

Introduction to  
Computer Fundamentals  
and  
Information Technology  
(Series 1 – With Simple Visual Basic 2008 Jumpstart)

Copernicus P. Pepito

## Dedication

To Tara B. Williams, my true north, south, east and west...joke.  
This book is also heartily dedicated in loving memory to Dean Michelle Diaz-Navarro  
who died without seeing this book in person (But I know you saw this book in spirit,  
Dean Mitch! Thank you for being a good friend and boss to me...seriously speaking.)

## Acknowledgement

From the bottom of my heart, I am so grateful to have a mom like you, Mama Glo. But you passed away so soon, leaving your family in great pain and agony. Your best encouragement that tells me to keep on writing books, still echoes in my mind. That encouragement sustains me to live my life happily, again.

I would like to express my heartfelt gratitude to Ms. Letty Custodio of National Bookstore - Purchasing Department who is very instrumental to the success of my books. Without her uncommon understanding and patience that are so rare to most human beings, my books could not have been written.

I am very thankful also to Madam Zeny Alulod of Cacho Hermanos Publishing, for the heart-to-heart talks and to Ms. Lyn Francisco of National Bookstore – Accounting Department whose inspiring words (based on biblical wisdom) can never be forgotten .

Well, if there is someone who motivated me to be brave in expressing myself through written-words, she was no other than my beloved grandmother, Dr. Roberta Pepito. Her editing-style made me feel very confident about my English-grammar proficiency (eventhough, I'm not good at it - honestly speaking!). By the way, I have other grandmother who taught me to be caring and loving, by being caring and loving herself - Lola Bening Prietos. And grandfather too, who taught me a lot of wisdom in his own little way – Lolo Ciano Prietos.

Lastly, I give thanks to our Almighty God who unceasingly poured out a lot of blessings to me, and whose plan to my life and the lives of my loveones I cannot questioned, and who answered my questions about life, trials, and death through the books written by His servants.

## About the Author

**Copernicus P. Pepito** is formerly an Assistant Professor of AMA Computer University – Quezon City Campus for 11 years and presently an Instructor and Training Consultant of Mapua IT Center – Makati Campus. He holds 4 degrees: Bachelor of Science in Computer Science (BSCS), Bachelor of Science in Computer Engineering (BSCoE), Master of Science in Computer Science (MSCS), and Master in Business Administration (MBA). Professor Pepito earned 7 international certifications in computer: Cisco Certified Network Associate (CCNA), Cisco Certified Academy Instructor (CCAI), Microsoft Certified Professional (MCP), Microsoft Certified Systems Administrator (MCSA), Microsoft Certified Database Administrator (MCDBA), Microsoft Certified Solution Developer (MCSD), and Microsoft Certified Systems Engineer (MCSE). Professor Pepito is an author of 9 computer books, all of which are published by National Bookstore.

## Preface to the First Edition

“Power comes not from knowledge kept, but from knowledge shared.”  
-Bill Gates

Hello out there! This book is written, because deep in my heart and soul, I'm craving to share the knowledge I learned about computers. As a teacher, I felt this urge to extend my classes from the four corners of my classroom to the far-reaching part of the Philippine archipelago. Invading every classroom, every library, and every home. I'd like to imagine that this book would be read by thousands of students with great interest and enthusiasm. I want them to enjoy reading the way I enjoyed writing it. This is my message to all students in Introduction to computer class, “our adventure to learn about computer has just begun”. Well, what can I say more, but: bon voyage, adventurer!

This is a common overheard statement: “there is nothing constant in this world but change”. I believe that this one is true with computers. Every year, we heard and read news about new computer models, new software versions and releases. We even wonder if what we have learned today can still be applied for tomorrow's technology.

As a matter of honesty, we even got discouraged and felt inferior to other high-tech countries like the U.S.A., Japan, and some other parts of Europe. We feel as though we cannot catch up with their technological advancement.

I know this because I feel also the same. This book is written as an attempt to playing “catch up” with the modern trends of information technology in the whole world. I feel that as a teacher in computer science, I have the responsibility to help in elevating our computer literacy-level through research with the different available resources at hand, and compile them into a book ready to be read and learned by the Filipino youth.

I see another obstacle to our learning endeavor. This is about the high cost of computer books nowadays. In other words this book is designed to be updated as possible in terms of technological trends and as affordable as possible in terms of price or cost of ownership. I could express it in these words: “This book is written by the heart and soul of a teacher whose very intention is to help and share, withholding nothing, not even his very intimate secret. Dare? Enjoy!

## I Believe

I firmly believe that computer fundamentals should embrace the past, present and future of information technology. Otherwise, we fall short of how computer evolves completely. Serving in the field of computer studies, I have the responsibility to build a bridge to link this past, present and future of computer revolution. And I'm hoping that those students who would like to pass on this bridge could be able to see the whole picture of what the computer is all about. Then next, how the computer enriches our lives and what to expect in the near future about its never-ending evolution. This book is written for the purpose of building that bridge.

Reading this book is your journey starting from the past, then to the present and to the future. I'd like to end this preface by quoting Microsoft's corporate motto: "Where do you want to go today?". My answer is: to SM (ShoeMart) watching movies and doing some window-shopping. That is how I spend my leisure time, most of the time. Very simple, very normal. But I have a dream.

Copernicus P. Pepito  
AMA Computer University  
Quezon City Campus

## Preface to the Second Edition

This is the first book I published under National Bookstore. I am so very happy and thankful that thousands of Filipino students were patronizing the books I wrote. I cannot think of other ways to share with you what I learned in the best way I can, but only through writing a book like this. I could be not your Instructor inside your classroom, but I am, in the other way around, for I write this book which primary purpose is to extend the four corners of my classroom at AMA Computer University – Quezon City campus (and now at Mapua IT Center - Makati Campus) to the far-reaching part of the Philippine archipelago.

I felt honored and fulfilled to received an e-mail from a student in Camiguin Islands (somewhere near in Cagayan De Oro, Mindanao) asking for help about her subject in programming. I didn't expect that such a far away place, my book was read by a student like her who was eager to learn.

I am hoping that this second edition will add more to your basic knowledge in computer and provides you an insights about Information Technology (IT). Have a happy day learning IT now!

Copernicus P. Pepito  
Mapua IT Center  
Makati Campus

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# Chapter 1

## Introduction

“Information Technology makes many things possible  
but it is only education that makes things happen.”  
-Bill Gates

### What's New with this New Edition

If you have read my previous book's edition, you can really feel the well-added improvement when it comes to topics, figures, pictures and images. What is more noticeable is that in the first edition, no pictures or images can be found. It is purely text and figures and line drawings and symbols. In this new edition, pictures and images are its main offering. I am also a believer of a common overheard statement, that “a picture can speak a thousand words,” or something like it. To make it a practice in my book writing endeavor, I will adhere to such old wisdom of the times. Here are the summary of the added exciting topics on this new edition:

- well-researched pictures and images
- more history of the computer revolution in terms of hardware, software, and networking technologies
- more predictions of the future computer technology
- mathematical, relational, and logical expressions (or equations) discussions are included with examples and laboratory exercises
- subroutine (subprogram) example in flowcharting and algorithm is also included and discussed
- additional significant discussions on the basics of hardware, software, and networking technologies,
- two chapters added - the first one is the “Business at the World Wide Web” and the next one is about “Basic Computer Security”

#### Note:

This second edition's revision and updates is mainly based on the latest book written by Peter Norton (principal developer and creator of Norton Anti-Virus and Utilities) entitled “Introduction to Computers”. So, if you find this new edition as something more “meatier” than the first edition, it is because this book stands in the shoulder of a giant.

## Why We Study Computer

We can accomplish many tasks in using this most amazing machine called “computer”, whether you are working on your case study, term paper or thesis written in Microsoft Word. This is in the case of the students. In the case of the teachers, they are using spreadsheet application software such as the Microsoft Excel to compute the grades of their students. Seminar and conference speakers are presenting their topics animatedly in the LCD (Liquid Crystal Display) Projector using Microsoft PowerPoint.

Let us go to the company on how they use computer to enhance their office-work productivity. The Sales Manager in the company is using the Microsoft PowerPoint for his or her sales report presentation. An office secretary is using the Microsoft Word to type the company’s circular memorandum.

How about other professionals? Are they too used the computer to enhanced their productivity? Let us see if they are. Architects are using **Autocad** software to design buildings and houses. Combat pilots are using computer to simulate and practice landing an F14 fighter plane on the deck of an aircraft carrier.

This time, we have to go to some business establishments. Banks are using Automated Teller Machine (ATM) so that we can withdraw anytime or anywhere we want. Remember that an ATM is 100 percent computer, nothing less. Airlines and shipping companies are using computer for their **online reservation systems** so that we can book our flight online and anywhere conveniently.

How about for the small people? Are they too enjoyed the many things a computer could offer? Yes, indeed! Today’s children are enjoying playing their favorite computer games.

Imagine, all of these are made possible because we have this computer technology. What we are discussing here are but just a tip of an iceberg of what the computer can do for us to enjoy life. There are actually hundreds of reasons why we have to study computer for our own good. I cannot remember them all. But I am sure you have already a lot of reasons of your own to add on the listed reasons above which I had previously presented.

## So, What Is A Computer

A **computer** is simply an electronic device that processes data, converting it into meaningful information that becomes useful to us. Any computer, regardless of its type or category, is controlled by the software that tells it, what it has to do. This software serves as the instructions to make the computer run.

### Note:

For technical reason, this book’s title did not contain the words “Second Edition”. One of the reasons being considered is its new title; since the old title is “Introduction to Computer Fundamentals: Concepts and Applications”, while the new edition is titled with “Introduction to Computer Fundamentals &

Information Technology". Furthermore, the new edition is a major revision that doubles the pages of the first edition. Aside from many added topics to almost all chapters and with enhanced discussions, another chapters were added to offer more important topics to the student most especially in the area of the World Wide Web and basic computer security.

## History Of Computers At A Glance

A long, long time ago (not in a far distant galaxy), humans had invented **abacus**. An Arabic number system that is used for calculation. But out of more human needs, abacus can no longer satisfy the new demands for highly complicated and repetitive tasks of calculations. This new demand had prompted the humans to invent more calculating tools. And to make it short, one of these, is the computer.

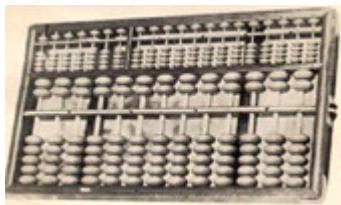


Figure 1.1 An Abacus

The following are the important landmarks of the early computer revolution:

### Computer Revolution: Timeline (From 1930's To 1960's)

-1939

- A German engineer **Konrad Zuse** invented the first general-purpose computer.
- An American professor John Atanasoff of the Iowa State College (now a university) invented the first electronic computer called the **Atanasoff-Berry** Computer (ABC).

-1940's

- Harvard University professor Howard Aiken invented the automatic general-purpose calculator called **Mark I** in 1944 which in turn was financed by the International Business Machine (IBM).
- John Mauchly and Presper Eckert invented the **Electronic Numerical Integrator and Computer (ENIAC)** that was used in World War II to calculate trajectory tables for new guns. When the World War II was over, Mauchly and Eckert developed the **UNIVAC 1**, the first general-purpose commercial computer. (This was used by the U.S. Census Bureau in 1951).

The UNIVAC 1 was considered as the first generation of computers that was built using **vacuum tubes**.

-1948

- The three physicists at Bell Laboratories – J. Bardeen, H.W. Brattain, and W. Shockley invented the **transistor** that could perform and accomplish the same function like the vacuum tube. Transistors were first used to build computers in 1956. This is the beginning of the computer's second generation.

-1960's

- In mid 1960's transistor-based computers were replaced by smaller and more powerful third-generation computers built around the concept of **integrated circuit (IC)**. The IC is a technology that integrates hundreds of transistors in one single tiny similar chip.

-1965

- In 1965, the first home computer is introduced by Honeywell Corporation in the United States. It is called the "**H316 Kitchen Computer**".

-1969

- In 1969, the first **microprocessor** (the brain of the computer) was first invented. This invention was considered the beginning of the fourth generation of computers.

## Computer Revolution: Timeline (In 1970's)

-1970's

- In mid 1970's, **Apple**, **Tandy**, and **Commodore** computer companies had introduced the first low-cost computers that are considered as powerful as many of the room-sized computers in early 1950's and 1960's.

-1971

- In 1971, the world's first commercially available microprocessor (the brain of the computer) was designed and created by **Dr. Ted Hoff** of Intel Corporation. It is originally designed for use in calculator that paves the way in its use in computer. At the same year, **Steve Wozniak** (co-founder of Apple Computer) together with his colleague **Bill Fernandez** design and create a computer which they called Cream Soda Computer. They named it after they had drank Cragmont cream soda during the construction of the computer.

-1972

- In 1972, the **5.25 floppy disk** (diskette) is first introduced in the market. This limited storage device makes it easy to transfer data, program, or any software from one computer to another. Today, computer users are typically using a USB Mass Storage Device (Thumb Drive or Flash Drive) to move their data, program or software anywhere, anytime.

-1973

- In 1973, the **hard disk** as mass storage device was introduced by IBM Corporation. It is originally designed to hold 70 MB of data. Today's hard disk is over 160 GB in capacity.

-1974

- In 1974, Intel Corporation and Motorola Inc. introduced an **8-bit micro-processor** with **64 KB of RAM** memory and runs a speed of 2 MHz. Today's microprocessor is a 64-bit, with 2 GB of RAM and runs over a speed of 2.3 GHz.

-1975

- In 1975, the first commercially available Personal Computer (PC) called Altair was introduced in the United States.

-1976

- In 1976, the first **Apple I** computer was designed and marketed by the founders of Apple company: **Steve Jobs** and **Steve Wozniak**. Their company Apple, Incorporated was established and named it after their favorite snack food.

-1978

- In 1978, the **Epson** company introduces their first dot-matrix printer with model number MX-80.

## A Short History Of Calculating Machines

Before computers came into existence, there were already calculating machines invented. If computers can be compared to lions and tigers, then these early machines are the dinosaurs. Like the dinosaurs, they were extinct. Their flesh and blood were long gone (as well as their usefulness) but their skeletons remained. Maybe to remind us, that they exist a long, long time ago and worth remembering as part of our past, part of our history. Now let us travel back in time (with our time machine?).

In 1642, **Blaise Pascal** a French mathematician and philosopher invented an adding machine called "Pascaline". His concept and design was used and adapted by the mechanical calculator inventors in the early 20<sup>th</sup> century.



Figure 1.2 The Pascaline



Figure 1.3 Blaise Pascal Pictures

In 1830, **Charles Babbage** an English mathematician invented the “Difference Engine” that would solve certain equations. After the British government withdrew its financial support to his project, he later conceived the idea to invent the “Analytical Engine” which he hoped would perform many kinds of calculations. His idea embodied the five key features of our modern computer today: an input device, a place for storage, a processor, a control unit, and an output device. This invention earns him the title “Father of Computer”. After Babbage’s death, his son was able to design and construct the analytical engine based on his model. Charles Babbage has a colleague in his work with the analytical engine. Her name is **Augusta Ada Byron**, a gifted mathematician who helped him develop the instructions for doing computations on it. She is a daughter of the English poet Lord Byron, and later become the **Countess of Lovelace**. Because of her close association with Babbage and her publications of notes about his work, she was named “the first computer programmer”.



Figure 1.4 The Difference Engine

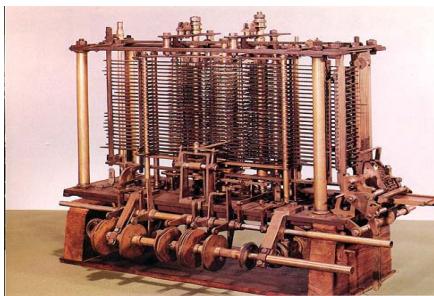


Figure 1.5 The Analytical Engine

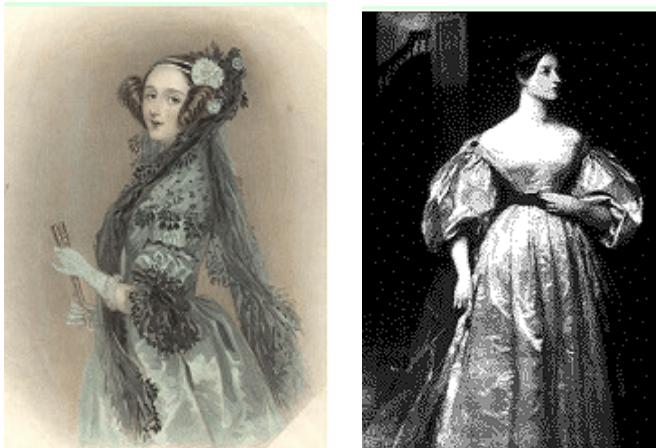


Figure 1.6 Augusta Ada Byron Pictures

In 1890, **Herman Hollerith** devised a punched-card tabulating machine. His invention was used to tabulate the 1890 U.S. census. Six years later, he founded the Tabulating Machine Company. Then five years afterwards, his company was merged with several companies and form the Computing–Tabulating Recording Company. **Thomas J. Watson Sr.**, the company's general manager changed its name to **International Business Machine (IBM)** in 1924. Today, IBM is still one of the world's biggest and largest computer company.

## The Computer Age Generation

Within the span of 40 years, we leap-frog through five generations of computer technology. The subsequent generations are defined here briefly.

### **First Generation Computer (1951-1958) : The Age of Vacuum Tube**

The vacuum tubes were used as the internal components for the first generation computer. The first generation of computers begun with the introduction of the first commercially viable electronic computer: the UNIVAC I. The short term for the

Universal Automatic Computer. The UNIVAC I was designed and patterned after the ENIAC (an acronym for Electronic Numerical Integrator and Calculator).

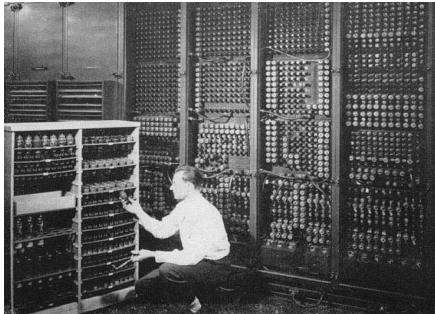


Figure 1.7 The ENIAC



Figure 1.8 Vacuum tubes

### **Second Generation Computer (1959-1964) The Age of Transistor**

The **transistor** was used as the internal components of the second generation computer. Transistors were much smaller, faster, and reliable than vacuum tubes. They consumed less electrical energy and needed no warm-up time.

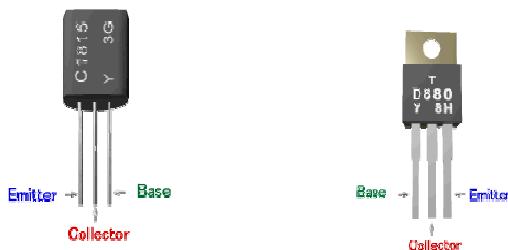


Figure 1.9 The Transistors

### **Third Generation Computer (1965-1970) : The Age of Integrated Circuit (IC)**

In 1965, integrated circuits began to replace transistors as the internal components used to construct the computer. Even the entire circuit board of transistors can be replaced completely with one chip (integrated circuit). This chip can be much smaller

than one transistor. Integrated circuits are made of silicon chip. A **silicon** is a semiconductor crystalline substance that can conduct electric current.

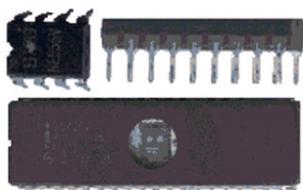


Figure 1.10 The Integrated Circuits (IC)

#### **Fourth Generation Computer (1971-present) : The Age of Microprocessor**

The fourth generation is just an extension of the third –generation technology. This next technological development is to put more power and capabilities in one chip called **microprocessor**. Microprocessor is considered as the brain of the computer. It is where almost all computations and operations of the computer circuitry are being done and coordinated. The application of microprocessor technology is not limited to computers alone. It can be used and applied for digital watches, pocket calculators, copy machines, television sets, cars, audio and video appliances.



Figure 1.11 The Microprocessors (Brain of the Computer)

#### **Fifth Generation ( Onward) : Information Superhighway**

The Japanese coined the term fifth generation computer to describe their plan to build a powerful computer by mid-1990's. Later the term evolved to encompass computer intelligence: artificial intelligence, natural language, and expert system. However, the fifth generation's focus is more on connectivity. This is to permit computer users to connect their computers to other computers. Like the way that happened with the Internet today. Can the Internet be the precursor of Information Superhighway? Who can tell?

### **The Computer Today**

Today, there are many types of computers which the people are using and talking about. Let us now know and learn their different categories:

## Mainframes and Minicomputers

Even today, large companies are still using computers for massive computing tasks and to utilize their big investments on these expensive room-sized machines. These mainframes are housed inside an air-conditioned room in big companies to keep them in good working condition. That's the reason why most of us have not seen them, personally.

Even-though most of the people are not aware of their existence, most of us are really using them indirectly and benefiting from their power and capability. Like for example when we are withdrawing money from an ATM (Automatic Teller Machine) or depositing money in our bank accounts. Big and large banks are still utilizing their **mainframe computer** for their banking operations, though these banks are using PCs (Personal Computers) at the same time for their other daily transactions.

Minicomputers are also like mainframes, though they are smaller and less expensive compared to mainframes. However, they are less powerful than mainframes but more powerful than personal computers . In today's present technology, this description can no longer be true. The new breed of Personal Computes (PCs) which are called high-end **network servers** can surpass the power and capabilities of minicomputers in terms of speed, accuracy and reliability.



Figure 1.12 Mainframe computer

## Personal Computers and Workstations

As the name implies, **Personal Computer (PC)** is for single or personal use by a certain individual. Most of the computers that we see and read about today are under this category. They are almost everywhere, from the comfort of our home to every office of a well-established company. When the personal computer is connected to a main computer called “server” (to form a network), it is called a *workstation*.



Figure 1.13 Personal Computer (PC) and a Flat-screen

**Note:**

Personal computer is also called *microcomputer* and *desktop computer*. The PC is also called microcomputer since it is smaller than the minicomputer in terms of its size and weight. It is also known as desktop computer, because PC always sits at the top of the desk.

## Laptop Computers and Pocket PCs

In late 1980's portable computers were approximately 20-pound suitcase look-alike with fold-out keyboards and small TV-like screens. They are called portable, because we can carry them from one place to another. Today, those portable computers were replaced by flat-screen and battery-powered **laptop computers**. They are so light and handy enough to rest in our lap while we are working with our company memo, budget estimates or simply our e-mail to be sent when we get our Internet connections in the office or at home. In our present trend, the typical laptop is called **notebook computer** that weighs much less and can be carried like a book.

Not only that, the **palmtop computers** (hand-held) are the fast emerging type of portable computers now. They are small enough to be put into a jacket's pocket. Generally, portable computers are more expensive than their personal computer (desktop) counterparts.

The next big wave in portable computers is the **Pocket PC** such as the famous Palm Pilot PC. Have you seen them in the latest computer magazine today? Or to your favorite computer store?



Figure 1.14 Laptop and Palmtop computers

## Supercomputers

The supercomputer like **Cray 1** generates data for aerodynamics research using computational fluid dynamics. Supercomputer primarily used for scientific research that involves with the manipulation of highly complex mathematical data and equations. These data requires trillions of operations to resolve.

Physicists use supercomputers to study and analyze the results of explosions of nuclear weapons which are presently being tested. Meteorologists use supercomputers to analyze and study the formation of tornadoes. Scientists and engineers are using supercomputers to sort through, analyze, and interpret mountains of seismic data gathered during oil-seeking explorations. There are only few hundred supercomputers presently used in the whole world today.



Figure 1.15 Supercomputers

## Embedded and Special Purpose Computers

There are computers that are made for a special purpose. They perform specific tasks such as controlling the temperature and humidity in a big building offices, and to monitor the heart rate of patients in the hospital. Embedded computers can be found in almost all electronic consumer goods: game machines, video player, phones, stereos, ovens, and in some parts of automobile's electronic systems. Yet, we didn't know that they are inside on that electronic devices we are using in our day-to-day living.

We may wonder how this embedded computers are being put inside our stereos, video player, or phones. Do they have keyboards, mouse, monitor, and disk drives? No, they haven't. What they have are the capabilities of performing tasks which are similar to personal computers. These embedded computers are usually built-in to a chip (integrated circuit) with a special-purpose program inside it. This program inside performs the task such as temperature control and heart rate monitoring. In other words, they are a combination of hardware (the IC) and software (the program) in one microprocessor-like packaged chip. The program inside it is technically called **firmware**.

## Computers for the People like Us

These are the types of computers that we are using personally:

- Personal Computer (PC) or Desktop computer
- Laptop Computer or Notebook computer
- Smart Phone or Handheld computer

**Handheld personal computer** is a computing device that is small enough to fit in our hand. A popular type of handheld PC is the Personal Digital Assistant (PDA). It is a small appointment book and is normally used for special applications, such as taking notes, displaying phone numbers and addresses and keeping track of dates or agendas.

**Smart Phone** is a cellular phone with advanced features such as an Internet Web surfing capability and access to e-mails, as well as a personal organizer at the same time.

## Computers for the Company

- Mainframes and Minicomputers (Midrange)
- Supercomputers
- Network Servers

**Network Server** is usually a powerful personal computer with powerful software and peripherals that enables it to function as the primary computer in the network. Workstations that are used by the employees in the company are usually connected to the network server which served as the central main computer. Most of the company's resources are stored to this main computer, that is why the employee can use any workstation in any department to access their files or folders or any information they need anywhere they are in the company premises.

## Computers Are All The Same

Have you heard someone who is angry about men's promiscuous affair? That particular woman would surely say (at the top of her voice), "All men are the same!". But before we go on with this battle of the sexes, let us apply that to the computer. As you will learn later on, all computers regardless of their types, categories, sizes, or specific functionalities – they are basically the same. Why? Because all of them are made up of the same basic components or parts, such as every computer has a CPU, memory, motherboard, adapter cards, and so on. Plus, they can only run if they have the needed software that instructs them to accomplish a certain task.

By the way, if you would ask me if I agree with what that cheated woman said at the first sentence of this paragraph, frankly speaking, I don't. Why? Because some men are not really a cheater by nature or by design, they are but just "only human". Born to give-in to temptations, and so weak to resist or fight back the feeling...or whatever it is. Or probably they forgot that they are married, happily married (what an excuse, this excuse, forgive me, is only mine, and mine alone). Joke, only.

## Did You Know That?

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### Even Great Scientist Needs Recognition and Appreciation Too!

( Charles Babbage – In His Own Words)

"I have sacrificed time, health, and fortune, in the desire to complete these Calculating Engines. I have also declined several offers of great personal advantage to myself. But, notwithstanding the sacrifice of these advantages for the purpose of maturing an engine of almost intellectual power, and after expending from my own private fortune a larger sum than the government of England has spent on that machine, the execution of which it only commenced, I have received neither an acknowledgment of my labors, nor even the offer of those honors or rewards which are allowed to fall within the reach of men who devote themselves to purely scientific investigations..."

If the work upon which I have bestowed so much time and thought were a mere triumph over mechanical difficulties, or simply curious, or if the execution of such engines were of doubtful practicability or utility, some justification might be found for the course which has been taken; but I venture to assert that no mathematician who has a reputation to lose will ever publicly express an opinion that such a machine would be useless if made, and that no man distinguished as a civil engineer will venture to declare the construction of such machinery impracticable...

And at a period when the progress of physical science is obstructed by that exhausting intellectual and manual labor, indispensable for its advancement, which it is the object of the Analytical Engine to relieve, I think the application of machinery in aid of the most complicated and abstruse calculations can no longer be deemed unworthy of the attention of the country. In fact, there is no reason why mental as well as bodily labor should not be economized by the aid of machinery."

**Note:**

Charles Babbage is considered the Father of Computer.

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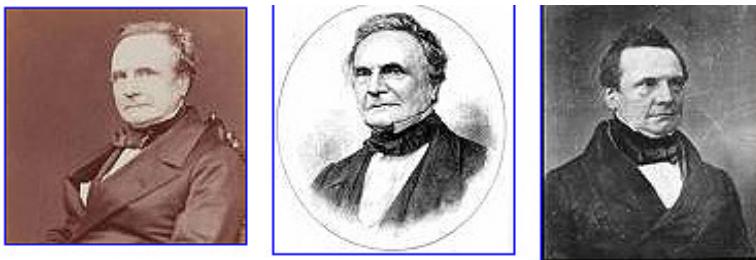


Figure 1.16 Charles Babbage in Pictures

## The Computer Number Systems (Series I)

### The Essence of Learning These Number Systems

Sometimes in our lives as students has this question in our minds why we study this and that. Are all these difficult subjects applicable and useful when we work in the company? How about this algebra, trigonometry and analytic geometry? Can I apply this when I work abroad? Well, I cannot answer you with a resounding yes. Maybe because, I am not a mathematician. Or simply I didn't know the answer (honestly speaking). However, I can answer you that we can use and apply our knowledge that we learned in studying number system conversion, because it is really an applied knowledge. Wise men said that knowledge can only becomes power when it is applied. I strongly agree. So here is now the reason :

Computers and networking equipment such as **routers** and **switches** work with **binary digits (bits)**. In other words, the base 2 number system (binary number system) is what the computers and data communication devices are using for its design, implementation, and operation. Bits can be either a binary 1 or binary 0 that can represent as the absence (0) or presence (1) of current which flows within a cable, wire or circuitry in the computer system. In **switching system** application, 1 can be an ON state, while 0 can be an OFF state. In writing the **programming logic** or **algorithm**, 1 can be interpreted as *True* or *Yes*, while 0 can be interpreted as *False* or *No*.

The bits are encoded internally in the computer system and on networking media (cables or wires) as either electrical voltages on copper cable such as *unshielded twisted pair (UTP) cable* or a light pulses on *fiber optic cable* and *electromagnetic waves* in the wireless communication.

Now let us consider the application of these number systems to the Internet technology. We, the human beings are more comfortable working with decimal numbers, therefore, **Internet Protocol (IP)** addresses are usually written as dotted-decimal numbers separated by periods (dots), each representing an octet, so that we can read them easily. This is referred to as “*dotted decimal notation*”. This is in IP version 4 (IPv4) of the Internet Protocol which uses the 32-bit address scheme (divided into 4 octets) to identify a particular **network** and a **host** on the network. In IP version 6 (IPv6), the IP address is written in hexadecimal format. We have to remember that these IP addresses which are written in decimal and hexadecimal numbers will be converted

into its equivalent binary numbers so that the network equipments such as computers, modems, network interface cards (NIC), routers and switches could understand them.

Knowing and learning binary numbers and how they relate to decimal and hexadecimal numbers are critical to understanding successfully the *network routing, IP addresses, subnets, and computer circuitry*. Not to mention on becoming a successful network administrator or network engineer someday. Who knows?

## Presenting: The Binary Number Systems

The binary number system is used in the design and implementation of computer's hardware and software. Binary method of notation uses two numbers only, the 0 and 1. The number 1 can be interpreted as **logical true, yes, or on** or simply a representation of the presence of current or signal. While 0 can be interpreted as **logical false, no, off** or a representation of the absence of current or signal. The 0 and 1 are called bits, the short term for binary digits.

Binary is a base 2 number system while the decimal is a base 10 number system. The base 2 number system is what all computers and data communications used to communicate and process data. Binary numbers are the key to understanding how **router** works and how *packets* get from one *workstation (host)* to another on a Transport Control Protocol/Internet Protocol (TCP/IP) network.

## Decimal Number System

A decimal number can be expressed as the sum of each digit times a power of ten in expanded notation. With decimal fraction, this can be expressed also in expanded notation. However, the values at the right side of the decimal point are the negative power of ten.

### Examples:

$$\begin{aligned} 1.) \quad 7642 &= 7 \times 10^3 + 6 \times 10^2 + 4 \times 10^1 + 2 \times 10^0 \\ &= 7 \times 1000 + 6 \times 100 + 4 \times 10 + 2 \times 1 \\ &= 7000 + 600 + 40 + 2 \\ &= 7642 \end{aligned}$$

$$\begin{aligned} 2.) \quad 28.36 &= 2 \times 10^1 + 8 \times 10^0 + 3 \times 10^{-1} + 6 \times 10^{-2} \\ &= 2 \times 10 + 8 \times 1 + 3/10 + 6 / 100 \\ &= 20 + 8 + 0.30 + 0.06 \\ &= 28.36 \end{aligned}$$

### A.) Binary To Decimal Number Conversion

Binary numbers can be converted into decimal number using an expanded notation in base 2 instead of base 10 (in the case of decimal numbers).

#### Examples:

$$1.) \quad 10_2 = 1 \times 2^1 + 0 \times 2^0$$

$$\begin{aligned} &= 2 + 0 \\ &= 2_{10} \end{aligned}$$

$$2.) \quad 110_2 = 1 \times 2^2 + 1 \times 2^1 + 0 \times 2^0$$

$$\begin{aligned} &= 4 + 2 + 0 \\ &= 6_{10} \end{aligned}$$

$$\begin{aligned} 3.) \quad 1111_2 &= 1 \times 2^3 + 1 \times 2^2 + 1 \times 2^1 + 1 \times 2^0 \\ &= 8 + 4 + 2 + 1 \\ &= 15_{10} \end{aligned}$$

### B.) Decimal To Binary Number Conversion

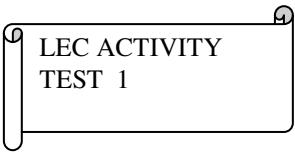
Decimal numbers can be converted into binary numbers by dividing it by 2. The remainders are considered as its binary equivalent by reading it upward or the last remainder is the first to be read. You have to neglect the numbers after the decimal point in the quotient.

	Divide	Quotient	Remainder	
1.) $14_{10} =$	$14/2$	7	↑ 0	
	$= 7/2$	3	1	
	$= 3/2$	1	1	
	$= 1/2$	0	1	
	$= 1110_2$			

2.) $9_{10} =$	$9/2$	4	↑ 1	
	$= 4/2$	2	0	
	$= 2/2$	1	0	
	$= 1/2$	0	1	
	$= 1001_2$			

$$\begin{array}{rcl} 3.) \ 120_{10} & = & 120/2 \quad 60 \\ & = & 60/2 \quad 30 \\ & = & 30/2 \quad 15 \\ & = & 15/2 \quad 7 \\ & = & 7/2 \quad 3 \\ & = & 3/2 \quad 1 \\ & = & 1/2 \quad 0 \end{array} \quad \begin{array}{c} \uparrow \\ 0 \\ 0 \\ 1 \\ 1 \\ 1 \end{array}$$

$= 1111000_2$



### TEST: Binary to Decimal Conversion

A.) Convert the following Binary numbers to Decimal numbers

$$1.) \ 11_2 = \underline{\hspace{2cm}} ?_{10}$$

$$2.) \ 101_2 = \underline{\hspace{2cm}} ?_{10}$$

$$3.) \ 111_2 = \underline{\hspace{2cm}} ?_{10}$$

$$4.) \ 1000_2 = \underline{\hspace{2cm}} ?_{10}$$

$$5.) \ 1011_2 = \underline{\hspace{2cm}} ?_{10}$$

$$6.) \ 1101_2 = \underline{\hspace{2cm}} ?_{10}$$

### TEST : Decimal to Binary Conversion

B.) Convert the following Decimal numbers to Binary numbers

$$1.) \ 8_{10} = \underline{\hspace{2cm}} ?_2$$

$$2.) \ 26_{10} = \underline{\hspace{2cm}} ?_2$$

$$3.) \ 48_{10} = \underline{\hspace{2cm}} ?_2$$

$$4.) \ 21_{10} = \underline{\hspace{2cm}} ?_2$$

$$5.) \ 110_{10} = \underline{\hspace{2cm}} ?_2$$

$$6.) \ 236_{10} = \underline{\hspace{2cm}} ?_2$$

---

## Chapter 2

# The Basics Of Computer Hardware

“Man is still the most extraordinary computer of all.”  
-John F. Kennedy, Jr.

The computer is very powerful and useful that they make our life very convenient and comfortable. They are used in scheduling airlines flight which makes ticket reservation so easy and fast, not to mention accuracy and convenience. They are even used to predict or forecast the weather conditions, making us well-informed about the incoming typhoon (or even a tidal wave). Automated Teller Machines (ATM) are computers that allow us to withdraw cash anytime, anywhere. These are all but the few benefits which we have enjoyed because of the invention of computers. Imagine, living without computers, how lousy life could be.

But, what the computer can really do? Why can they accomplish such incredible tasks? The truth is, computers can do only four simple tasks: receive an input, process information, produce output, and store information. The question here is why they can accomplish such tremendous task? The answer is: man made them so. Behind every computer's power and tremendous capabilities is an intelligent man. Man's boundless creativity and brilliance are the driving forces that power-up this computer; and they express it in terms of a **program**. A program is a set of commands or instructions for a computer to follow. We usually call this end-product: a **software**. This will be our topic in the next chapter. As of this moment, we will just limit and focus our discussions to the hardware aspects of computer.

Every computer system contains hardware components that are used for receiving input, processing information, producing the output, and storing information. Let us start with the input device. The most common input devices are keyboards, mouse, and joystick (used in computer games). And the most common output devices are monitor (screen) and printer.

Let us go to the microprocessor. The microprocessor is used in processing information such as performing arithmetic computations and making decisions based on given choices or alternatives. Technically speaking, the microprocessor is also called the **central processing unit (CPU)** or the brain of the computer.

