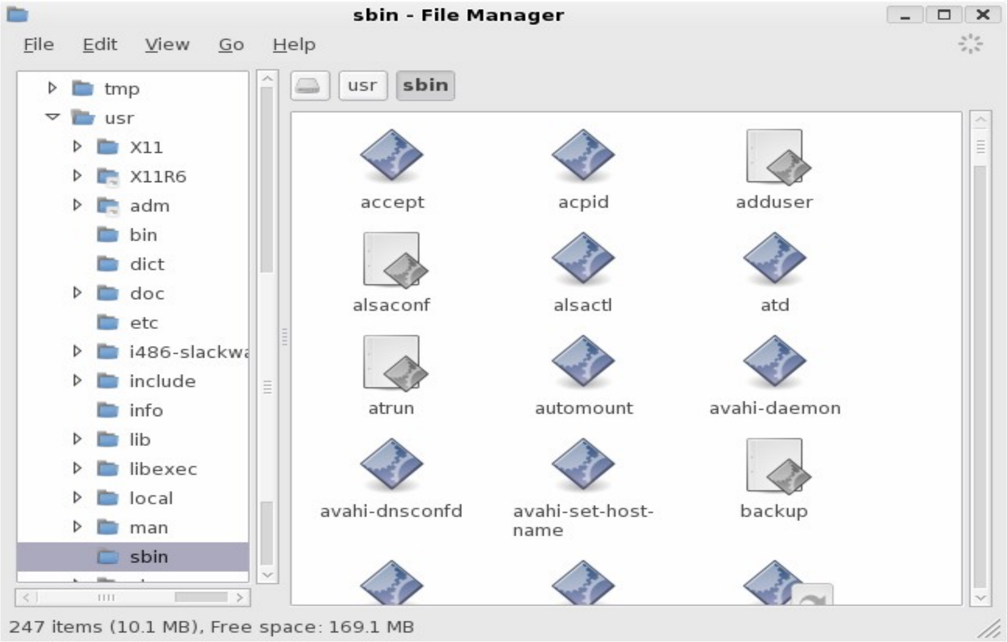
- System administration commands. These commands can only be executed by those with administrator (*root)* privilege. These commands are normally stored in directory /sbin (Figure 4.23) and /usr/sbin (Figure 4.24).

- User commands. These commands may be accessed by ordinary users. These command is normally stored in directory /bin (Figure 4.25) and /usr/bin (Figure 4.26).



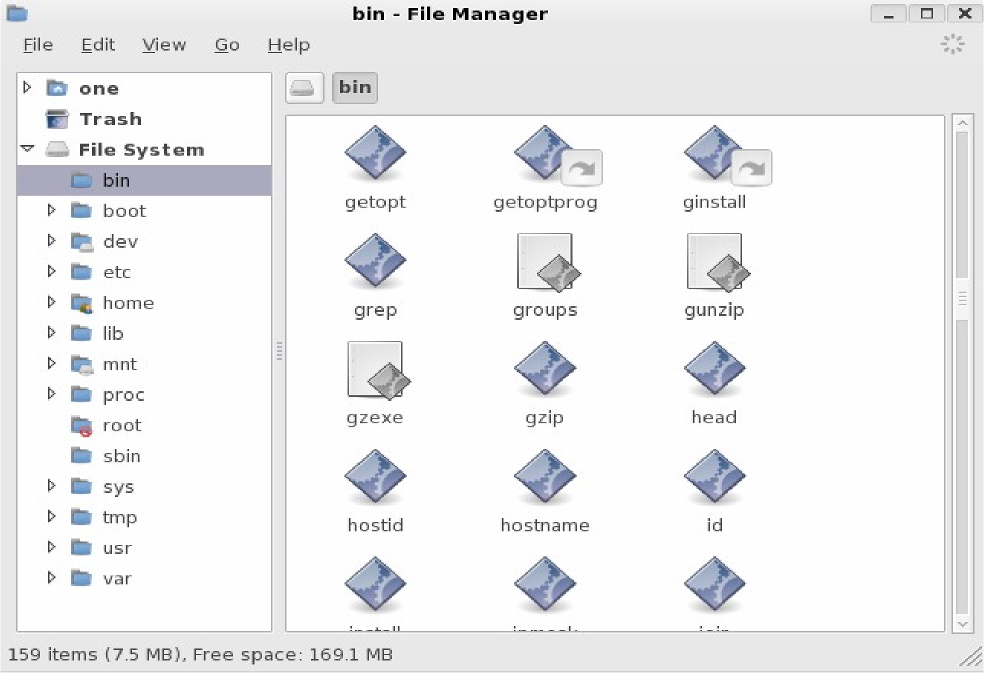
158 items (10.5 MB), Free space: 169.1 MB

Figure 4.23. Commands in directory /sbin.



247 items (10.1 MB), Free space: 169.1 MB

Figure 4.24. Commands in directory /usr/sbin.



159 items (7.5 MB), Free space: 169.1 MB

Figure 4.25. Commands in directory /bin.

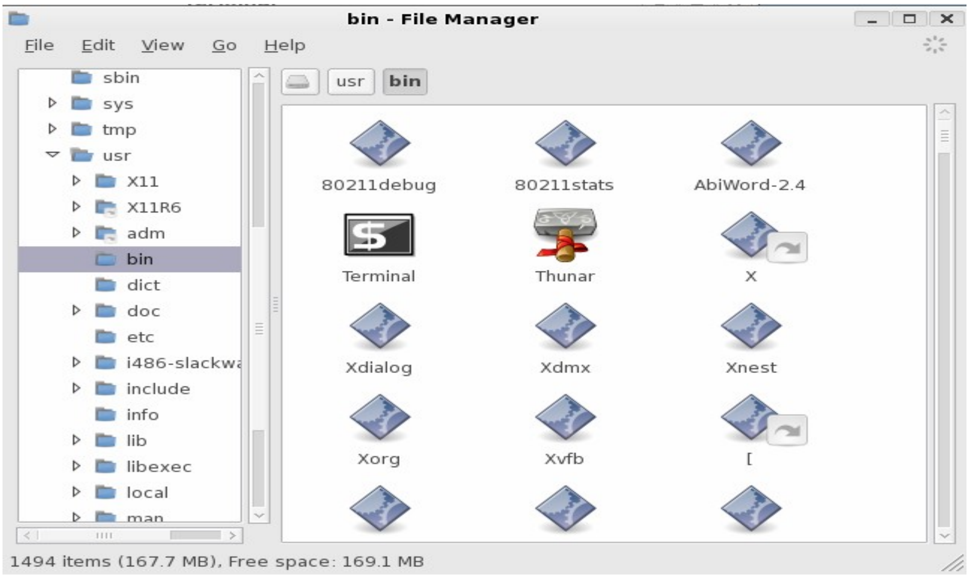
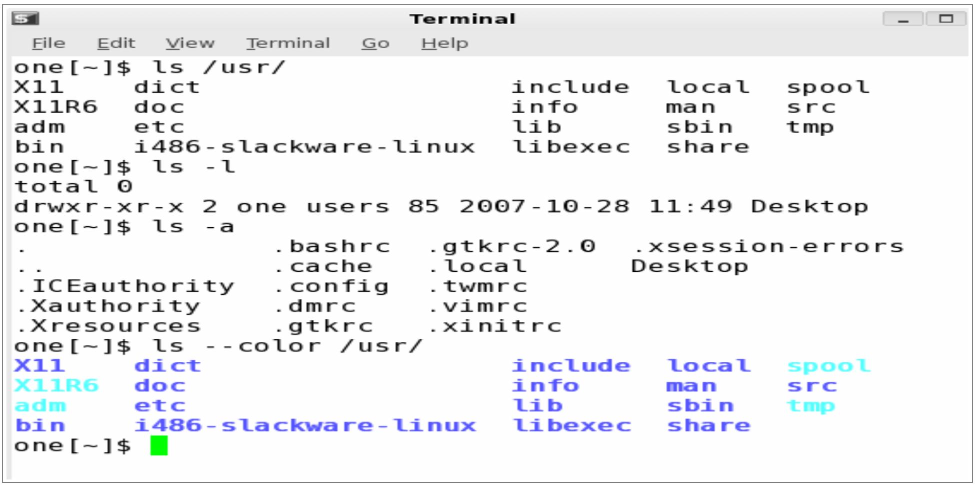


Figure 4.26. Commands in directory /usr/bin.

The followings are some of the important command in CLI mode:

- **Display the directory content**

  To list the directory content, it can be done by using ls followed by other arguments as needed. Figure 4.27 shows how to use ls.