The most common storage devices that are used for storing information are floppy diskettes, hard disks, CD-ROMS, DVD-ROMS, USB Flash Drive and backup tapes. Computer's memory (both temporary or permanent storage) such as RAM (Random Access Memory) and ROM (Read Only Memory) are considered storage devices (technically speaking). It's because they are capable of holding information temporarily (in the case of RAM chips) and permanently (in the case of ROM chips). The computer is made of these major components.

## History of Computer Hardware Revolution

One of the best ways to understand the computer hardware is to study its history and how it evolves all throughout these years. The progression of its evolution is as important as the present hardware technology in itself. This will give you a glimpse of the past, and how and when the computer hardware started. So let us start its history first before going into the details of what a computer hardware is all about.

### Hardware Revolution: Timeline (In 1980's)

-1981

- In 1981, the first portable computer called **Osborne I** was introduced. It has two floppy drives and no hard disk. It has pre-installed software – an operating system called **CP/M (Controlled Processor for Microcomputer)**, word-processing software called WordStar and spreadsheet software called SuperCalc.

In August 1981, IBM Corporation introduces its first IBM PC running an operating system called **DOS (Disk Operating System)** provided by Microsoft Corporation. It runs a speed of 4.77 MHz, 16 KB of RAM with two floppy disk drives and an 8-bit microprocessor with a model number of 8088 designed and developed by Intel Corporation.

At the same year, Xerox Corporation introduces Xerox Star computer with the use of a mouse. This is the first time, the mouse is used as an input device and as an alternative (partially) to the keyboard for navigation of the PC's screen.

-1982

-In 1982, the Sun Microsystems, Inc. was established (founded) and introduces its first workstation called **Sun 1**. At the same year, Intel corporation, introduces its 16-bit 80286 micro-processor.

-1983

-In 1983, **Compaq** computer company releases the first successful 100 percent IBM-PC compatible.

-1985

-In 1985, Intel corporation introduces its **32-bit 80386** microprocessor. Another giant computer company Hewlett-Packard, releases the LaserJet laser-printer with its main feature is a 300 dpi (dot per inch) resolution.

-1986

-In 1986, IBM corporation introduces its first **laptop computer**. At the same year, **CD-ROM** technology is being introduced as a promising storage device in an international conference held in Seattle, Washington, U.S.A.

-1987

-In 1987, the **Extended Industry Standard Architecture** (EISA) bus design is introduced by a group of independent computer manufacturers to compete with

IBM's proprietary bus design – the **Micro-Channel Architecture** (MCA). At the same year, the **Video Graphics Array** (VGA) interface card was introduced by IBM corporation that offers 256 colors at 320x200 resolution. **Hewlett-Packard** (HP) corporation releases the first ink jet printer called **HP Deskjet**.

-1988

-In 1988, Next Inc. a computer company established by Steve Jobs after he left the Apple Computer company which he co-founded, introduces the first PC to use Object-Oriented Programming (OOP) in its operating system and uses CD-ROM drive instead of a floppy disk drive.

-1989

-In 1989, Apple Computer introduces its laptop computer called **PowerBook**. At the same time, the Apple Computer together with IBM and Motorola companies signed a cooperative agreement to design and produce a **RISC-based (Reduced Instruction Set Computing)** chips, object-oriented operating system, and develop common multimedia standards. Their collaborative efforts resulted to the invention of the microprocessor called **PowerPC**.

### Hardware Revolution: Timeline (In 1990's)

-1992

-In 1992, IBM corporation releases their ThinkPad laptop computer.

-1993

- In 1993, IBM corporation introduces its first RISC-based workstation, the **RS/6000**, powered by the PowerPC 601 microprocessor chip.

-1994

- In 1994, Apple Computer follows IBM by introducing its own RISC-based computer powered by PowerPC microprocessor chip.

-1995

-In 1995, Intel Corporation introduces the Pentium microprocessor. Power Computing company releases its first-ever Apple-Macintosh clones. It is called **Power 100**.

-1996

-In 1996, the U.S. Robotics company introduces the **PalmPilot**. This is the start of the world-renowned **Personal Digital Assistant** (PDA). At the same year, Sun Microsystem introduces its first workstation with 64-bit micro-processor called **Sun Ultra**.

-1997

-Intel Corporation introduces its **Pentium II** microprocessor. At the same time, they introduced MMX (Multi-Media Extension) technology that increases the

multimedia capabilities of the designed microprocessor. It is also in the same year, the Digital Video Disc (**DVD**) technology was introduced in the market, which has more storage capacity than the VCD technology. The DVD is predicted to become the standard CD-ROM technology in PC and home entertainments systems, (replacing the VCD), such as used in our TV and stereo players.

-1998

-Intel Corporation releases the **Pentium II Celeron** microprocessor which offers slower performance but with reduced price. Ideal for home-user or for companies whose users do not need a fast PC. Intel Corp. names their new Pentium II as "**Xeon**" which is designed for high performance network servers and workstations used by companies or universities who need fast PC's.

At the same year, Apple Computer introduces its colorful **iMac**. It features the new G3 microprocessor and USB connections but without a floppy disk drive. Its microprocessor is more faster than Intel's Pentium II.

-1999

Intel releases its **Pentium III** microprocessor which features an enhancements for Website's graphic application. In the same year, the Advance Micro Devices (AMD) Corp., a premier competitor of Intel Corp. introduces its **Athlon** microprocessor that competes with Pentium III's Xeon and Celeron market.

Apple Computer at the same time, releases its iMac computer with a G4 microprocessor, faster than Intel's Pentium III or AMD's Athlon microprocessor.

### Hardware Revolution: Timeline (In early 2000)

-2000

Both AMD and Intel Corp. announced to release the world's first microprocessor to run in 1GHz speed.

-2001

Apple Computer introduces **iPod**, the first music player with an internal 5 GB mass storage device that can store 1,000 CD songs. The 3 general categories of Apple iPods are: iPod Shuffle (the smaller one with 1Gb capacity), iPod Nano (8 Gb capacity), and iPod Video (with 160 Gb of capacity). The iPod Shuffle was designed and introduced to the market late, compared to the Nano and Video version.

-2003

Another supercomputer was created by **Mike Showerman** and **Craig Steffen**. It can perform 6.5 billion mathematical operations per second and it uses Linux as its operating system. At the same year, **Intel and AMD** release its respective **64-bit microprocessor**, as well as Apple Computer with their Power Macintosh- a G5-64 bit microprocessor.

We saw also around this year, the emergence of the Intel Centrino technology for Laptop computers which are commonly known as "wireless" technology. This

means that you can surf the Internet with your Laptop without wires. Bringing your Laptop to Starbucks and Robinsons Shopping Center, will give you a free access to the Internet connection.

-2005

The **Bluetooth**-enabled devices allow sharing of text, pictures, videos, music or files, across a broad range of devices such as on your cell-phone, PDA, or iPod. The Intel's dual core processors (also known as Core Duo) are hot in the market.

-2006

Intel's Core 2 Duo is the emerging microprocessor technology in the market. It boasts an increase of 40 percent more performance to its predecessor, the Core Duo microprocessor.

-2007

Intel' Quad Core is now in the market for Desktop computers. We are waiting excitedly for the Quad Core CPU that will also be used to power-up the Laptop computers.

## The Computer Sub-System and Peripherals

### The CPU (Central Processing Unit)

The CPU is also called **microprocessor**. It is considered as the **brain** of the computer. The CPU interprets and carry out the instructions or commands in each program or software. Moreover, it does arithmetic and logical data manipulations, and communicates with all the other parts of the computer system. This may be the reason why the microprocessor is considered as the brain, since it has these capabilities as though it has a capability to think and decide on its own when given a tasks, situations or alternatives.

The speed of the microprocessor to perform its tasks is measured in units called megahertz (MHz). So a CPU with 300 MHz means its speed to accomplish a tasks is 300 MHz. Todays computer runs in 2 GHz or more. We have to remember that **mega** is an engineering term which means- *million* while the term **giga** is an engineering term that refers to a meaning of a *billion*. So in other words, 2 GHz means two billion hertz. Many software applications that use intensive graphics (such as pictures, images, and drawings) and large number calculations (in over ten digits) require faster CPU speed.

The performance of the microprocessor is dictated mainly by its internal design, or commonly known in computer engineering field as "architecture", and the number of bits of data it can process at any one time. For example some microprocessor design or architecture is based on the **complex instruction set computing** (CISC). The computer you owned now is based on this microprocessor (unless you are holding a supercomputer right this time which is impossible if not improbable), since IBM-compatible PCs are designed with CISC. The other microprocessor architecture is called **reduced**

**instruction set computing** (RISC). Most of the UNIX-based computers (such as the high-end servers and workstations) are RISC-powered and as well as other Apple Macintosh computers too. Today's Macintosh is powered by Intel Core 2 Duo and Quad Core microprocessor technology, which means that the new breed of Macintosh computers are CISC microprocessor designed.

Another microprocessor design technology is emerging in the present time (though it is not a new idea, historically-speaking). Its hype is so overwhelming. It is popularly known as **parallel processing** microprocessor design. This system has a multi-processing capability. We have to remember also that the microprocessor's architecture has the biggest influence on how many transistors it has. And in microprocessor design, the more transistors a microprocessor has, the faster and powerful it is.

Intel's model of microprocessors are the following:

- **Pentium** for Personal Computers (PCs)
- **Celeron** for Budget PCs
- **Centrino** for Laptops
- **Itanium** for Server computer
- **Xeon** for High-end Workstation and Server PCs

AMD's model of microprocessors and their primary use are the following:

- **Athlon** for Personal Computers (PCs)
- **Duron** for Budget PCs
- **Opteron** for Server computer
- **Turion** for Laptops

The other factor that affects the performance of a computer is its capability to process the number of bits of data at any one time. For example, the older Intel 8088 microprocessor can only move data in 8-bit chunks. Then followed by the Intel 80286 microprocessor that can move data in 16-bit chunks. The succeeding Intel microprocessors can move data in 32-bit. And presently, AMD and Intel are producing microprocessor that can move data in 64-bit. So the higher data bit-rate transfer, the faster the microprocessor. So if we compare the data to vehicles running on the road, then bit-rate transfer can be compared to road lanes. An 8-bit could be a one lane, and 16 bit could be two lanes, 32 bits are four lanes, while 64-bits could be 8 lanes. The more lanes in the road, the more vehicles can run. The same thing with bit-rate transfer in the computer. The more bit-rate transfer, the faster the computer.

## Intel Dual-Core Technology

The Intel Dual-Core micro-processor technology is designed for energy-efficiency performance. It also boosts multi-tasking power with improved performance for highly multi-threaded and calculation-intensive applications. It improves multi-media application such as in intense network-gaming.



Figure 2.1 Dual-Core Technology Logo

## Intel Core 2 Duo Technology

The Intel Core 2 Duo technology increases the performance of Dual-Core technology by 40 percent. The shared L2 cache is increased by 4 MB. It has five more features compared to its predecessor, the Dual-Core. And here are the summary features:

- **Advanced Smart Cache** – provides more cache system, thus, delivers higher processing performance.
- **Smart Memory Access** – provides optimization of the available data bandwidth, thus, improves system performance.
- **Advanced Digital Media Boost** – accelerates a broad range of applications, including engineering and scientific applications, video, image, photo, and audio processing, data encryption, and financial applications.
- **Intelligent Power Capability** – delivers more energy-efficient smarter battery performance.
- **Wide Dynamic Execution** – delivers more instructions per clock cycle to improve execution time.



Figure 2.2 Core 2 Duo Technology Logo

## Intel Quad Core Technology

The Intel Quad core technology is an integration of two Core 2 Duo dual-core micro-processors on a single substrate for a total of 4 CPU cores in a single LGA 775 socket, with 8 MB L2 Cache. The Land Grid Array (LGA) is a new design technique wherein the pins of the LGA socket is directly built into the socket not on the CPU. This total reversal of earlier design resulted to better power distribution, thus increasing the speed of the Front Side Bus. The front side bus on a computer connects the processor to the north side bridge, which comprises the memory bus, PCI (Peripheral Component Interface) bus and AGP (Accelerated Graphics Port) bus. In general, a faster front side

bus means higher processing speeds and a faster computer. The PCI bus is a computer bus used for attaching peripheral devices to a computer motherboard. While the AGP bus is the specification for a type of dedicated video card interface over which the card can access system memory (RAM) at a very high transfer rate (up to 2.1GB per second at the 66 MHz PCI bus clock speed). This provides up to eight times the bandwidth of the PCI bus. AGP is one part of the solution to the memory requirements of accelerated 3D video. Video cards use on-board memory for storing images, textures, and geometry data, which allows the video hardware direct, rapid access to it. The amount of data is very large, and the speed at which it must be transferred from the system memory is too high for the PCI bus. The high bandwidth capability of the AGP allows data to move rapidly from main memory to video RAM (Random Access Memory).



Figure 2.3 Quad Core Technology Microprocessor

## AMD Turion 64 x 2 Dual-Core Mobile Technology

The archrival of Intel is the Advance Micro Devices (AMD) Corporation has their own version of Intel's Dual Core technology called the AMD Turion 64 x 2. The AMD Turion 64 delivers exceptional multi-threading and multi-tasking performance for both 32-bit and 64-bit environments. It boosts long battery life and better system security with **Enhanced Virus Protection** feature. And here are the other features:

- **HyperTransport technology** – delivers system agility that makes application more responsive.
- **AMD Digital Media Xpress**- enables stellar performance and playback quality on digital entertainment such as streaming audios and videos, music, DVDs, and intense network-gaming.
- **AMD PowerNow! technology** – extends battery life up to 65 percent.

## Cache Memory

This type of memory is extremely fast! It is placed inside the computer's microprocessor (brain) or directly on the motherboard circuitry. This memory is represented through levels, such as Level 1 (L1), Level 2, (L2), or Level 3 (L3).

## The RAM and ROM

The RAM (Random Access Memory) is the computer's main memory. RAM's are integrated circuits (IC) or chips that can be used to store program instructions and data temporarily. The computer accesses information through this main memory randomly by using a unique memory address number for each data stored. This unique address (memory location) scheme is applied so that the computer would easily find where to retrieve the data or information needed. Remember that the RAM is capable of holding millions of data temporarily. In other words, to make it easier to search the data needed, the computer uses this memory address scheme to locate it. RAM is a volatile type of memory, because whatever we stored into it during the time we use the computer would vanish completely once we turn off the computer's switch.

The RAM has a tremendous impact on the speed, power and performance of your PC. Generally speaking, the higher the bytes of RAM in your computer, the more it can perform certain tasks faster and better. So, you better upgrade your computer's RAM to enjoy some higher speed and better performance.



Figure 2.4 The RAM and the ROM chips

The ROM (Read Only Memory) is a non-volatile type memory because the program and data stored into it are permanent. Like RAM, the ROM is also a chip. The computer can only read information or instructions from it, but it can never write or store any new information or program on it. The ROM is used to check the basic subsystems of the computer hardware, in order to ensure that all basic parts are working and in good condition. Otherwise, the ROM won't let the computer to function. In short, the ROM holds the instructions (programs or software, technically speaking - a *firmware*) that the PC needs to operate.

## The CMOS

The CMOS (Complementary Metal-Oxide Semi-conductor) chip is used to hold and record all the basic setups of the computer system such as the number of hard disks installed, the system date and time, and if other computer peripherals are connected to it such as modem, sound card and others. The CMOS is a type of semi-conductor design technology that consumes less electrical energy.

In desktop personal computer, this chip is powered by a battery. That's the reason why your computer has an updated time clock and date, even if you had switched it off

for a day or week. All settings of hardware and software are recorded on CMOS chip. Once we boot-up our computer, all the settings will be read and restored so that the computer can function properly. In this way, the computer would know what are the hardware peripherals are installed or connected to the computer's main system, the exact date and time, and its software and hardware configurations.

## Flash Memory

This type of non-volatile memory is often used in digital camera, MP3/MP4 players, and USB (Universal Serial Bus) Flash Disk to store voluminous of data, information, software, music, video and pictures. Flash memory is so small that it can be transported and carried in your wallet or pocket.

### Note:

The MP4 technology works like the MP3. The MP3 compresses music and audio files without affecting its quality, while MP4 compresses video or movie files. MP4 is also known as MPEG-4 AVC (Advanced Video Coding).

## The Input Devices

The most common types of input devices are the **keyboard and mouse**. The other input devices are also listed here to let you know that there are many of them.

The computer **keyboard** is similar to typing on a typewriter's keyboard. Whatever you typed from the keyboard will be displayed into the screen or monitor at the position of the blinking cursor. The cursor is the current position indicator.



Figure 2.5 Computer keyboard

The **mouse or trackball** are both pointing devices that are designed to move a big arrow pointer around the screen and point to a specific characters or objects.



Figure 2.6 Computer mouse

The **touch screen** can respond when the user points to or touches a particular part of the screen regions. These touch screen is commonly used in a well-established malls, airports, and libraries.

The **touch tablet** is used by designers, engineers, and artists. They use it for drawing or designing a particular object.



Figure 2.7 PC Touch tablet

The **barcode readers** use light rays to read a product code for the purpose of easy inventory and monitoring of product movements and status. In a well-established stores, barcode readers are attached to the POS (Point-of-Sale) machines or to the ECR (Electronic Cash Register) machines. POS machines resemble like the ECR, but it is 100 percent computer since all the basic parts and features of Personal computer (PC) can be found on it.



Figure 2.8 Barcode reader

A **scanner** is an input device that can convert photographs, drawings, charts, and other printed information into bit patterns which can be saved or stored in a computer's storage device or main memory. This stored information can be manipulated, revised, modified or changed by the user using a special type of software.



Figure 2.9 Scanner

A **digital camera** looks like an ordinary camera that we are using in taking pictures to preserve a treasured memories and special moments in our lives. However, a

digital camera is not limited to capturing printed images; it can capture snapshots of the real images. Instead of capturing images or pictures on the film, a digital camera stores bit patterns on disks or other digital storage devices.



Figure 2.10 Digital camera

We use the **webcam** when we want to see our relatives, friends and acquaintances in a distant places while chatting with them using the Internet. A **webcam** is a small camera which images can be accessed through the Internet, instant messaging, or in video conferencing. This webcam is attached to our desktop computer or already built-in in our laptop computer.



Figure 2.11 Webcam (Internet Web Camera)

The **microphone** is an input device to record speech. This is really important in multimedia application when the presentation can benefit from the narration of the user. With the *microphone* or a headset microphone with an earphone, we can use computer to make telephone calls or use it in *video-conferencing* over the Internet. By using audio recording software packaged with Windows Operating System (OS), we can record our voice and save it on a disk or flash drive. We can incorporate it in our multimedia presentation, embed in Web pages or send it through e-mails.



Figure 2.12 Headset equipped with a microphone (headphone)

The **pen** can be used on personal digital assistants (PDA), handheld-computers, or tablet PCs, for inputting data. The other term for pen is a *stylus*. To use the pen, we have to hold the pen and write it on a special pad or directly on the PDA's screen or on the screen of the tablet PC. Because of the reason that human's handwriting is so difficult to recognize (most especially if you write like a doctor, my gosh!), pen-based computers or PDA's are not used to input large amounts of data or text, instead it is used frequently to take short notes or messages. It is also used for data collection, where the touch of a pen might place a check in a check box or a dot on a radio button to indicate a product to be ordered or a service that has been requested by a customer.

The **audio digitizers** contain circuitry to digitize sounds from microphones and can be stored into a computer's main memory or storage device. Once it was stored, it can be modified, manipulated or enhanced through the use of a special type of software. There are also other input devices such as **sensing devices** which are designed specifically to monitor temperature, pressure, and humidity. The data provided by these sensing devices is used in scientific research and application, robotics, medical monitoring, weather forecasting, and environmental climate control.

The **joystick** and **game pad** are game controllers used by the users to play games in the computer alone or by groups or teams through a network-based computer games in a Local Area Network (LAN) or in an Internet settings. The joystick enables the user to "drive" or "fly" through a game, directing a vehicle such as a plane or car or directing a character such as a soldier or warrior in a battle-ground.



Figure 2.13 Joystick Pictures

## The Output Devices

There are two main types of computer output devices: **monitor and printer**. There are two classes of monitors. The first one is **cathode ray tube** (CRT), a television-style screen. The second one is **liquid crystal display** (LCD), a flat-panel model. Well this time, even our TV is using the flat-panel model. The LCD is the newest technology in designing and manufacturing a computer monitor (as well as TV screen too!). It produces crisper images, high-resolution color, and totally improved quality for viewing. The term **resolution** refers to the sharpness or clarity of an image we can see in our computer's monitor. A monitor's resolution is determined by the number of pixels on the screen, expressed as a matrix. The more pixels a monitor can display, the higher, better

and clearer its images appear on the screen. We have to take note, that as the resolution increases, the image on the screen gets smaller. The resolution settings are expressed in pixels horizontally across the screen such as 640 x 480 or 1280 x 1024 and so on. Higher settings of resolution are not always better, because they can cause images on the screen to appear too small which causes eyestrain. An **eyestrain** means a fatigue of the eyes. The muscle of our eyes becomes strained when we look at the screen for so long.

The quality of the images or pictures that a monitor can display is defined as much by the **video card**, also commonly known as video controller or video adapter. This video card is a device we plug in to one of the expansion (input/output) slots in the PC's motherboard. In some newer designed motherboard, this video card is already built directly on it. The most commonly used video cards are **nVidia**, **ATI**, and Intel's **GMA** (Graphics Media Accelerator).

Personal Computer replaces the old-fashioned slide projectors and overhead projectors as the source of presentation. Instead, we are now using **Data Projector** (LCD Projector), to present our slides with Microsoft PowerePoint presentation software. This makes our presentation so attractive, alive and animated. We can show our presentation directly to the white-painted wall, whiteboard or on a white large screen as though we are watching the presentation the way we watch movies in the cinema's theater.

A **printer** is used to produce a hard copy on paper for whatever information or images are displayed on the screen. There are two basic groups of printers: impact and non-impact. **Dot-matrix printers** are the best example of impact printer. It prints text and graphics by using pinpoint-sized hammers that transfer into the paper; while the **ink-jet and laser printers** are the best examples of non-impact printer.



Figure 2.14a Printer

An **ink-jet printer** sprays an ink directly into a paper, while the laser printer use a laser beam that creates patterns of electrical charges on a rotating drum. The patterns of electrical charges attract black toner and transfer it to paper while the drum rotates.

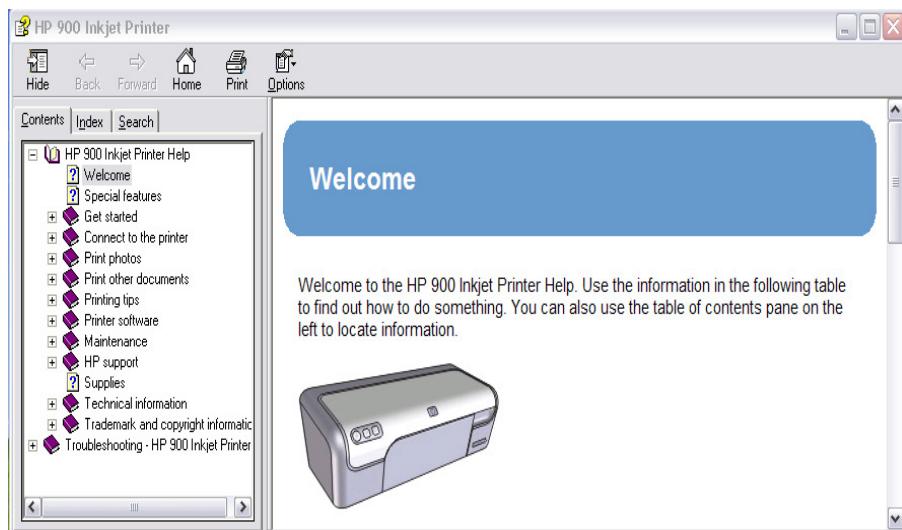


Figure 2.14b The HP 900 Inkjet Printer Help Guide

A **plotter** is typically like a printer, but its primary use is in scientific and engineering applications, since it can print large format images such as house blueprint drawing designed by architects.



Figure 2.14c The Epson Plotter

**Synthesizers** are specialized type of computers that are designed to generate sounds electronically. It can be used to produce music or noise. Most PC's have built-in synthesizers for producing sounds.

By using **headphones** or **headsets**, we can play MP3 music in our PC or Laptop without disturbing others. We will simply plug it in, into the sound-card's microphone port at the back of our PC or in front of our Laptop.

The **LCD Projector** (Data Projector) is used for presentation purposes which is usually connected to our PC or Laptop. With it, we can watch the output of our computer like the way we watch movies. We display the output into the big white screen, to a whiteboard, or to a white-painted wall.



Figure 2.15 The LCD (Data) Projector

## The Storage Devices

**Floppy disk (Diskettes)** is a magnetically sensitive and flexible plastic wafer housed in a plastic case. The disk drive can retrieve or store information from any part of a diskette. The PC usually include one disk drive that allows the computer to read from or write to the diskette.



Figure 2.16 Floppy Drive

### Note:

Today's Laptop has no floppy drive. Instead, we use USB drive (or USB Flash disk) to store our data, software, pictures, graphic images, MP3s, and .avi (video files or MP4s).

**Hard disk** is rigidly solid and magnetically sensitive disk that spins rapidly and continuously inside the computer system unit case. We would know if the hard disk drive is active when the small red light (located usually in-front of the CPU casing) is flashing or blinking. This means that our computer is storing or retrieving data or information in our hard disk.



Figure 2.17 Hard Disk

**CD/DVD-ROM disk** (Compact Disc – Read Only Memory) is an optical disk, which is physically identical to musical compact disc which we are using in our hi-fi CD cassettes and stereo players. An optical disk drive uses laser beams rather than magnets to read and write a data or information on the disk surface. A CD/DVD-ROM can hold a large and voluminous content of data or information, thus, making it an ideal storage device for storing pictures and sounds at the same time. Pictures, graphics, and sounds consume a large capacity of bytes.



Figure 2.18 CD-ROM Drive

**USB Flash Disk (Thumb Drive)** is a small and lightweight flash memory mass storage device that is rewritable and removable. USB Flash drive is generally faster and can hold more data and yet reliable to use. Its size is as small as our thumb, that is why the other name of it is “thumb drive”. We have to plug the USB Flash Disk into the USB port or hub so that we can access the data or software stored into it. We can see a small printed circuit board (PCB) inside a transparent or a see-through Flash Drive case.



Figure 2.19 USB Flash Drive

**Tape Drive** is a type of storage device that reads and writes data or information on a magnetic tape. We usually used the tape drive to backup our important data or files from our hard disk. The main disadvantage of this type of storage device is its slower seek time, that results to slow access of data.



Figure 2.20 Tape Drive

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## Computer Ports

**The computer ports** allow the user to connect to the input and output devices or other peripherals into the PC or Laptop. These ports are usually can be found at the back of our PC or in some cases, in-front of it.

- . **Keyboard and Mouse ports** – as the name implies, we can plug our PC's keyboard and mouse into them.
- . **Monitor port** – the LCD monitor is plug into this computer port.
- . **Network port** – to connect our PC or Laptop to the company or school's Local Area Network (LAN), this is the port we use, as well as to connect to the Internet via the company or school's LAN. Presently, we call this port as RJ-45 port, the standard port used in LAN technology. RJ stands for Reference Jack.
- . **Modem port** - this is the port we use to connect our PC to a phone line in order to access to the Internet. We usually call this port as RJ-11 port.
- . **Parallel port** - the older model printer should be connected to this port for hardware compatibility. Newer model of printers are using the USB (Universal Serial Bus) ports to connect them.
- . **Serial port** – this port is the one we use to connect our **external modem**. This is mostly applied if we want to connect our PC or Laptop to the Internet via phone line and by using open-source software such as Linux operating system (O.S). External modem is a small box with light-emitting diode (LED) on it that indicates if the data are transmitted, received or a signal is on. Microsoft Windows-based OS such as Windows XP or Vista is using an **internal modem** that is directly installed and plugged inside our computer's motherboard and central processing unit (CPU) case.
- . **USB port** – the universal serial bus (USB) is a newly designed port for computer devices or peripherals to connect to, such as the printers, USB flash drive, iPod, and digital cameras.
- . **Audio port** - there is a color coding or symbols (sometimes called an icon) used and applied to this port to distinguish it from one another. The **yellow speaker out** port is designed to connect to home stereos, while the **green** speaker out is for desktop speakers or headphones. The **pink** microphone port is for small microphone we use in chatting over the Web.

Note:

Some Laptop most especially the Acer, has a color coding like the way we can find in our PC. But some Laptop used only two ports, without any color-code. In this case, the icon

or symbol is used. The icon for audio port is used to connect your speaker or sub-woofer on it, while the icon for microphone port is used to connect your small microphone on it.

## Computer Bus

The **computer bus** is a group of parallel wires that is a path or route between the different interconnecting components of a computer system. The two main buses in a computer are the internal or **system bus** and external or **expansion bus**.

The **expansion bus** connects external devices such as mouse, printer, keyboard or modem to the CPU, while the **system bus** connects the CPU to other devices that resides on the motherboard (main board of a computer).

The system bus has two parts. They are called **data bus** and **address bus**. Since 1 byte is equivalent to 8 bits, then a 16-bit data bus can transfer two bytes of data at a time, while a 32-bit data bus can transfer four bytes of data, and 64-bit data bus can transfer 8 bytes of data. Like the microprocessor, the speed of the bus is measured in megahertz (MHz). The **address bus** connects only the RAM and CPU and carries only memory location addresses.



Figure 2.21 The Computer Motherboard

## Bus Standards

- . **Industry Standard Architecture (ISA) bus** is used in **many** computers to connect slower devices such as modem and other input devices.
- . **Universal Serial Bus (USB)** is a hot swappable bus which means that a computer user can connect then disconnect a USB device without affecting the PC or Laptop.

- . **Local Bus** is designed to attach faster devices to the CPU.
- . **Accelerated Graphics Bus or Port (AGP bus)** allows the video card to access the RAM directly, thus increasing the speed of graphics performance for 3-D (Dimensional) and full motion video applications.
- . **PC Card bus** is used exclusively on Laptop computer and is used as network cards, external modem WiFi card, thumb scanner and biometric security system.
- . **FireWire (IEEE 1394) bus** is used to connect digital and video cameras. We can use the FireWire bus to transfer data in high speed rate.

## Expansion Slots

Through expansion slots, we can increase the capability of our computer. Like for example, you can add a new high-end video card to your PC so that you can enjoy playing your computer games that demand higher video graphics display resolution. If your PC is older and it has no internal modem attached to it, you can buy an internal modem adapter card and plug it in - in one of the available expansion slots of your PC. In that way, you can connect your PC to the telephone lines to surf the Internet.

The expansion slots are but just an extension of the computer bus that we have discussed earlier. Can you still remember it?

## The UPS

The **Uninterruptible Power Supply (UPS)** is a standby battery backup for your computer or company's server. The UPS provides temporary and limited electrical energy while your computer and company's server is experiencing electrical brown-outs or any electrical power failure or when electrical current fluctuates abnormally.

### Note:

The **surge suppressor** is a device that protects your computer against voltage spikes. There is also a device called *line conditioner* that protects the PC with line noise which came from high-demand electrical equipment that operates near your PC.



Figure 2.22 Uninterruptible Power Supply (UPS) Pictures

## The Computer Number System(Series II)

### Presenting : The Octal Number System

The Octal Number System has eight basic digits: 0, 1, 2, 3, 4, 5, and 7. It is a Base 8 number system. The octal number system is used to conserve memory storage location of the computer system by grouping the binary digits into three. Meaning, 3 bits is equivalent to 1 octal number.

#### A. Decimal To Octal Number Conversion

To convert decimal number into octal number, first we divide the decimal number by 8. Then we have to take note the remainder after each computation of division operation. The computation process will stop when the quotient becomes 0. Again we have to read the remainders in upward direction or the last number is to be read first.

##### **Examples:**

Divide   Quotient   Remainder

$$\begin{array}{rcl} 1.) \ 10_{10} & = & 10/8 \quad 1 \\ & = & 1/8 \quad 0 \qquad \qquad \uparrow 2 \\ & = & 12_8 \end{array}$$

$$\begin{array}{rcl} 2.) \ 136_{10} & = & 136/8 \quad 17 \qquad \qquad \uparrow 0 \\ & = & 17/8 \quad 2 \qquad \qquad \downarrow 1 \\ & = & 2/8 \quad 0 \qquad \qquad \uparrow 2 \\ & = & 210_8 \end{array}$$

$$\begin{array}{rcl} 3.) \ 1490_{10} & = & 1490/8 \quad 186 \quad 2 \\ & = & 186/8 \quad 23 \quad \uparrow 2 \\ & = & 23/8 \quad 2 \quad \downarrow 7 \\ & = & 2/8 \quad 0 \quad 2 \\ & = & 2722_8 \end{array}$$

#### B. Octal To Decimal Number Conversion

To convert octal number to decimal number, we have to multiply each octal number by its positional value. Then we sum up all the resulting products.

**Examples:**

- 1.)  $14_8 = 1 \times 8^1 + 4 \times 8^0$   
 $= 8 + 4$   
 $= 12_{10}$
  
- 2.)  $230_8 = 2 \times 8^2 + 3 \times 8^1 + 0 \times 8^0$   
 $= 128 + 24 + 0$   
 $= 152_{10}$
  
- 3.)  $6_8 = 6 \times 8^0$   
 $= 6_{10}$

**C. Octal To Binary Number Conversion**

Using the given table below, we can convert octal number to its equivalent binary number. Each octal number must be converted one at a time by its equivalent binary number.

Octal	Binary
0	000
1	001
2	010
3	011
4	100
5	101
6	110
7	111

**Examples:**

- 1.)  $36_8 =$   
 $3 = 011_2$   
 $6 = 110_2$   
  
 $= 011110_2$
  
- 2.)  $142_8 =$   
 $1 = 001_2$   
 $4 = 100_2$   
 $2 = 010_2$

$$= 001100010_2$$

3.)  $75.03_8 =$

$$\begin{array}{r} 7 = 111_2 \\ 5 = 101_2 \\ 0 = 000_2 \\ 3 = 011_2 \end{array}$$

$$= 111101.000011_2$$

### Other Solution

We can solve this octal to binary conversion by using the following technique:

4    2    1	← The Octal Equivalent
1    1    1	← The Binary Equivalent

For example, we want to convert an octal number 7 to binary number equivalent. Obviously, we have the answer : 1 1 1. Now if you try to analyze the process, you could notice that we can easily get the answer by adding the octal number equivalent at the top of each binary number (4+2+1) .

For example again, we want to convert an octal number 6 to binary number equivalent. We have the answer: 1 1 0 since we simply add the octal number equivalent of each binary number (4+2). What if we want to convert an octal number 5 to its binary number equivalent? Going back to our technique, we have the answer : 1 0 1 since we add the octal number equivalent above each binary number ( 4 + 1). In other words, when we combine the three octal numbers ( $765_8$ ), we will arrive to the answer :  $111110101_2$ .

What we did with the excess binary number is to simply make it a zero number.  
Can you now solve it by your own?

### D. Binary To Octal Number Conversion

We just simply reverse the procedure when we convert the binary number into octal number. You could notice that every octal number has three equivalent binary digits (bits). That's why we group the bits in three during the conversion process. We will add zeroes to complete the group when incomplete groupings occur. Now refer to the table above to know the corresponding equivalent.

### Other Solution

We can solve this binary to octal conversion by using the following technique:



For example, to convert the binary number to its equivalent octal number we simply group them into three bits:

$$\begin{array}{r} 4 \quad 2 \quad 1 \\ 1 \quad 1 \quad 1 \end{array} / \begin{array}{r} 4 \quad 2 \quad 1 \\ 1 \quad 0 \quad 1 \end{array}$$

By summing up all the octal numbers equivalent at the top of each respective binary 1 we can get the right answer :  $75_8$  ( $4 + 2 + 1 / 4 + 1$ ).

Another example; to convert the binary number  $100110000$  to its equivalent octal number, we group them again into three bits:

$$\begin{array}{r} 4 \quad 2 \quad 1 \\ 1 \quad 0 \quad 0 \end{array} / \begin{array}{r} 4 \quad 2 \quad 1 \\ 1 \quad 1 \quad 0 \end{array} / \begin{array}{r} 4 \quad 2 \quad 1 \\ 0 \quad 0 \quad 0 \end{array}$$

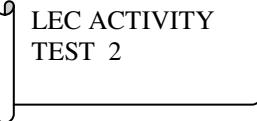
Now summing up all the octal numbers at the top of each respective binary 1, we will arrive to the answer :  $460_8$  ( $4+0+0 / 4 + 2 + 0 / 0 + 0 + 0$ ). We simply didn't include in our summation any octal number equivalent at the top of each respective binary 0.