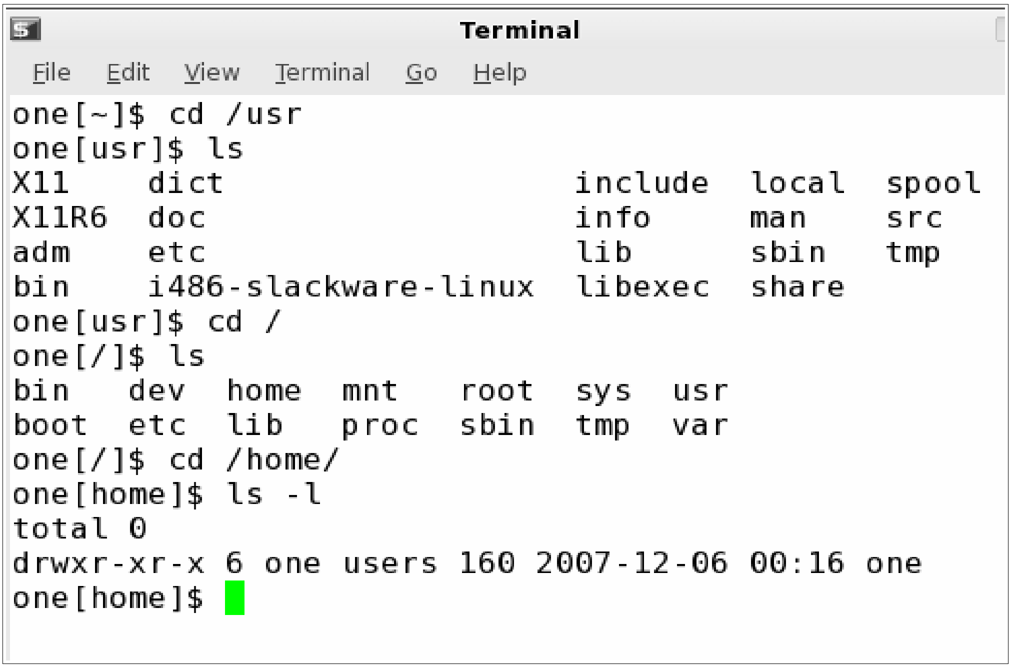


```
one[~]$ ls /usr/
X11     dict                     include   local   spool
X11R6   doc                      info      man     src
adm     etc                      lib       sbin    tmp
bin     i486-slackware-linux     libexec   share
one[~]$ ls -l
total 0
drwxr-xr-x 2 one users 85 2007-10-28 11:49 Desktop
one[~]$ ls -a
.                  .bashrc     .gtkrc-2.0   .xsession-errors
..                 .cache      .local       Desktop
.ICEauthority      .config     .twmrc
.Xauthority        .dmrc       .vimrc
.Xresources        .gtkrc      .xinitrc
one[~]$ ls --color /usr/
X11     dict                     include   local   spool
X11R6   doc                      info      man     src
adm     etc                      lib       sbin    tmp
bin     i486-slackware-linux     libexec   share
one[~]$ 
```

Figure 4.27. Example of ls usage.

- **Change directory**

  Change directory may be performed by using cd followed by the destination directory. Figure 4.28 shows the example of cd usage.

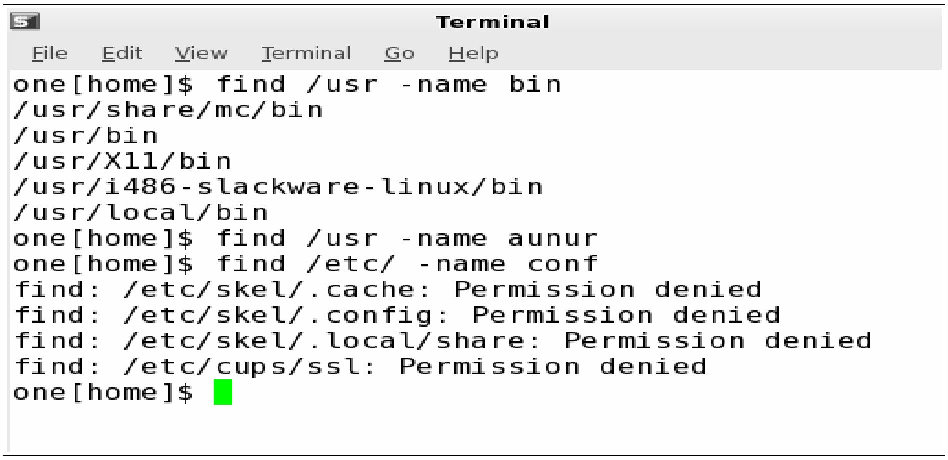


```
one[~]$ cd /usr
one[usr]$ ls
X11    dict                   include  local  spool
X11R6  doc                    info     man    src
adm    etc                    lib      sbin   tmp
bin    i486-slackware-linux   libexec  share
one[usr]$ cd /
one[/]$ ls
bin   dev  home  mnt   root  sys  usr
boot  etc  lib   proc  sbin  tmp  var
one[/]$ cd /home/
one[home]$ ls -l
total 0
drwxr-xr-x 6 one users 160 2007-12-06 00:16 one
one[home]$ 
```

Figure 4.28. Example of cd usage.

- **Locate a file**

  To locate a file at certain location, the find command can be used. Figure 4.29 shows the example of find usage.

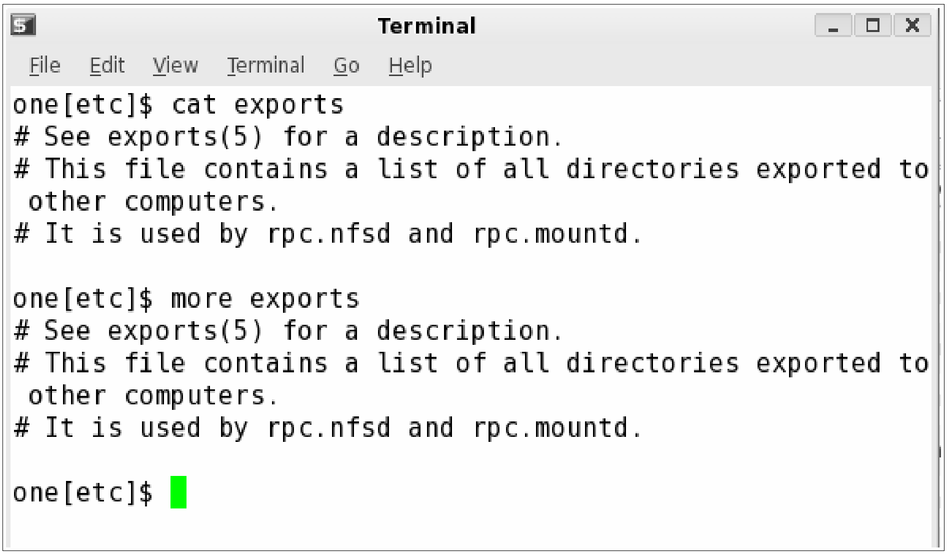


```
one[home]$ find /usr -name bin
/usr/share/mc/bin
/usr/bin
/usr/X11/bin
/usr/i486-slackware-linux/bin
/usr/local/bin
one[home]$ find /usr -name aunur
one[home]$ find /etc/ -name conf
find: /etc/skel/.cache: Permission denied
find: /etc/skel/.config: Permission denied
find: /etc/skel/.local/share: Permission denied
find: /etc/cups/ssl: Permission denied
one[home]$
```

Figure 4.29. Example of find usage.

- **Show file content**

  To show the content of a file, we can use more, less or cat commands. Figure 4.30 shows some of the examples.

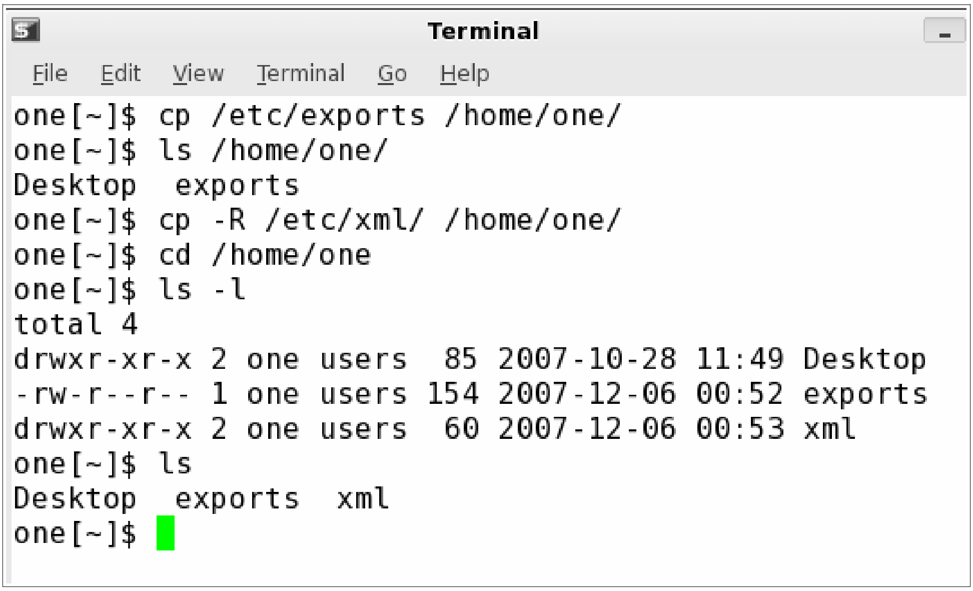


```
one[etc]$ cat exports
# See exports(5) for a description.
# This file contains a list of all directories exported to
 other computers.
# It is used by rpc.nfsd and rpc.mountd.

one[etc]$ more exports
# See exports(5) for a description.
# This file contains a list of all directories exported to
 other computers.
# It is used by rpc.nfsd and rpc.mountd.

one[etc]$
```

Figure 4.30. Example of cat and more usage.

- **Copy file of directory**

  cp command may be used to copy files of directory. Figure 4.31 shows the example of cp usage.

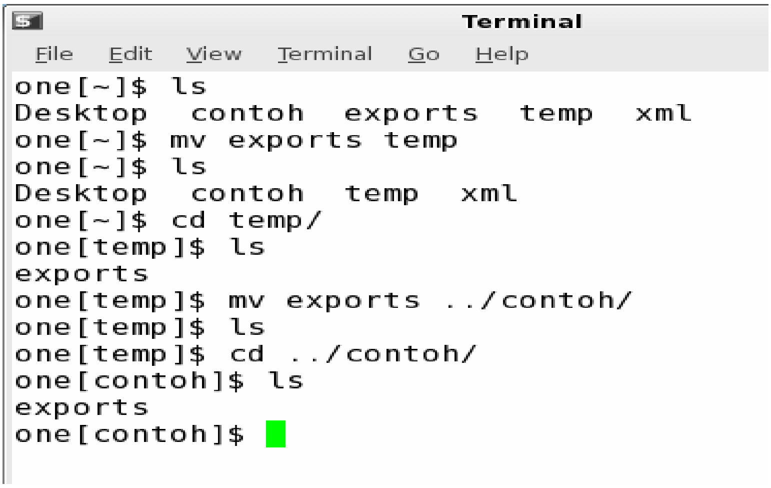


```
one[~]$ cp /etc/exports /home/one/
one[~]$ ls /home/one/
Desktop  exports
one[~]$ cp -R /etc/xml/ /home/one/
one[~]$ cd /home/one
one[~]$ ls -l
total 4
drwxr-xr-x 2 one users  85 2007-10-28 11:49 Desktop
-rw-r--r-- 1 one users 154 2007-12-06 00:52 exports
drwxr-xr-x 2 one users  60 2007-12-06 00:53 xml
one[~]$ ls
Desktop  exports  xml
one[~]$ 
```

Figure 4.31. Example of cp usage.

- **Move files.**

  To move files, the mv command may be used. Figure 4.32 shows the example of mv usage.

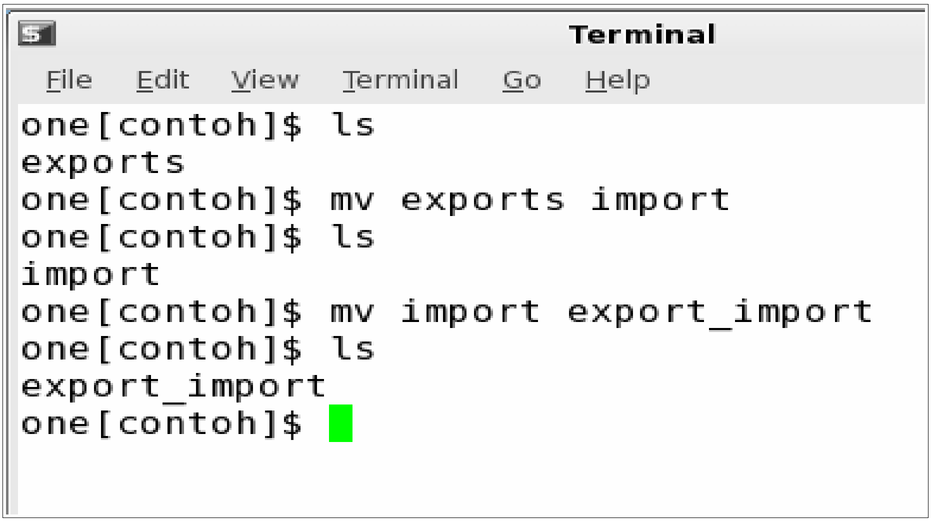


```
one[~]$ ls
Desktop  contoh  exports  temp  xml
one[~]$ mv exports temp
one[~]$ ls
Desktop  contoh  temp  xml
one[~]$ cd temp/
one[temp]$ ls
exports
one[temp]$ mv exports ../contoh/
one[temp]$ ls
one[temp]$ cd ../contoh/
one[contoh]$ ls
exports
one[contoh]$ 
```

Figure 4.32. Example of mv usage to move files.

- **Rename a file**

  The mv command may be used to rename a file. Figure 4.33. shows the examples of using mv command.

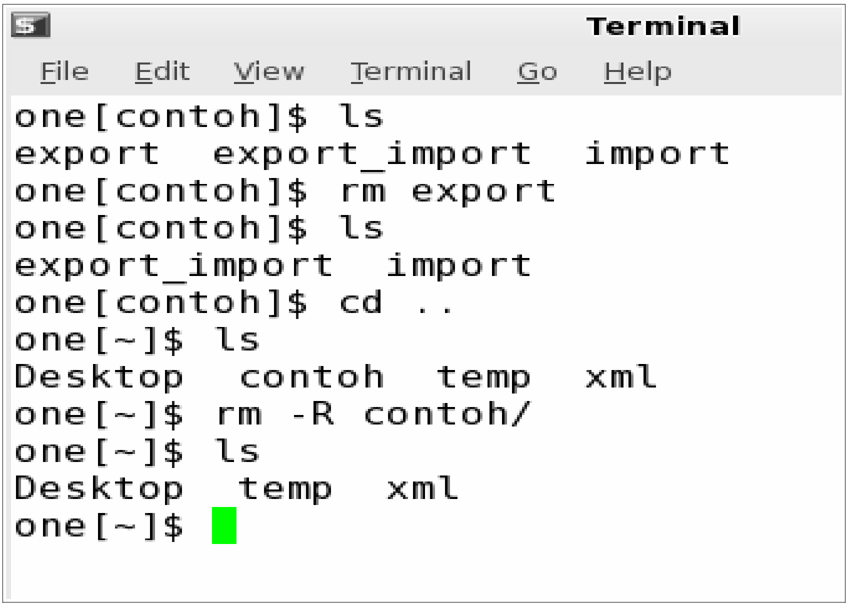


```
one[contoh]$ ls
exports
one[contoh]$ mv exports import
one[contoh]$ ls
import
one[contoh]$ mv import export_import
one[contoh]$ ls
export_import
one[contoh]$ 
```

Figure 4.33. Example of mv usage to rename a file.

- **Remove files or directory**

To remove files or directory, rm command may be used. Figure 4.34 shows the example of rm usage.

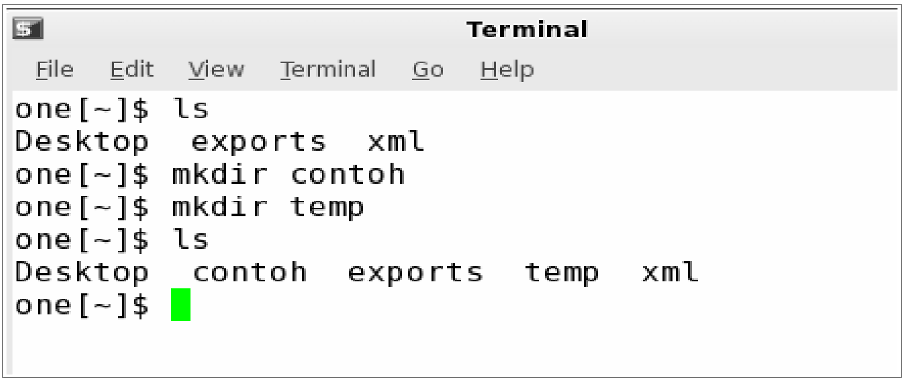


```
one[contoh]$ ls
export  export_import  import
one[contoh]$ rm export
one[contoh]$ ls
export_import  import
one[contoh]$ cd ..
one[~]$ ls
Desktop  contoh  temp  xml
one[~]$ rm -R contoh/
one[~]$ ls
Desktop  temp  xml
one[~]$
```

Figure 4.34. Example of rm usage to remove files or directory.

- **Make a directory**

To make a new directory, mkdir command may be used. Figure 4.35 shows the example of mkdir command.