### Examples:

$$\begin{aligned} 1.) \quad 111000101_2 &= \\ &\quad 111_2 = 7 \\ &\quad 000_2 = 0 \\ &\quad 101_2 = 5 \\ &= 705_8 \end{aligned}$$

$$\begin{aligned} 2.) \quad 110.111_2 &= \\ &\quad 110 = 6 \\ &\quad 111 = 7 \\ &= 6.7_8 \end{aligned}$$

$$\begin{aligned} 3.) \quad 100_2 &= \\ &\quad 100 = 4 \\ &= 4_8 \end{aligned}$$



### TEST: Decimal to Octal Conversion

A.) Convert the following Decimal numbers to Octal numbers

$$1.) \ 11_{10} = \underline{\hspace{2cm}} ?_8$$

$$2.) \ 134_{10} = \underline{\hspace{2cm}} ?_8$$

$$3.) \ 28_{10} = \underline{\hspace{2cm}} ?_8$$

$$4.) \ 765_{10} = \underline{\hspace{2cm}} ?_8$$

$$5.) \ 1689_{10} = \underline{\hspace{2cm}} ?_8$$

$$6.) \ 2387_{10} = \underline{\hspace{2cm}} ?_8$$

### TEST : Octal to Decimal Conversion

B.) Convert the following Octal numbers to Decimal numbers

$$1.) \ 70_8 = \underline{\hspace{2cm}} ?_{10}$$

$$2.) \ 42_8 = \underline{\hspace{2cm}} ?_{10}$$

$$3.) \ 165_8 = \underline{\hspace{2cm}} ?_{10}$$

$$4.) \ 436_8 = \underline{\hspace{2cm}} ?_{10}$$

$$5.) \ 3,216_8 = \underline{\hspace{2cm}} ?_{10}$$

$$6.) \ 2,543_8 = \underline{\hspace{2cm}} ?_{10}$$

### TEST : Octal to Binary Conversion

C.) Convert the following Octal numbers to Binary numbers

$$1.) \ 47_8 = \underline{\hspace{2cm}} ?_2$$

$$2.) \ 65_8 = \underline{\hspace{2cm}} ?_2$$

$$3.) \ 132_8 = \underline{\hspace{2cm}} ?_2$$

$$4.) \ 547_8 = \underline{\hspace{2cm}} ?_2$$

$$5.) \ 23.61_8 = \underline{\hspace{2cm}} ?_2$$

$$6.) \ 44.12_8 = \underline{\hspace{2cm}} ?_2$$

### TEST: Binary to Octal Conversion

D.) Convert the following Binary numbers to Octal numbers

$$1.) \ 111_2 = \underline{\hspace{2cm}} ?_8$$

$$2.) \ 101_2 = \underline{\hspace{2cm}} ?_8$$

$$3.) \ 111.101_2 = \underline{\hspace{2cm}} ?_8$$

$$4.) \ 101101_2 = \underline{\hspace{2cm}} ?_8$$

$$5.) \ 111100111_2 = \underline{\hspace{2cm}} ?_8$$

$$6.) \ 101000111_2 = \underline{\hspace{2cm}} ?_8$$

## Chapter 3

# The Basics Of Computer Software

“The heart has its reason which reason knows not of.”  
-Blaise Pascal

The software is the one that drives the hardware (the computer) to do amazing things. Without it, a computer is just a box, nothing but a lifeless box. Software truly brings the computer to life. Basically, the software enables a computer to perform specialized tasks. In other words, the software contains a set of instructions for a computer to follow willingly, like a servant following his or her master's commands. Generally, the software is categorized into two. The first one is the **system software**, while the other is the **application software**.

Operating systems such as Windows Vista and Linux, and utility software such as anti-virus program and anti-spyware belong to the system software category. While Microsoft Office 2007, database software, graphics software, computer games, multimedia authoring software, entertainment and education software, are under the application software category.

### History of Computer Software Revolution

Like the computer hardware revolution, it is also noteworthy to study the history of the software revolution and when or where it took place and how it evolves all throughout these years. Here is now its timeline.

#### Software Revolution: Timeline (In 1970's)

-1970

The **UNIX** Operating System (OS) was created by Dr. Dennis Ritchie and Ken Thomson of AT&T Bell Laboratories. This is a multi-tasking and multi-user OS that powers up high-end computers, network servers and workstations. The OS is written in assembly language.

**Note:**

The Pascal programming language was created by Dr. Niklaus Wirth became the most popular structured programming language in its time. During this decade, Pascal language was used and popularized as the easiest programming language of choice by the academicians, and in fact the most recommended programming language for introductory course in programming in the United States and in other parts of the world.

-1972

The **C** Programming Language (PL) was created by Dr. Dennis Ritchie and Brian Kernighan. The UNIX OS was re-written in C.

-1975

Bill Gates and Paul Allen (founder and co-founder) of Microsoft Corporation created **BASIC** (Beginner's All-Purpose Symbolic Instruction Code) computer programming language to run on Altair microcomputer (PC). It is also in this same year they established their company.

-1979

The **VisiCalc** was released by Software Arts, Inc. This is the first commercial spreadsheet software for PC users. Today, we are using Microsoft Excel as our spreadsheet software. On the same year, **WordStar** was released by MicroPro International Incorporated. This is the first commercial word-processing software for PC users. Today, we are using Microsoft Word as our word-processor. The Oracle Corporation (formerly Relational Software Inc.) releases the **ORACLE** relational database management system (RDBMS) software to the market. The **Oracle Database** is the world's first commercial SQL (Structured Query Language) language.

### Software Revolution: Timeline (In 1980's)

-1980

The **Lotus 1-2-3** was released by Lotus Development Corporation. Mainly, this software is a spreadsheet, but also features a database system and capable of graphically presenting the data.

-1981

The **Disk Operating System (DOS)**, an IBM PC-DOS and Microsoft's MS-DOS teamed-up and introduces it to the PC users. For over a decade, DOS dominates the PC world as the most popular and widely used operating system, conquering more than half of the market for IBM PC and Compatible users.

During this time also, the **CP/M** (Controlled-Processor for Microcomputers) operating system is introduced to power up the first created portable computer, bundled with SuperCalc (a spreadsheet software) and WordStar (a word-processing software).

-1982

The **AutoCAD**, an engineering and architecture software is introduced by Autodesk, Inc. It is primarily used to design 2-D and 3-D (D stands for Dimensional) drawings or objects.

-1983

The first version of **C++ Object-Oriented Programming (OOP)** language was developed at AT&T Bell Laboratories, lead by Dr. Bjarne Stroustrup.

-1984

The free software project called **GNU** (GNU's not UNIX) was initiated by Richard Stallman of Massachusetts Institute of Technology (MIT). The Free Software Foundation supports the undertaking, as an alternative to expensive proprietary software like the

Microsoft products and technologies. At the same year, another word-processing software called **WordPerfect** was released by Satellite Software International. This software has more capabilities than the previous WordStar word-processor.

**-1985**

The first desktop publishing software called **PageMaker** was released by Aldus Inc. Although it was originally developed for Apple Macintosh computer, sooner it was also developed for IBM PC and Compatible computers.

At the same year, the first Graphical User-Interface (GUI) operating system for IBM PC and Compatibles called **Windows 1** was announced by Microsoft Corporation.

**-1987**

The visual programming language called **HyperCard** was introduced by Apple Computer.

**-1988**

The first multi-tasking and multi-user operating system for IBM PC called **OS/2 1.0** was introduced by IBM and Microsoft corporations. They jointly developed this operating system (O.S.).

**-1989**

In 1989, the Word-processor of Microsoft called **MS Word** for Windows O.S. was introduced in the market.

### Software Revolution: Timeline (In 1990's)

**-1991**

In 1991, the Chief Software Architect of Nokia company, **Linus Torvalds** releases the source code of **Linux**. This is a clone of UNIX operating system that is specifically designed for the personal computer (PC) with an Intel 80386 microprocessor.

**-1993**

In 1993, Microsoft Corporation releases the **Windows NT** operating system (OS).

**-1994**

In 1994, the most commonly used Linux distribution called **Red Hat Linux** was introduced to the market.

**-1995**

In 1995, Microsoft Corporation releases the **Windows 95** operating system. At the same year, the computer scientists at Sun Microsystems created and developed the **Java** programming language that runs on any hardware and software platforms.

-1996

In 1996, the **Virtual Reality Modeling Language** (VRML) was introduced to the PC users. This is an authoring tools that provide simple interfaces and drag-and-drop editing features to create three-dimensional worlds with color, sound texture on the Internet Web.

-1998

Microsoft Corporation releases the **Windows 98** as an upgrade version of Windows 95. **Microsoft Visual Studio 6.0** which consist of Visual Basic 6.0, Visual C++ 6.0, Visual FoxPro 6.0 and Visual InteDev was also released for programmers and developers.

-1999

In 1999, the Linux O.S.-based **Star-Office** which is a fully-featured alternative to MS Office was released in the market by Sun Microsystems.

-2000

In February 2000, Microsoft Corporation releases **Windows 2000** operating system as well as the **SQL (Structured Query Language) Server 2000**. At the same year, the giant computer hardware company (IBM) announces to ship their PC's bundled with Linux operating system.

-2001

In 2001, Microsoft Corporation introduces **Windows XP** operating system as an update to Windows 2000 Professional, a client-operating system. At the same year, the Apple Computer company introduces a new operating system called **OS X**. It is based on BSD (Berkley Software Distribution) UNIX with magnificent graphical user-interface (GUI).

-2002

In 2002, an operating system developer Michael Robertson introduces **Lindows**, a Linux-based O.S. with a fully graphical user-interface (GUI). This O.S. is packaged with an OpenOffice software, an MS Office counter-part in Linux world. During this year, the OpenOffice is a file-format compatible with MS Office, meaning you can open your MS Office application to OpenOffice. The beauty about OpenOffice is that it can run on Linux, as well as in Windows, Apple Mac OS (OS X), and even in Sun Solaris (a UNIX O.S.). The first release of **Visual Studio .NET** framework happened in year 2002. The new programming language called **C#** (C Sharp) was also introduced to the developer's community.

#### **Note:**

The C# programming language was originally launch in 2000. However, its official release as part of the Visual Studio bundled programming language product was in 2002.

-2003

The Microsoft Corporation releases a family of Windows server-operating system called Windows Server 2003 which include the **Windows Server 2003 Standard Edition, Enterprise Edition, Web Server Edition, Small Business Edition, and Data Center**

**Edition.** At the same year, the MS Office 2003 was also introduced to computer users as well as the Visual Studio .NET framework's second release.

-2005

The Microsoft Corporation releases an enhancement to the .NET framework which is the **Visual Studio 2005**. **Microsoft SQL Server 2005** was also introduced. This is a major enhancement to the previous SQL Server 2000.

-2007

The long-awaited client-operating system popularly known as **Windows Vista** was released in 2007. This will replace Windows XP operating system. At the same year, the **Microsoft Office 2007** was also introduced to PC users. In the third week of November 2007, Microsoft corporation releases the **Visual Studio 2008** which exclude the J# programming language. The remaining programming languages packed into Visual Studio 2008 are **Visual C# 2008**, **Visual Basic 2008**, **Visual C++ 2008**, and Internet web development software called - **Visual Web Developer 2008**.

-2008

Microsoft Corporation releases a new family of server-operating system called **Windows Server 2008**, and at the same time, the **SQL Server 2008** is also introduced to the systems administrators and database administrators.

## Bits, Bytes, Data and Information

A **bit** is a short term for binary digit and the smallest unit of information (in computer term). Usually, a bit is a value represented by zero (0) or one (1). Other representations of bit is True, Yes, or On as equivalent to 1; and False, No, or Off as an equivalent to 0. A **byte** is a grouping of 8 bits. A single letter, number, or special symbol is made up of 8 bits which in turn equivalent to one byte. In other words, one character consumed one byte of storage capacity. So a diskette that has 1.2 Mb (Megabytes) of storage capacity (density) can hold approximately 1,200,000 characters since the word Mega is an engineering term which is equivalent to 1,000,000 (one million). Well, you have to include the space or spaces between words because a space is considered as one character.

Technically and in reality, 1 MB is more than 1,000,000 since 1KB (kilobytes) is exactly equivalent to 1024 bytes. Kilo is an engineering term which means 1,000. The 1024 is a resulting computed value of  $2^{10}$  (base 2 exponent 10), since computer operation is using a binary-based number system. This number system denotes all numbers with combinations of two digits only : 0 and 1.

The term **information** has many meanings. We only consider the definitions that are applicable to computer usage. Information can be applied to anything that can be communicated through any form of media. In computer application, information is usually called the end-product of the input data, while **data** is considered the raw materials to be processed by the computer in order to produce meaningful and useful information.

For example, in a computerized enrollment system, the data are the names, student numbers, subjects enrolled, and number of units taken. When the computer processed these data, it produces the information: the registration form that contains the list of subjects with its corresponding units, the different fees to be paid, such as miscellaneous fees, library fees, and laboratory fees. From the registration form, you would know how much tuition you have to pay, what room you are assigned and how much you would pay for the next payment period such as on midterm exam or final exam. These information are helpful to you for your budgeting tasks, otherwise you wouldn't know exactly how much you spend for leisure and fun without sacrificing your budget for the tuition fee. In short, information can help us to decide effectively. This is also applicable to other computerized business application systems. They are designed and constructed to help managers and executives to decide and manage effectively. Information Technology (IT) is truly an indispensable tool that aids our decision-making process.

## The Computer Programming Languages

In the early evolution of computers, programmer and computer scientists are forced to write every program in machine language level, translating each instructions or commands into binary codes. Today, almost all programmers use high-level programming languages that are easy to write, debug, and understand. The most commonly used are: C/C++, Visual Basic, Visual C#, and Java. To program and use these languages require considerable patience, interest, careful analysis, brain power, and time investment. Programming languages are used to solve complicated problems encountered in business operations, scientific research, and other industrial and manufacturing operations.

Since most of these programming languages are written and expressed in English-like instructions, these must be translated into a machine language. This is because the computer can only understand machine-level language. These translator programs are usually called: **interpreter**, **compiler** and **linker**. A *compiler* converts all the source code into machine code, which eventually creates also the executable file. This executable file is usually has a .EXE filename extension.

The *interpreter* converts also the source code to machine code. However, instead of creating the executable code, the *interpreter* translates and then executes each line of the program, one line at a time.

## Structured Programming Language

The **Pascal** and **C** programming languages are the most popularly used structured programming language in the world and the most widely used worldwide in 1970's, 1980's and early 1990's. In structured programming language, the programmer constructs programs out of small modules which are easy to understand, maintain or enhance. Each module which is also called *sub-routine*, performs(action) a specific task (logic). The action and logical structures of the code are local only to the module. It cannot affect

other module. The module can be reused by other parts of the program. The program in structured programming language is viewed as a logical procedure that takes an input data from the keyboard or disk, process the input data by the microprocessor, and produces output data into the monitor's screen.

## Object-Oriented Programming (OOP)

The C++, Java, and C# programming languages are originally designed and developed as 100 percent pure OOP language. An OOP is another programming paradigm which approach to program design and development organizes the programs around **objects** rather than actions, and **data** rather than logic. In object-oriented programming, we view the programming tasks more on the objects that we want to manipulate, rather than focusing on the logic required to manipulate them; the way we do with structured programming paradigm. Anything we can see in our world is considered as object such as people, computer, buttons, lists, buildings and so on.

## Different Categories of Programming Languages

There are two broad categories of programming languages. The first one is combined – the **machine and assembly languages** as one category. The second is **high-level language**. Historically, the machine language is the **first-generation** language while the assembly language is the **second-generation** language. The high-level language is considered as the **third-generation language** (3GL).

Machine language and assembly language are difficult to program. An **assembly language** use a short English-like abbreviations to represent common elements of the machine code.

**High-level language** was developed to make programming easier to read and understand. It uses syntax or commands that is more like the language used by humans in their daily conversations.

There is also another generation of computer programming languages. They call them: **fourth-generation language** (4GL) and **fifth-generation language**. The **fourth-generation language** uses **integrated development environment** (IDE), where the programmer uses a Toolbox or Control Bar to drag and drop various controls such as buttons, text box, check boxes, radio buttons, list box, scrollbars and more into the Form control when designing and developing their programs or systems. This will provide visual definitions and representation of their application program to the intended users.

The most common and popular IDEs today are Microsoft Visual Studio, Sun Microsystems Java Studio, and Oracle JDeveloper Studio.

The **fifth-generation language** (5GL) in principle, uses artificial intelligence (AI) to create and build software based on our description and desire of what the software would do and accomplish. As of the time of this writing, 5GL is still just in its conceptual stage, though some computer experts claim that some authoring languages today are already a fifth-generation language.

## C Programming Language

The C programming language was invented by Dr. Dennis Ritchie at AT&T Bell Laboratories, New Jersey, USA in 1970's. This is considered as one of the most powerful programming language in its time. Its main objective why it was created is to replace Assembly language as a programming language to design and develop operating systems and system programs such as compilers, interpreters, utilities and databases. C language was so very successful in its attempt. In fact, C was used and implemented by Dr. Ritchie to develop the UNIX operating system. And almost all of its codes are written in C. Some minor codes are written in Assembly language. The C programming language is considered as middle-level programming language, because it combined the power of a low-level language such as the Assembly language and the elegance of high-level language like Pascal language. This further means that C language can directly manipulate the bits, bytes, and even the computer hardware memory addresses. This makes the C programming language so powerful and ideal for system programming and embedded intelligence programming. Embedded intelligence programs are embedded inside an Integrated Circuit (IC) that can be found in some intelligent electronic devices.

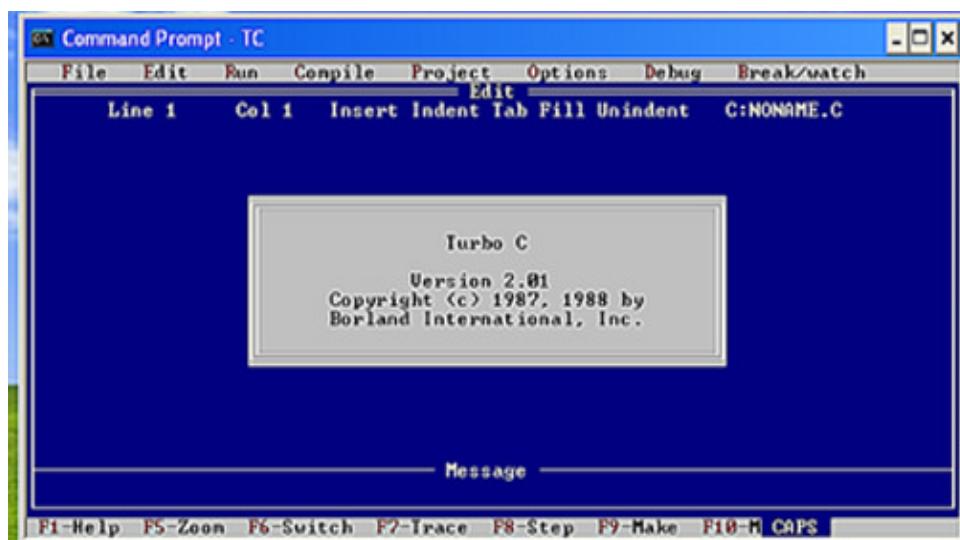


Figure 3.1 The Turbo C Programming Language Integrated Development Environment

## C++ Programming Language

The C++ is a superset of C programming language. This language was invented by Dr. Bjarne Stroustrup of AT&T Bell Laboratories, in 1985. This is the standard Object Oriented Programming (OOP) language, meaning, the other newly invented programming languages that are OOP language in nature adheres to its design philosophy.

The computer scientists had observed that the Structured Programming languages like Pascal and C can no longer meet the present demand of computing. More and more users wanted more graphics; programmers and developers wanted more powerful language that can make larger programs easier to develop, manage, and maintain. This is the very reason why C++ was created: to come up with a programming language that makes larger programming tasks easier and faster to design and construct.

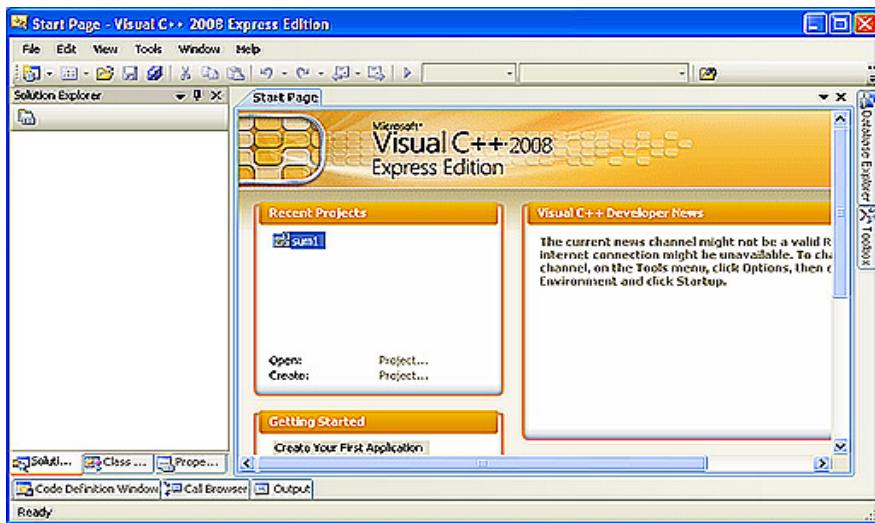


Figure 3.2 The Visual C++ 2008 Integrated Development Environment

## Visual Basic Language

The Visual Basic programming language was developed by Alan Cooper, an American computer scientist in the late 1980's. This programming language was created with the main purpose of teaching programmers and developers how to design and develop graphical-user interface (GUI) programs easily. The reason behind the GUI name is that we work more with graphics, forms, and icons, than typing text to accomplish a particular task. In GUI approach, rather than trying to remember a hard to remember command and its corresponding parameter, we can remember easier by using pictures, objects and images.

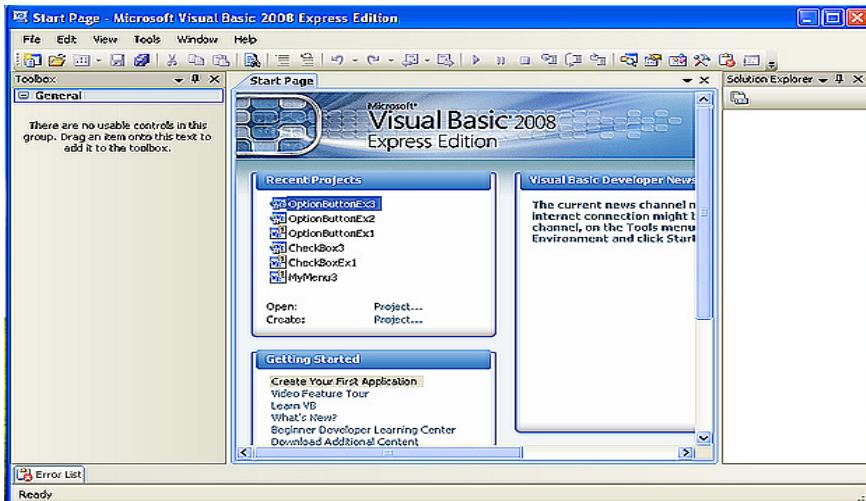


Figure 3.3 Microsoft Visual Basic 2008 Integrated Development Environment

## C# Programming Language

The Microsoft corporation releases officially the C# programming language version 1.0 in July 2000, which primary objective is to change the way how the programmer and developer construct their Windows and web applications. This language was invented by Anders Hejlsberg and Scott Wiltamuth – the two distinguished Microsoft engineers. Anders Hejlsberg is legendary in the circle of programming language invention arena, because he was the one who created Turbo Pascal programming language and lead-creator of Delphi IDE at Inprise company (formerly Borland International).

C# is created and developed by combining the strengths found in three programming languages: C++, Java, and Visual Basic, and avoids its respective weakness points. The objective of C# is to provide an object-oriented, Internet-centric, high-performance and yet simple language for the .NET framework development environment.

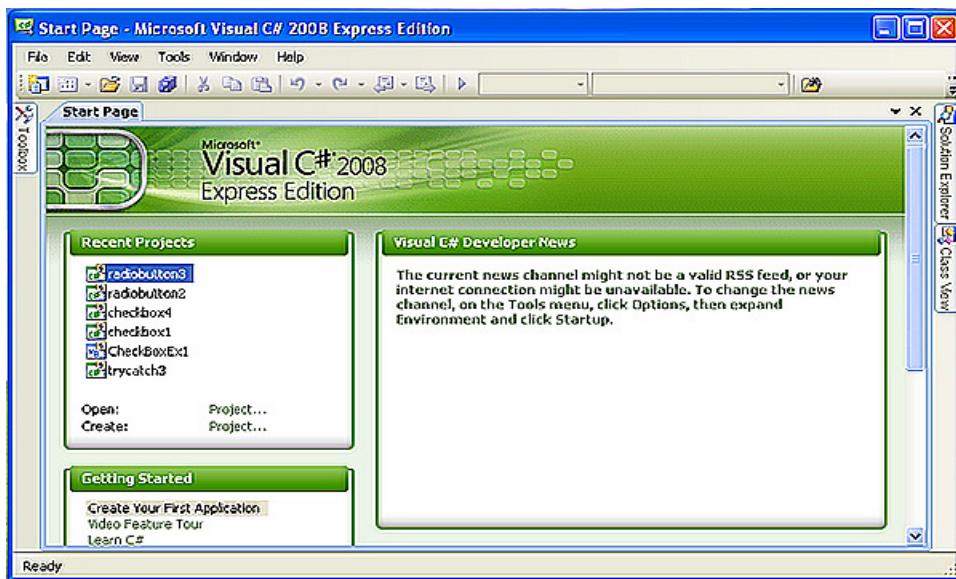


Figure 3.4 Visual C# Integrated Development Environment

## About Visual Web Developer 2008

Microsoft Visual Web Developer is an Integrated Development Environment (IDE) where you can design and develop your web page and website using either the Visual Basic 2008 or Visual C# 2008 syntax. Most of the work of the web page designer and developer can be done by the guide of a wizard or with a combination of hard-coding. This will make web page and website development easy and fast, adding more productivity to the developer or designer. Rapid Application Development (RAD) is truly applied and implemented in Microsoft Visual Studio 2008.

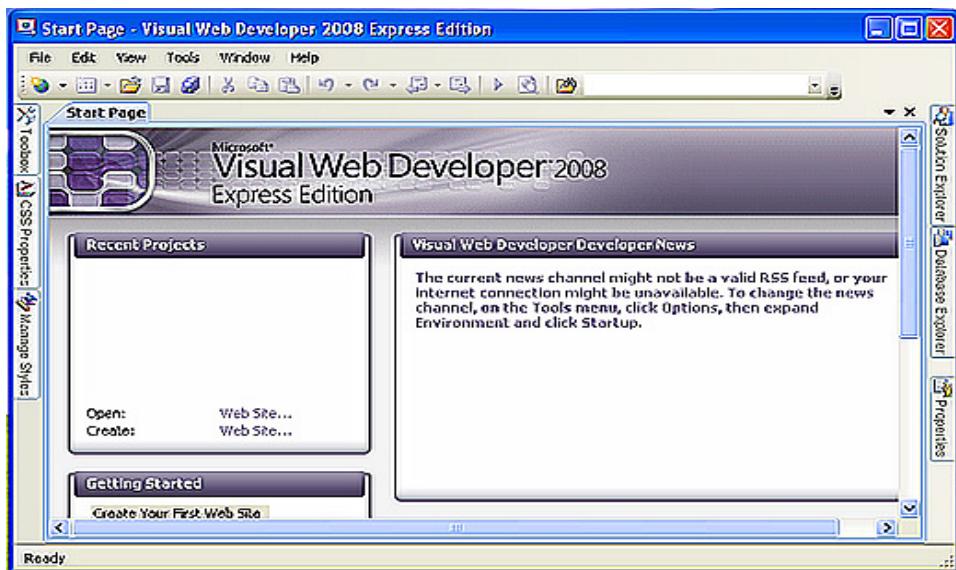


Figure 3.5 Visual Web Develop 2008 Integrated Development Environment

## A Special Note about IDE

The Integrated Development Environment (IDE) is the term used to describe the working environment of a particular programming language where you can compile, debug, and run your program in a menu-driven and graphical-user interface (GUI) manner. Plus, coding your program with the programming language's IDE is easier and faster, because it has many tools integrated to it, that will make the task of the programmer better and more productive. One of these features is the “intelli-sense” that provides (automatically and instantly) the developer a list of command syntax, class, object, and method name, and many more, as he or she writes the code. Errors will also be automatically highlighted with some color (usually in red), to make you easily visualize them. In an IDE, some of the code with ready-made templates will be automatically provided to you. You just have to invoke them. One of these templates are the Get() and the Set() methods which functionality is about assigning and initializing values to particular parameters, variables, or objects.

## Java Programming Language

Java is an object oriented programming (OOP) language invented by Dr. James Gosling of Sun Microsystems, in early 1990s. It was designed to run on almost any computers and in any operating systems, or literally speaking- in any hardware or software platforms you are using. Java is primarily designed as a programming language for Internet-based program development. Meaning, from the ground-up, its strength lies in its ability to work with the Internet technology and its inherent idiosyncrasies.

In Java, we can write program called **applets**. The applet can be embedded in web pages to provide some intelligence, so that the web pages we designed becomes dynamic, animated, or alive in the face of the website visitors and web surfers. This will not limit to animation and graphics alone, but also to interact with the user or surfer. In other words, to become interactive with the visitors where they can input data, and get a reply or result from it.

The Java **application** programs are stand-alone programs that we can run in any platforms. This further means that the application program will run without any modifications or problems to any software or hardware where we implement it. The good thing about Java application program is that we can develop and implement it in a stand-alone computer or network computers. In other words, Java application programs are not Internet-based programs like the applets do.

This short discussion of Java capabilities cannot justify its immense power. In reality, Java is so very powerful. It can do a lot of things that you can imagine. I just can't explain it here in a way of listing it one by one. Afterall, this is a book about introductory computer concepts and applications, not an intensive discussion and treatment about Java programming language.

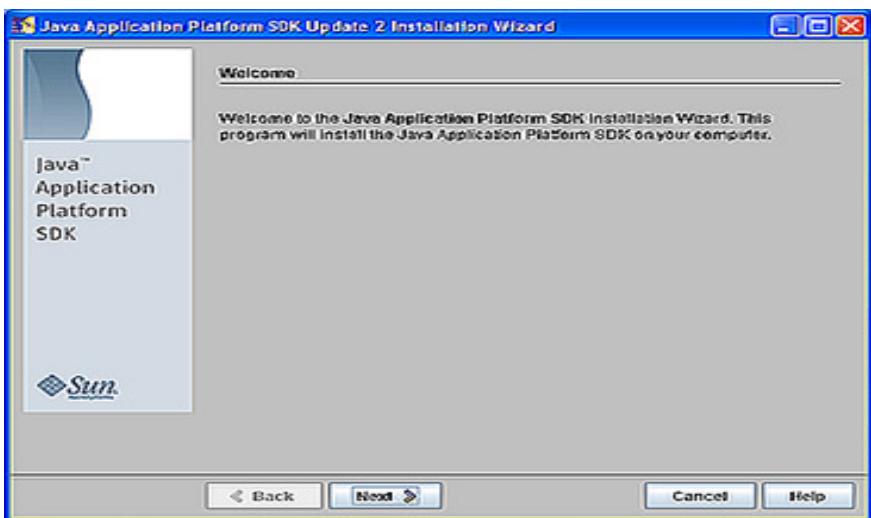


Figure 3.6a The Java Application Platform Software Development Kit



Figure 3.6b The Java Runtime Environment (JRE) Setup

#### Note:

I am also writing about Java book. If you are intrigued enough about Java's immense power and capability, then I'd like to suggest that you have to read books about Java programming, especially the one I wrote. I explain Java programming in that book in a way that is easy to learn, understand, and enjoyable to program with. I promise.

## Python Programming Language

The **Python** language is known in the open-source community for its dynamic semantics and binding capabilities which are very ideal for Rapid Application

Development (RAD). These capabilities of Python language are suitable for scripting operating system administration tasks or as a glue language to connect system components together. Like any new high-level programming languages, Python is also an Object-Oriented Programming (OOP) and interpreted language. One of the most outstanding features of Python is its simplicity in the implementation and design. For example, it is easy to debug your Python program, because any error or bad input data found in your program will not cause a segmentation fault. Instead, the Python interpreter will simply raise an exception when an error or bad input occurs. And if in case the Python program was not able to raise an exception, the Python interpreter will simply print a stack trace for a programmer to easily trace the error in his or her program.

**Note:**

The **exception** is an error-handling mechanism within your program. Usually, this *exception* code is written with the combination of *try-catch* and *finally* statements.

## The Scripting Languages

The scripting languages evolved during the Internet revolution. They were the languages used so that the Internet or the World Wide Web became available for us to see it, enjoy it, and having fun with.

### The HTML

The HTML is a scripting language that was developed by Tim Berners-Lee back in 1989. We will use HTML in writing simple web pages.

The HTML stands for **Hypertext Markup Language**, which defines a set of common styles for web pages. These common styles or elements are the tags, headings, paragraphs, lists, tables and character styles (fonts) such as boldface, italics, or underlined. The HTML describes also the structure of a document.

Markup language means that we start with the text of our page and add special tags around paragraphs and words. The tags indicate the different parts of the page and produce different effects in the browser. The HTML tags are the information inside the bracket (< >). This indicates the elements or features of a page. The pages written in HTML are plain text file. They can be read by any text editor that supports text writing.

Each HTML page needs a title to indicate what the page describes. The title indicates what the web page is about and how it is used to refer to that page in bookmark or hotlist entries.

```

<HTML>
<HEAD>
<BODY>
</TD>
<<FONT FACE="Helvetica, Arial"
COLOR="#000000">
<B>Our Portable
<BR>GenLab is ushering
<BR>in a new age.</B></FONT>
<FONT FACE="Helvetica, Arial"
COLOR="#0000FF">
<B>Would you
<BR>&nbsp;&nbsp;&nbsp;&nbsp;like to see
it?</B>
</FONT></FONT></TD>
</HEAD>
</BODY>
</HTML>

```

Figure 3.7 The HTML Code Sample

## The JavaScript

The JavaScript is a scripting language that enhances the functionality and usefulness of the mere static HTML web pages. With the use of JavaScript, we can create dynamic and interactive web pages such as validate information in our Form that is filled-up and submitted by a visitor of our website, add alert boxes to our web page, customize reactions to mouse actions and keystrokes, perform calculations, and much much more. The JavaScript was developed by Brendan Eich at Netscape Communications in 1995, the company that releases the first world renowned web browser – Netscape Navigator.

The good thing about JavaScript is that it adheres to Object-Oriented Programming (OOP) design principles, though not completely. In other words, you can apply your OOP knowledge and skills in designing and developing JavaScript code.

```

<html>
<head>
<title>Displaying Hello World!</title>
<script type="text/javascript">
    var datenow = Date();
    var msg = 'Hello, World! The date today is ' + datenow;
    alert(msg);
</script>
</head>
<body onload="hello();">
</body>
</html>

```

Figure 3.8 Sample JavaScript code

## The PHP

The PHP (Hypertext Preprocessor) scripting language is used to create dynamic Internet web pages. This PHP is an embedded and a server-side scripting language which goal is to allow the Web developers to write dynamically generated pages quickly and efficiently. Most of the command and function syntax of PHP are borrowed from C programming language, Java, and Perl scripting language. The PHP is also very excellent in database connectivity, whether you are using MySQL database, Oracle database, PosgreSQL database, and others. Rasmus Lerdorf, invented PHP which was originally defined as Personal Home Page. His original main purpose of inventing this scripting language is to be able to monitor the Web page views. However, it was developed into a more powerful language that is capable of developing dynamic web pages and database connectivity in a simple and straight-forward manner.

```
<html>
  <head>
    <title>Hello World</title>
  </head>
  <body>
    <?php

      echo("Hello world!<br />");
      print('Goodbye.<br />');

    ?>
  </body>
</html>
```

Figure 3.9a Sample PHP code

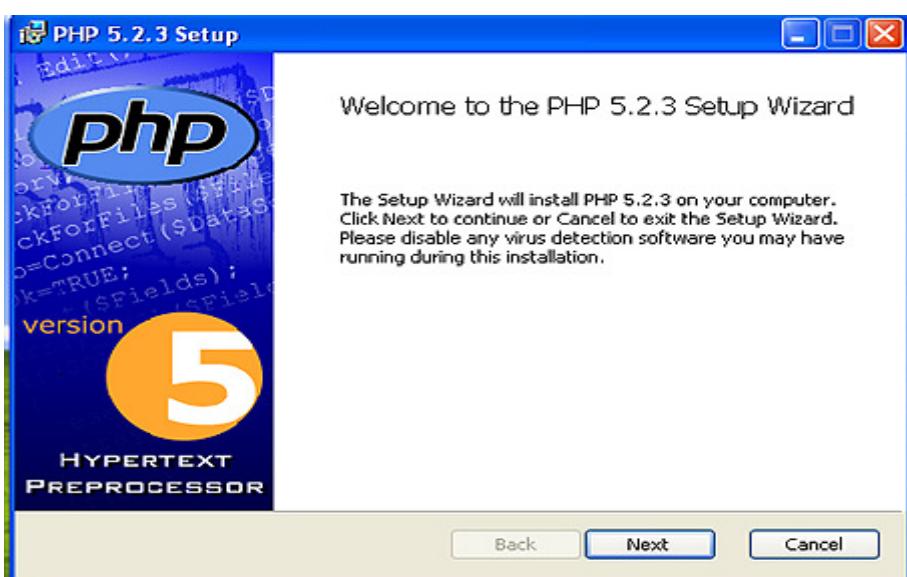


Figure 3.9b The PHP Setup Wizard

## The XML

The XML is a markup language developed by the World Wide Web Consortium (W3C) which main goal is to overcome the limitations of HTML. The acronym XML stands for the eXtensible Markup Language. In XML, there is no predefined tags, unlike in HTML. Meaning, the designer and developer of the web page and website will create the tags only if they are needed for his or her applications. This is how the XML developer would do to his or her documents, to structure it the way he or she wants it. Structuring a document is providing format to a document. This formatting process will dictate how a document must be processed, manipulated, or presented. Like for example, the price tag means a price tag in XML. Now this price tag has no equivalent tag in HTML because the XML developer is the one who assigned this tag to his or her Point-Of-Sale application system. Truly, XML extends the capability of HTML and made it more useful, powerful, and flexible.

```
<?xml version="1.0"?>
<productlist>
    < product code="01">
        <name> Hamburger </name>
        <price> 35.00 </price>
    </product>

    <product code ="02">
        <name> French Fries </name>
        <price> 20.00 </price>
    </product>

    <product code = " 03">
        <name> Spaghetti </name>
        <price> 25.00
    </product>
</productlist>
```

Figure 3.10 Sample XML code

## The CGI

The CGI stands for **Common Gateway Interface**, a method for running programs on the web server that is triggered by an input from a web browser. The CGI scripts enable our reader to interact with our web pages. These interactions can be a simple search for a chunk of information in a database, or to select an item from a form and get a reply in return, or to offer a comment on what we have written.