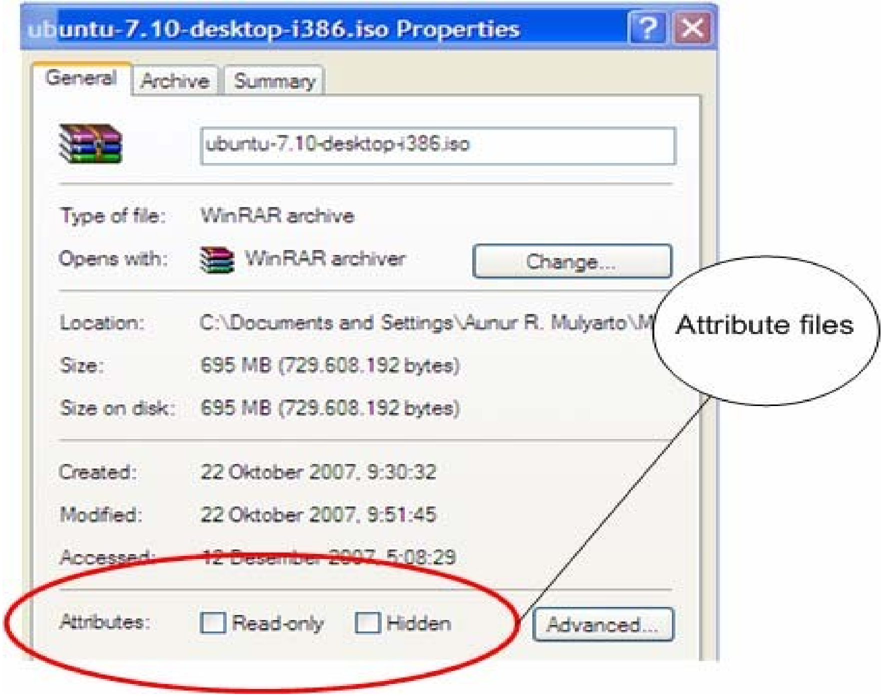


```
one[~]$ ls
Desktop  exports  xml
one[~]$ mkdir contoh
one[~]$ mkdir temp
one[~]$ ls
Desktop  contoh  exports  temp  xml
one[~]$
```

Figure 4.35. Example of mkdir usage.

- Understanding file and directory access right

In Windows operating system, there is no sufficient file protection for files and directories as it is only a limited attribute as shown in Figure 4.36.



ubuntu-7.10-desktop-i386.iso Properties

ubuntu-7.10-desktop-i386.iso

Type of file: WinRAR archive

Opens with: WinRAR archiver

Location: C:\Documents and Settings\Aunur R. Mulyarto\M

Size: 695 MB (729.608.192 bytes)

Size on disk: 695 MB (729.608.192 bytes)

Created: 22 Oktober 2007, 9:30:32

Modified: 22 Oktober 2007, 9:51:45

Accessed: 12 Desember 2007, 5:08:29

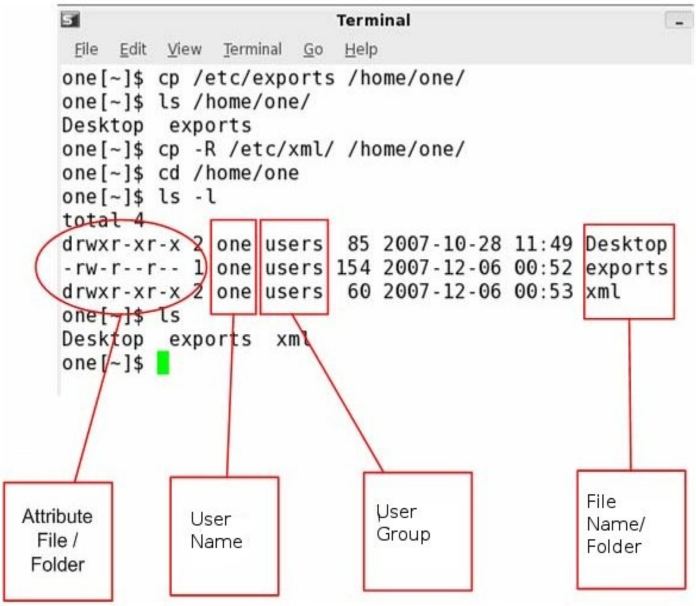
Attributes: □ Read-only □ Hidden

Figure 4.36. File / folder attribute in Microsoft Windows.

As shown in Figure 4.35, file / directory attribute are limited to Read-only and Hidden. If Read-only box is chosen, file can only be read. If Hidden box is chosen, file is hidden and will disappear from Windows Explorer.

In Unix family, including Linux, file / directory attribute is more tightly controlled. Thus, increase security and ease for users in managing their file and directories requirements.

There are four (4) important parameter in a file / directory, namely, attribute, user (owner) of the file / directory, group where the user belongs to, and the name of file / directory. The first three columns set the access right owner, the following three columns set the group's access right, and the last three columns set the other access right (other than owner and group member). The letter r indicates that the file / directory can be read, the letter w indicates it can be written, while the x letter shows that the file / directory may be executed. Please see carefully Figure 4.37.



```
one[~]$ cp /etc/exports /home/one/
one[~]$ ls /home/one/
Desktop  exports
one[~]$ cp -R /etc/xml/ /home/one/
one[~]$ cd /home/one
one[~]$ ls -l
total 4
drwxr-xr-x 2 one users  85 2007-10-28 11:49 Desktop
-rw-r--r-- 1 one users 154 2007-12-06 00:52 exports
drwxr-xr-x 2 one users  60 2007-12-06 00:53 xml
one[~]$ ls
Desktop  exports  xml
one[~]$ 
```

Figure 4.37. File / directory attribute in Unix family.

Figure 4.37 indicating the followings:

- **Desktop** and **xml** are directory as noted in mark d, whereas exports is a file noted by mark -.
- **Desktop** and **xml** have an attribute **drwxr-xr-x,** meaning the owner (**one**) has the right to read, write, and execute the directory. While the group (**users**) has the right only to read and execute. Other users may read and execute the directory.
- **Exports** has an attribute **-rw-r -- r--** meaning the owner (one) has the right to read and write into the file. While the group and others may only read the file.

To change attribute of files / directories, we can use the following commands:

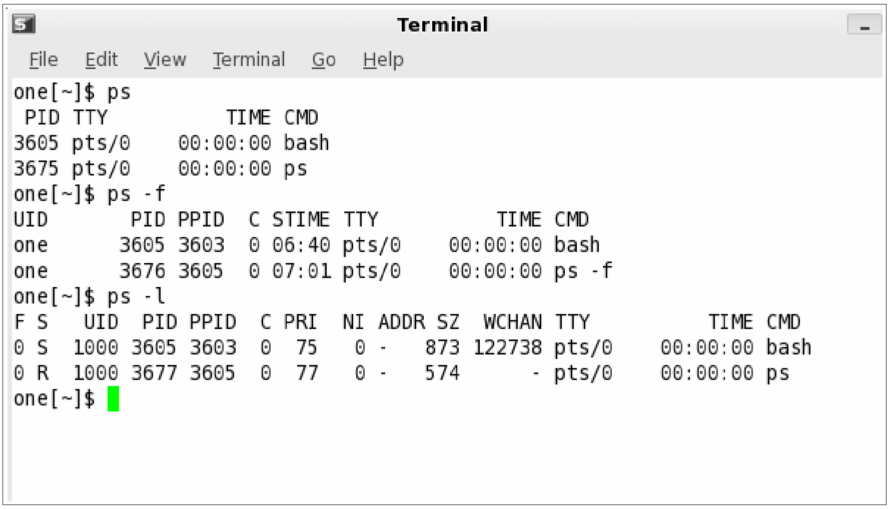
Table 4.1. Commands related to file / directory management.

Commands	Function
chgroup [options] group file	Change the group ownership of files / directories.
chmod [options] attribute file	Change access right of files / directories.
chown [options] owner file	Change ownership of files / directories.

- **Process control**

Process control is an important part of Linux. Thus, all commands related to process control should be understood.

To see running process, we can use ps command. Figure 4.38 shows the example of ps usage.



```
one[~]$ ps
 PID TTY          TIME CMD
3605 pts/0    00:00:00 bash
3675 pts/0    00:00:00 ps
one[~]$ ps -f
UID        PID PPID  C STIME TTY          TIME CMD
one       3605 3603  0 06:40 pts/0    00:00:00 bash
one       3676 3605  0 07:01 pts/0    00:00:00 ps -f
one[~]$ ps -l
F S   UID  PID PPID  C PRI  NI ADDR SZ  WCHAN TTY          TIME CMD
0 S  1000 3605 3603  0  75   0 -   873 122738 pts/0    00:00:00 bash
0 R  1000 3677 3605  0  77   0 -   574      - pts/0    00:00:00 ps
one[~]$ 
```

Figure 4.38. Example of ps command usage.

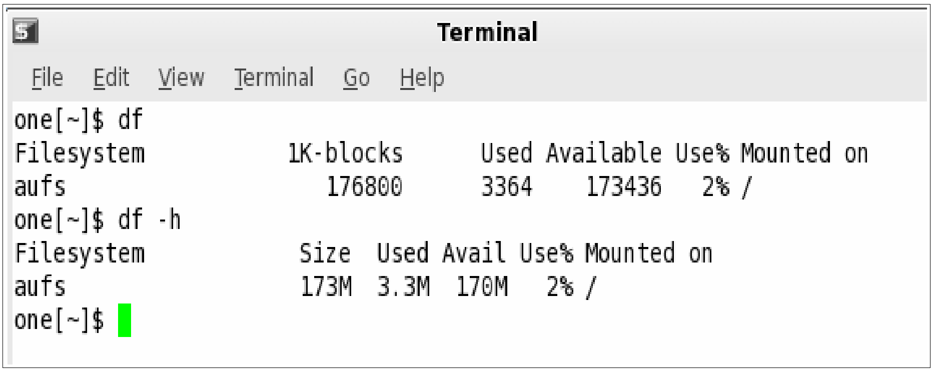
As shown in Figure 4.38, there are several options in ps command. The complete list of the options may be reviewed through command **man ps** in terminal. In the figure there are two (2) processes run by user **one**, namely, **bash with process ID (PID) 3605** and **ps -f with process ID (PID) 3676.**

To stop a running process, we can use **kill** command follows by the process

ID. For example, **kill 3605** will kill the bash process.

- **Checking disk space**

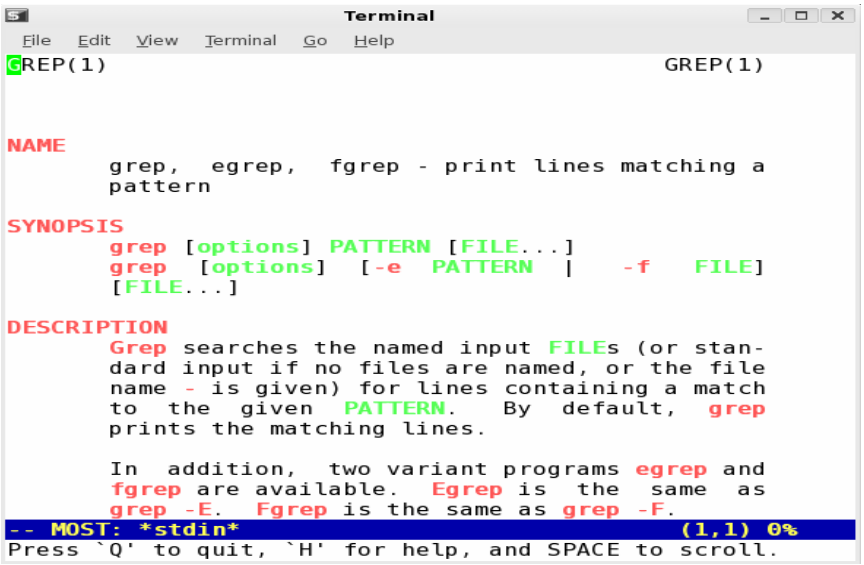
In many cases, we need to know the remaining space on our disk. Figure 4.39. shows the example of df usage to check on disk space.



```
one[~]$ df
Filesystem           1K-blocks      Used Available Use% Mounted on
aufs                    176800      3364    173436   2% /
one[~]$ df -h
Filesystem            Size  Used Avail Use% Mounted on
aufs                  173M  3.3M  170M   2% /
one[~]$
```

Figure 4.39. Example of df command usage.

There are a plenty of CLI in Linux. If you like to know more on the detail options of certain command, please use **man** follow by the command as shown in Figure 4.40.



```
GREP(1)                                              GREP(1)


NAME
       grep,  egrep,  fgrep - print lines matching a
       pattern

SYNOPSIS
       grep [options] PATTERN [FILE...]
       grep  [options]  [-e  PATTERN  |   -f   FILE]
       [FILE...]

DESCRIPTION
       Grep searches the named input FILEs (or stan-
       dard input if no files are named, or the file
       name - is given) for lines containing a match
       to  the  given  PATTERN.   By  default,  grep
       prints the matching lines.

       In  addition,  two variant programs egrep and
       fgrep are available.  Egrep is  the  same  as
       grep -E.  Fgrep is the same as grep -F.
-- MOST: *stdin*                                 (1,1) 0%
Press `Q' to quit, `H' for help, and SPACE to scroll.
```

Figure 4.40 Example of man usage to see detailed options of a command.

4.3.4. Work with GUI

GUI in general will ease the users in using an operating system via a mouse to carry out several orders. There are several functions of a mouse, some of them are:

- One click – to pick an object / file prior to any operation.
- Double click – to execute a command / a file, such as, open a folder and execute a file.
- Right click – to open a menu context as shown in Figure 4.41.
- Drag and drop – to move a file or an object from one place to another place as shown in Figure 4.42.

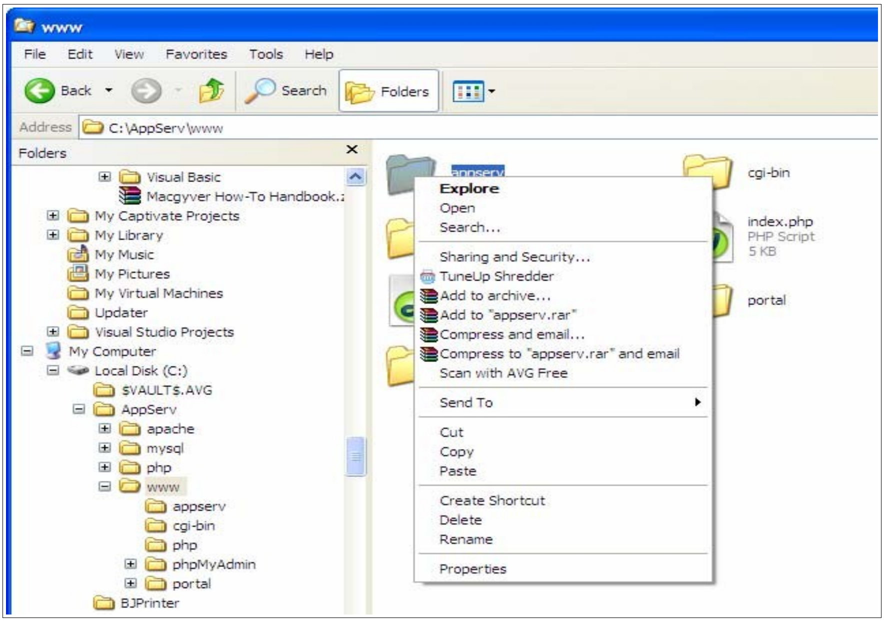
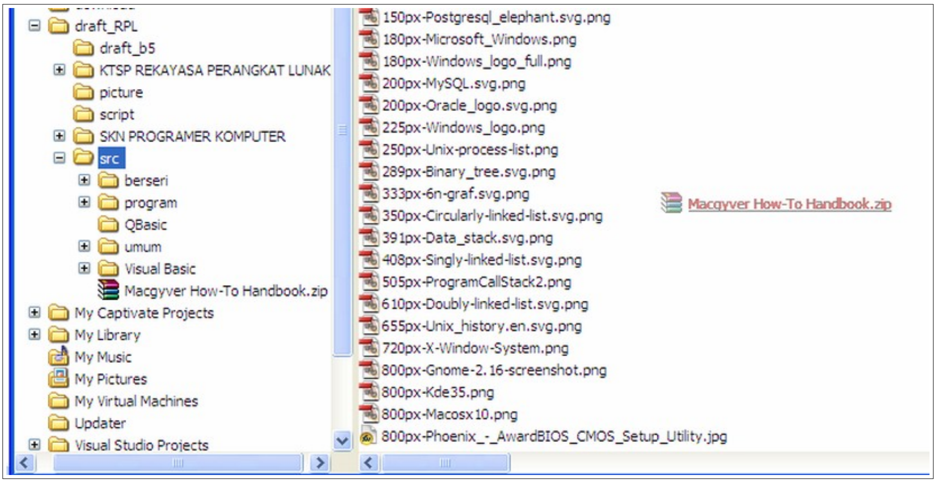


Figure 4.41. Right click to open a menu context.



draft_RPL
draft_b5
KTSP REKAYASA PERANGKAT LUNAK
picture
script
SKN PROGRAMER KOMPUTER
src
berseri
program
QBasic
umum
Visual Basic
Macgyver How-To Handbook.zip
My Captivate Projects
My Library
My Music
My Pictures
My Virtual Machines
Updater
Visual Studio Projects

150px-Postgresql_elephant.svg.png
180px-Microsoft_Windows.png
180px-Windows_logo_full.png
200px-MySQL.svg.png
200px-Oracle_logo.svg.png
225px-Windows_logo.png
250px-Unix-process-list.png
289px-Binary_tree.svg.png
333px-6n-graf.svg.png
350px-Circularly-linked-list.svg.png
391px-Data_stack.svg.png
408px-Singly-linked-list.svg.png
505px-ProgramCallStack2.png
610px-Doubly-linked-list.svg.png
655px-Unix_history.en.svg.png
720px-X-Window-System.png
800px-Gnome-2.16-screenshot.png
800px-Kde35.png
800px-Macosx10.png
800px-Phoenix_-_AwardBIOS_CMOS_Setup_Utility.jpg

Macgyver How-To Handbook.zip

Figure 4.42. Drag and drop.