When we encounter a search dialog or a fill-in form (in case of membership application) on the web, then we have to use a CGI script in real application. A CGI

script is an extremely powerful feature of server interaction and web browser. The script is usually a link between the server and some other program running on the Internet system. This is usually a database program. The script performs some action based on the input from the browser. The action includes calling other program from the system, querying a database information, or calculating a value. The script also generates an output which the server can understand. When the server receives the output from the script, it passes back to the Web browser. Finally, the browser formats and displays the output for the readers.

**Note:**

The **Perl** and other operating system scripting languages, particularly in the UNIX and Linux environment are not included in the discussion above, because most of these scripting language originated as a system administrator's tool to accomplish his or her task in managing the network. They are not originally part of the scripting language that revolutionizes the Internet technology. Though, in one way or another, they are used in some cases to accomplish some Internet-related processes, they cannot be classified as scripting language for the Internet web design and development purposes. The "opinion" is purely mine.

## Authoring Software

The **authoring software** is a special-purpose programming tools for creating computer-based training (CBT) programs, Web pages, and multimedia applications. Using authoring software such as the Adobe Director, we can create multimedia titles combining music clips (MP3s), animation (avi files or MP4s), graphics, and text messages - all in one application. Plus, the code of the application is written automatically. We can also design and develop Web pages in an easy way using Microsoft Front Page or Macromedia Dreamweaver and Flash. These authoring tools allow the designer and developer to visually write Web pages, most especially if he or she wants to create forms, tables, and other components for HTML pages.

## The Operating System

The **Operating System** is a collection of programs that perform a variety of tasks or functions. The tasks performed by the operating system (OS) involve communicating with the disk drives, printers, hard disks, CD-ROMs, monitor, modem and other peripheral devices. The operating system performs also memory management task such as keeping track of how the memory of the computer is being used so that no job would conflict with another job performed at the other parts of the memory.

Moreover, operating system performs data management. It provides a level of system security that protects a certain type of data or information. It acts like a clerk locating and accessing files and programs which are requested by the user.

### The DOS (Disk Operating System)

In 1980's and early 1990's, DOS dominates the market as a standard operating system for personal computers. This operating system is designed with a character-based user interface, meaning we have to type a command to perform a particular task, like

copying, deleting, transferring, or running a certain program or software. Unlike in Windows operating system, we just simply use the mouse to point and click and drag to accomplish the above mentioned task.

There are two versions of DOS that reigned as an operating system of choice during that time. The first one is called IBM PC-DOS and Microsoft MS-DOS. The DOS operating system suffered a lot of weaknesses or limitations. For example, it supports a limited amount of RAM, it has no built-in support for networking and supports only 16-bit programs.

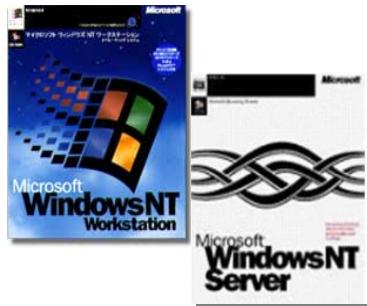


Figure 3.11 Different Editions of Microsoft Windows NT

## Microsoft Windows Operating System

In early 1990's, Microsoft released Windows 3.0, 3.1 and 3.11 that requires MS-DOS to be installed first completely. It runs on top of DOS to provide a GUI and additional capabilities.

In August 1995, the Microsoft released their **Windows 95**. A total enhancement of the Windows 3.1 and 3.11 which were used by few computer users in the early 1990's who wanted to a graphical user-interface (GUI) type of operating system. This time, the DOS is no longer needed for its installation, configuration and operation. Windows 95 puts all data communication activities in a single screen icon. These activities are e-mail, downloads, and Internet access. Windows 95 supports the "plug-and-play" feature. This concept lets the computer to configure itself when a new computer peripheral is added, connected, or installed.

**Windows 98** is considered just an update to Windows 95. One noticeable change in Windows 98 is the inclusion of the Internet Explorer (IE) Web browser, and the Active Desktop that lets the user to browse the Internet and local drive of the PC or Laptop in a similar manner.

The **Windows Me** (Millennium Edition) offers more enhancements such as digital video editing, improved multi-media support and capabilities, and enhanced Internet features. The main problem with *Windows Me* is that its unstable operation results to frequent crashes.

The **Windows 2000 Professional** combines the user-friendly interface of Windows 98 and a networking power of Windows NT. Its main feature is a support for symmetric multiprocessing (SMP) with up to two microprocessors (CPUs).

The **Windows NT** (New Technology) was released in 1993 before Windows 95. It was originally designed as the successor of DOS, but it turned out to be repositioned as

a high-end operating system for powerful workstation (Windows NT Workstation) and network servers (Windows NT Server) used heavily in business operations.

With the release of Windows XP (Home Edition for personal use and Professional Edition for corporate networks operations) in October 2001, the PC desktop has more three-dimensional (3D) look, with more shading and rounded corners, and offers more brighter color choices. It supports 64-bit CPU. With its digital media support, the user can take advantage of video and audio rendering rendering for multimedia projects and digital broadcast support. The Advanced Networking and Communications feature of Windows XP, the user can now enjoy the more enhanced Plug and Play support which enable the computer to find and use the hardware connected via a network, without forcing the user to configure the system or install the required drivers. With the Internet Connection Sharing feature, the user can connect multiple PCs to the Internet via a single connection. Through the use of Advanced Mobile Computing automatic configuration feature, the user can connect an XP-based Laptop to a PC without the need to know different type of network settings. Plus the IrComm modem support will allow us to use a cellular phone to connect to the Internet.

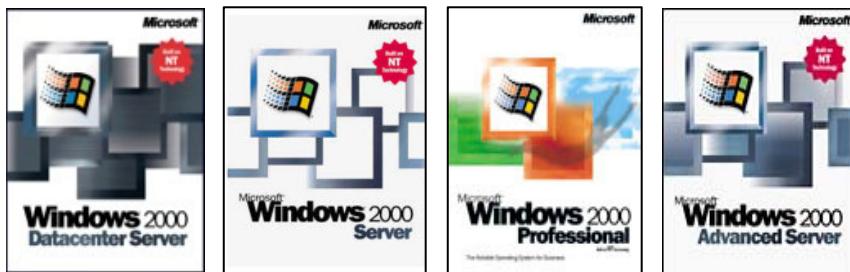


Figure 3.12 Different Editions of Microsoft Windows 2000 Operating Systems.

## **Windows Vista (A Real-Life Example of a Client or Workstation Operating System )**

The Microsoft Windows Vista is a computer operating system. The World Wide Web is easily accessible from anywhere in Windows Vista. By using Windows Vista, we can access the Support Online Web site for answers to our common questions. It has tools that can help us to regularly test our hard disk and check system files. Plus, it can even correct some of the problems found.

Windows Vista is a truly Web integrated. The Internet connection wizard makes the connection to the Web fast and simple. Using Microsoft Outlook Express, we can send e-mails to our friends or post messages to the newsgroups in the Internet. With the use of Microsoft NetMeeting, we can collaborate with others on documents edited by teams. Plus, we can even hold a teleconferencing over the Internet. Using Microsoft NetShow, we can play live media over the Internet.

Windows Vista supports DVD technology and high definition digital audio, so we can play high quality digital movies and music on our computer. Using Microsoft Web-TV, we can watch television broadcasts and check TV program listings.

Windows Vista includes a wide range of helpful troubleshooters that assist us with common computer problems. When we have difficulty setting up a new high-tech printer, the Print troubleshooter can walk us through the process step by step. We can use the Support Online Web site to find answers to technical questions about Windows Vista.

The Windows Vista includes the Discover Windows Vista online tutorial, which teaches us about the basics of Windows operating system. We can subscribe to our favorite Website, we can schedule times

for Windows Vista to automatically check the website on a regular basis and notify us when the website is updated.

The Web pages that we subscribe to can be automatically downloaded to our computer or sent via e-mail. By subscribing, we are free from the hassle processes of downloading, connecting times, and busy Web servers.

In Windows Vista, we can browse the computer contents the same way we surf the Web sites. More than ever, the PC's now has more three-dimensional look, more shading and rounded corners. It offers also some brighter color choices. It supports also the capabilities of a new microprocessor in 64-bit to take full advantage of it.

With Windows Media Player 11, users can take advantage of digital broadcast support, as well as video and audio rendering for multimedia presentations. Windows Vista enables the computer to find and use hardware connected via a network by taking advantage of the universal Plug and Play support feature. The automatic configuration feature of mobile computing in Windows Vista makes it easy to connect to the Internet on this present time of wireless technology.

With Windows Vista's IrComm modem support, we can use a cellular phone to connect to the Internet. In addition, we can protect our data, programs and other files through its complete PC Backup and Restore feature. This particular feature is ideal for disaster recovery when our PC malfunctions.

With Windows Firewall feature, we can stop many kinds of malware before they can infect our PC or other computers on our Local Area Network (LAN). This feature is a critical first-line of defense to protect our PC against many types of malicious software such as viruses, Trojan, and worms.

The Wireless Networking of Windows Vista, allows us to create a PC to PC wireless network right in the comfort of our home. With wireless technology, playing computer games can be very exciting and comfortable anywhere in the house or in the backyard or in the "sala" or in the kitchen.

Now you can easily edit your family affair videos with Windows Vista's Movie Maker feature. This affair could be your first baby's birthday, your debut of last year, or simply your family's yearly reunion. These are just among the Windows Vista's features. Discover the other features by yourself. Are you ready now?

---

Here are the summary of the things you can do with Windows Vista:

- **Finding the File in a few quick clicks** – you can save time by instantly tracking down any file, document, MP3, video, software, or photo by using the Instant Search capability of Windows Vista.
- **Keeping Photos Organized** – with Windows Vista, you can tag your photos with a keyword or date, or any label that you can remember easily, so that you can search them quickly using those labels.
- **Create a Customized Movie** – the Windows Movie Maker feature of Windows Vista can blend photos and videos into a personalized movie with soundtracks of your own choice, and proper titles that you can imagine, and credits and acknowledgements for those people involved in the movie-making process. After-all, movie-making is a team effort.
- **Keeping track of your Music** – With Windows Media Player 11 (all-black effect), you can easily browse and play your MP3 and WMA files or your entire music library. It takes only a single click to create a new playlist of your favorite music album or your most played tracks of songs.
- **Watch and Record TV drama series** - this time, you can record any TV drama series (or comedy series) any time you want, and watch it at your own convenient schedule. The computer hardware you just need is a TV tuner that you can buy from your favorite computer store, and the software you need is the Windows Vista's Media Center.
- **Surfing Multiple Web at once** – with the new Internet Explorer 7, you can open multiple web pages in one window and easily click between them with its tab browsing feature. A similar feature and capability that you can find with Mozilla Firefox (a reincarnation of the Netscape Navigator's glorious days).
- **More System Security**- with Windows Vista's **Defender** security software, you can be protected from spam and phishing. Plus, you can protect your children from encountering some "for adults stuff" in the Internet by using the centralized **Parental Controls** feature. With Parental Controls,

you can set boundaries on what your kids can do on the computer connected to the Internet to provide them a safer web-surfing experience.

- **See everything you have open lately** – with the Windows Flip 3D, you can easily track of what files you have open lately, by flipping through all the files and windows with a simple click of the mouse.



Figure 3.13 The famous Windows XP Operating System

## Other Operating System

### Linux

The Linux is a multi-tasking operating system that supports multiple users and multiple processors. Linux can run on nearly any type of computers (from Desktop, Laptop, Server, and Supercomputers), and supports almost any type of software applications. The most popular Linux operating system distributions are from Red Hat Linux and Novell Linux. Most of the Linux distributions are free. Meaning, you can get it without worrying about licenses or online activation.

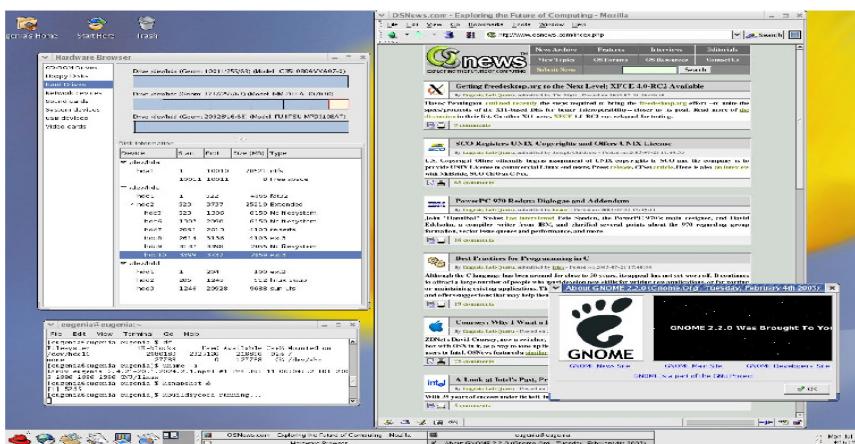


Figure 3.14 Linux Operating System Screenshot

## UNIX

The UNIX operating system has been popular for high-powered workstations that are used in engineering and scientific applications. It is also heavily used in a mission-critical applications such as Web servers that are used for online transactions, maintaining Internet domain names, large database servers of banks, manufacturing companies, and pharmaceutical firms.

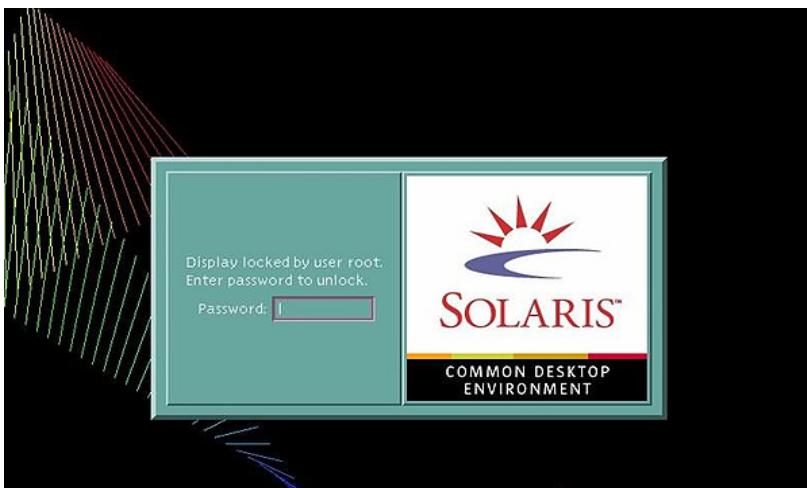


Figure 3.15 The Solaris (UNIX) Operating System Screenshot

## Mac OS X

The new Apple Macintosh operating system, popularly known as Mac OS X, is based on the UNIX operating system code (the BSD (Berkley System Distribution) UNIX). The Mac OS is heavily favored by graphics artists, multi-media developers, and media publishers. This is due to its highly powerful graphics features and capabilities. Graphics artists who created cartoon movies and TV cartoon series, TV, magazine, and newspaper advertisements, are using iMac computers as their tools for their creative works.

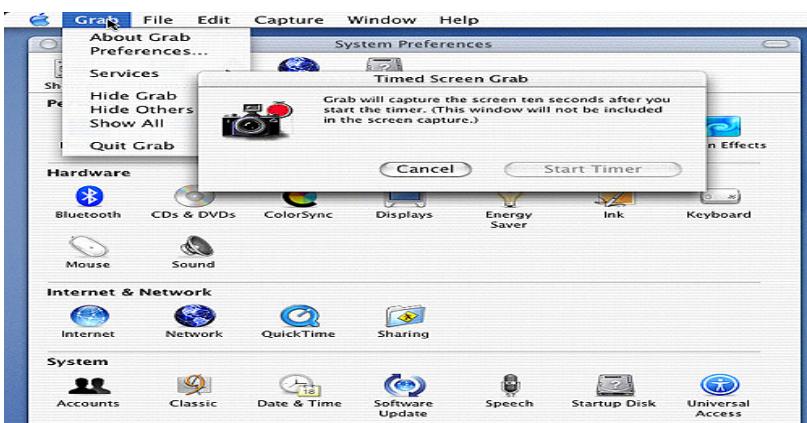


Figure 3.16 The Apple Macintosh Operating System Screenshot

## Palm Pilot OS and Microsoft Windows CE (Embedded Operating System)

There is another kind of operating system that is not popular to us, but we usually used them already through some of our electronic gadgets. This kind of operating system is directly built into the circuitry of an electronic device such as in our PDA's (Personal Digital Assistant), cell phones, medical equipments, bar-code scanners, and electronic devices found in automobiles. The widely used embedded operating systems are the following:

- **Microsoft Windows CE.NET and Windows XP Embedded**
- **Palm Pilot OS** ( found in Palm PDAs and Sony PDAs)
- **Microsoft Pocket PC OS**
- **Symbian OS** (found in smart phones of Nokia and Sony-Ericsson)

## Cisco Internetwork Operating System (IOS)

The Internet devices called **routers** and **switches** use an operating system that is specifically designed for them to operate and work. Most of the popular router and switch are designed and developed by Cisco Systems, the world leader in Internet device design and manufacturing. It is called the Cisco IOS. A router is simply a special type of computer with very specific function and purpose. Like the computer we use that needs an operating system to run, the router needs an OS to run too. The router needs the Cisco IOS to run configuration files that contain instructions and parameters that control the traffic in and out of the Cisco router or switch. The configuration files specify all the information for the correct setup of selected routing protocols on the router to communicate with other routers, successfully. By using routing protocols, the router can decide effectively how to send the packet that contains data or information to the best path to reach its destination in a fast and efficient way.

```

Router#
Router#
Router#sh ip int brief
Interface          IP-Address      OK? Method Status       Prot
ocol
FastEthernet0/0     1.1.1.2        YES manual up           up
Loopback0           10.1.1.1       YES manual up           up

Router#sh ip ro
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, OA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, # - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

C    1.0.0.0/8 is directly connected, FastEthernet0/0
      10.0.0.24 is subnetted, 1 subnets
C      10.1.1.0 is directly connected, Loopback0
R    192.168.1.0/24 [120/1] via 1.1.1.1, 00:00:05, FastEthernet0/0
Router#

```

Figure 3.17 The Cisco Internetwork Operating System (IOS) Screenshot

## The Four Categories of Operating System

The Operating Systems are actually categorized in four classifications. The first one is the **Workstation OS** which are used primarily by computers that are not connected to the networks. These are usually the type of operating system that we used at home, or installed in our laptops. The Microsoft Windows, Linux, and UNIX, have their own individual version for this workstation operating system. The most popular are from Microsoft which are called the Windows XP Home Edition and Windows XP Professional and Windows Vista. The Windows XP Professional operating system is used primarily in the computers found in the company that are connected to the Local Area Network, Intranet, Internet or Extranet. It is specifically designed for a computer (workstation) that connects to the server in the network that needs system security settings.

The second category is a **Network Operating System** (NOS) that is specifically designed for network servers. Network servers act as the main computers used in the company. The most famous server operating systems are still from Microsoft. They are the Windows Server 2003 and Windows Server 2008. The Linux and UNIX operating systems are usually used as server operating system in the company.

The third in the category of an operating system is the one used for PDAs, cell phones, bar-code readers, and electronic devices found in automobiles. It is called the **embedded operating system**. The most popular embedded system are Windows CE.NET, Windows Pocket PC, Palm OS and Symbian OS.

The last category is an operating system called the **Internetwork Operating System** (IOS) which specific application is in the Internet devices called routers and switches. Because of the IOS that powers up the *router* and *switch*, the computer connected to the Internet can communicate to each other, regardless of distance or time. The router and switch made this possible.

## Utilities Software

The operating system has already the utility software programs included in its package. These utility programs perform system maintenance, repair, enhance or extend the capabilities of the operating system.

The utility software is used when damaged system files happened during the time we forgot to shutdown our computer properly. Some other cases involve the sudden electrical power outage and hard disk's head crash. This would result to many bad sectors and lost clusters in our hard disk. This is reported during the time we boot our computer.

When the damage is a severe case, it is advisable that we have to reformat and repartition the hard disk. Although some of the stored or saved software and data can be back-uped, the affected files are possibly cannot be restored. There are commercial utility programs such as the famous **Norton Utilities** that can repair these affected files. You have to purchase this utility software separately. The Norton Utilities can diagnose and repair damaged disk, recover files that have been accidentally deleted, resurrect a crashed hard disk, and optimize hard disk drive performance by *defragmenting* the disk.

The **antivirus** software, **backup** utilities, and **firewalls** are also classified as utilities software. They can enhance or extend the capabilities of the operating system. The antivirus utility can examine or check the contents of the hard disk, USB drive, and RAM for hidden viruses that might be lurking on these storage devices. The **firewall** software or hardware (or a combination of both), can examine or block traffic coming from or going to the Internet. In this way, your computer could detect (and will inform you) if you are being attacked by a hacker or simply an intruder that violates your right to privacy.

These are the following type and examples of these utilities:

Type	Examples
Backup Utilities	Nero
Antivirus software	Norton, McAfee, AVG
Firewalls	Cisco, 3COM, CheckPoint FireWalls
Compression Utilities	WinZip, WinRAR

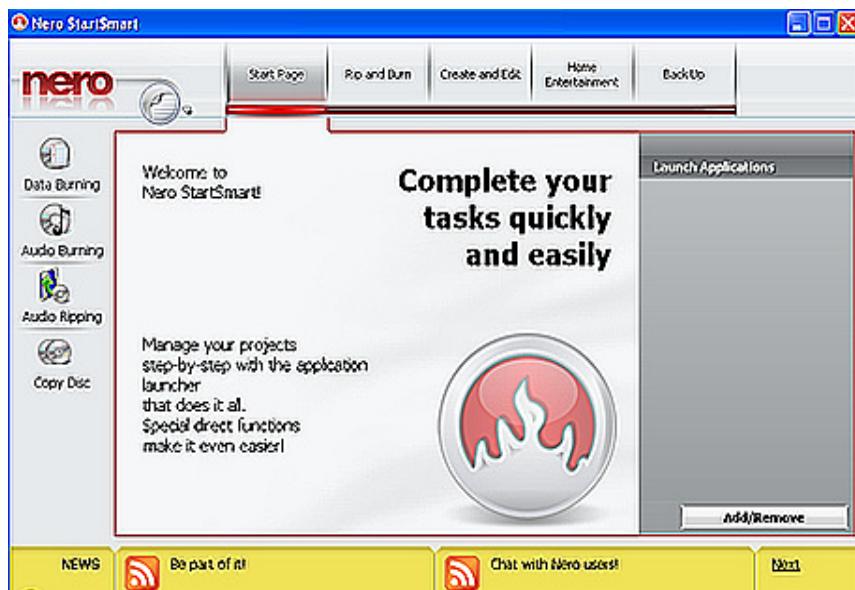


Figure 3.18 The Nero Main Menu

#### Note:

Download manager software such as IDM (Internet Download Manager), Torrent, and Kazza, are classified as software utilities too. They are used in downloading files in the Internet in a fast and easy way.



Figure 3.19 Internet Download Manager Screenshot

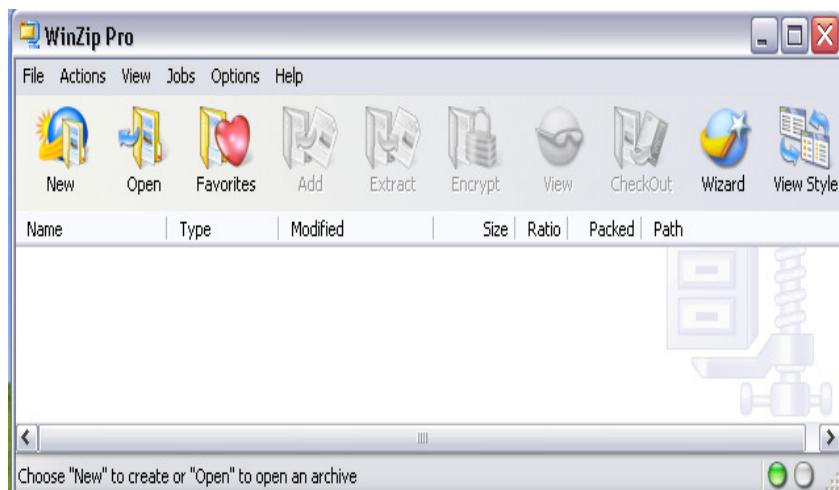


Figure 3.20 WinZip Compression Utility Software

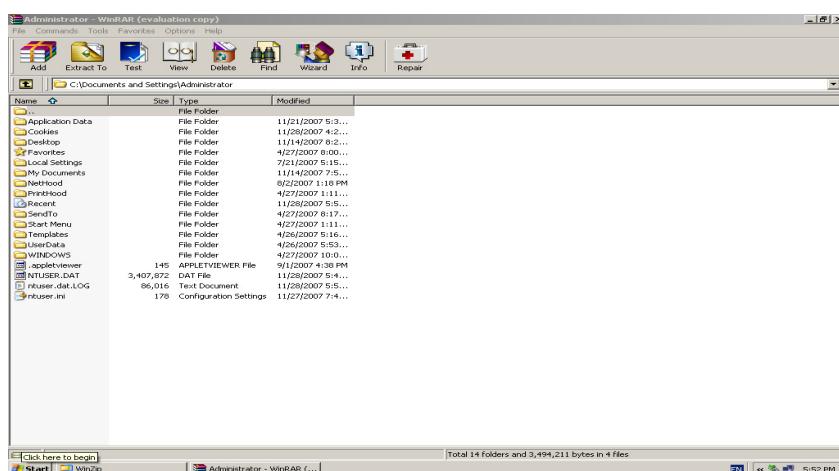


Figure 3.21 WinRAR Compression Utility Software

## The Word Processor

The word processing technology today makes it possible to enjoy typing effectively. The typist will no longer suffer the agony of retying the text to produce clean and a net draft. Through the use of word processing software such as the **Microsoft Word** and its OpenOffice counterpart, a user(typist) can concentrate on thinking about the ideas and let the computer handle the details of laying out the words and spacing neatly on the page. This can be accomplished because we can easily insert text at any point in the document, delete text from any part of the document, move text from one part of the document to another section of the same document or to another document, search and replace selected words or phrases throughout a document, copy text from one part of a document and duplicate it in another section of the document. These are but the basic features of word processing software. As a matter of fact, there are dozens more capabilities a word processor can do such as automatic underlining of important words or phrase, changing fonts and sizes, adding colors to any words you want to be highlighted, automatic footnoting and hyphenation, and automatic checking the spellings of all words you typed in the document, and the ability to incorporate graphics or picture created with other software applications.

### **Microsoft Word 2007** (A Real-World Example of a Word-Processor)

The **Microsoft Word 2007** is a full-featured word-processor designed to help us work efficiently with our paper works in the office. Typing text in MS Word is similar to typing on a mechanical typewriter. The letter arrangement of the keys is the same. So if we have a background in using a typewriter, it is easier for us to learn how to use the keyboard.

We could find that MS Word 2007 is easier to use than a typewriter. Moreover, it helps us to accomplish our task faster, more neat and presentable. For example, when we type enough words to reach the end of the line, MS Word automatically moves to the next line. This feature is called a **word wrap**. With this feature, we don't have to watch for the end of the line.

The most outstanding feature of MS Word is its editing capability. If we change our mind after we write something, we can edit what we have written, delete the word or sentence we do not want or add a word or sentence to our document. And then the MS Word will automatically adjust the spacing of the text.

We can also apply **formatting** to control the appearance of our document. We can format the text appearance by making it in italic, underlined, or bold form. We can even specify to center the text, to left justify or to right justify the text. Plus, we can add or insert pictures and graphs to our documents. Not only that, the MS Word can automatically check the spelling of our text. So you don't have to worry about wrong spelling anymore. With this feature of MS Word, we can be perfect in our spelling. How about our grammar? Well, the time will come, the MS Word can accurately pinpoint our grammatical errors. For now, let us be just contented with what it can do.

When an MS Word, finds a wrong spelling, it underlines the word with a red zigzag line. You could notice that it underlines your first name, last name, address or *tagalog* expressions you typed in your document. Take note that the word "tagalog" here was underlined with a red zigzag line by the Microsoft Word 2007 at the time I typed this document . This means that the spelling checker of MS Word can only understand English words and consider other foreign words as misspelled words as its default. When an MS Word, suspects a wrong grammar in your sentence constructs, it underlines the phrases with a green

zigzag line. Now remember, MS word is like humans, it is not perfect (the grammar correction pinpoints only some possibilities, not accuracy of pinpointing it).

The new Microsoft Word 2007 features a **translation tool tip** option available for English (US), Spanish, and French. When selected, pointing the mouse cursor over a word will display its translation in the particular language. With the Document Inspector feature, it can strip MS Word documents of information such as author name and comments. The feature of **building blocks** lets us save frequently used content, so that they are easily accessible for further use. The **contextual spell checker** feature catches incorrect usage of correctly spelled words. With MS Word 2007, we can write directly our blog entries to a blog sites. These are but just few of the features of MS Word 2007.

### Note:

This book is written using MS Word 2007!

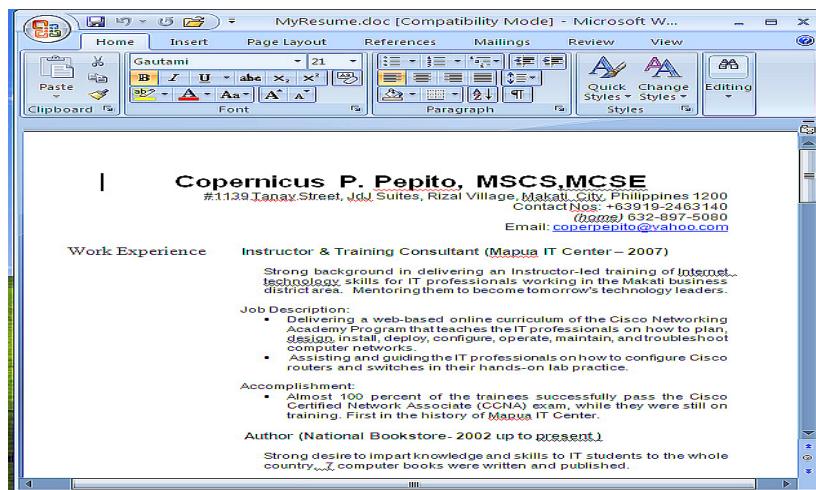


Figure 3.22a Microsoft Word 2007

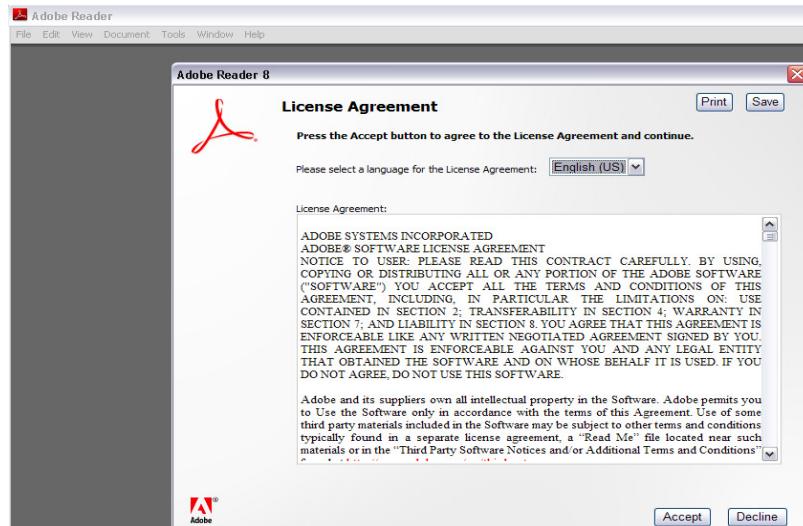


Figure 3.22b Adobe Reader 8.1

### Note:

The Adobe Reader 8.1 is used to open a .PDF (Portable Data Format) formatted document. You oftenly encounter this type of document when you are downloading a document from the Internet.

## The Desktop Publishing Software

Desktop publishing is the process of producing magazines, newspapers, books and other publication materials. In today's modern desktop publishing technology, the personal computer can be used to produce these publication materials in less cost.

Before the advent of personal computer, publishing required expensive equipments and highly trained personnel to operate the equipments. A modern desktop publishing system includes a computer, a laser printer, and a desktop publishing software. A highly knowledgeable person can possibly do all the writing, editing, graphic production, page layout and typesetting a desktop publication.

### **Microsoft PowerPoint 2007 ( A Real-World Example of a Presentation Software)**

The Microsoft PowerPoint is the leader in presentation graphics software. It has all the tools needed by the presenters to show sales figures charts, profits and losses analysis, and any presentations for business meetings.

The PowerPoint has text handling, outlining, graphing, and drawing features. We can refine the content of our presentation by rearranging and editing text in the Outline and Slide views menu. We can even move the slides around in the Slide Sorter view to adjust to the look we want.

In our presentation, we can add clip art, drawings, graph and charts. We can even produce speaker notes pages and hand-outs to support our presentation. Microsoft PowerPoint can help us create overhead slides, audience hand-outs, speaker's notes, and an outline, easily; all in a single presentation file. It has also a Wizard to help us organize and design our presentation task in a step by step manner.

The PowerPoint has five views to assist us in our presentation task. The first one is the *Slide view* that allows us to work individual slides. Second, is the *Outline view* that allows us to work on the title and body text of our presentation. Third, the *Slide Sorter* view allows us to organize each slide of our presentation. Fourth, the *Slide Show view* will display our slides. Fifth, the *Notes Pages* view will allow us to create speaker's notes.

The new Microsoft Power Point 2007 can now render 3D graphics. It can support for tables pasted from Microsoft Excel 2007. The **Slide Library** feature lets us reuse any slide or presentation as a template. Any of our presentation or slide can be published to the Slide Library. Now in PowerPoint 2007, we can sign our presentation digitally. There is an added support for Widescreen slides and allows us of custom placeholder.

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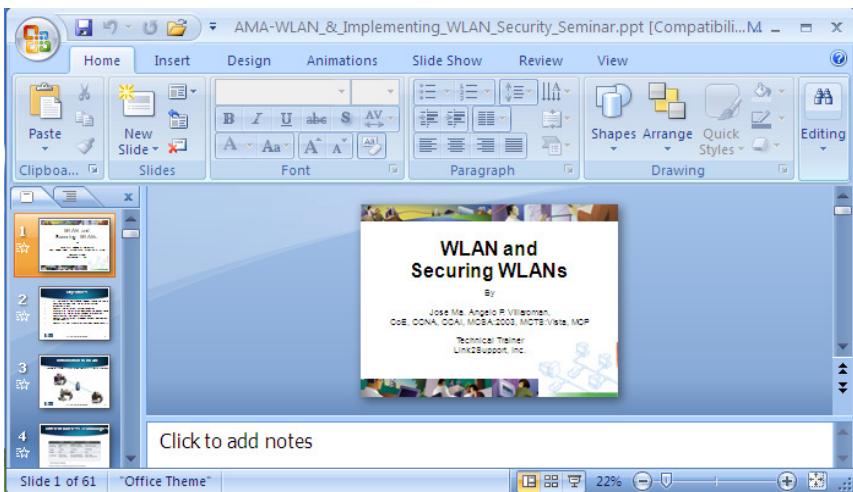


Figure 3.23 Microsoft PowerPoint 2007

## The Electronic Spreadsheet Software

A spreadsheet software allows the user to easily compute repetitive calculations in a fast and accurate manner. A spreadsheet document called **worksheet** are composed of numbered rows and alphabetically lettered columns. The intersection that forms a highlighted box is called a cell.

For example, the cell B2 means the intersection of column B, and row 2. A cell can contain a numeric value, a formula or a label. The worksheet must use a formula to compute a group of numeric values in vertical or horizontal listings. For example, cell B7, might contain the formula :  $(B1+B2+B3+B4+B5)/5$ . This formula commands the computer to add numbers in cells B1, B2, B3, B4, and B5, then divide the total by 5. And finally displays the resulting computation in the cell B7 where the formula was located. We cannot see the formula in cell B7, we can see just the computed value.

Most of the spreadsheet software contains the following features: automatic replication of values and formulas, automatic recalculations, predefined mathematical functions and macros. Spreadsheet software is also useful and helpful in answering “what if” questions, because it allows the user to change the numbers and see the effects instantly upon changes. Spreadsheet software includes a feature where we can turn the figures in our worksheet into a graph or chart automatically. These graph can be a line chart, pie chart, or bar chart (graph).

### **Microsoft Excel 2007** **(A Real-World Example of a Spreadsheet Software)**

Microsoft Excel 2007 is an excellent software for calculating and organizing numeric data. The Excel software is under the spreadsheet category. It displays data in row-and-column format, with gridlines between rows and columns, similar to accounting ledger books or graph paper.

Excel is primarily used for numeric data in accounting tasks, statistical computations, and even in scientific research. In Excel, we use workbook or group of worksheets. This workbook is a file that can

contain multiple worksheets. A worksheet is a grid of rows and columns in which we can type the data or value. The **cell** is designated by a thick border, and it is the intersection of rows and columns in a worksheet. An active cell is a cell in which you can enter data in a worksheet.

Excel provides capabilities for moving the existing content of one or more cells to a different location. This approach is called cut and paste because you cut or remove data from its original location, and then paste or insert the data at a different location.

A **font** is a general appearance of text, numbers, and other character symbols. To make our worksheet attractive, we have to change the font and font size for selected headings, labels, and values. Using the *AutoFormat* feature, we can format the data in our worksheets, applying a professionally designed template. It adds different colors, shading, and font effects to provide clarity and visual appeal to the worksheet.

The Microsoft Excel contains graphing functions too, which has its own *ChartWizard*. With the use of ChartWizard, Excel can walk us through the four necessary steps required to create a chart (graph). Excel has a database manipulation capability. It can organize the data or information in systematic way. In other words, Excel spreadsheet software can store and retrieve data, in the same way we use database management system software such as Microsoft Access or Microsoft SQL Server. But maybe not that good enough like the way Microsoft Access can do.

The new Microsoft Excel 2007 features **conditional formatting** that support Color Scales, Icon Sets, and Data Bars. The **color scales** will automatically color the background of a group of cells with different colors. The **icon sets** will precede the text in a cell with an icon that represents some aspect of the value of the cell. The **data bars** show a gradient bar in the background of the cell.

The **Formula Auto-complete** feature of MS Excel 2007 automatically suggests function names, arguments and name ranges and automatically completing them if desired. The feature of CUBE functions allows the importation of data including a set of aggregated data from data analysis services coming from SQL Server Analysis Services.

The **Page Layout View** feature shows the spreadsheet in a way that mirrors the formatting that will be applied when printed. The Quick Filter option allows the selection of multiple items from a drop down list of items in the column. The option to filter based on color has been added to the choices available. Its new charting engine feature supports advanced formatting, including 3D rendering, shadows and transparencies. The chart layouts can also be customized to highlight various trends in the data.

The **User-Defined Functions** (UDF) feature of Microsoft Excel 2007 are custom functions written by the user to supplement Excel's set of built-in functions. This is handy if the function needed by the user cannot be found in Excel 2007.

		Q1	Q2	Q3	QAVE	CS	CRE	FE	GRADE	GRADE	REMARK
6	Student Name										
7	ALVAREZ, Von Daryl	58	75	89	74	60	92	80	76	3	Passed
8	CUSI, Francis	81	87	94	87.333	55	83	80	78.533	2.5	Passed
9	FERRER, Jeremiah Jhem	78	89	87	84.667	75	95	88	85.467	2	Passed
10	GELITO, Marvin	64	80	91	78.333	89	94	81	84.133	2.25	Passed
11	KO, Harold	82	50	98	76.667	55	88	87	76.667	2.75	Passed

Figure 3.24 Microsoft Excel 2007

## Other Application Software of Microsoft Office 2007

Most of us are using Microsoft Word 2007, Microsoft Excel 2007, Microsoft PowerPoint 2007, and Microsoft Excel 2007, to accomplish our paper works in the office or in the school. There are other application software that are bundled with Microsoft Office 2007 which most of us are not aware of or not familiar with. What they are and what they can do to make our work better and life easier, are listed below:

- **Microsoft Office Groove 2007**

-is a collaboration software that enables a team to work together of a particular project effectively, efficiently and dynamically. This is regardless of their respective location or what company they work for. They can collaborate with the team members even if they work offline or working away in other site. With Office Groove 2007, the team can keep the files, tools, and information in one place and can be accessible anytime and anywhere, with the most up to date revision available for each and every member. This is possible with the **synchronization** feature.

- **Microsoft Office Outlook 2007**

-this is a personal information manager software that is used mainly for e-mail application and shared mailboxes, contact management, meeting time allocation and calendar, and web browsing. With the new feature such as the Instant Search, you can organize your e-mails and view them alongside with your other e-mail accounts, plus, the ability to access your information even when you are offline. With Office Outlook 2007, you can also track business data and manage sales using the Business Contact Manager feature.

- **Microsoft Office OneNote 2007**

-is a tool for taking notes, gathering information and data, and collaborate with other computer users. You can add drawings, pictures, audio, or movie to the information you gathered with Office OneNote 2007. You can also perform some calculations using the calculator capability of OneNote. This is handy if your notes need some calculations. With Office OneNote, you can easily gather, search, and share notes and information wherever you are, conveniently.

- **Microsoft Office Publisher 2007**

-is the business publishing software that helps you design, create, and publish communication and marketing materials, intuitively and superbly. You can create any publication materials for e-mail, print, and the Web, informing (or even yet, enticing) your target customers about your products and services. With Office Publisher 2007, producing marketing campaign materials is so easy, fast, and professionally designed by you.

- **Microsoft Office InfoPath 2007**

-is the software you use to collect business data and information from the people whom you work and deal with. These people could be your customers, clients, suppliers, partners or colleagues. Some application of Office InfoPath 2007 is when you want to create a Form template Christmas party expense reports for the employees in your company. Or in some cases, a group of sales executives can use the Office InfoPath 2007 to collect and share data or information about the sales per region, per city, or per class of customer's buying behavior.

- **Microsoft Access 2007**

-is a personal database software. Most of us are not using it directly. Some company departments are using Office Access 2007 for managing departmental data and record keeping operations. It has inherently limited capability to handle small database files (a typical of a few thousands of records ) with up to 10 database users are allowed to access the database engine of MS Access 2007 simultaneously.



Figure 3.26 Microsoft Access 2007

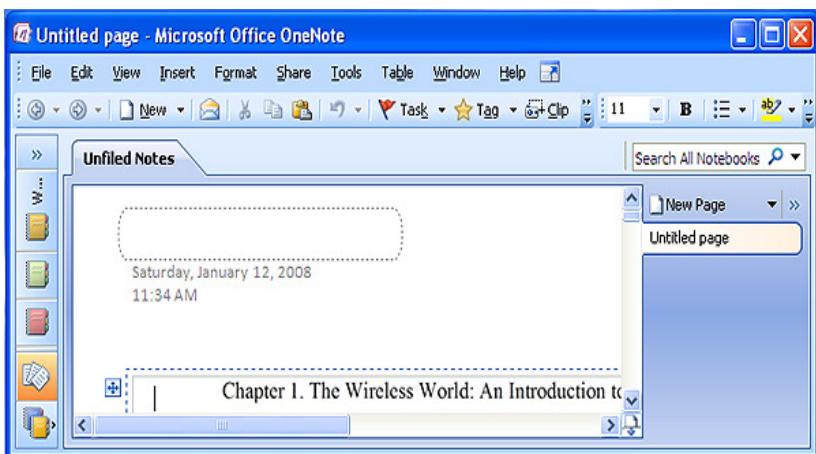


Figure 3.27 Microsoft Office OneNote 2007



Figure 3.28 Microsoft Publisher 2007

## The Microsoft Office 2007 Nemesis: The OpenOffice

The OpenOffice is the counterpart of Microsoft Office 2007 in the open-source community. If Linux operating system competes with Windows Vista and Windows Server 2008, then OpenOffice competes directly with Microsoft Office 2007. They are both an office suite application software. The OpenOffice supports the OpenDocument standard which further means that it is compatible with Microsoft Office document. In other words, you can open your Microsoft Word document to OpenOffice word-processor without encountering any problems, and vice-versa. Like the Linux operating system, you can acquire the OpenOffice for free. So download it now! By the way, download the Linux operating system first, because you have to run the OpenOffice under the Linux OS environment or in Solaris UNIX operating system. Try it!



Figure 3.29 OpenOffice Home Page

## Mathematical, Scientific and Statistical Software

Most businesses and businessmen use professional accounting and financial management software. Accounting software automatically adjusts the balance in every account after a transaction so that the history can be traced later when the demand or need arises in the near future. Aside from fast and easy record-keeping, financial management software can automate the generation of check writing, budgeting, and bill paying.

Example of this application software is **Quicken and MS Money**. Mathematical processing software are used by many professional and students whose needs are beyond the capabilities of spreadsheet software. This software can handle complex equations, formulas, and calculations.

Mathematicians can easily create, manipulate and solve equations, the same way the word processors help the writers. These software can handle the calculations for matrix and linear algebra, complex trigonometry and polynomial factoring.

Statistics is the branch of applied mathematics and considered as the science of collecting and analyzing data. Statisticians depends heavily on computers in speeding up the collections and analysis of raw data. Statistical analysis software can produce graphs that shows how two or more variables relate to each other. The statisticians can analyze and uncover trends by looking for unusual patterns in the graph of dots and lines that appear on the monitor.

**Scientific visualization software** uses location in space, shape, and color to help us understand the relationship of things and objects that are invisible in our eyes. The user usually used or wears some polarized lenses or electron microscope that are connected to the computer. This peripherals will permit the user to see three dimensional (3-D) images of molecules to be analyzed.

In some application that study the outer-space, this peripheral can be used to see and observe the mysterious clustering of galaxies. This visualization software can help the researcher to see the relationship that might have been obscure to grasp without it.

**Computer Modeling and Simulation software** is use to create abstract models of objects, organizations, processes, and organisms. The marketing executives who design a worksheet to forecast monthly profits and losses is trying to model or simulate the economic condition that would affect the company's financial status.

A statistician who examines and analyzes the data collected from the respondents has created statistical models to describe a particular trend or phenomena. An engineer who uses mathematical and engineering software can test the stress capacity of a bridge before it is constructed.

Most **computer games** are models or simulations of an actual or imaginary ideas, processes, works, or situations. Chessboards, ballgames, sports arenas, battlefield, medieval dungeons, mythological societies and interplanetary cultures have been modeled through computer games. This computer model is an abstraction to reality, which means that it is a set of concepts and ideas designed to emulate an actual situation.

## Computer Simulation

Schools, military, and businesses use simulation techniques for training. User-oriented simulations allow the person to temporarily live their fantasies. Sports simulation like the world re-known athlete stars are among the favorite computer games of the new generation today.

In military application, the fighter jet pilot can simulate the right and safe landing of F14 in an aircraft carrier using the computer.

## Database Management System

A **database management system** is a type of software that is used for organizing storage and retrieval of information. In other words, this software allows people to store, search, retrieve, process, or access data fast and easy. The Internet is the world's richest source of voluminous information. To store and retrieve the information in a fast and easy way from the Internet, database management system is applied. Take for example, with the *Google*. In Google, you just simply type the word or words that you would like to search. In a matter of seconds, you will get the list of links to choose from so that you can narrow your search to find what you searched for.

A **database** is considered as a computerized version of an inventory file stored in an office file cabinet, a library card catalog or a card index containing the names and addresses of business contacts.

Here are the basic components of the database management system:

- a. **Database** – is a collection of information stored in a systematic form in a computer.
- b. **Table** – a complete collection of related records in a row and column format.
- c. **Record** – is a collection of related data about a person or object.

The following are the basic operations and uses of database:

- a. **Query.** This is an information request.
- b. **Indexing.** This is a database command that allows us to arrange records in alphabetical or numerical order.

Database software allow users to efficiently and quickly manage, organize, store and retrieve large amounts of information. We can view data in many ways, arrange records in any order, and print reports in any form and arrangement.

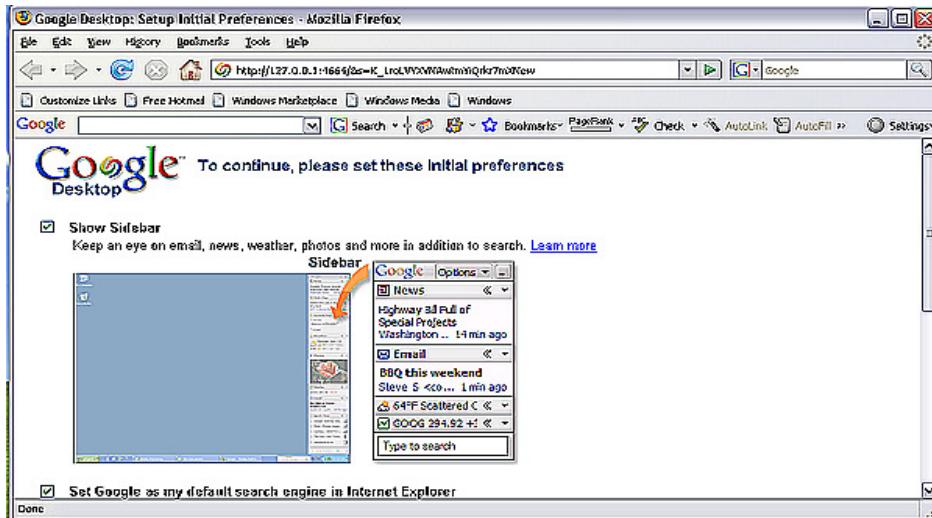


Figure 3.30 The Google Desktop

## Corporate Databases

### SQL Server 2008

The SQL Server 2008 is the database of Microsoft corporation and considered as the fastest-growing DBMS today. Presently, it runs only in Windows operating system such as in Windows XP, Windows Vista, and Windows Server 2003 or 2008.



Figure 3.31a Microsoft SQL Server Installation Wizard

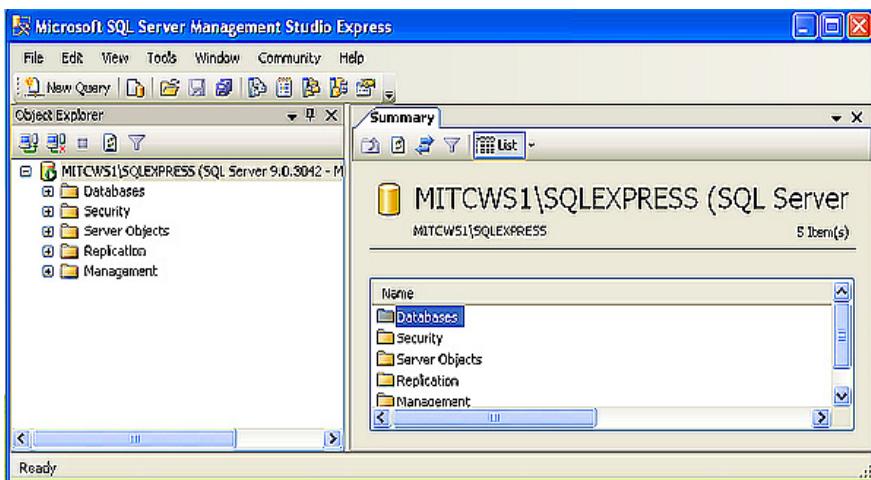


Figure 3.31b Microsoft SQL Server Management Studio

**Note:**

The Microsoft SQL Server Management Studio is a database utility that is used mainly to manipulate the table and other parts of SQL Server database.

### Oracle Database 11g

The Oracle Database is the world's first commercially-available relational database management system (RDBMS). Currently, it is the number one RDBS used worldwide. It runs in Windows operating system, Mac OS, Linux, and UNIX Solaris. Oracle Database is packed with a large suite of business application software, utilities, and languages that can be used together to solve business process problems.

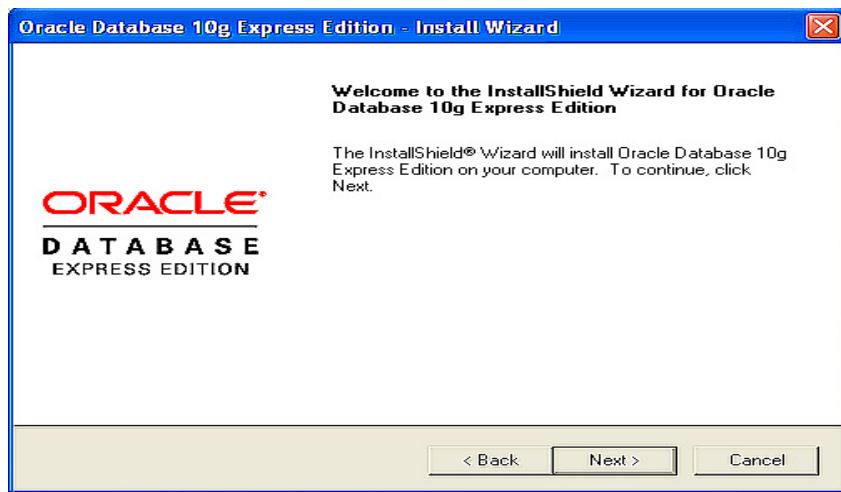


Figure 3.32a Oracle Database Installation Wizard

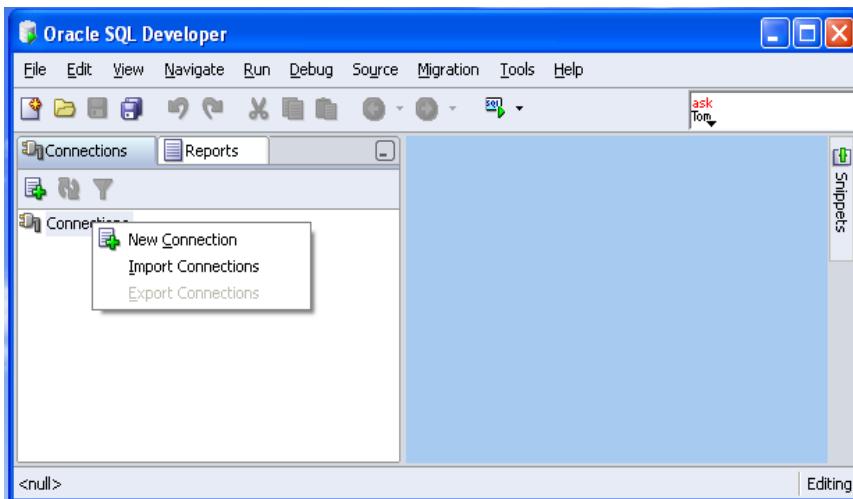


Figure 3.32b Oracle SQL Developer

#### Note:

The Oracle SQL Developer is a database utility software which is the graphical-user interface (GUI) equivalent to the Oracle SQL Plus console-based manipulation of the Oracle database. This Oracle SQL Developer can also be used to manipulate the database of SQL Server, MySQL, and Microsoft Access, graphically.

### IBM DB2 Universal Database

The IBM DB2 Universal Database is a suite of business application software that can be used by companies for their data analysis, integration, and data-mining, data-warehousing, and other data management tasks. Like Oracle Database, IBM DB2 has a version that will run in Windows, Linux, and UNIX operating systems. IBM DB2 offers a superb service and technical support by its company- the IBM Corporation. It is also a stable and robust database server for high-volume activity transactions.

### MySQL

This is the most popular and widely used RDBMS in the open-source community. Well, it doesn't mean that MySQL Database runs only in Linux, it will also run in Windows operating system environment. MySQL is definitely simple to use, probably because it has less features than Oracle or SQL Server. This does not mean that MySQL RDBMS is not powerful. As a matter of fact, there are about over 4 million installed MySQL Database applications worldwide, estimatedly. Since MySQL is an open-source RDBMS, therefore, it is free. Now when cost is the main factor why your company cannot afford a high-end RDBMS like Oracle or SQL Server, then settle with MySQL first. Later on, if you have the ready budget in your pocket, switch-on to Oracle or SQL Server. This is only in the case of a company. For personal use, like for experimentation purposes, you can have every database you want, from Oracle, to SQL server and many others, free of charge (by downloading the Express Edition at the Internet). Believe me, it is true.



Figure 3.33a The MySQL Setup Wizard

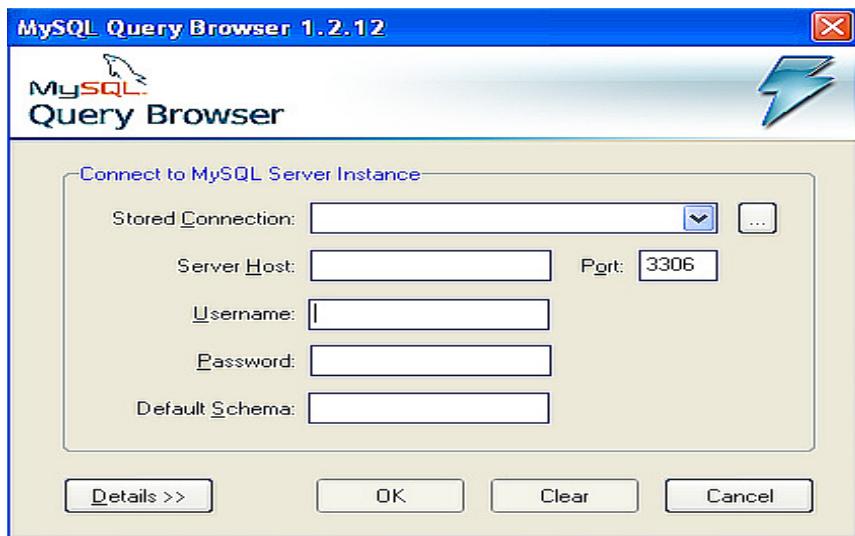


Figure 3.33b The MySQL Query Browser

**Note:**

The MySQL Query Browser is a database utility software that is used to manipulate the MySQL database.

## PostgreSQL

The PostgreSQL is dubbed as the world's most advanced open-source database. This RDBMS was originally developed in early 1970's and was formerly called "Ingres". Ingres database became a commercial database success. As time goes by, many interested RDBMS creators enhance and improve the capabilities of PosgreSQL, until such time that today, it was developed by many developers around the world to become a highly-scalable object-relational database server.



Figure 3.34a The PostgreSQL Installation Wizard

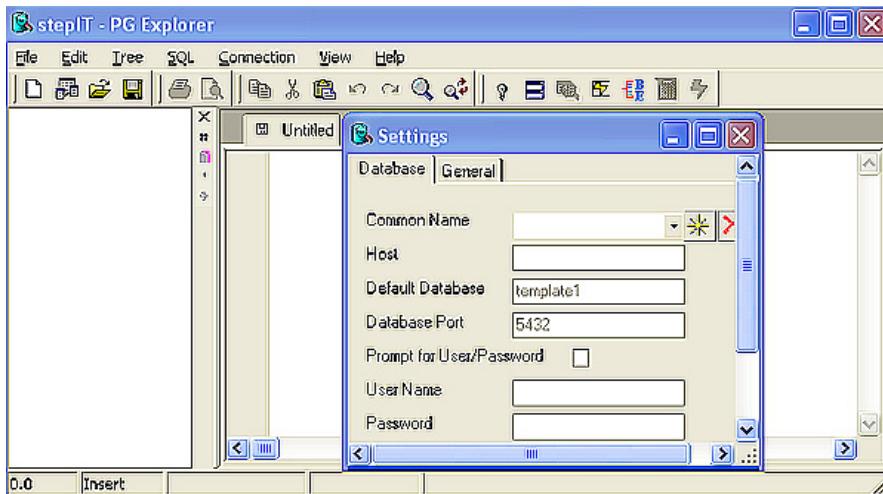


Figure 3.34b The PostgreSQL (PG) Explorer

**Note:**

The PG (PostgreSQL) Explorer is a database utility software that is used in manipulating the PostgreSQL database.

---

## Express Edition Too, Is A Free Software

Okay, we already heard that the Open Source Community or the Open Software Foundation is giving their software for free. Yes, definitely yes! That is the very reason why you got your Linux operating system for free. You get your PHP and MySQL free, and Java programming language too! Plus, a dozen of cool and powerful software are given away for you to learn and master.

But, we must not forget also that commercial software that cost millions of pesos have their own free version. The giant computer software companies such as Microsoft and Oracle call their free software version as **Express Edition**. Though it has some inherent limitations, these limitations are purely more of limited storage capacity of data to be stored and computer memory and CPU usage, not actually with software features and capabilities. You can download these software directly from their website. This further means, that whatever you want to learn and dream to design and develop, you have the tools you need to transform them into reality. And all these tools are free for your constant practice and experimentation in honing your programming knowledge and skills.

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## The Computer Number System (Series III)

### Presenting : The Hexadecimal Number System

The actual application of Hexadecimal Number System is in the way how the computer assigned memory addresses. Memory addresses are the actual memory location where each data is stored systematically for easy and fast search and retrieval process. Moreover, our data, information, program, or software are stored in hexadecimal number format. Needless to say, it's like Octal Number System that is used to conserved memory storage space. We have to take note that the computer system has done many conversion process involving a binary to decimal number conversion and vise-versa to store, retrieve, manage, and control our data, program, or software.

In computer networking, Hexadecimal Number System is applied as the physical address of the LAN-card which is called **MAC** (Media Access Control) **address**. In other words, each and every LAN-card in a computer network has a unique MAC address that is in hexadecimal format. The new IP address scheme in the Internet is also in hexadecimal format. It is the IPv6 (Internet Protocol version 6). The older IP address is expressed in decimal format. The old IP address scheme was called IPv4(IP version 4).

With this consideration in mind, our learning experience will never go in vain. These reasons are the very essence why we study this different number system which the computer is using extensively. The hexadecimal number system consists of ten numbers: 0 to 9 and six letters. These six letters: A through F are also considered as numerical values. This is a base 16 number system. The given table that follows is the comparison

between the decimal and hexadecimal numbers. The letter A in hexadecimal is 10, while B is 11, C is 12, and so on.

Decimal Number	Hexadecimal Number
0	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	A
11	B
12	C
13	D
14	E
15	F
16	10
17	11
18	12
19	13
20	14
21	15
22	16
23	17
24	18
25	19
26	1A
27	1B
28	1C
29	1D
30	1E
31	1F

#### A. Decimal To Hexadecimal Number Conversion

To convert a decimal number into hexadecimal number, we simply divide it by 16 and we get the remainders. The remainders are read in reverse order to get the hexadecimal equivalent numbers.

Examples:

$$\begin{array}{r} \text{Quotient} \quad \text{Remainder} \\ 1.) \ 42_{10} = ?_{16} \end{array}$$

$$\begin{array}{r} 42/16 = 2 & 10 \text{ (is A)} \\ 2/16 = 0 & 2 \\ \cdot \cdot \cdot & \uparrow \\ 42_{10} = 2A_{16} \end{array}$$

$$2.) \ 338_{10} = ?_{16}$$

$$\begin{array}{r} 338/16 = 21 & 2 \\ 21/16 = 1 & 5 \\ 1/16 = 0 & 1 \\ \cdot \cdot \cdot & \uparrow \\ 338_{10} = 152_{16} \end{array}$$

$$3.) \ 21_{10} = ?_{16}$$

$$\begin{array}{r} 21/16 = 1 & 5 \\ 1/16 = 0 & 1 \\ \cdot \cdot \cdot & \uparrow \\ 21_{10} = 15_{16} \end{array}$$

## B. Hexadecimal To Decimal Number Conversion

To convert hexadecimal number into decimal number, we have to multiply each digit by its positional notation value. Since we are using letters for 10 up to 15(A to F), we should change A into 10, and B into 11, and so on and so forth. Finally, we will compute the sum to get the final answer.

Examples :

$$\begin{aligned} 1.) \ 9B5_{16} &= ?_{10} \\ 9B5_{16} &= 9 \times 16^2 + 11 \times 16^1 + 5 \times 16^0 \\ &= 2304 + 176 + 5 \\ &= 2485_{10} \end{aligned}$$

$$2.) \ F1C_{16} = 15 \times 16^2 + 1 \times 16^1 + 12 \times 16^0$$

$$= 3840 + 16 + 12$$

$$= 3860_{10}$$

$$3.) \ E8_{16} = 14 \times 16^1 + 8 \times 16^0$$

$$= 224 + 8$$

$$= 232_{10}$$

### C. Hexadecimal To Binary Number Conversion

To convert hexadecimal number into binary number system, simply replace each hexadecimal number by its 4 binary digit equivalent. Use the given table below as a guide.

Hexadecimal Number	Binary Digit
0	0000
1	0001
2	0010
3	0011
4	0100
5	0101
6	0110
7	0111
8	1000
9	1001
A	1010
B	1011
C	1100
D	1101
E	1110
F	1111

Examples :

1.)  $3BD6_{16} = ?_2$

$$\begin{array}{l}
 3 = 0011 \\
 B = 1011 \\
 D = 1101 \\
 6 = 0110
 \end{array}
 \quad \downarrow$$

$\therefore 3BD6_{16} = 0011101111010110_2$

2.)  $4F.9A_{16} = ?_2$

$$\begin{array}{l}
 4 = 0100 \\
 F = 1111 \\
 9 = 1001 \\
 A = 1010
 \end{array}
 \quad \downarrow$$

$\therefore 4F.9A_{16} = 01001111.10011010_2$

3.)  $E7_{16} = ?_2$

$$\begin{array}{l}
 E = 1110 \\
 7 = 0111
 \end{array}
 \quad \downarrow$$

$\therefore E7_{16} = 11100111_2$

## Other Solutions

We too, can solve this hexadecimal to binary conversion by using the following technique (like the way we did in octal to binary conversion):

$$\begin{array}{ccccccc}
 8 & 4 & 2 & 1 & \longleftarrow & \text{The Hexadecimal Equivalent} \\
 1 & 1 & 1 & 1 & \longleftarrow & \text{The Binary Equivalent}
 \end{array}$$

For example, we want to convert a hexadecimal number **F** to binary number equivalent. Obviously, we have the answer : 1 1 1 1. Now if you try to analyze the process, you will notice that we can easily get the answer by adding the hexadecimal number equivalent at the top of each binary number ( $8+4+2+1$ ). For example again, we want to convert a hexadecimal number **A** to binary number equivalent. We have the answer: 1 0 1 0 since we simply add the hexadecimal number equivalent of each binary number ( $8+2$ ). What if we want to convert a hexadecimal number **8** to its binary number equivalent? Going back to our technique, we will have the answer : 1 0 0 0 since we add the hexadecimal

number equivalent above each binary number ( 8+0+0+0). In other words, when we combine the three hexadecimal numbers ( $FA8_{16}$ ), we will arrive to the answer :  $1111\ 1010\ 1000_2$ . What we did with the excess binary number was to simply make it a zero number. Now solve it by your own?

#### D. Binary To Hexadecimal Number Conversion

To convert binary digit into hexadecimal number, the binary digit is to be grouped by 4 first, before replacing to its equivalent hexadecimal number. The grouping of 4 digits will start from the right then to the left. Add zero (at the left side group) to make the digits a multiple of four when lacking of digit arises. Use the previous table as a guide.

##### **Examples:**

$$1.) \ 1111010_2 = ?_{16}$$

$$\begin{array}{r} 0111 \diagup 1010 \\ \text{We add zero at the left side group} \end{array}$$

$$\begin{array}{r} 7 \quad A \\ \cdot \end{array}$$

$$\therefore 1111010_2 = 7A_{16}$$

$$2.) \ 10101111011_2 = ?_{16}$$

$$\begin{array}{r} 1010 \diagup 1111 \diagup 1011 \\ A \quad F \quad B \end{array}$$

$$\therefore 10101111011_2 = AFB_2$$

$$3.) \ 0001_2 = ?_{16}$$

$$\begin{array}{r} 0001 \\ 1 \end{array}$$

$$\therefore 0001_2 = 1_{16}$$

#### Other Solutions

Now this time we reverse the process by converting the binary number into hexadecimal number equivalent. Again, we can solve this binary to hexadecimal

conversion by using the following technique (like the way we did in hexadecimal to binary conversion):

8    4    2    1		The Hexadecimal Equivalent
1    1    1    1		The Binary Equivalent

For example, we want to convert 1111 binary number to hexadecimal number equivalent. Obviously, we have the answer : **F**. Now if you try to analyze the process, you could notice that we can easily get the answer by adding the hexadecimal number equivalent at the top of each binary number ( $8+4+2+1 = 15(F)$ ) .

For example again, we want to convert a binary number 1011 to hexadecimal number equivalent. We have the answer: **B** since we simply add the hexadecimal number equivalent of each binary number ( $8+0+2+1$ ). What if we want to convert a binary number 0011 to its hexadecimal number equivalent? Going back to our technique, we will have the answer : **3** since we add the hexadecimal number equivalent above each binary number ( $0+0+2+1$ ). In other words, when we combine the three groups of binary numbers (1111 1011 0011<sub>2</sub>), we will arrive to the answer : FB3<sub>16</sub>.

What we did with the excess binary number is to simply make it a zero number. Now solve it by your own?



### TEST : Decimal to Hexadecimal Conversion

A.) Convert the following decimal numbers into hexadecimal numbers

$$1.) \ 62_{10} = ?_{16}$$

$$2.) \ 34_{10} = ?_{16}$$

$$3.) \ 239_{10} = ?_{16}$$

$$4.) \ 951_{10} = ?_{16}$$

$$5.) \ 719_{10} = ?_{16}$$

$$6.) \ 860_{10} = ?_{16}$$

### TEST : Hexadecimal to Decimal Conversion

B.) Convert the following hexadecimal numbers into decimal numbers

$$1.) \ 8A2_{16} = ?_{10}$$

$$2.) \ E1D_{16} = ?_{10}$$

$$3.) \ F4_{16} = ?_{10}$$

$$4.) \ CC_{16} = ?_{10}$$

$$5.) \ F9A2_{16} = ?_{10}$$

$$6.) \ 6E7B_{16} = ?_{10}$$

### TEST : Hexadecimal to Binary Conversion

C.) Convert the following hexadecimal numbers into binary numbers

$$1.) \ 9A_{16} = ?_2$$

$$2.) \ 7F_{16} = ?_2$$

$$3.) \text{ E3.5D}_{16} = ?_2$$

$$4.) \text{ 4B28}_{16} = ?_2$$

$$5.) \text{ 1CE}_{16} = ?_2$$

$$6.) \text{ CE1}_{16} = ?_2$$

### TEST : Binary to Hexadecimal Conversion

D.) Convert the following binary numbers into hexadecimal numbers

$$1.) 10101100_2 = ?_{16}$$

$$2.) 11110000_2 = ?_{16}$$

$$3.) 110011110000_2 = ?_{16}$$

$$4.) 1101_2 = ?_{16}$$

$$5.) 1110111_2 = ?_{16}$$

$$6.) 1011101_2 = ?_{16}$$

## Chapter 4

# The Basics Of Computer Networking

“Make it simple as simple as possible  
but not simpler.”  
-Albert Einstein

### So What is a Computer Network, Anyway?

A **computer network** is an interconnection of two or more computers through the use of cables, telephone lines, radio transmitter, satellites and other wireless telecommunication devices which goal is to successfully communicate to each other through information interchange and resource sharing. A network is a set of technologies, including the media used to connect computers together, as well as the software and hardware used to construct and operate it. These media are the copper wire, fiber optic cable or radio frequency in the case of a wireless technology. The network allows many users to access shared data, programs, software, movies, pictures. MP3s, e-books, and many others, almost instantly. Moreover, the networks open up new ways and means to communicate, such as Internet chat and e-mails, and other instant messaging, and phone-calls by long-distance which is free-of-charge using the Voice Over IP (VoIP) technology. See, how this network technology makes our life so easy, so exciting, and so enjoyable. I cannot imagine life without it!

In addition to e-mails and Internet chat, the company employees and officers enjoy the benefit of **teleconferencing**, one of the best technologies that evolves because of networking technology. Through *teleconferencing*, the companies meeting is no longer limited to physical presence of the attendee, but anywhere and anytime she or he can join the meeting, virtually. The attendee just need a computer connected to the networks or Internet to make this high-tech way of communicating, possible. In a teleconference settings, data, audio, and video signals travel across a Local Area Network (LAN), through the use of wires, access points, hubs, switches; or across the network's Internet connections to company branches located anywhere in the world. The three categories of teleconferencing that you would always hear or encounter in daily technology “talks” are: **videoconferencing, audio-conferencing, and data-conferencing**.

Computer networks are mostly categorized in two main types: Local Area Network (LAN) and Wide Area Network (WAN).

### History of Computer Network Revolution

Without studying the history of how the computer networks evolve all throughout these years, we are left wondering what transpired in the past that made our network technology today. Here are the most significant timeline of the network revolution:

## Network Revolution: Timeline (In 1960's and 1970's)

-1969

In 1969, the seeds of the Internet were planted. It is called **ARPANET**, and this is the year when the **Advanced Research Project Agency** (ARPA) of the U.S. Department of Defense began connecting computers at the different defense contractors and universities.

-1977

In 1977, the first commercial LAN technology was introduced. It's called ARCnet or a short term for Attached Resource Computing Network. Datapoint Corporation is the company that invented this LAN technology.

-1978

In 1978, the next LAN technology called **Ethernet** was introduced by its inventor, Bob Metcalf who at the same time established the networking company called 3COM corporation.

## Network Revolution: Timeline (In 1980's)

-1980

The National Science Foundation (NSF), another U.S. federal agency, joined the Internework project after the U.S. Defense Department stopped funding the ARPANET. Their own version is called **NSFnet**.