4.4. WORK IN COMPUTER NETWORK

Today, work in a networked computer is fairly common. Many sites with many computers will likely interconnect it into a network. Thus, basic knowledge in computer networking is very important.

4.4.1. Preparation

There are three (3) important things must be prepared prior to create a connection into computer network that is the hardware, the software and access to the network.

- **Hardware**

  The required hardware would be depend on the type of network connection. To connect to a Local Area Network (LAN) a Network Interface Card (NIC) is needed. The driver software must be installed. To connect to a dial-up connection, a dial-up modem connected to a analog telephone cable is needed.

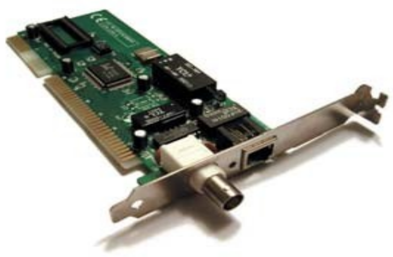


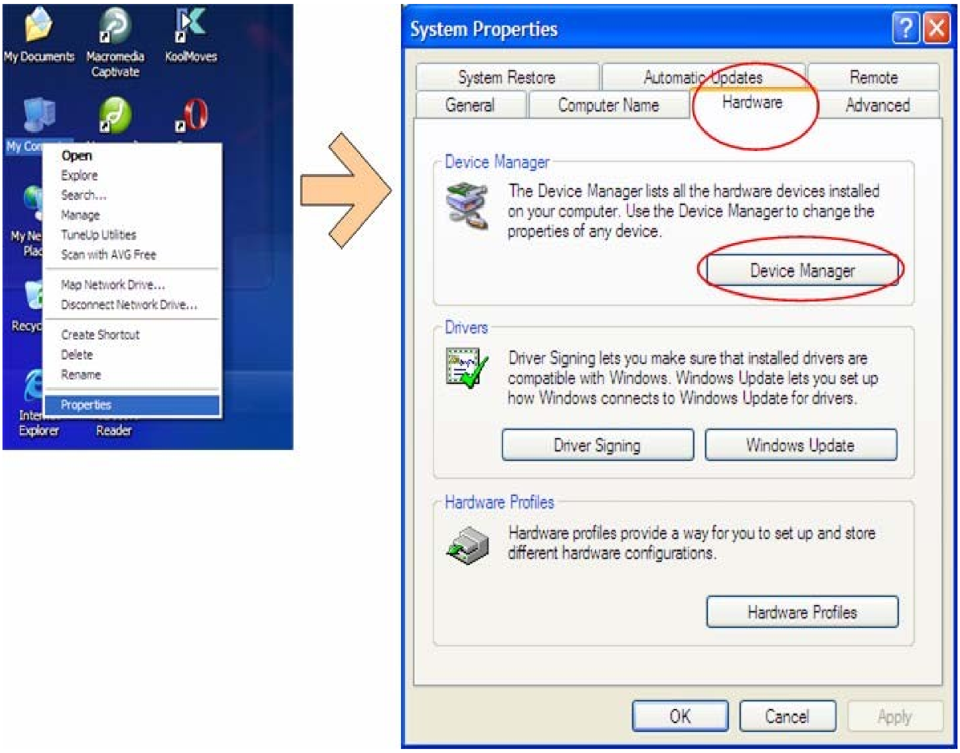
Figure 4.43. Network Interface Card

To see whether the required hardware, such as, NIC or phone modems, is correctly installed, it can be checked though the devices recognized by the operating system.

In Windows operating system, it can be done by right click on the My Computer icon in desktop and select Properties in the menu as shown in Figure 4.44. If we use System properties, select hardware tab and click on Device Manager (shown in Figure 4.44), so that Device Manager windows is emerged as shown in Figure 4.45.

In Figure 4.45 may be seen a network adapter that has been correctly identified by the operating system. A question mark indicates that the hardware is not properly recognized as shown in Figure 4.45.

In Linux family, we check whether a device has been recognized or not by typing **lspci** as shown in Figure 4.46 and **ifconfig**.

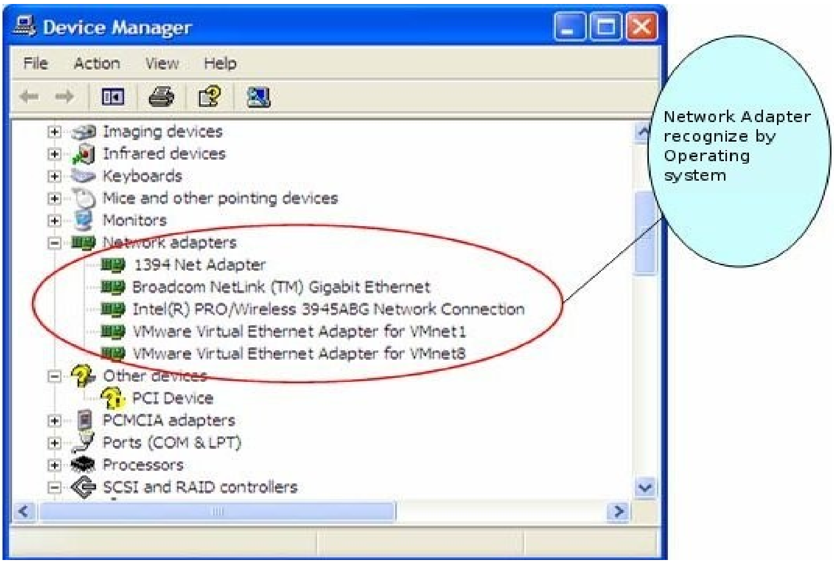


The Device Manager lists all the hardware devices installed on your computer. Use the Device Manager to change the properties of any device.

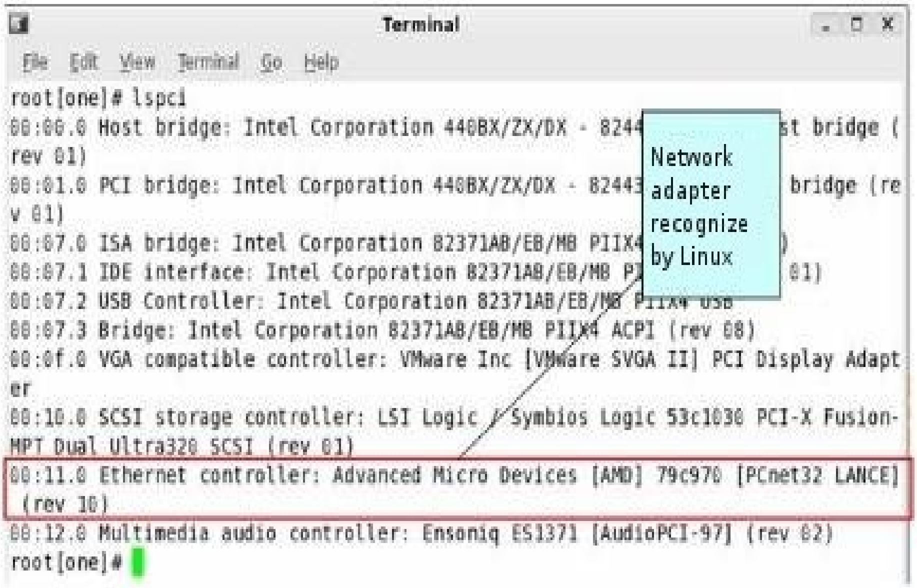
Driver Signing lets you make sure that installed drivers are compatible with Windows. Windows Update lets you set up how Windows connects to Windows Update for drivers.

Hardware profiles provide a way for you to set up and store different hardware configurations.

Figure 4.44. Open System Properties.


Device Manager
File Action View Help
Imaging devices
Infrared devices
Keyboards
Mice and other pointing devices
Monitors
Network adapters
1394 Net Adapter
Broadcom NetLink (TM) Gigabit Ethernet
Intel(R) PRO/Wireless 3945ABG Network Connection
VMware Virtual Ethernet Adapter for VMnet1
VMware Virtual Ethernet Adapter for VMnet8
Other devices
PCI Device
PCMCIA adapters
Ports (COM & LPT)
Processors
SCSI and RAID controllers

Network Adapter recognize by Operating system



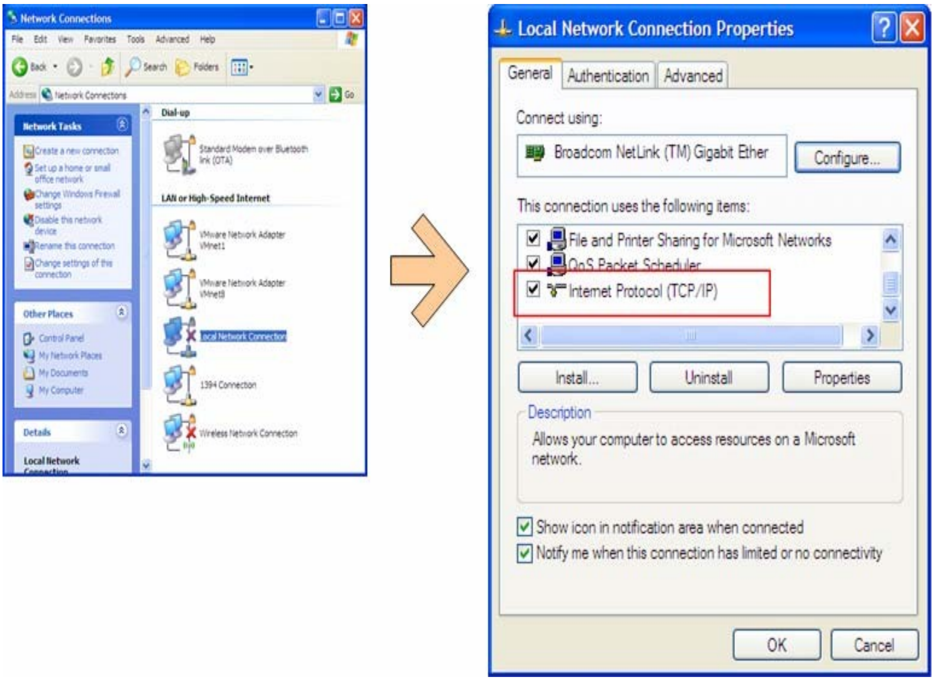
```
root[one]# lspci
00:00.0 Host bridge: Intel Corporation 440BX/ZX/DX - 8244          st bridge (
rev 01)
00:01.0 PCI bridge: Intel Corporation 440BX/ZX/DX - 82443          bridge (re
v 01)
00:07.0 ISA bridge: Intel Corporation 82371AB/EB/MB PIIX4          )
00:07.1 IDE interface: Intel Corporation 82371AB/EB/MB PI          01)
00:07.2 USB Controller: Intel Corporation 82371AB/EB/MB PIIX4 USB
00:07.3 Bridge: Intel Corporation 82371AB/EB/MB PIIX4 ACPI (rev 08)
00:0f.0 VGA compatible controller: VMware Inc [VMware SVGA II] PCI Display Adapt
er
00:10.0 SCSI storage controller: LSI Logic / Symbios Logic 53c1030 PCI-X Fusion-
MPT Dual Ultra320 SCSI (rev 01)
00:11.0 Ethernet controller: Advanced Micro Devices [AMD] 79c970 [PCnet32 LANCE]
 (rev 10)
00:12.0 Multimedia audio controller: Ensoniq ES1371 [AudioPCI-97] (rev 02)
root[one]#
```

Network adapter recognize by Linux

Figure 4.46. Output of lspci command to check on network adapter.

- **Software**

Apart from the operating system, the main software is the TCP/IP package needs to be correctly installed. In Windows operating system, it can be done by double clicking on the connection type, in the properties windows, check if TCP/IP has been correctly installed & configured as shown in Figure 4.47.


Network Connections
File Edit View Favorites Tools Advanced Help
Back Search Folders
Address Network Connections Go
Network Tasks
Create a new connection
Set up a home or small office network
Change Windows Firewall settings
Disable this network device
Rename this connection
Change settings of this connection
Other Places
Control Panel
My Network Places
My Documents
My Computer
Details
Local Network Connection
Dial-up
Standard Modem over Bluetooth link (OTA)
LAN or High-Speed Internet
VMware Network Adapter VMnet1
VMware Network Adapter VMnet8
Local Network Connection
1394 Connection
Wireless Network Connection

Local Network Connection Properties

General | Authentication | Advanced

Connect using:

Broadcom NetLink (TM) Gigabit Ether [Configure...]

This connection uses the following items:

☑ File and Printer Sharing for Microsoft Networks
☑ QoS Packet Scheduler
☑ Internet Protocol (TCP/IP)

[Install...] [Uninstall] [Properties]

Description

Allows your computer to access resources on a Microsoft network.

☑ Show icon in notification area when connected
☑ Notify me when this connection has limited or no connectivity

[OK] [Cancel]

Figure 4.47. Check on TCP/IP protocol.

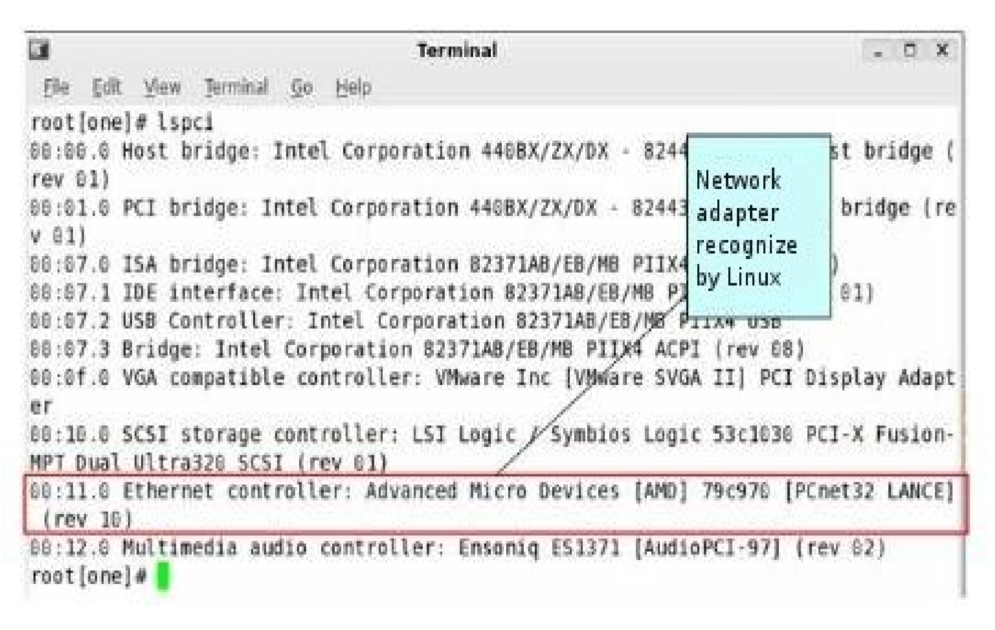
- **Network Access**

  Access to network is related to the right to access the network, specially in getting an IP address and password to join the network. An automatic allocation of an IP address may be possible in a network with DHCP server. However, if there is no DHCP server, one needs to statically configure the IP address by consulting the network administrator.

4.4.2. Configuring network connection.

In today operating system, configuring a network connection is not a difficult task as most of it may be automatically performed by the operating systems. In a LAN with DHCP server, Windows computers (version 2000 or latest), and Linux workstations may be automatically connected to the network and automatically getting the IP address. In Windows operating system, network status may be checked in *systray (notification area)* located in the lower right hand side of the desktop as shown in

Figure 4.48.



```
root[one]# lspci
00:00.0 Host bridge: Intel Corporation 440BX/ZX/DX - 8244          st bridge (
rev 01)
00:01.0 PCI bridge: Intel Corporation 440BX/ZX/DX - 82443          bridge (re
v 01)
00:07.0 ISA bridge: Intel Corporation 82371AB/EB/MB PIIX4          )
00:07.1 IDE interface: Intel Corporation 82371AB/EB/MB PI          01)
00:07.2 USB Controller: Intel Corporation 82371AB/EB/MB PIIX4 USB
00:07.3 Bridge: Intel Corporation 82371AB/EB/MB PIIX4 ACPI (rev 08)
00:0f.0 VGA compatible controller: VMware Inc [VMware SVGA II] PCI Display Adapt
er
00:10.0 SCSI storage controller: LSI Logic / Symbios Logic 53c1030 PCI-X Fusion-
MPT Dual Ultra320 SCSI (rev 01)
00:11.0 Ethernet controller: Advanced Micro Devices [AMD] 79c970 [PCnet32 LANCE]
 (rev 10)
00:12.0 Multimedia audio controller: Ensoniq ES1371 [AudioPCI-97] (rev 02)
root[one]# 
```

Network adapter recognize by Linux

Figure 4.48. Network connection status.