-1981

In 1981, the first modem was introduced by Hayes Microcomputer Products, Inc. It's called **SmartModem**.

-1982

The term "Internet" was first used to refer to the worldwide network of networks of computer (**International Networks**). The global network that emerges from the ARPANET and NSFnet.

-1984

In 1984, the IBM Corporation introduces its own LAN technology called **Token Ring** networking system.

-1987

The **HyperCard** programming language was introduced by Apple Computer that leads to the development of HTML.

-1988

The computer virus called "**Internet Worm**" crippled about 10 percent of all Internet host computers.

-1989

The European Particles Physics Laboratory in Geneva, Switzerland called **CERN** created the World Wide Web (WWW).

### Network Revolution: Timeline (In 1990's)

-1990

The ARPANET was replaced by **NSFnet** as the backbone of the Internet.

-1992

The Internet becomes the world's largest e-mail network with an estimated 25 million Internet users.

-1993

The first commercial graphical-user-interface (GUI) Web browser called "**Mosaic**" was developed at the **National Center For Supercomputing Applications** (NCSA) in the U.S.

-1994

The **Netscape Navigator**, a Web-browser was introduced by Netscape Communications company. It is based on Mosaic standard, but with more advanced and powerful features.

-1995

The first online auction company called **e-Bay** was founded.

-1997

In 1997, both Netscape Communication and Microsoft Corporation release the new version of their respective Web-browser, the Netscape Navigator and **Internet Explorer 4**.

-1998

The new Internet Protocol standard called **IPv6** (Internet Protocol version 6) was drafted and released by the **Internet Engineering Task Force** (IETF).

-1999

The new Internet term called "**blog**" was coined by **Peter Merbolz**.

### Network Revolution: Timeline (In early 2000)

-2002

The **XML** ( Extensible Markup Language) becomes very popular for Web-based applications. At the same time, the boom of wireless networking started.

-2003

The **Wi-Fi** (Wireless Fidelity) of the IEEE 802.11 b/g standard for wireless network is widely used in the U.S. with hotspots springing up in companies or other commercial locations such as Starbucks Coffee.

-2004

In 2004, the unsolicited e-mail called **Spam** causes major problems across the Internet.

-2005

All IP (Internet Protocol) addresses of the old IP standard called IPv4 (version 4) were all used, thus it can no longer be assigned. After 2005, the network devices must use the new IPv6 standard in assigning IP addresses.

## Local Area Network (LAN)

The **Local Area Network (LAN)** is an interconnection of personal computers that are close to each other, usually in the same building, campus or area. In a LAN, one or more computers can serve as a “**server**” (the main computer), while the computers connected to it are called *workstations* or *client* PCs. The *server* serves as a storehouses for software and data that are shared by many users who are connected to it through cables or antenna (for wireless connection). The user is usually using the **workstation**. This is the term used for a computer connected to the main computer called server. In real setting, there are many workstations connected to a server. To use this workstation, the user is required to enter a login name and its corresponding password. This kind of set-up is applied to protect the software resources and confidential information that can be found in the whole network. The term used for this application is called **system security**.

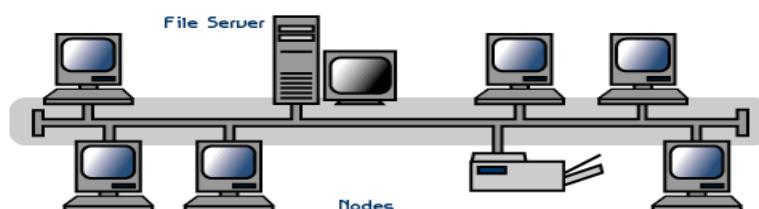


Figure 4.4a The LAN Connection

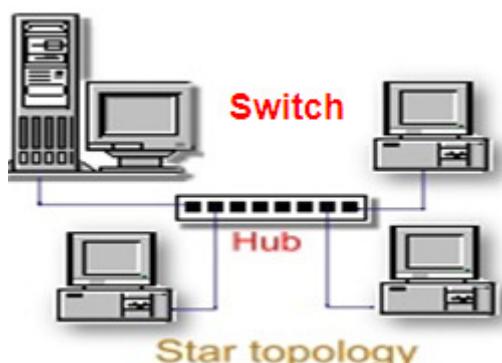


Figure 4.4b LAN Connection with a Hub or Switch

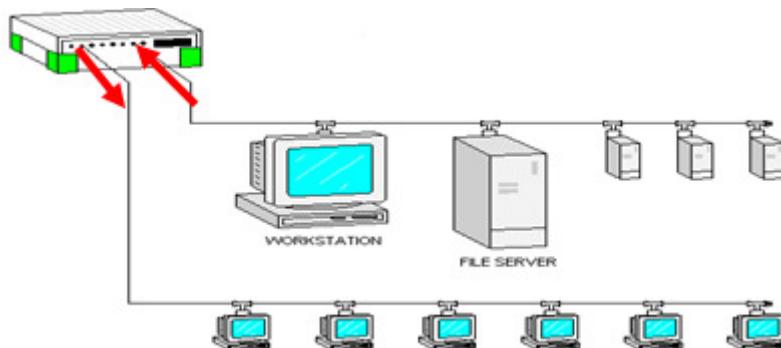


Figure 4.4c LAN Connection

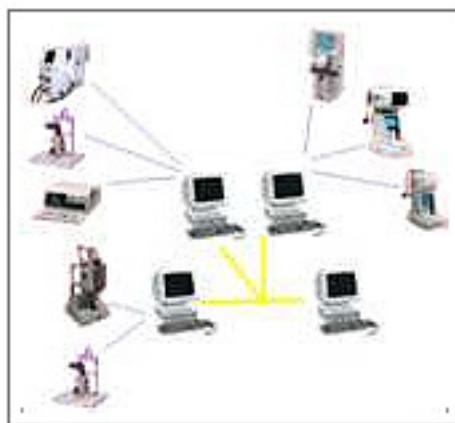


Figure 4.5 The LAN Connection with High-tech Devices

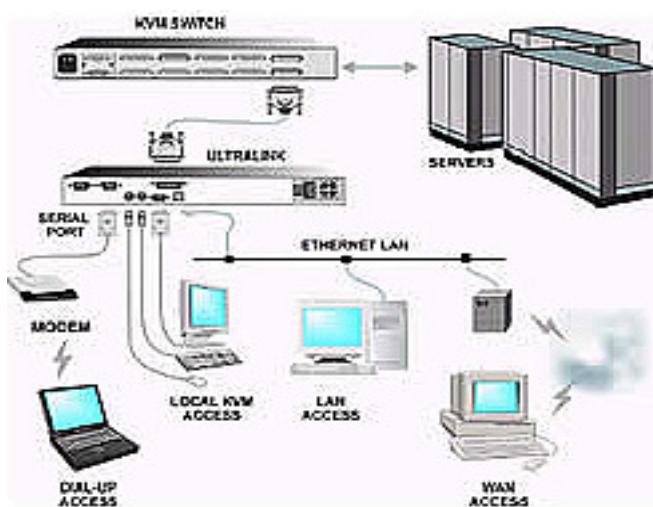


Figure 4.6 The old LAN Connection with Big Servers

## Wide Area Network (WAN)

The **Wide Area Network (WAN)** is an interconnection of many computers that are located from different cities or countries. WAN is made up of two or more LANs which are separated by geographic distance and linked through phone lines, microwave towers, and communication satellites.

Wide Area Network allows users to share computer hardware, software, information or data even if they are separated by a long distance. The user can send (upload) or receive (download) data, information, software, pictures, images, MP3s, eBooks and movies through the network. In a network environment, the users can possibly work together for a particular project. All users can see the changes made by other users. For example, a company may have its main office and manufacturing plant in one city or province, and its marketing office in another city. Each site needs resources, such as data, programs, or projects to work to, locally, but it also needs to share data with the other sites. To accomplish this need of data communication, the company can use a WAN setup. This is possible because some telecommunication network usually a phone company or an Internet Service Provider (ISP) will link the different LANs of the company that are located in different cities so that it can communicate to each other.

**PhysWANConnections.gif**

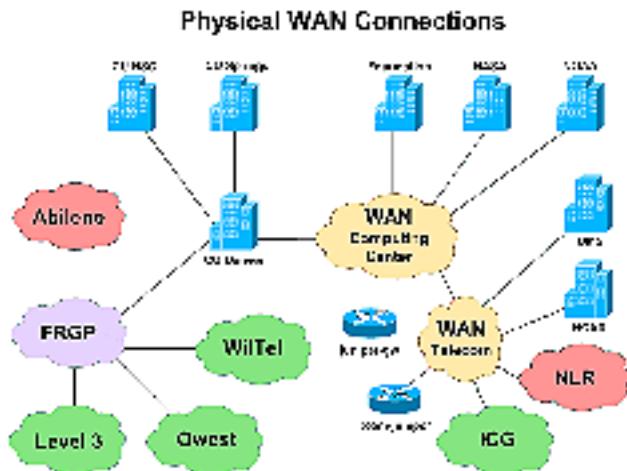


Figure 4.7 WAN Connection

## Metropolitan Area Network (MAN)

The metropolitan area network (MAN) is a large-scale network that connects multiple corporate LANs together, across a wide geographical area such as by regions. Usually, the users are sharing resources with other regional resources. This type of networks are not owned by one company, but usually owned by two or more

different companies. The network devices and communication equipments of Metropolitan Area Networks are maintained by the network provider that offers network services to corporate customers.

## Wireless Networks (WLAN,WWAN,WMAN)

Wireless LAN is so common today. Even Wireless MAN and Wireless WAN are prevalent in todays present technology. We can see and hear how this present emerging technology works to make our life better and better. A wireless network simply enables people to communicate anytime and anywhere, and access application and information without being required to connect to the network using wires or cables. This literally provides freedom of movement and the ability to extend applications to different parts of a building, cities, or practically anywhere in the world.

For example, if I want to connect to the Internet to research some topics of interest or opening my e-mail, and yet free-of-charge, I will simply bring my Laptop to Robinsons. Robinsons mall provides free access to the Internet, wirelessly. You can try it! You will enjoy it.

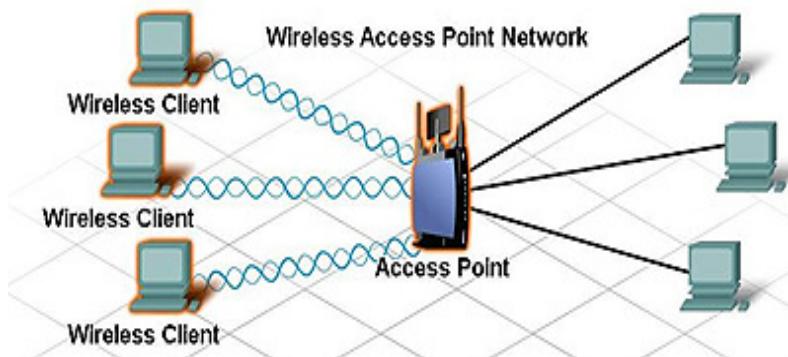


Figure 4.8a The Wireless Connection

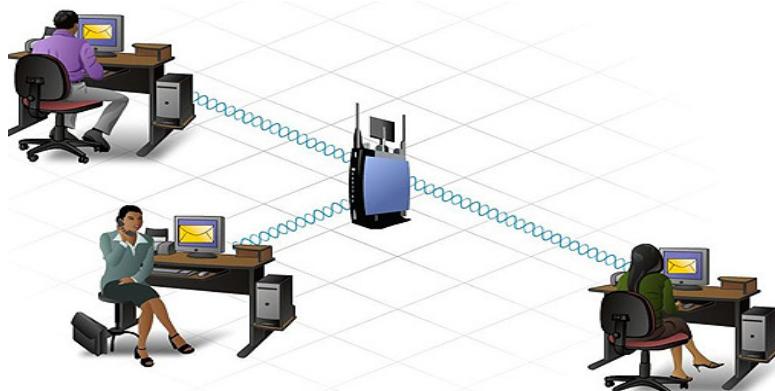


Figure 4.8b Wireless Connection with users



Figure 4.8c Wireless Connection using Laptops

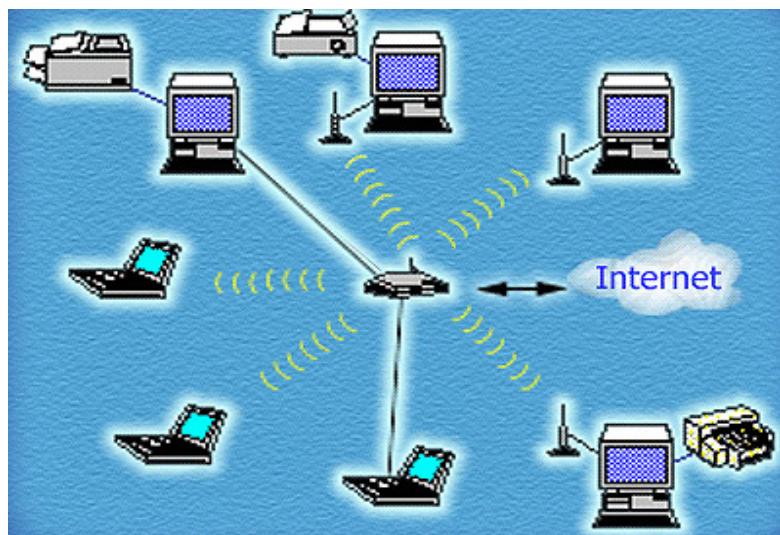


Figure 4.8d Wireless Local Area Network with Wireless Network Adapter

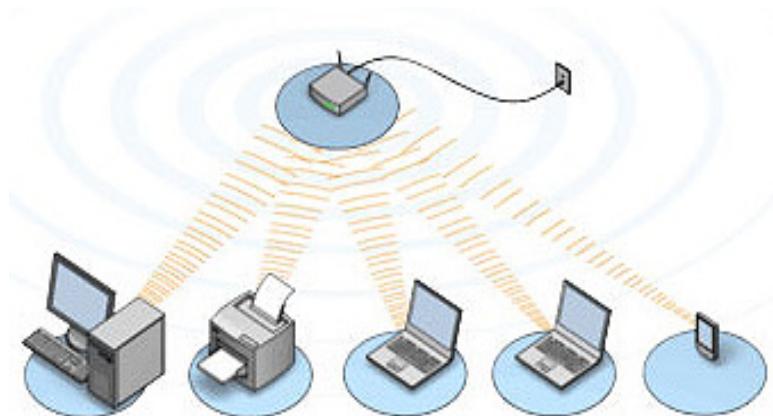


Figure 4.8e Wireless Local Area Network with Wireless Access Point 1



Figure 4.8f Wireless Local Area Network with Wireless Access Point 2

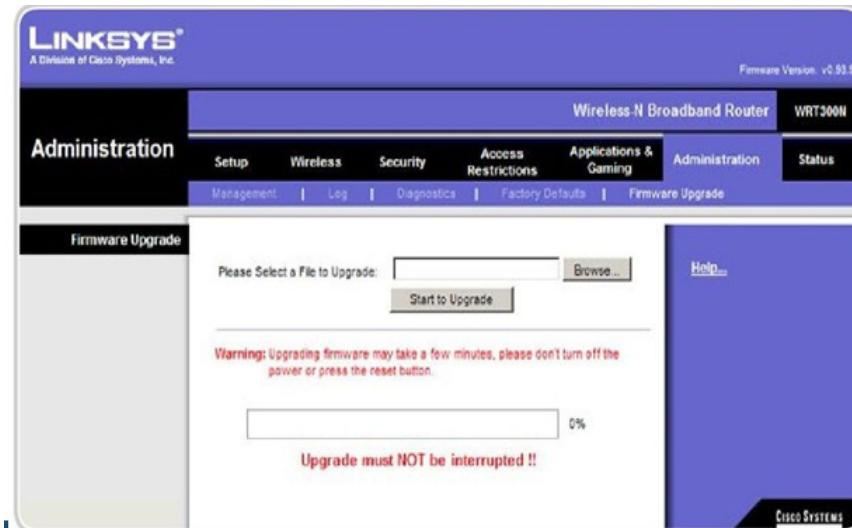


Figure 4.8g The Cisco LinkSys Administrator's Menu

## The Internet

The Internet is an interconnection of networks all over the world that links schools, companies, government agencies, and research institutions. It is a collection of millions of interconnected computers located in countries throughout the world - all linked by phone lines and high speed cables, satellite discs, satellite space-stations to form a gigantic computer network system. In reality, the Internet is a collection of thousands of smaller networks, each network linked to the next network to form one large worldwide network.

It enables us to communicate to other millions of people around the globe. In the Internet, we can send or receive Electronic Mail (E-mail) to any of these millions of people who have their own E-mail address. These people could be our relatives,

friends, lovers, clients, or new acquaintances whom we have some special feelings or interests.

We can connect to any computer server or network from any parts of the world that is open to public users. Connections and accessing of information that are not classified or confidential are possible even those that we can find in NASA, The Whitehouse, and other big companies. We can enjoy these benefits in using the Internet without worrying to pay long distance charges. We just simply pay a minimum charge for a monthly rate that is fixed or with an equivalent of hours to be spent in using the Internet. We pay our bills to an Internet Service Provider (ISP) such as the Pacific Internet, or Network Service Provider (NSP) like PLDT SmartBro, or Globe's Broadband.

We can do our research work without the need to go to a particular library or school. We simply type or choose a particular topic of interest on a Uniform Resource Locator (URL) commonly known as websites such as **whatis.com and asks.com** websites, then the browser like the Internet Explore (IE) or Firefox would take us to the topics we are researching. There are many different search engines software in the Internet like **Google.com** or **yahoo.com** which will simplify our research tasks and make our search endeavor so quick and easy. We can also get a meaning to a particular *word* by using the free online encyclopedia – the *Wikipedia*.

We can exchange messages, thoughts, beliefs, philosophies, and principles to other students or teachers in other universities here in the Philippines or abroad. We can reach these people by sending messages to them through E-mail or chatting with them through Internet Relay Chat (IRC). We can have real-time discussions and forum with them anywhere they are in the world.

IRC is subdivided into hundreds of categories where users talk live around the clock and around the world about everything under the sun (the moon and the stars). The IRC would even permit us to go to a private chat room to talk about topics that are confidential, rated-R, or personal in nature.

The UseNet produces thousands of pages of discussions everyday and organized subject categories. These subjects can be about politics, cultures, society, history, or business. We can choose, view or read only those areas or topics that are important to us. And we can participate the discussion freely and interestingly. The UseNet Newsgroup is a highly sophisticated venue to broadcast messages or articles in which we can receive feedbacks, comments, and even answers to our questions.

## How Internet Started

The Internet started as ARPANET which means, an “Advanced Research Projects Agency”, a project started by the U.S. Department of Defense. In other words, historically, the Internet was invented and created as a tool for war. Indeed, the best tool to win the war. Why? Because, based on the history of wars in the world, the country or countries who has the best communication systems, eventually wins the war. In short, the Internet is a communication system. To understand it well, we have this succeeding discussion. The goal of this communication system project called ARPANET is to create and build a large computer network with multiple paths (telephone lines) that could

survive a nuclear attack or natural disasters such as tornado, tidal wave, super typhoon, or an earthquake. When such attack or disaster happens, the network must still function so that the communication of the people will not stop or totally hindered. Yes, in the Internet design and implementation, because of its multiple paths or redundant paths, even if one part of the network was destroyed, the other parts of the network would still remain operational, thus the data communication could continue to flow through other surviving lines of the network.

### Peter Norton says:

“But what is the Internet? Simply put, the Internet is a network of networks – global communications system that links together thousands of individual networks. As a result, virtually any computer on any network can communicate with any other computer on any other network. These connections allow users to exchange messages, to communicate in real time (seeing messages and responses immediately), to share data and programs, and to access limitless stores of information.”

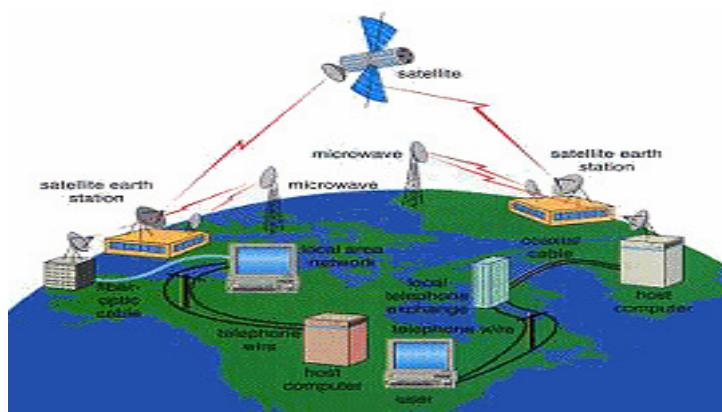


Figure 4.9 The Internet Connection Depiction

### Intranet (The private Internet)

How about Intranet? The **Intranet** is the private network version of Internet (the public network). In private network, only those authorized users are permitted to access information or resources to the Intranet server or computer system network. Unlike in the Internet, any user can have access anytime, anywhere. The Intranet is most commonly used in private big companies. Usually, employees only in these companies have the right to access in their company's Intranet.

Intranet is a secure and a reliable enterprise-wide network and associated applications which use Internet technologies and standards. Most Intranet implementations today focus primarily on internal corporate World Wide Web (WWW) servers (Intrawebs) for the purpose of simple document distribution. The full potential of Intranets can be realized only if the diverse management capabilities and functionality available in a Local Area Network (LAN) environment can be replicated at an enterprise-wide level using the Internet platform. Like for example the speed in accessing resources is faster in the Local Area Network, compared to the Intranet.

## Extranet

Maybe you heard also about Extranet. The **Extranet** is an Intranet which is partially accessible by authorized users who are physically located outside the company or employees in the other companies that are business partners such as distributors, suppliers, or contractors. These other company employees need to have a valid login name with the corresponding password to successfully access and use the Extranet.

In the Extranet setup, these authorized outside users are also limited to view or access some specific resources in the hosting networks. Based on the users login name, password, or possible domain name, the outside users can be managed and controlled effectively on what particular web pages or information they are allowed to view or get. This is also applicable on other shareable resources in the networks such as downloadable files, videos, pictures, images, company marketing campaign materials, product demos in mpeg format. So this is how extranet differs from intranet.

## Virtual Private Networks (VPN)

Before the popularity and emergence of Internet, organizations with their branches nationwide or worldwide connect their WAN, through expensive dedicated leased lines provided by telecommunication companies. Generally, the faster the service of the leased lines, the higher the cost. The development of VPN lowers the cost of WAN connections. This technique on network setup simply utilizes the Internet infrastructure (both its software and hardware components), so that there is no need of a dedicated lines to connect smaller networks from one city to another, or from one country to another.

The main issue on VPN implementation is about system security because of the inherent danger posed by the basic design and operation of Internet which operate as a public network. To solve this issue, the VPN network employs a method called **tunneling**, in which each data from the transmitting source network is encapsulated and encrypted as it travels through the Internet's gigantic network infrastructure until it reaches to the receiving destination network.

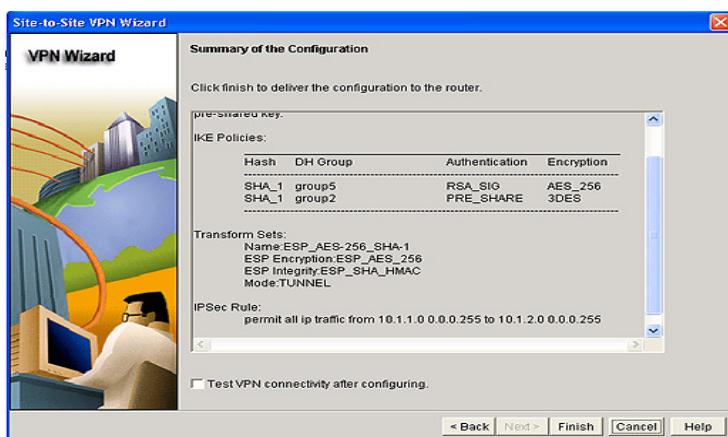


Figure 4.10a The Cisco Systems VPN Configuration Wizard

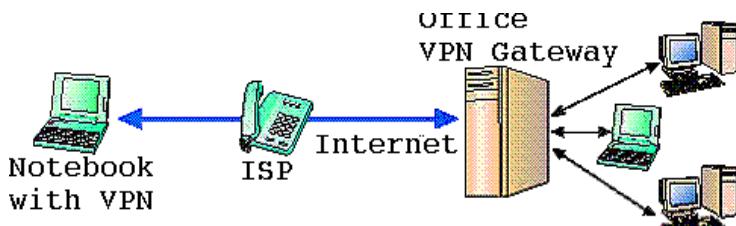


Figure 4.10b The VPN Connection Depiction 1

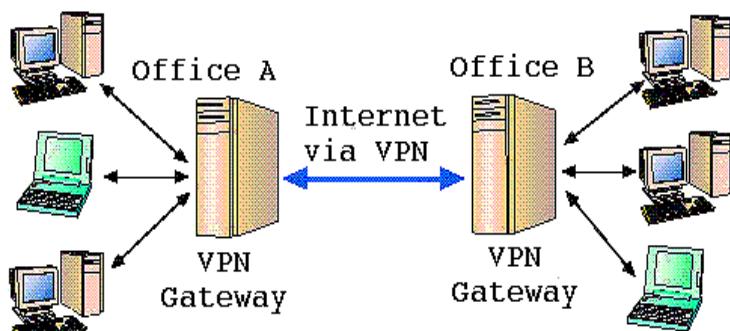


Figure 4.10c The VPN Connection Depiction 2

## Basic Network Structure

Two popular basic network structures that we always heard about are client/server and peer-to-peer networks. These two differ in many ways, most especially in terms of system security, accessing resources, reliability and scalability. Let us examine them one by one.

### Peer-to-Peer Networks

The **peer-to-peer network** is characterized by its simplicity in implementation and operation. However, system security and scalability suffer because of these characteristics. For example, in peer-to-peer, all computers connected to the network have equal relationships to each other and have similar types of software and hardware that support the sharing of resources. Accessing resources are almost free for all, because every computer can access other computer, though it requires login-name and password. There is no centralized management of systems security. Since, every computer is free to access other computer, scalability is also difficult to achieve. Centralization of managing resources and system security administration is vital to a successful and scalable network which is not part of a peer-to-peer design structure and implementation.



Figure 4.11 Peer-to-Peer Network Connection

### Client/Server Networks

A client/server network is a server-based network. Meaning, the server will act as the central or main computer, while other computers called *clients* or *workstations* will access it for resources request. Each and every client PCs on the network share the processing and storage workload with the main computer called *server*.

One of the most common application of client/server settings is in the operation of a relational database management system (RDBMS). The corporate database such as Oracle, SQL Server, and PostgreSQL is commonly installed on the main computer for centralized access of its resources. When a user needs to find information in the database server, he or she will simply use the database client software to send a query to the server computer, which in turn searches that particular information in the database and returns the needed information to the user who requested it.

Main computers (servers) and client PCs (workstations) are the two most important devices found in the computer networks. They are the network devices that the computer users have interacted with, most of the time in their office works.

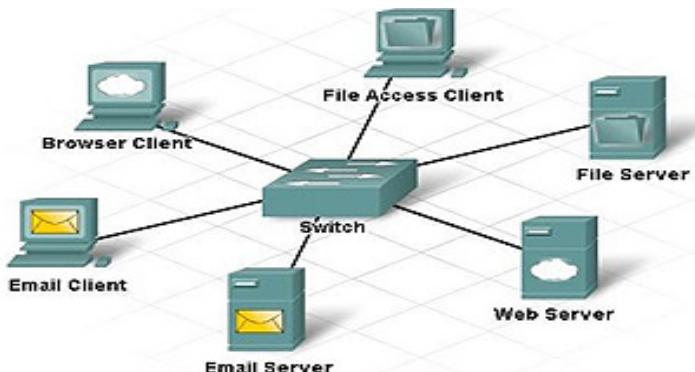


Figure 4.12 Client/Server Architecture Connection

### Hardware Used in Networks

In the discussion of the two most common network structures, we learned that computers are the most important hardware used in networking. There are other hardware or devices used in networks, which enable these computers to communicate to each other successfully. Like for example, how the client computer can access with the server computer? They have to be connected in some ways, such as through cables or radio

frequency signal (in the case of a wireless network) or other networking devices that links them. This is now the main focus of our discussion. What are these networking devices? Here they are.

### Networking Media

Todays organization use both the wire-based networking media and the wireless media to form a **hybrid computer network**. Most of the cables or wires that we can see at the back of our company PCs are called **unshielded-twisted-pair (UTP) wire**. This cable consists of four pairs of wires inside it. Each pair has two wires that are separately insulated or coated in rubberized plastic, then they are twisted around each other. This cable is made of copper and the signal that passes through it, is an electric current or voltage.

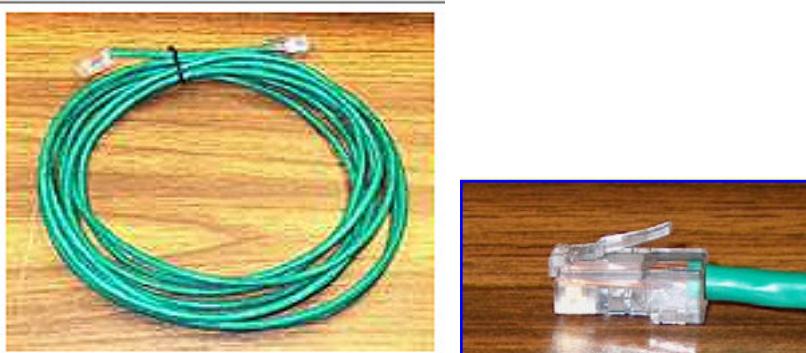


Figure 4.13 Unshielded- twisted- pair cable and the RJ 45 plug

The two cable design that is used to connect networking devices are called **straight-through** or **cross-over** cable. When we connect similar network devices such as computer to computer, switch to switch, router to router, or a router to computer, or hub to switch, we need to connect them with cross-over cable. Router and computer are considered similar devices because their design or architecture are the same. In other words, most of their components are the same in functionality. The same holds true with switch and hub. The switch networking device simply enhances and extended the capability of a hub. As a matter of fact, a switch is but an intelligent hub. It is capable of being configured and administered so that the network can achieve high performance.

In a cross-over cable design, some pair of wires are cross-connecting to other pair of wires, as though they form an X as they are crossing over to each other's path. The cross-connect design can be achieved easily by color coding of wires.

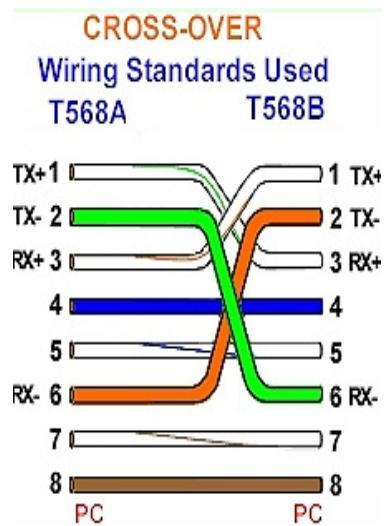


Figure 4.14 Cross Over Connection of Wires Standard

The **straight-through** designed cable is just the opposite of cross-over when it comes to its implementation in the network operation. Straight-through designed cable is used to connect dissimilar networking devices such as connecting the computer to a switch or hub, and connecting a router to a switch or hub.

Straight-through designed cable is the easiest to design compared to cross-over or roll-over designed cable. As its name implies, straight-through wires are the same in color-code from both on its extreme edge.

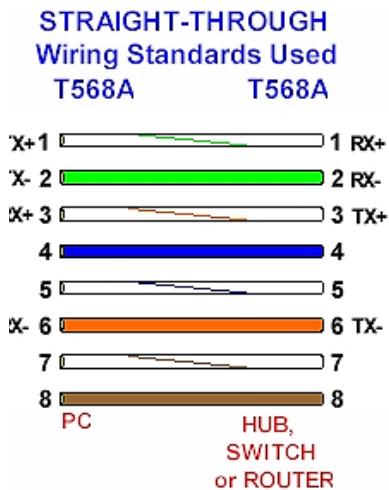


Figure 4.15 Straight-Through Connection of Wires Standard

There is also a special type of cable design that is primarily used to be plugged into the port of a router or a switch so that a network administrator or network engineer

can configure and administer them. This is called the **roll-over cable**. The roll-over cable is designed specifically to this purpose.

There are eight wires inside a twisted pair cable. In a roll-over designed cable, the first wire at the extreme edge has the same color of the last (8<sup>th</sup> wire) wire found at the other extreme edge of the cable, while the second wire has the same color of the 7<sup>th</sup> wire found at the other extreme edge of the cable, and so on, hence the term “roll-over” implies.

Unlike the first two cable designs (straight-through and cross-over) where most of them are designed by network administrators or network engineers or systems administrators and systems engineers, the roll-over cable is already a packaged component with a router or switch purchase.

One cable used also in networking is called **fiber-optic cable**. Unlike the UTP wire which is made of copper, the fiber-optic cable is made of fiber-glass. And the signal that passes through it is in the form of light. That is why, this type of cable is so very expensive and its data transmission capability is very fast compared to the UTP cable.

Wireless media uses radio signal or infrared signal (in the case of a Bluetooth technology implementation) that travels through the air for transmitting data. The Laptops today are equipped with wireless media (cellular modem) which allow the user to connect to the companies LAN, Intranet and Internet without the use of a wire or cable.

### Note:

There is another cable used in the network which has a specialized function. It is used to configure the **router** and **switch**. This cable is known as **rollover** cable. This type of cable does not need to be designed and terminated by the network administrator, because it is already bundled with the router or with the switch.

### Network Interface Card

The network interface card (NIC) is used to control the data that is being transmitted through a cable or wirelessly from one computer to another. This printed circuit board which is also known as network adapter card is inserted to the PC's expansion slot and provides an RJ-45 (Reference Jack) port where the network cable such as the UTP is attached or plugged.

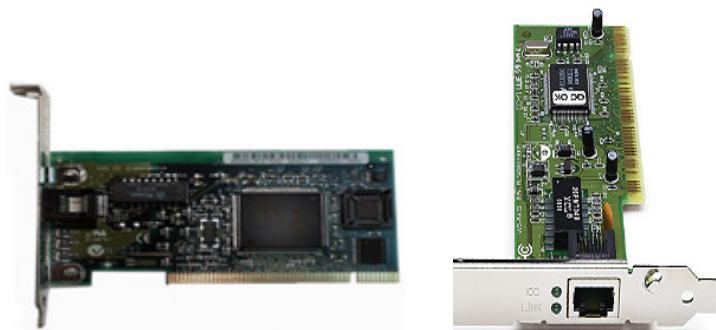


Figure 4.16 Network Interface Card (NIC) – Front View & Side View

### Switch

The **switch** is an intelligent hub which has its own Internetwork Operating System(IOS) inside it. The IOS is the very reason why the switch has enough intelligence

of its own to learn how to manage network traffic in a fast and efficient manner. In other words, a switch is used to ease bandwidth shortages and network bottlenecks. This network device acts as the concentration point for the connection of client computers (workstations), servers, hubs, routers, and other switches in the network. In a hub, two or more computers could possibly send data at the same time within a single path or link in the network, that is why a collision happened, because two or more data would collide to each other when they pass at the same time within a single path or link. In using a switch, this collision will no longer occur because the switch provides a dedicated, point-to-point virtual circuit (logical link) between two connected network devices such as the workstations. Moreover, a switch can segment a LAN into microsegments. **Microsegmentation** is a technique wherein the network administrator can organize his or her network to be subdivided into two or more virtual LANs (VLANs). These VLANs are simply smaller LANs within one physical LAN. Each and every VLAN domain is a collision-free domain, so no collision of data will happen.



Figure 4.17a Cisco Network Switch with connected cables on it



Figure 4.17b Cisco Network Switch without connected cables

### Note:

The repeater, hub and bridge are three networking devices that are rarely used in today's networking operation, (though most commonly used in early 1980's up to late 1990's). Why? The functionality of a hub (as well as repeater) and bridge are already incorporated within the switch capabilities and features. So why use hub or bridge, when you can use a switch that makes your network to rock and roll.

### Router

A router is a network device with the most intelligence of any networking devices found in the network. It is capable of determining and deciding where to transmit the data from one computer to another and choose the best path in order to deliver the data to its recipient, successfully - regardless of distance and time. Within a router is a very powerful operating system called Internetwork Operating System (IOS). This is the driving force behind the router's capability to choose the best path in transmitting data. The router makes all things possible in the Internet. Actually, without the invention of it, an Internet cannot be what it is today. The Internet operates 24 hours a day, 7 days a

week, and 265 days a year with millions of routers scattered and installed around the world.



Figure 4.18a High-end Cisco Routers



Figure 4.18b Cisco Routers for Medium-Scale Enterprise

### Wireless Access Points

This wireless access point is needed so that we can design and implement a wireless LAN or a hybrid LAN. A hybrid LAN refers to a LAN design and implementation that uses both the cable-based connections and wireless connections. Meaning, the company or school are using workstations connected to the LAN with Category 5 cable at its back, while some students are using Laptops that connect to their LAN via wireless connections. The cable-based connections are using usually a Class C Private IP addresses while the Laptops uses a Class B Private IP addresses or both if the Laptops are also connected using Category 5 cable.

Wireless access point has an access limitation due to distance. Only Laptops or PCs equipped with wireless LANcard within 50 to 150 meters radius from wireless access point antenna can access the network.