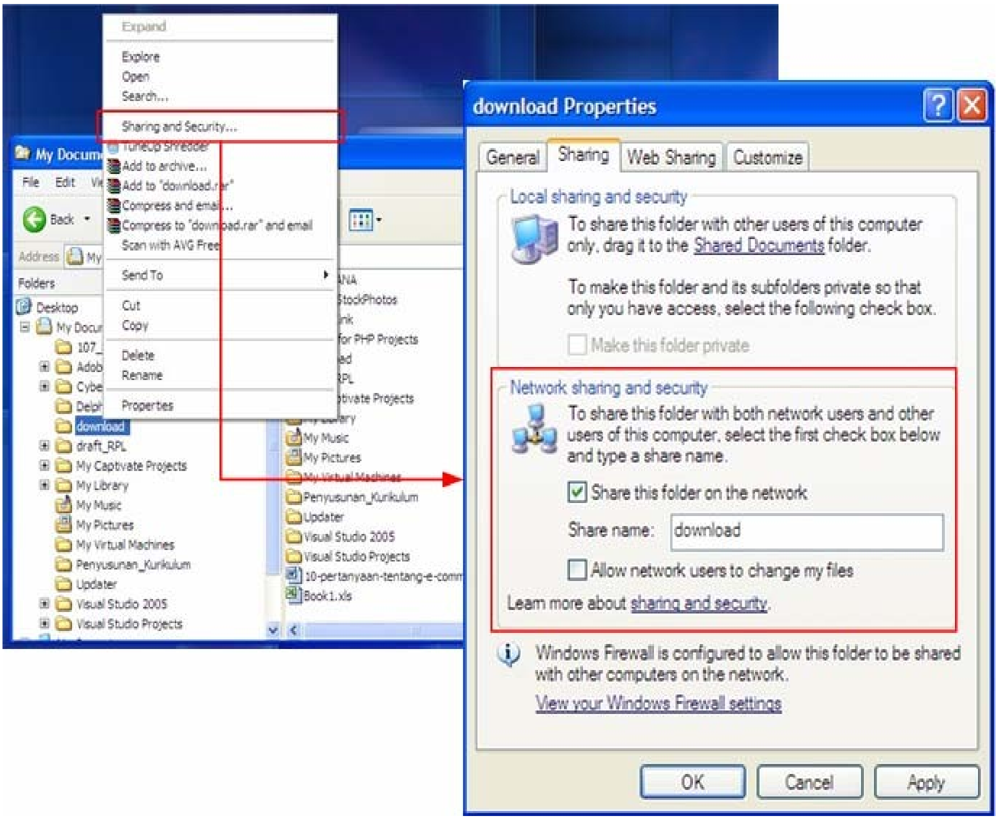
4.4.3. File, printer and resource sharing

Main advantage of having a computer network is resource sharing, such as, file, printer, media (CD-RW or DVD-RW), scanner etc. In this section, file and printer sharing will be explained. Other resources may also be shared in fairly similar manner as file or printer.

- **File sharing.**

  Directories and files in our computer may be shared in the network to be accessed by other computers vice versa.

  To share a directory or a file in Microsoft Windows, the following stages may be used. Firstly, open the **Windows Explorer**, right hand side button click on the directory or file that we like to share and select **Sharing and Security.** In **Properties** windows select **Sharing** tab and in **Network sharing and security** check on **Share this folder on the network** and set the name of the shared directory as shown in Figure 4.49.



Local sharing and security

To share this folder with other users of this computer only, drag it to the Shared Documents folder.

To make this folder and its subfolders private so that only you have access, select the following check box.

□ Make this folder private

Network sharing and security

To share this folder with both network users and other users of this computer, select the first check box below and type a share name.

☑ Share this folder on the network

Share name: download

□ Allow network users to change my files

Learn more about sharing and security.

Windows Firewall is configured to allow this folder to be shared with other computers on the network.

View your Windows Firewall settings

Figure 4.49. Managing File Sharing.

To be able to access a directory or files in other computer, we could use Windows Explorer, click on My Network Places -> Entire Network -> Microsoft Windows Network. We should find something like in Figure 4.50. From the Windows Explorer we can browse the shared resources on other computer on the network by clicking on the computer name.

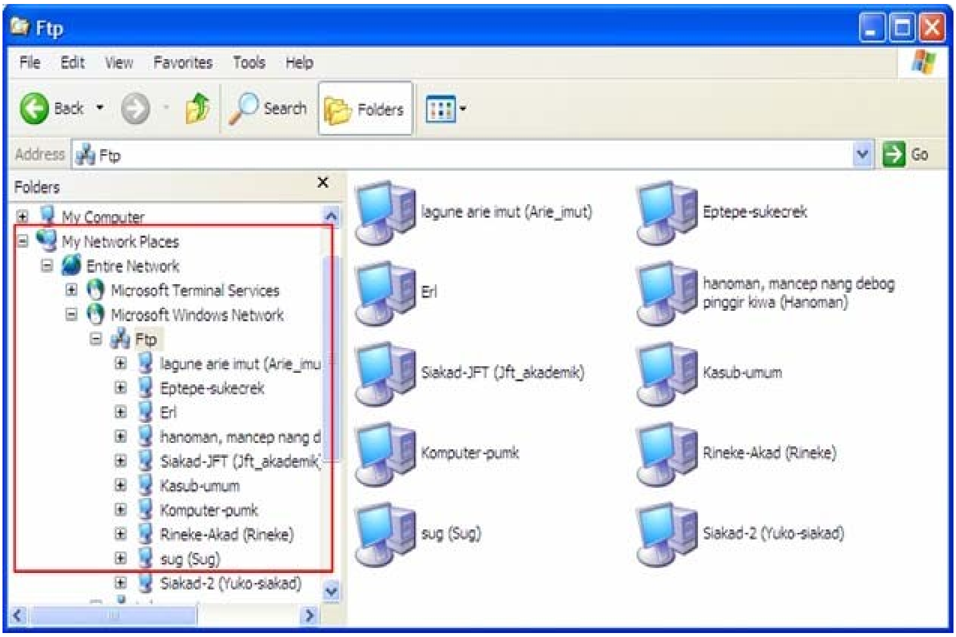
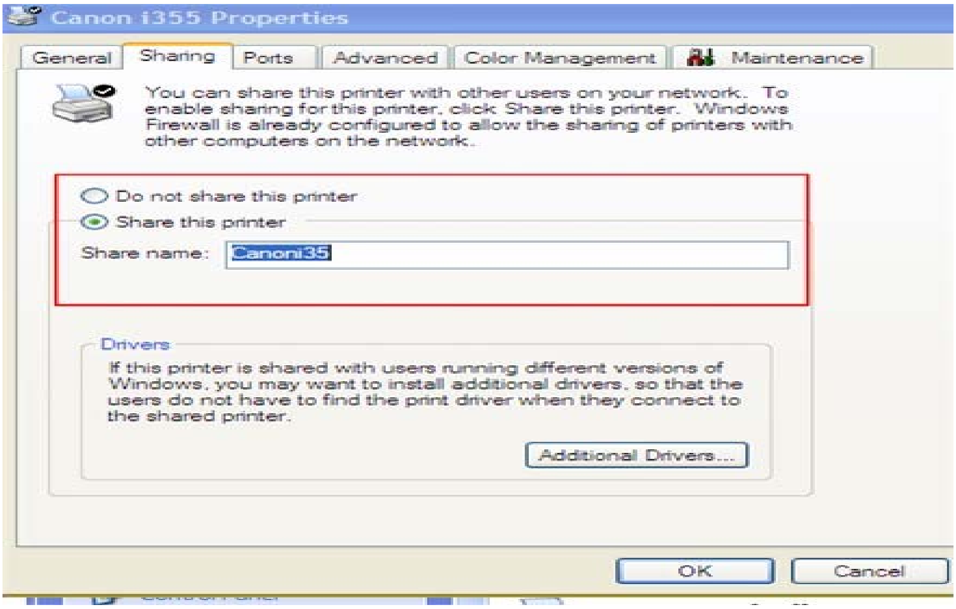


Figure 4.50. Browsing the computers on the network.

- **Printer sharing**

To share a printer on our computer, we need to do a fairly similar procedure as file sharing. Firstly, we need to open Printers and Faxes window through the following sequence Start -> Settings -> Printers and Faxes. After the window is opened, right click on the printer and select Sharing. After Properties windows is opened, select Sharing tab and click on Share this printer and provides the name of the shared printer as shown in Figure 4.51.



You can share this printer with other users on your network. To enable sharing for this printer, click Share this printer. Windows Firewall is already configured to allow the sharing of printers with other computers on the network.

○ Do not share this printer

● Share this printer

Share name: Canoni35

If this printer is shared with users running different versions of Windows, you may want to install additional drivers, so that the users do not have to find the print driver when they connect to the shared printer.

Figure 4.51. Printer sharing.

4.5. SUMMARY

- Operating system is the software that manages resource usage in a computer and provides user interface to access the resources.
- Operating system provides user interface, manages memory, files, processes and input / output.
- BIOS main function is to identify and recognize computer hardware and peripherals.
- There are several known operating system, namely, DOS, Windows, Mac OS, UNIX and Linux.
- Every operating systems must be installed prior to its usage.
- Operating system may use text based command or GUI depending on its configuration and facilities.

4.6. EXERCISE

1. Explain the term operating system.

2. Elaborate the functions of an operating system.

3. Describe the booting stages of a computer?

4. Please try to install one of Linux distro on a computer and observed the installation process. Compare the Linux installation process to Windows installation process. Describe the difference between the two installation processes?

5. Try to boot to Linux operating system, observes the booting process and compares to Windows booting process. Describe the difference?

6. Operate Linux operating system, open a terminal. Do a series of command using ls, cd, find, cat, cp, mv and mkdir. Take note what you find during the processes.

7. A file has the attribute **--rw-r -- r --** and owned by user rony. Describe the meaning of that particular artibute. How to configure so that other users have the right to read and write to that particular file?