Figure 4.19 LINKSYS Wireless Router and Access Point

**Note:**

Older Laptops (pre-Centrino technology) need a **wireless adapter** to be able to connect to the network wirelessly.



Figure 4.20 LINKSYS wireless adapter for Pre-Centrino technology Laptops

**What is a Gateway?**

Historically, in the early invention of a router, it was commonly called a gateway. Network engineers and scientists found the term unsuitable for the present capabilities of a router. A router is not just a gateway to connect to a larger network like the Internet and Intranet, it is more than that. That is why, today a gateway has a lot of meanings. The question is, what is a gateway? A **gateway**, in its simplest definition and description, is a node on a network that serves as an entrance to another network. In a small or medium-scale businesses, the gateway is the network device (usually a router or a computer server) that routes data from one local computer to an outside larger network such as the Internet. The router or server accepts and redirects and filters any data packets passing through the network.

When we configure our internal network such as our LANs or Intranets to be able to connect to the Internet, we need to point each and every workstations (client PCs) to the gateway's IP address. This means, that all our workstations must be configured with a Gateway IP address of our router or server's fast Ethernet IP address. The gateway IP addresses are automatically supplied and assigned by the Dynamic Host Configuration Protocol (DHCP) server that is also configured to manage needed IP addresses of our

network, from IP addresses of our Domain Name Service (DNS) server, Web Server, Mail Server, Application Server, and Windows Internet Naming Service (WINS) Server, and all workstations and switches connected in our network.

### **Ethernet Technologies**

In networking world, the quality of networking media is measured in terms of its speed and the distance a data can travel down the cables or wires (whether it is a Category 5 or Fiber optic), or through air (in the case of wireless technology). **Bandwidth** is the measurement of speed of networking media which is expressed in cycles or bits per second (Hertz) or (bps). In other words, this is the amount of data a networking media can carry. This further means also that the higher the bandwidth of the networking media, the faster it can transmit data.

Originally, the Ethernet (10Base-T) technology's speed is in 10 Mbps (Mega-bits-per-second). Today, we have the **Fast Ethernet** (100Base-T) technology that runs 100 Mbps. The next wave is the **Gigabit Ethernet** which can achieve a speed of 1000 Mbps or 1Gbps data transfer rate.

### **Networking Protocols**

Networking **protocols** are set of rules and conventions that govern a particular aspect of how networking devices on a network communicate. The most common protocol in use today in the Internet or LAN is the Transport Control Protocol- Internet Protocol (TCP/IP). One of the common uses of a protocol is how the data should be formatted as it is transmitted between two networking devices.

#### **Note:**

There are other protocols used by different operating system (OS) vendors before, the two widely used are IPX/SPX of Novell IntranetWare and NetBIOS/NetBEUI of Microsoft Windows Server.

### Digital Connections

#### **DSL Connections**

The Digital Subscriber Line (DSL) is usually used by Internet users at home. This is the most affordable and easy to setup and install. Though it has a limited bandwidth, it is typical for Internet users whose needs are mostly for e-mails using Hotmail or Yahoo, school-research through Google search-engine, and high-tech socialization with friends using Friendster, or watching short movies (.avi or mpeg) with YouTube.

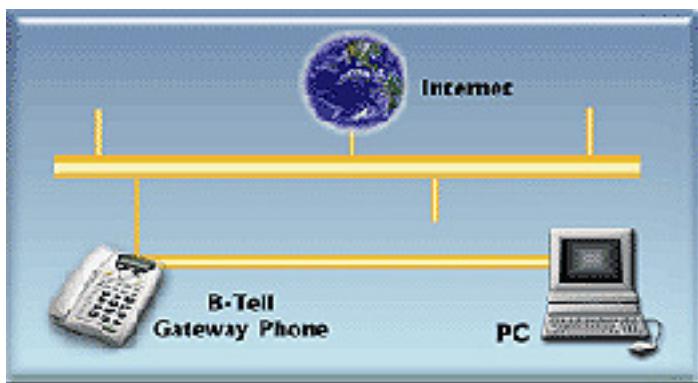


Figure 4.21 Depiction of DSL Connection

### Broadband Connections

Broadband connections simply describe a network connection that can transmit data faster than a DSL technology can do. Some of the broadband connections utilize WAN technologies such as the T1, T3, Integrated Service Digital Network (ISDN), and Asynchronous Transfer Mode (ATM).

### Cable Modem Connections

This is a technology that utilizes the present Cable TV technology infrastructure. This means that a cable modem connection enables home PC users to connect to the Internet through their cable TV connection with higher speeds than those offered by DSL connection.

### Wireless Connections

The **wireless connections** technology allows connectivity so that portable and handheld computers such as Laptops and PDAs can move around while being continuously connected to the network, and can communicate to each other successfully without wires. There are many situations when mobility plays an important role for a particular employee in accomplishing his or her tasks, as well as increasing his or her productivity level.

#### Note:

Few years back, I'm using a Dial-up connection. A dial-up connection is simply to dial-up a particular telephone number given by an Internet Service Provider (ISP) in order for you to connect to the Internet. You need to have a telephone lines and a modem (internal or external) so that you can have this type of network connection. You can get a connection to the Internet by setting up an inexpensive account with the ISP provider or buy an ISP pre-paid card with a specific maximum number of hours you can use the card to access the Internet. It works like your cell-phone pre-paid cards.

## Flowcharting and Algorithms ( Part 1)

### Flowchart

A **flowchart** is a graphical representation of a program. It shows the logical sequence of instruction which a computer has to follow. The individual instructions in the flowchart are connected by arrow lines. These lines indicate the order on how the instructions are followed or executed by the computer. The major uses of flowchart are in program documentation and program presentation. Some of us can communicate easily and effectively through the use of symbols or drawings. That is why we present our ideas or concepts in terms of these techniques: drawing presentation.

Like any other techniques, drawing or symbol presentation has its own advantages and limitations. For example, flowchart is easier to understand compared to the actual program. However, there are some ideas or concepts that are so difficult to express in a drawing form. We have two types of flowcharts: The first one is the **system flowchart**. This type of flowchart illustrates which data is used and how it interacts with the hardware and the user. The second one is the **program flowchart** which illustrates graphically the logical sequence of the program. We will use the program flowchart in our example. Let us just leave the study of system flowchart to your advance subject in computer science or information technology course. Mostly, system flowchart is intensively used and discussed in Systems Analysis and Design subject, as well as in Software engineering subject. The program flowchart is also partly discussed in the first part of any introductory programming subjects such in C programming, Pascal programming, or Visual Basic programming.

The flowchart can help us to view the relationships between the two or more parts and subparts of the program. How they relate or interact to each other. Moreover, it improves the clarity of our logical thoughts, since we had seen its relationships to each other in graphical form. The computer program involves the three basic main operations:

- Input (to enter data)
- Process (to calculate or make choices)
- Output (to produce a result or report)

Here is the graphical representation of these operations:

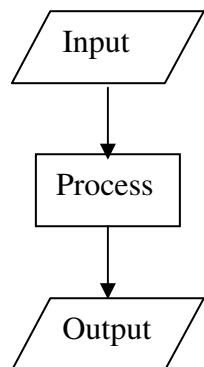


Figure 4.22 The Input-Process-Output (IPO) Flow (From Top To Bottom)



Figure 4.23 The Input-Process-Output (IPO) Flow (From Left To Right)

The basic flowcharting symbols are given below:

<b>Symbol</b>	<b>Name</b>	<b>Meaning and Usage</b>
	Terminal symbol Oval	Signifies the start or end of a program
	Input/Output symbol Parallelogram	Indicates where the data are to be entered or results to be displayed
	Processing symbol Rectangle	Specifies processing procedures that usually involves calculations
	Decision symbol Diamond	Denotes a choice or decision to be made by the computer

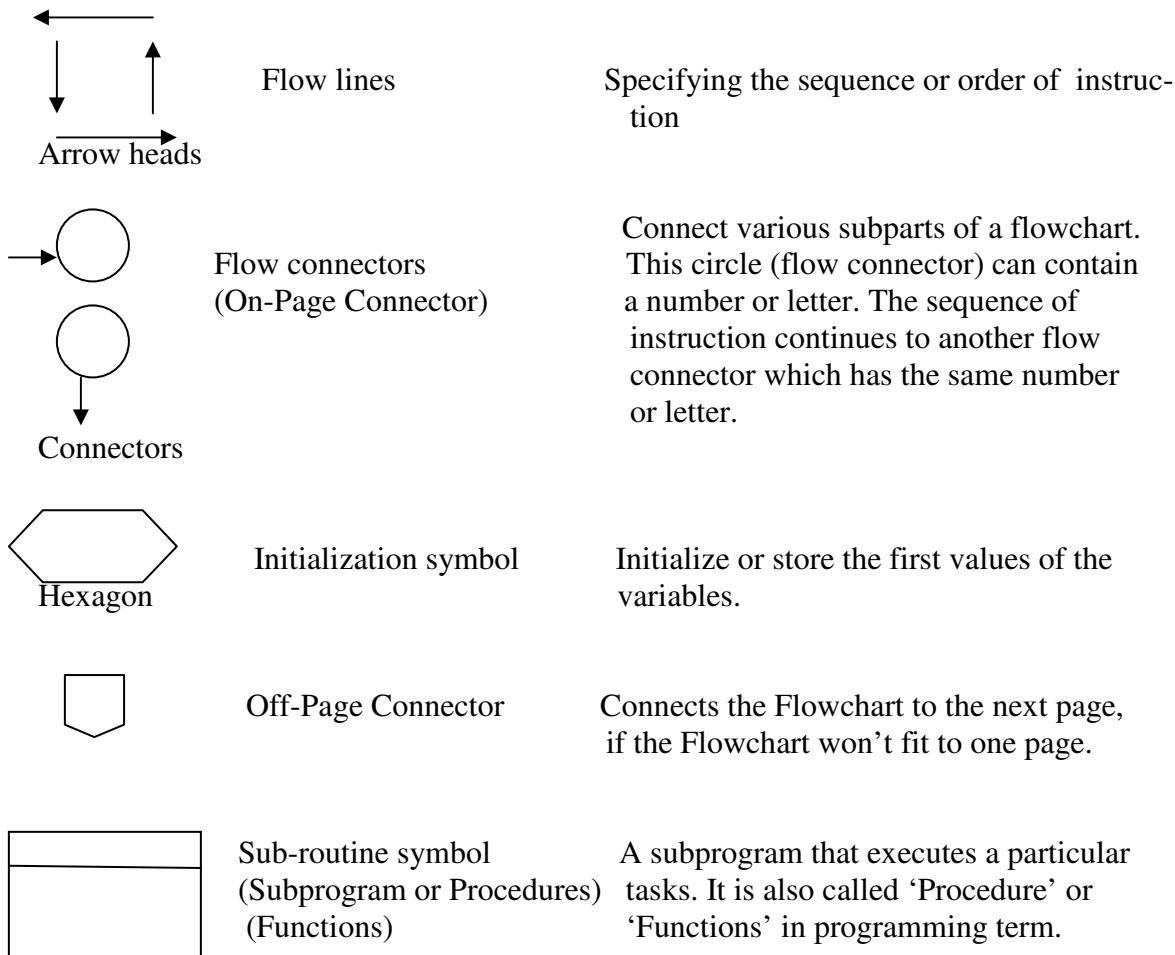


Figure 4.24 Different Flowchart Symbols

## Algorithms or Pseudo-codes

An **algorithm** is an English-like way of writing and expressing a solution to a problem. It is a step by step list of instructions. Algorithm or pseudo-code is like a flowchart. It helps us to construct the actual program easily and clearly. As a matter of fact, flowchart is a visual or graphical representation of an algorithm. It is also like a blueprint of a program, since it served as an effective guide to our programming tasks.

The advantage of using algorithm or flowchart before designing a program, is that it relieves us from worrying the rules or syntax of a specific programming language. Instead, it helps us to concentrate more on the logic of our ideas and programs. Furthermore, we can change, improve or modify our algorithm easily compared to the actual program. In actual program, some of the variables or statements will be affected by the latest improvement or development of the system that takes place. In reality, this kind of situation demands more time, energy, and patience, in the part of the programmer and analyst. It is helpful to solve the programming problems using algorithm and flowchart at the same time, but not always. In my own experience, algorithm is already

sufficient to successfully solve the programming problem. Remember that this algorithm is the product or result of our ideas which we think logically through analysis. In other words, we need an analytical minds or brains that can think in logical way. Have you learned to think logically in your subject: LOGIC? Think again.

Let me finish this discussion by sharing with you about a very short story of Isaac Newton, the scientist who discovered and formulated the “Law of Gravity”. He was asked how he discovered the law of gravity. His answer is very simple and straightforward. This is his answer: “I think always about it”.

In constructing flowchart, algorithm or even writing our program, the best way to come up with the solution is simply to think about it all over and over again. And if you are as crazy as me in programming, never go to sleep until you find the idea on how to solve the present programming problem at hand. Are you willing to go to that extent? Then if you would, I’m sure you’ve got what it takes to be a programmer, by blood and by flesh.

To end this discussion (again, this time I really mean it!) let me tell you about the importance of the word “think” in the programmer’s life. The late Thomas J. Watson, Sr. founder of IBM Corporation (one of the world’s largest and biggest computer companies) put an inscription above his table. And you know what is that? This inscription is a single word : THINK. I think why? Would you like to think why too? Okay, let us put it this way: in our programming task, let us “think”. Don’t ask me why, period!

## Flowchart and Algorithm Elements and Its Structure

We will have here the following elements and structure used commonly in our Flowchart and Algorithm. Since Algorithm and Flowchart are the guides and blueprints in order for us to design and develop computer programs successfully, then the following structures and elements are also applicable or “ready-to-apply” in the actual coding of our programs.

**A.) Constants** – are literal values that do not change during program execution. It can be of the numeric or string data type.

**Numeric Constant** - may be an integer (whole number) or a real number (with a decimal point). It may be preceded by a positive (+) or negative( - ) sign.

### Examples:

11    -26    +3.5    -0.2130    20119

We have to take note that there should be no other characters that should be used in conjunction with constant values such as the following incorrectly written constant values: 20,000    \$44.60    450/hr     $\frac{1}{2}$ . The foregoing incorrectly written constants are natural for us humans, but for the computer to process constant values, they are not. The comma is not allowed, as well as the dollar sign. The / (slash) symbol is not allowed in

declaring a constant value. This will result to a “syntax error” when you convert your Algorithm to an actual computer program.

**String Constant** – is a character or group of characters enclosed in double quotation marks (“ ”) or in some cases, in a single quote (‘ ’). The numbers 0 through 9, alphabetical letters from letter A through letter Z and all special characters such as a space, \*, %, \$, \_, & and many others are also considered as string constants if they are enclosed with a pair of quotes.

### Examples:

‘9’, “Ms.” “This, I promise you!” ‘Y’ “d@#ghter of @ g#%???”

### Note:

The entire string constant values must be enclosed in quotation marks, one before the first character and the other after the last character. In the third example of the list, the double quotation mark can be found before the letter T and the other quotation mark can be found after the exclamation mark of the string, ‘This, I promise you!’.

B.) **Variables** – Is a portion of the computer’s main memory used to store a numeric or string constant. The value stored in the variable must be given a unique variable name, and it can only hold one value at a given time.

### Variable names must conform to the following requirements:

- Must contain only letters, numbers or an underscore.
- Must begin with a letter.
- Must end either with a letter or a number.
- Must be unique that is, not a name of another variable.
- Must not be any of the programming language keywords such as *for, while, do, case, switch, if, else, default, break, try, catch, finally*, and many others.

### Note:

A variable may be one of the following types: Numeric, String, or an Array. Numeric types are in numbers, while String types are in character or series of characters. The Array is a special type of variable which has only one name referenced to it, but can hold one or more similar data type values at the same time. Ordinary variable can only hold one value at a time.

## Operators Or Notations Used In Flowcharting

We are already familiar with most of these operators such as the mathematical and relational operators that we had used in our high school mathematics subjects (well, with a slight difference only). In programming, there’s another important operators: **logical operators**. These logical operators were originated and patterned from the formulas used to invent the computer itself. They call it the “Truth Table”. Without further ado, let me introduce them: the logical AND, OR, and NOT.

Here are the summaries of the mentioned operators:

### **Mathematical Operators**

+	Addition
-	Subtraction
*	Multiplication
/	Division
%	Modulus
**	Exponent

### **Hierarchy or Priority of Mathematical Operators Calculations**

1. Expressions in parenthesis (inner-most expressions are first to be computed)
2. \* / %
3. + -
4. From Left to Right

### **Relational Operators**

>	greater than
<	less than
>=	greater than or equal to
<=	less than or equal to
<>	not equal to
!=	not equal to

### **Logical Operators      Name of the Symbols (Special Characters)**

&&	(Logical AND)	Double Ampersand Symbol
	(Logical OR)	Double Pipe Symbol
!	(Logical NOT)	Exclamation Mark

### **Operators      Rules**

**And (&&)**      If both or all expressions are evaluated to True, then the result is True.

**Or (||)**      When either or any (or just one) of the expression(s) is True, the result is True.

**Not ( ! )**      If the expression is True, then the result is the opposite of the expression.

**Note:**

The pipe (|) symbol which is used as logical OR symbol can be found at the top of the Enter key and below the Backspace key in the keyboard. In other words, it is located between these two keyboard keys. In some keyboard design, this symbol is below the Enter key.

The Logical AND (&&) is also equivalent to logical multiplication with the use of the symbol asterisk(\*), while the Logical OR (||) is also equivalent to logical addition with the use of the plus (+) symbol.

In logical operators, 0 is equivalent to False and 1 is equivalent to True. So the first table below is equivalent to the second table that follows:

### Logical AND Truth Table

X	Y	Z=X * Y
0	0	0
0	1	0
1	0	0
1	1	1

First Table of Logical AND

X	Y	Z = X&&Y
False	False	False
False	True	False
True	False	False
True	True	True

Second Table of the Logical AND

### Logical OR Truth Table

X	Y	Z=X +Y
0	0	0
0	1	1
1	0	1
1	1	1

X	Y	Z = X    Y
False	False	False
False	True	True
True	False	True
True	True	True

### Logical NOT Truth Table

X	!Z
0	1
1	0

X	Z
False	True
True	False

In logical Not operator, the value of variable X is simply inverted, so the value of variable Z is the inverted value of variable X.

### Hierarchy or Priority of Logical Operator's Evaluation

1. Not ( ! )
2. And ( && )
3. Or ( || )

The logical NOT operator has a higher precedence than the others. The AND operator has higher precedence than the OR operator. Both the logical AND and OR operators have lower precedence than the relational and arithmetic operators.

#### Note:

When Mathematical and Logical Operators are found in an equations or expressions, then, the Mathematical Operators have higher priorities than Logical Operators in the calculation process. The computer follows usually the rules in mathematics when it comes to calculating mathematical expressions.

### A.) Mathematical Expressions

#### Examples:

$$\begin{aligned} 1. \quad & 12 + 10 * 3 \\ & = 12 + 30 \\ & = 42 \end{aligned}$$

$$\begin{aligned} 2. \quad & 11 \% 2 - 5 \\ & = 1 - 5 \\ & = -4 \end{aligned}$$

$$\begin{aligned} 3. \quad & 20 / 4 * 3 \\ & = 5 * 3 \\ & = 15 \end{aligned}$$

### B.) Relational Expressions

#### Examples:

1. I<=5
2. Ctr>60
3. Ans !='Y'

We will see the actual application of the Relational Expressions in the Flowchart, Algorithm or Pseudocode, as well as to actual computer program.

### C.) Logical Expressions

#### Examples:

$$1. \ 9 >= 5 \ \&\& \ 4 <= 8$$

T	&&	T
		T

#### Explanation:

We know that 9 is greater than 5, so this results to the evaluation of True, while 4 is less than 8, so it results to True also. Based on the AND ( $\&\&$ ) Truth Table, the True (T) AND True (T) evaluation will result to True. If we convert the True (T) to the value of logical 1, then we can calculate it logically as  $1 * 1$  where logical AND is equivalent to logical multiplication (\*). The resulting calculation is 1 which is equivalent to True (T).

$$2. \ 5 >= 9 \ || \ 8 <= 4$$

F		F
		F

#### Explanation:

We know that 5 is not greater than 9 so this results to the evaluation of False, while 8 is not less than 4, so it results to False also. Based on the OR (||) Truth Table, the False (F) OR False (F) evaluation will result to False. If we convert the False (F) to the value of logical 0, then we can calculate it logically as  $0 + 0$  where logical OR is equivalent to logical addition (+). The resulting calculation is 0 which is equivalent to False(F).

$$3. \ (9 >= 5 \ \&\& \ 4 <= 8) \ || \ (5 >= 9 \ || \ 8 <= 4)$$

( T	&&	T )		( F		F
T						F
						T

#### Explanation:

We know that 9 is greater than 5 so this results to the evaluation of True, while 4 is less than 8, so it results to True also. Based on the AND ( $\&\&$ ) Truth Table, the True (T) AND True (T) evaluation will result to True. If we convert the True (T) to the value of logical 1, then we can calculate it logically as  $1 * 1$  where logical AND is equivalent to logical multiplication (\*). The resulting calculation is 1 which is equivalent to True (T).

We know that 5 is not greater than 9 so this results to the evaluation of False, while 8 is not less than 4, so it results to False also. Based on the OR (||) Truth Table, the False (F) OR False (F) evaluation will result to False. If we convert the False (F) to the value of

logical 0, then we can calculate it logically as  $0 + 0$  where logical OR is equivalent to logical addition ( $+$ ). The resulting calculation is 0 which is equivalent to False(F).

This time, we have to evaluate the last remaining logical expression which is  $T \text{ || } F$ . Based on the OR ( $\text{||}$ ) Truth Table, True (1)  $\text{||}$  False (0) is equal to True (1). We can calculate it easily to use its numerical equivalent by this logical addition operation:

$$1 + 0 = 1.$$

$$\begin{array}{l} 4. (9>=5 \&\& 4<=8) \&\& (5>=9 \text{ || } 8<=4) \\ (\text{T} \&\& \text{T}) \&\& (\text{F} \text{ || } \text{F}) \\ \text{T} \qquad \&\& \text{F} \\ \text{F} \end{array}$$

### **Explanation:**

We know that 9 is greater than 5 so this results to the evaluation of True, while 4 is less than 8, so it results to True also. Based on the AND ( $\&\&$ ) Truth Table, the True (T) AND True (T) evaluation will result to True. If we convert the True (T) to the value of logical 1, then we can calculate it logically as  $1 * 1$  where logical AND is equivalent to logical multiplication (\*). The resulting calculation is 1 which is equivalent to True (T).

We know that 5 is not greater than 9 so this results to the evaluation of False, while 8 is not less than 4, so it results to False also. Based on the OR ( $\text{||}$ ) Truth Table, the False (F) OR False (F) evaluation will result to False. If we convert the False (F) to the value of logical 0, then we can calculate it logically as  $0 + 0$  where logical OR is equivalent to logical addition ( $+$ ). The resulting calculation is 0 which is equivalent to False(F).

This time, we have to evaluate the last remaining logical expression which is  $T \&\& F$ . Based on the AND ( $\&\&$ ) Truth Table, True (1)  $\&\&$  False (0) is equal to False (0). We can calculate it easily to use its numerical equivalent by this logical multiplication operation:

$$1 * 0 = 0.$$

## **D.) Combination of Mathematical, Relational and Logical Operators**

$$\begin{array}{l} 1. 9 / 3 == 9 \% 3 \\ 3 == 0 \\ \text{F} \end{array}$$

### **Explanation:**

It is obvious that 3 is not equal to 0. That is why our answer is False (F). The left side of the equation divides 9 by 3, and the result is 3, while at the right side of the equation is the number 9 divided by 3 and its remainder is zero (0). This is how the percent (%) works in Flowcharting, Algorithm, Pseudo-code, and Program. The operation of percent (%) symbol will return the remainder value.

$$\begin{array}{l} 2. 7 != 15 / 2 \\ 7 != 7.5 \\ \text{T} \end{array}$$

**Explanation:**

The exclamation mark (!) together with the equal (=) symbol, means “not equal” in programming application. Since 7 is not equal to 7.5, therefore, our answer is True (T).

$$3. (5 > 3) \&\& (7 != 7) || !(9 <= 9)$$

```

T && ( F ) || !( T )
T && F || F
      || F
      F

```

**Explanation:**

The Relational expression  $5 > 3$  evaluates to True (T) while the Relational  $7 != 7$  evaluates to False, and Relational expression  $9 <= 9$  evaluates to T (eventhough 9 is not less than 9, however it is equal to 9). Obviously, 5 is greater than 3; and 7 not equal to 7 is False, because they are actually equal to each other. The  $9 <= 9$  evaluates to True because of the equal (=) symbol after the less than (<) symbol that results to  $9 = 9$ . The True and False (T && F) evaluates to False, because using the equivalent logical multiplication that translates to  $1 * 0 = 0$ , where True is equivalent to 1 and False is equivalent to 0. Now the !(T) just simply evaluates to False, because this translates to NOT True, which means it is False. The False Or False ( F || F ) evaluates to False, because using the equivalent logical addition that translates to  $0 + 0 = 0$ , where True is equivalent to 1 and False is equivalent to 0.

$$4. (10 == 10 \% 2 * 2) \&\& !( (4 > 2) \&\& (6 < 4) )$$

```

F           && !( ( T ) && ( F ) )
F           && ! (     F     )
F           &&         T
      F

```

**Explanation:**

The expression  $10 == 10 \% 2 * 2$  evaluates to False (F) because the expression at the left side of our equation will never be calculated to 10. The inner expression in the parentheses T && F will evaluate to False because using the logical multiplication  $1 * 0 = 0$ , where True is equivalent to 1 and False is equivalent to 0. The !( F ) negates the value, so it evaluates to True.

**E.) Assigning Values to Variables**

Giving the following variable declarations:

A = 1, B = 2, C = 3, D = 4

$$1. (A < B) \&\& (C < D)$$

(1 < 2) \&\& (3 < 4)

T      &&      T  
      T

**Explanation:**

The variable A has a value of 1, while the variable B has a value of 2. Therefore the expression A < B evaluates to True. The variable C has a value of 3 and variable D has a value of 4, that is why the expression C < D evaluates to True.

2.  $((A * C) \leq (B + D)) \mid\mid (C \geq B)$

$$\begin{aligned} & ((1 * 3) \leq (2+4)) \mid\mid (3 \geq 2) \\ & (3 \leq 6) \mid\mid (3 \geq 2) \end{aligned}$$

T            ||      T  
      T

**Explanation:**

We first substitute the variable with its respective value. In the case of variable A, it has a value of 1, while B has a value of 2, and so on. The expression  $3 \leq 6$  evaluates to True, as well as also the expression  $3 \geq 2$ . Then finally, we have the logical evaluation True Or True ( $1+1=1$ ), which evaluates to True.

**Note:**

In actual programming practice, the variables used are usually longer characters (not a single character) that denotes what a particular variable is all about. For example, the variable for Quantity could be Qty, or the variable used for Centimeter is Cm. In some instances, programmers and developers use the entire word as a variable name. In this way, the variable stands out what it means.

We used single characters here in our example, for the sake of simplicity. This is opposite in programming practice, because the longer the name of the variable, the easier it is to understand the code.

3.  $((A+D) > (C-A)*2) \&\& ((B>A) \mid\mid (D < C))$

$$\begin{aligned} & (1+4) > (3-1)*2 \quad \&\& ((2>1) \mid\mid (4<3)) \\ & 5 > 4 \quad \&\& (T \mid\mid F) \\ & T \quad \&\& T \\ & \quad \quad \quad T \end{aligned}$$

**Explanation:**

The expression  $(3-1)*2$  is calculated as 4, because the inner expression in the parentheses was first calculated  $(3-1)$ , which computed value is 2. Then we multiply this computed value 2 to 2 that results to the computed value of 4.

Now the expression  $2>1$  evaluates to True while the expression  $4<3$  evaluates to False, and yet this will be logically results to True since  $(1 + 0 = 0)$ , where 1 is equivalent to True and 0 is equivalent to False.

Finally we have the expression T && T ( $1 * 1 = 1$ ), that evaluates to True.



**General Instructions:** Evaluate and determine if the following expressions are True or False.

A. Combination of Mathematical, Relational, and Logical Operators

1.  $100 / 2 == 21 \% 3$
2.  $100 / 2 != 21 \% 3$
3.  $(15 >= 15) \&\& (7 == 7) || (1001 != 1001)$

B. Assigning Values to Variables

Where:

$$W = 10 \quad X = 20 \quad Y = 30 \quad Z = 40$$

4.  $(W > Z) || (X != Y)$
5.  $((W * Z) < (X * W)) || (Z > W)$
6.  $((W + X) <= (Y - W) * 3) \&\& ((W < Z) || (Z > Y))$

## Chapter 5

# Business At The World Wide Web

"If you can dream it, you can do it."  
-Walt Disney

### World Wide Web (WWW)

The World Wide Web is a global, cross-platform, and graphical system of organized hypertext information on the Internet, which links web pages on similar subjects located at different websites around the world. We can simply type or click a certain topic or website, then it will take us to that particular site on the Internet easily. Hypertext information system enables us to read and navigate text and visual information in a nonlinear way, based on what we want to know or see next.

Cross-platform means that we can access Web information equally well regardless of computer hardware or software we are presently using. Whether we are using the Apple-Macintosh, Unix PowerStation, IBM-compatible computers running Windows Vista, or even a multi-million dollar mainframe.

We can gain access to the Web by using an application software called - Internet browser. A browser is used to view and navigate Web pages and other information on the World Wide Web, while a website is a location on the Web that publishes some kind of information or entertainment. When we view a Web page, our browser connects to that website to get that information. The two famous and widely used browsers today are **Microsoft Internet Explorer** and **Mozilla Firefox**( which source code is originated from **Netscape Navigator** web browser).

### How the World Wide Web Started

Some of us thought that the Internet and the World Wide Web (WWW) are the same or synonymous from each other. But it is not, definitely not. They are two distinctly different things. As a matter of fact, the Internet was invented two decades before the World Wide Web was created. The Internet is the network infrastructure of a gigantic global networks, while the Web is a service - a type of system for accessing documents online using the network infrastructure of the Internet.

If the Internet started in the United States at the Department of Defense, the World Wide Web started in Europe. It was invented and created in 1989 at the European Particle Physics Laboratory in Geneva, Switzerland. The World Wide Web was originally a method for cross-referencing an online documents and incorporating them with footnotes and figures. This is how one document is *link* from another documents. The other documents could be stored in different locations on a single PC, or on different workstations on the Local Area Network (LAN), Wide Area Network (WAN), or on the Internet. The goal of the inventors of the Web is to create a simple way to access any

document that was stored on a network, without having to search through indexes or directories. And without having to manually copy the documents from one computer to another before opening them.

Web documents or commonly known as **Web pages** can be linked together because they are designed and developed in a **hypertext** format. This hypertext formatting is a system that provides an easy way to manage large collection of different documents. These documents can include static and moving text, graphics, image, sound, movies, pictures, and much much more. The hypertext system enables us to view other documents that are linked to the present web document (web page) that we are currently viewing - by clicking its respective link. The Hypertext Transfer Protocol (HTTP) is the type of protocol we used to design and develop this web document (web page).

## The Web Browser

If we got our Internet connection from PLDT Bro or Globe Broadband, we may have two or more browsers to use. Either the famous Microsoft Internet Explorer (IE) or the secured Mozilla Firefox. The **web browser** is a type of software application designed and developed to find hypertext documents (web pages) on the Web and use to open the document (web page). This web browser provides a graphical-user-interface (GUI) that enables the Web surfer to click the hyperlinked text and images to jump to other documents (web pages) or view other information on the Web.

The Web browser's job is to be able to access the information pointed by the Uniform Resource Locator (URL). In other words, URL is a pointer to a specific bit of information on the Internet. The URL is simply an Internet addressing scheme with a special formatting. The following is the sample of URL's format:

*Type: //InternetAddress/Path*

Where the *Type* specifies the type of Server in which the file is located, the *InternetAddress* refers to the address of the Server, while the *Path* is the location within the file structure of the Server. The *Path* includes the list of folders where the desired Web page is located.

When it comes to hypertext Web documents, the browser will communicate with the Web server using the Hypertext Transport Protocol (HTTP). The HTTP protocols are set of rules on how the computers connected to the Internet would communicate to each other.

Most of the time, the browser is dealing with formatting and displaying Web documents (pages). The most common scripting languages use to design and develop a Web page are Hypertext Mark-up Language (HTML) and JavaScript. The HTML program includes the text of the Web page, the structure of it, and the links to other Web page or images. JavaScript extends the capability of HTML by making web pages to become alive, dynamic and interactive. There are also other commercial software that are use to design and develop web pages such as Microsoft's FrontPage, Macromedia's Dreamweaver, Adobe Flash, and many others.

There is also other technology to know besides HTTP. It is the FTP. The **FTP** (File Transfer Protocol) protocol enables us to send or receive files, images, pictures, MP3s, videos, or software from a computer connected to the Internet anywhere in the Philippines or anywhere in the world.

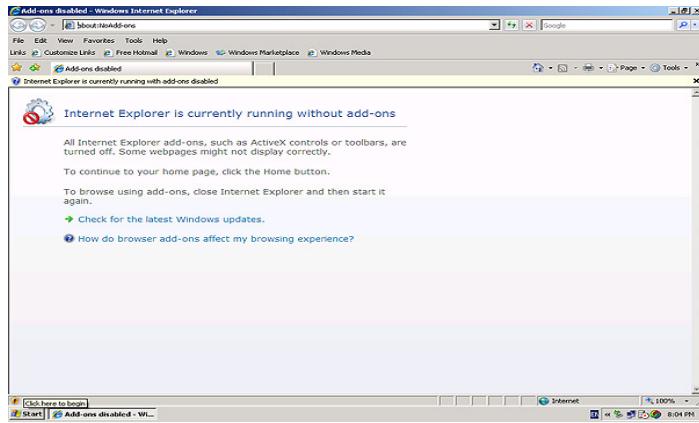


Figure 5.1 Microsoft Web browser: Internet Explorer 7 Screenshot

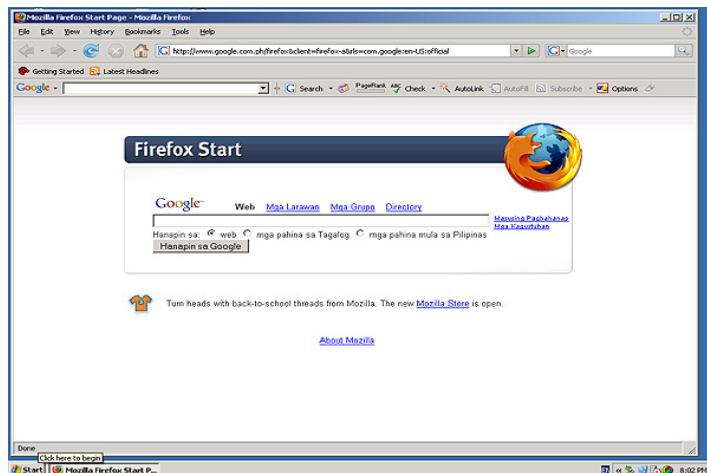


Figure 5.2 Open Source Web browser: Mozilla Firefox Screenshot

## How to Use the URL and Hyperlink

The URL is the key to navigate or explore the World Wide Web. When we provide a URL to the Web browser by typing it on its Address box, the Web browser will find the URL's web page and then transfers the web page to our computer. The content of the Web page will appear on our computer's screen through the window of the Web browser.

We can also go to a particular Web page by clicking the hyperlink of a particular URL. The **hyperlink** is usually written in our Web page with an underline on it. The hyperlink can appear as pure text with an *underline* on it, or it can be an image, or a navigational

control such as a button with an arrow drawn on it. We can click a hyperlink and jump or transfer from our present location to the URL specified by the hyperlink.

When the mouse pointer touches the hyperlinked text, the hyperlink's URL appears in the Web browser's status bar, and then the mouse pointer changes its shape. The shape of the mouse pointer becomes a hand icon with a pointing index finger. Other hyperlinked design is expressed in an image map where we can click on its different parts to jump or transfer to different links or Web pages.

## The Web Server

A **web server** is the program that runs on web site. Its primary responsibility is to reply the browser's requests for files. We need a web server before we can publish documents on the Web. To request a page on a website, the web browser establishes a connection to a Web server using the HTTP protocol. The server accepts the connection, sends the requested file, and finally closes the connection. After that, the web browser formats the information it got from the server.

The **web server** is also responsible for managing information storage, linking forms and browser with programs such as large array of databases. There are many servers available for different platforms or environments with different features and capabilities.

## The Web Site

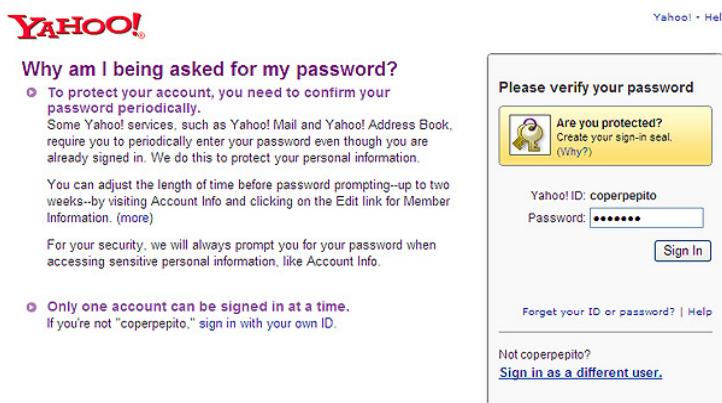
The **Web site** is simply a collection of related Web documents (web pages). The Website is housed on Web servers. The **Web server** is a powerful and high-performance Internet host computer that often store thousands of Web documents. The Web pages are used to offer products through online catalogs, distribute online news, offer interactive educational services such as certification exams, and live playing of online audio such as in *esnips.com* or an online video of your own self-directed and choreographed comedy through *YouTube.com*.

## Electronic Mail (E-Mail)

E-mail is the electronic letter equivalent of our postal mail. Instead of sending our mail through the post office, we send it through the computer connected to the Internet. Like our postal mail, to reach the destination we have to specify the address of the recipient. In e-mail, the address is also applied. But we can shortcut the specifications. For example my actual e-mail address is [coper7@hotmail.com](mailto:coper7@hotmail.com). The coper7 is my e-mail address and *hotmail.com* is the E-Mail company that serves as the international *mail server* where all E-Mail users of *Hotmail* can be found. Our e-mail address must be unique from the other e-mail users in a particular e-mail service company. Actually, that's the reason why I put the number 7 after my nickname, because someone out-there

somewhere (on planet earth) and at *hotmail.com* company was already using the “**coper** e-mail address”. Once you registered your e-mail address on a particular e-mail service company, you and you alone is the only one who has the sole and reserved right to use it. However, your e-mail address can have a similar address in other e-mail service company such as the *Yahoo.com* mail or *gmail.com* (a Google mail). Like for example, my e-mail address in [coper7@hotmail.com](mailto:coper7@hotmail.com) has similar e-mail address in *yahoo.com* which is [coper7@yahoo.com](mailto:coper7@yahoo.com) whose owner is someone other than I. This is okay since [coper7@hotmail.com](mailto:coper7@hotmail.com) and [coper7@yahoo.com](mailto:coper7@yahoo.com) are not the same e-mail service company. The disadvantage in my part is that when I want to have my other e-mail address at *yahoo.com*, I have to use other e-mail address because **coper7** has already been owned by someone else. This is also the very reason why I use this e-mail address in my Yahoo mail account as: [coperpepito@yahoo.com](mailto:coperpepito@yahoo.com). So much for this stuff about e-mail address idiosyncrasies. Let us go to its application in the company setting.

E-mail is one of the most important communication tools a company can use to its advantage. Bill Gates, in his book, “Business at the Speed of Thought”, has pointed out that his company, Microsoft, has a flat organizational chart. An opposite to a bureaucratic hierarchical type of organization. Gates explained that at Microsoft, any employee who has a genuine concern to the company can send him an e-mail anytime he or she wants. In other words, this particular employee doesn’t have to ask permission to his immediate superior about the thing he would like to communicate with the Chairman of the Board. This makes Microsoft with a flat organizational chart. According to Gates, the employee of Microsoft can talk anything even though this could be a bad news to him. He even encourages his company officers that such news must be given full attention, and must travel fast - up, up, and up to him. With this technique, according to Gates, the middle manager cannot have the opportunity to intercept, regulate, screen, or worst of all, cover-up a bad news, that is eventually beneficial to the company as a whole. So at Microsoft, “bad news must travel fast”, so that solutions can be formulated to solve any problems a company has.



Please verify your password

Are you protected?  
Create your sign-in seal.  
(Why?)

Yahoo! ID: **coperpepito**

Password:  **\*\*\*\*\***

[Forgot your ID or password? | Help](#)

Not coperpepito?  
[Sign in as a different user.](#)

Figure 5.3 Yahoo Mail Screenshot



Figure 5.4 The Microsoft Hotmail Screenshot

## The E-Mail Advantage

To those of us who used e-mails to communicate with our family, relatives and friends; here are some advantages that we can enjoy with electronic mail. The following are the advantages of Electronic Mail (E-mail) compared to the traditional postal service mail. E-mail is fast. It takes a few minutes to send the E-mail in order to reach its destination, whether across the office or other branches of the company, or across the ocean (or all over the sea) or anywhere in the world.

The E-mail message can be read by the recipient from any computer which is connected to the Internet. That computer can be at home, in the office, or anywhere in the globe. It is like receiving your e-mail anywhere you are and anytime you want. As long as the Internet exists on the area where you are in. It is more economical to send E-mail to many people compared to the postal mail. You don't need an individual stamp for each letter with the same content and you don't need to use individual paper and envelop for each recipient.

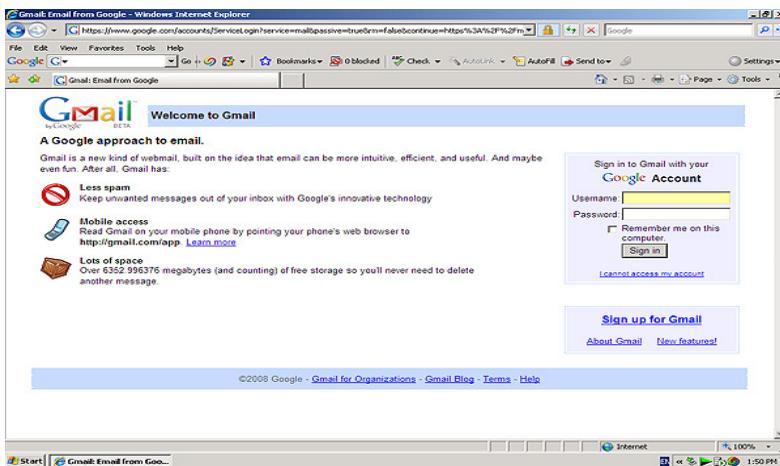


Figure 5.5 The Gmail Home Page (A Google Mail Server)

## The E-Commerce

The e-commerce is a high-tech term that means doing and conducting business online with the use of Internet. For example, when a customer buys a product over the Web, instead of going to a store physically to buy it.

The study of *electronic commerce* (E-Commerce) often focuses on security, cryptography, and electronic currency and payments. But e-commerce is more than just the exchange of money in business transaction. It also includes research, development, marketing, advertising, negotiation, sales and support.

The e-commerce has given companies around the world a new opportunities in conducting business in a totally different way compared to the traditional business transactions. Using large online databases and powerful websites, companies can sell goods, and customer can order them online, send invoices to customers and receive payments through credit cards or other form of electronic payment (e-payment).

In e-commerce, the B2B (Business-to-Business) transaction is the most popular implementation. In B2B, the business transaction is more of company to company, not from a company to a customer or consumer. Hence, the term B2B implies.

## Internet Sales

*Internet sales* are likely to take two general forms: ordinary commerce in tangible things and information commerce. *Ordinary commerce* in tangible things will greatly resemble common transactions today: purchases that are currently carried out by telephone, ordinary mail-order, and even in person. In *information commerce*, unlike ordinary commerce in tangible things, there may be no package to help identify the sender after the goods are delivered. Instead, both parties will conduct the exchange electronically: the buyer will send digital cash using credit cards or some form of electronic payment such as fund-transfer, and the seller will send information or the goods. Some of these transactions may be sizable, such as the sale of access to proprietary databases or the purchase of computer software, videos (MP4s), music (MP3s), eBooks and other products that needs intellectual capital to produce. For example, providers of information on the World Wide Web might choose to charge a fraction of a penny to each person accessing their pages, downloading files or software, MP3s, MP4s, eBooks, or Online exam reviewers from their website.

The common issue that this online sale is suffering is that credit cards used in purchasing products through the Internet can be used illegally by hackers for their own spending. The micro-commerce solves this issue. Micro-commerce in information will require a digital payment system that does not rely on the participation of a third party such as credit bureau or credit card issuer. If such payment system could be widely deployed, the potential for growth of Internet information commerce is enormous.

## Online Shopping

You can buy a computer directly from Dell via their website. Or a company can purchase their routers and switches directly to Cisco Systems through its website. These two great companies rake big profits through online purchases by their customers. As a matter of fact, most of their sales came from online buyers. These are just among the few celebrated success stories of online shopping.

Online shopping is the very example of the Internet buzzword called B2C or **business-to-consumer** transactions. Though, in the case of our second real-world example of Cisco Systems, the sales transaction is called B2B (Business-to-Business) because it is a company to company sales transaction.

There are other celebrated success stories of online shopping. Two of these are the Amazon.com that originally sells books online, and *eBay* where you can bid on just any kind of products you can think of. The *Amazon.com* is a type of an online shop, while *eBay* is an online auction.



Figure 5.6 Amazon.com Homepage

## Online Catalog

The online catalogs are set up like directories in the *Amazon.com*. These online catalogs are presenting the products and services into categories and subcategories. For example, if we want to buy a PDA at *Amazon.com*, we have to select first the Electronics category on the list, secondly the Personal Electronics subcategory list, then to the Handheld Devices subcategory list, and finally choosing the PDA item on the list.

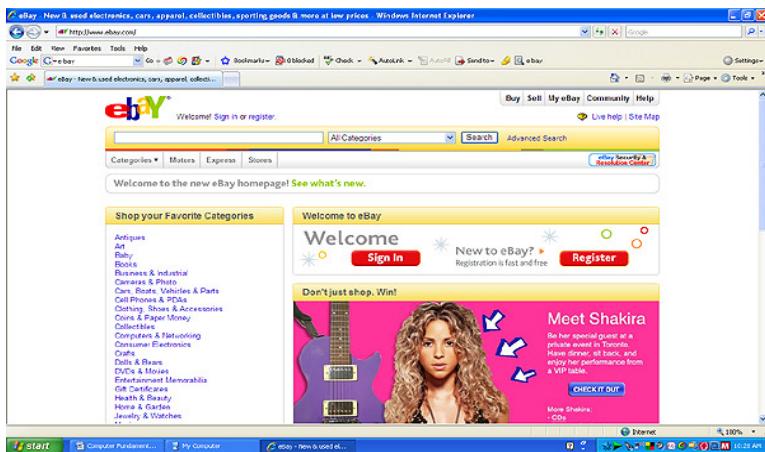


Figure 5.7 eBay Homepage

## Online Purchase

To shop online, we have to choose the products or items we want to buy using the online catalogs. Now to select these items (like the way we buy in the supermarket where we use a push carts to fill in with the goods we buy), we have to fill a shopping cart – an electronic holding area that stores information about the products that we have selected to buy. After we are ready to make our purchase, we can pay for it through our credit cards or through an online account that we set up with an online vendor.

## Online Banking

If you are using your bank's website to accomplish the following task: paying your credit card bills, monthly telephone bills, water and electric bills, view your sons or daughters ATM withdrawal transactions or simply checking if the check you deposited had already been posted into your bank account; then you have made an online banking without you noticing it.

## Online Window Shopping?

Though this discussion is purely my own idea, without any reference to foreign books, most especially the book written by Peter Norton, "Introduction To Computers", I find it very interesting to talk about it – online window shopping. Most of us, do a lot of window shopping. Sometimes we do this for our "canvassing" purposes, or in most cases, we do window shopping because we have no money to buy what we want, at all.

Now, I share with you this high tech way of online shopping with realistic example. Well, to make realistic, let us make it happen. If you are connected to the Internet right now, we can do our online window shopping right away. Like for instance,

you would like to shop by the window only (through the Internet) on other books that I have written, you can simply type my name at the Google, (and then presto!) you will be presented with the hyperlink to National Bookstore website where you can be taken and directed to navigate more. Try it!

Are you ready now? If you are ready, type this is what you have to do:

1. Type my full name (including my middle initial such as *Copernicus P. Pepito*) at the Google search engine. You will be taken to the hyperlink of National Bookstore website.
2. Click the hyperlink of National Bookstore. This time you will see the National Bookstore website.
3. Now at the top-right portion of the National Bookstore home page, you can see the **Search by:** List box. Choose now the **Author** item, so that you will have now the *Search by Author* category. After this, type my full name: **Copernicus P. Pepito** at the Search text box.
4. Finally, click the **Search** button.

Can you see now the list of the other books I have written? I hope you did it right! Here are the figures below, to give you a glimpse on our online window shopping:



Figure 5.8 Online Window Shopping Using the Google Home Page

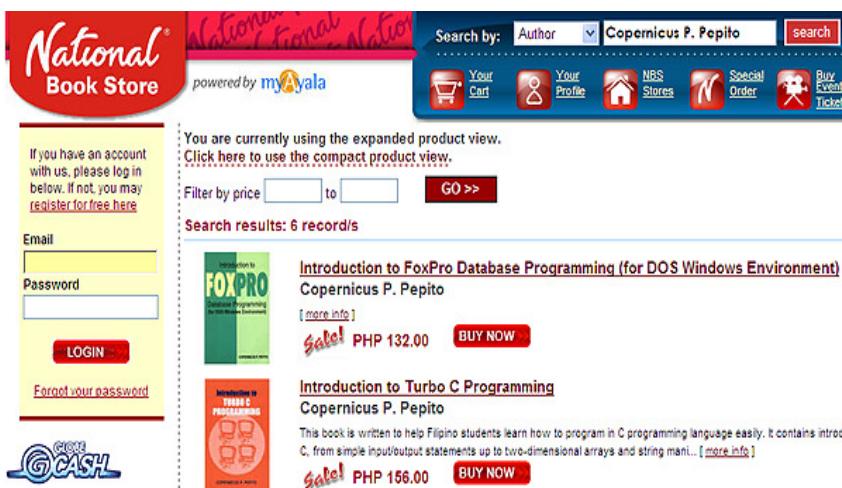


Figure 5.9 Online Window Shopping using National Bookstore Home Page

## Electronic Data Interchange (EDI)

The electronic data interchange is a form of e-commerce, because it is the electronic transfer of information companies over computer networks. These information ranges from purchase orders and invoices sending a very sensitive patient medical records from one hospital to another, or from a hospital to a company that requests the records.

## Telecommuters: A New Breed of Workforce

The employee who just stayed home to do their company's job is a telecommuter type of employee, though some telecommuters are employees who are constantly moving from one location to another. Most of these employees are technical support engineers and consultants who constantly travelling to serve their client's needs and need to send reports of accomplishments back to their headquarters. They can also troubleshoot some of their clients network and information systems while they are at home or while they are on the road. This saves them time, money and effort than being physically present to the office or in the client's place.

Telecommuters rely heavily on computers and Internet connections to accomplish their tasks. They are constantly on the go, while some others are constantly present at the comfort of their house. In either way, they are very productive.

## Cool Stuff That We Can Enjoy with the Web

To make it easy in finding the information we need at the Web, we need tools such as search engine, online encyclopedia, and the right Web site to surf. In this way, we can get what we want such as finding downloadable eBooks, Online Certification exam reviewers, MP3's, cellphone ringtones, 3G videos, free long distance call using VoIP

technology (Voice Over IP), and much, much more. It seems that the long time held belief that the best thing in life is free - is now a reality with Internet technology. Well, there is always a price to pay – a rampant violation of intellectual property rights owned by the creators and producers of the intellectual products and services. Some of these are legal, some are don't. It is up to you how you can enjoy without being feeling guilty. Here are the cool Web sites that we can enjoy surfing with:

- The Google is a search engine where we can easily find the hyperlinked of the Web sites we need to go to:

<http://www.google.com>



Figure 5.10 The Google.com Homepage

- The Wikipedia is an online encyclopedia where we can learn the meaning of the word we want to know or to check the exact meaning of the word we presently encountered:

<http://en.wikipedia.org>



Figure 5.11 The Wikipedia.org HomePage

- The YouTube is a website where you can watch your favorite singer with their MTV or some clips of their recent concert. Or just simply watching some comedy videos created and directed by a common and normal humans like you. You can publish your own video too at *YouTube.com*.

### <http://www.youtube.com>

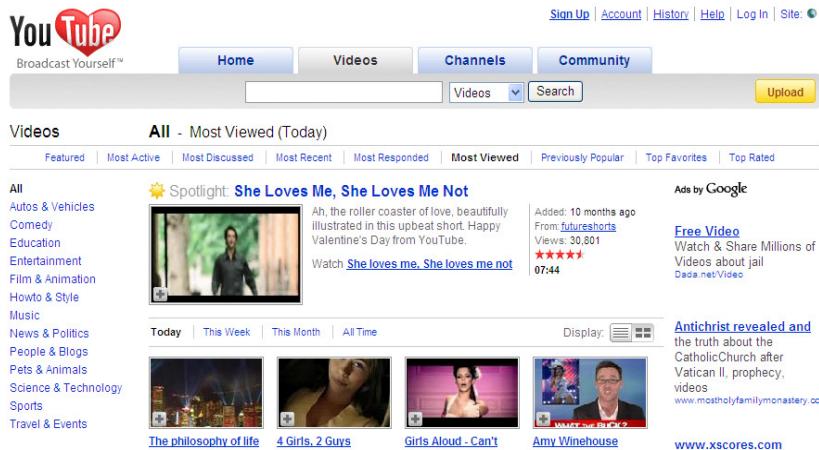


Figure 5.12 YouTube HomePage

- The Friendster is a website for communicating with your friends online, and share with them your thoughts, pictures, events, and hobbies. This is where you can socialize to them in a high tech way.

### <http://www.friendster.com>



Figure 5.13 Friendster HomePage

- The Esnips is a website where you can share your favorite songs. You can also play MP3's online with this website. With the use of a download manager software such as the Internet Download Manager or Torrent, you can download the MP3s you like.

<http://www.esnips.com>

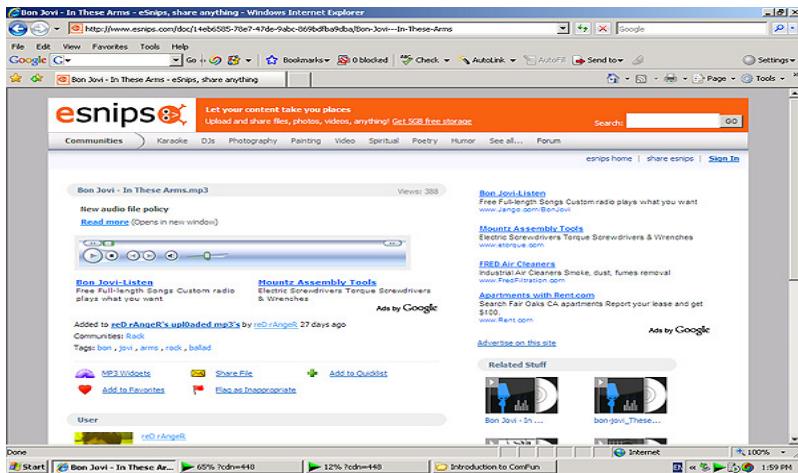


Figure 5.14 ESNIPS Website

- The Ebooksboard is a website where you can find the eBooks you need. You can download them freely.

<http://www.ebooksboard.com>

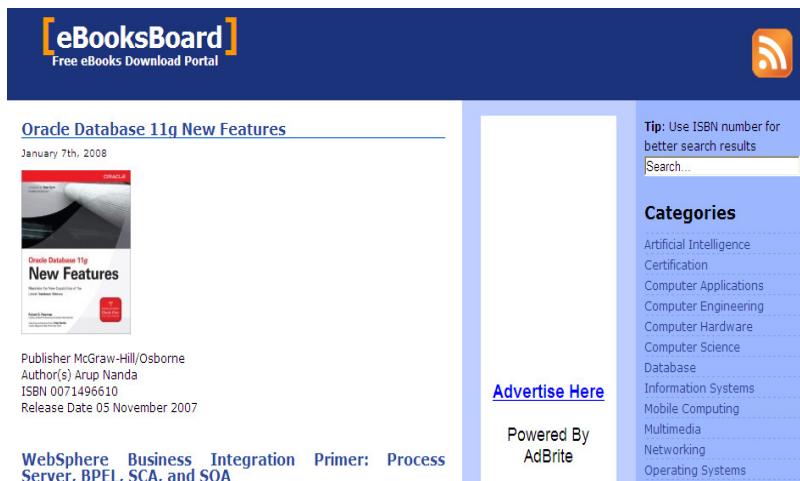


Figure 5.16 Ebooksboard Homepage

### Note:

You can surf the <http://www.knowfree.net> too, so that you can find other eBooks. It's also an excellent web site to download eBooks. Try it now!

- The Sadikhov is a website where you can get your IT related certification exams reviewers such as for Cisco Systems certification, Microsoft certification, Sun Microsystem certification, Oracle certification, and much, much more.

<http://www.sadikhov.com>

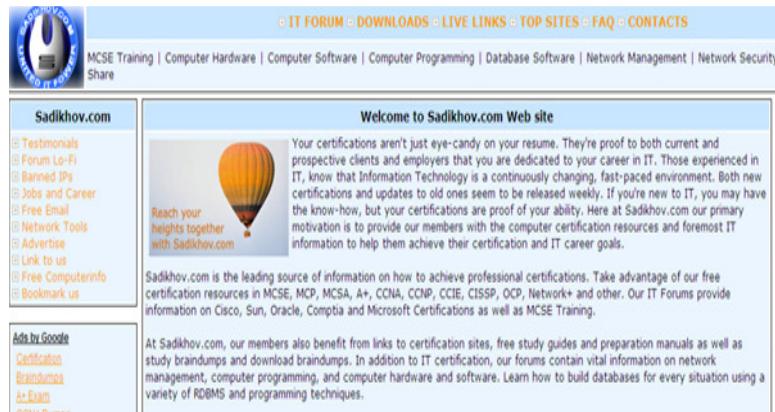


Figure 5.17 Sadikhov Homepage

- The Zedge is a website where you can download your cellphone ringtones, 3G videos, wallpaper, screensavers, and cellphone games.

<http://www.zedge.net>

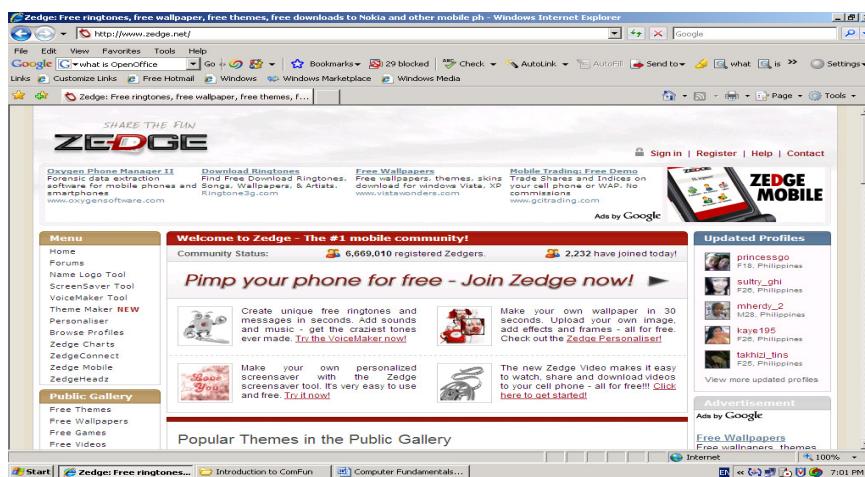


Figure 5.18 Zedge Homepage

- The *Download* is a website where you can download your PC or Laptop hardware components drivers and software utilities, computer games, and more.

<http://www.download.com>

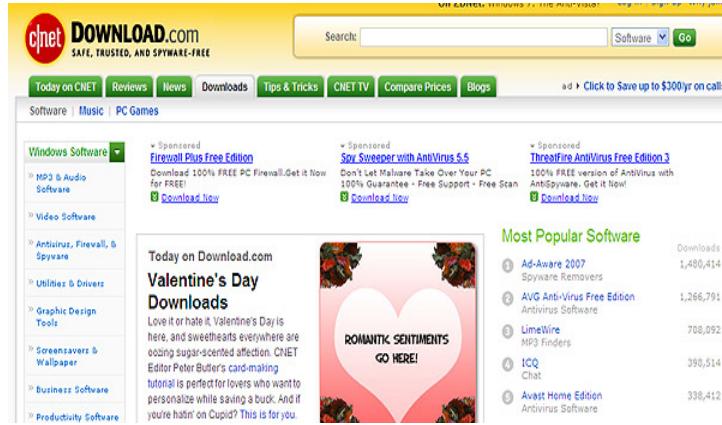


Figure 5.19 Download Homepage

- The Net2Phone is a website where you can use your PC or Laptop to call long-distance to your family, relatives, or friends who lived or work in any countries around the world using the VoIP (Voice Over IP) technology for free. Yes, the best thing in life is free like this one. Unbelievable, isn't it?

<http://www.net2phone.com>



Figure 5.20 The net2phone Home Page

### Note:

You can use also the <http://www.skype.com> to call a long-distance, free-of-charge using the VoIP technology.

- The **meebo** is an instant messaging software like your Yahoo Messenger (YM) and your Microsoft Instant Messaging software. Chatting with your friends, relatives, and families becomes so high-tech with *meebo* and *YM*.

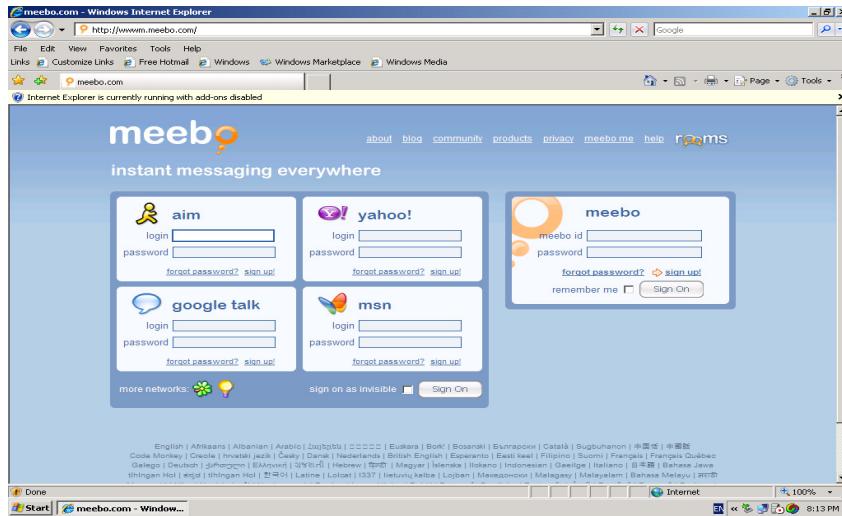


Figure 5.21 The Meebo Instant Messaging Home Page

## Online Dictionary and Encyclopedia

We can also install an online dictionary and encyclopedia directly to our PC or Laptop. For example, I bought a dictionary at National Bookstore which is the Merriam-Webster Collegiate Dictionary, 11<sup>th</sup> Edition which has a CD-ROM at the back cover. This CD-ROM is the online equivalent dictionary. What I did is leaving my very thick Dictionary in my province (in Cebu, actually in a remote barrio where I grew up), and install the Online Dictionary at my Laptop while I'm working in Manila as a teacher. As I write the revision of this book, I enjoyed so much in checking the word or term I used to express my ideas using the online dictionary. It's really a great help in my writing endeavor. So amazing, and so enjoyable!

There is also a very popular online dictionary and encyclopedia produced by Microsoft Corporation. It has also a printed version (book-type) that you can buy at National Bookstore or other bookstores in the city. It is called the **Microsoft Encarta**. You can choose whatever you prefer to use as your online dictionary.

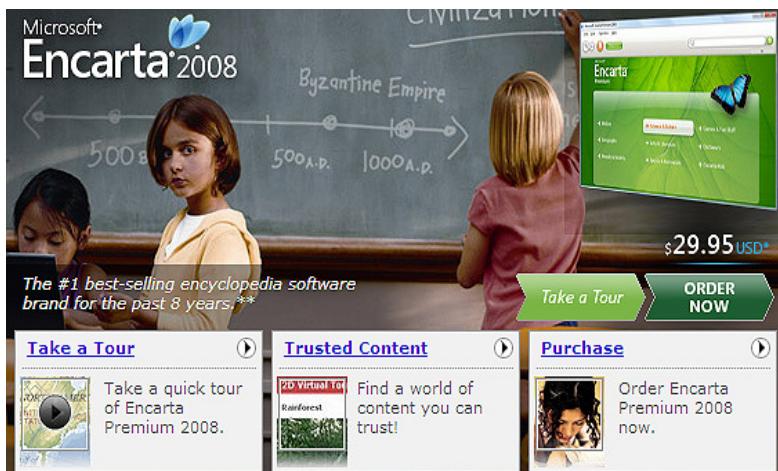


Figure 5.22 Microsoft Encarta Homepage

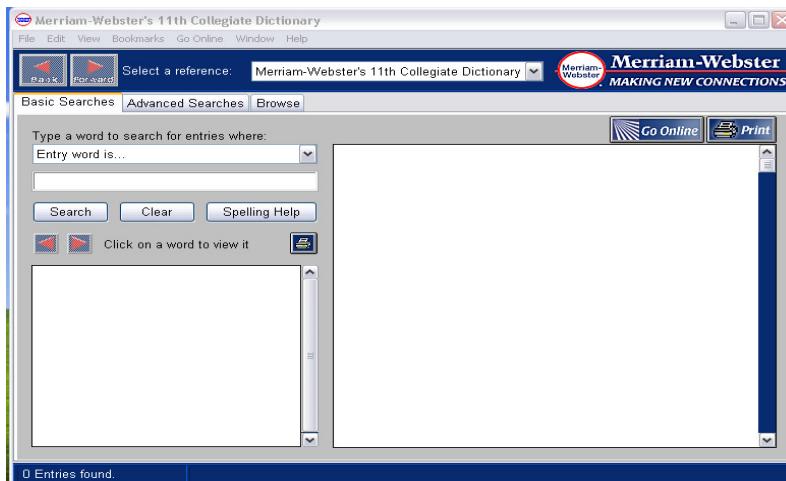


Figure 5.23 Merriam-Webster Online Dictionary Screenshot

## Simple Input/Output Statement ( Formula-Oriented Worded-Problems)

In this example, we will use and apply the input/output symbol and process symbol to accomplish the tasks. Remember, that the ideas and logic which we can learn from these examples are readily applicable to actual programming tasks to any computer programming languages.

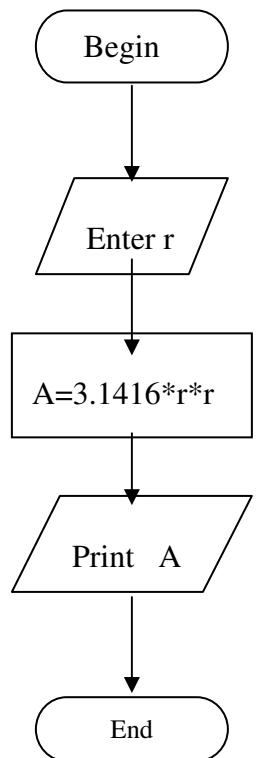
### Example:

- 1.) Draw a flowchart that computes and prints the area of a circle. Use the formula:  $A = \pi r^2$  where  $\pi$  ( $\pi$ ) is approximately equivalent to 3.1416.

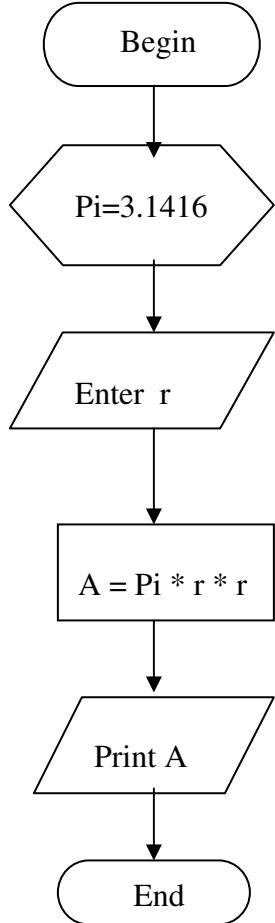
### Solution: In Algorithm

```
Enter the value of r (for radius)
Compute the Area (A=3.1416*r*r)
Display or print the value of A (for Area)
```

### First Solution: In Flowchart



Second Solution : In Algorithm  
 ( Using Initialization symbol for constant value of Pi (3.1416) )



This famous example about the area of a circle gives us an idea on the classical truth, “that there are many solutions in a particular problem”. Or like the way we said, “there are many ways to kill a chicken, if the chicken is your problem”. But a computer is no chicken. It is a mind game. Yes, a mind game. In this example, we have two correct solutions, but we arrived with the same correct final answers. So think more, to come up with more solutions. In actual programming task, the second solution presented is more preferred and recommended. Because declaring a constant value at the top of the program, makes the program more readable and easily modifiable. This is a good programming habit. The famous philosopher Aristotle once said: “We are what we repeatedly do. Excellence, then, is not an act but a habit.” Let us practice this good programming habit now, to achieve par excellence. Who knows, Aristotle could be right?

**Example:**

- 2.) Draw a flowchart that converts an input temperature in degree Celsius into Fahrenheit . Display or print its result. Use the formula :  $F= (9/5)*C+32.$

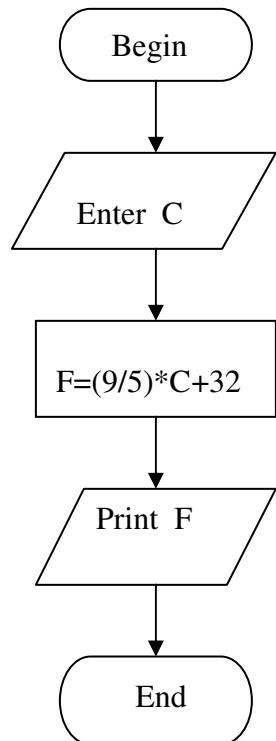
Solution : In Algorithm

Enter the value of C (for Celsius)  
 Compute the Fahrenheit ( $F=(9/5)*C+32.$ )  
 Print the value of F (for Fahrenheit)

**Note:**

You could notice that in formula –oriented worded problems, the input part is always the variables (r or c) at the right side of the equation. And the output part is always the unknown (A or F in our example). Never say “Enter Area” if the area is the unknown. This is the technique in formula-oriented worded problems.

Solution: In Flowchart





- 1.) Draw a flowchart that converts an input temperature in degrees Fahrenheit into Celsius. Display or print its result. Use the formula :  $C=(5/9)*F-32$
- 2.) Draw a flowchart that computes and prints the area of a sphere. Use the formula :  $A= 4\pi r^2$  where  $\pi$  ( $\pi$ ) is approximately equivalent to 3.1416.
- 3.) Draw a flowchart that will compute and print the volume of a sphere. Use the formula :  $V=4/3\pi r^3$  where  $\pi(\pi)$  is approximately equivalent to 3.1416.
- 4.) Draw a flowchart that computes the simple interest (I) on a short-term loan and print its result. The given input data are P for pesos. R for annual interest, and L for the number of days of the loan. Use the formula :  $I = P*R*(L/365)$ .

# Chapter 6

## The Basics of Graphics and Multimedia

“The last thing one knows in constructing  
a work is what to put first.”  
-Blaise Pascal

### The Pixels and Bitmaps

An image on a computer screen is made of tiny dots of white, black, or color which are arranged in rows. These tiny dots are called **pixels**. The pictures, words, and numbers we see on the screen are patterns of pixel produced by software. Painting software such as **Paintbrush** and **ClarisWorks** allows us to paint pixels on the screen by using pointing devices. These pointing devices are input devices like the keyboards, mouse, trackball, light pen, or joystick, translating the pointer movements into lines and patterns on the screen. A pointing program offers many tools on screen. Some tools emulate real-world painting tools. Line and shape tools are used to draw lines, ovals, rectangles, and other shapes on the screen. Air brusher and spray cans, can produce special shading effects in a particular area of a drawing.

There are editing tools also to be used for erasing, rotating, or magnifying a particular object in a drawing before it is printed on paper. Painting programs produce **bit-mapped graphics** (BMP) such as the Microsoft Paint software. BMP is a picture that shows simple maps on how the pixels are represented on the screen.

The **resolution** is the density of the pixels, usually expressed in **dots per inch (dpi)**. If the computer we use has a high resolution monitor and video card capabilities, painting software and other bit-mapped image editing software can even be used to edit photographic images and pictures.

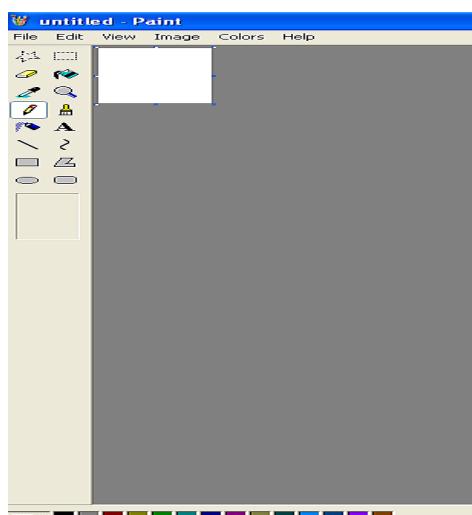


Figure 6.1 Microsoft Paint software

## Graphics You Can See Everywhere

We may not realize it, but many of the pictures and images we saw in printed papers and in movies and TV cartoon movies are drawn and created using a computer. Printed papers such as what we can see in magazine illustrations. Even the giant billboards of advertisement we can see in different parts of the highways are designed with computer using graphics software. Television programs and movies are developed and created using highly sophisticated multimedia software.

With today's computer capability, whatever the artist can do using brushes, pencils, and other tools for drawing, can now be done using the computer instead. Plus, redrawing the drawn image is easier and more flexible on the computer screen than on the actual canvass. With this flexibility, the artist now can produce designs and renderings so visually appealing, accurate, and stunning to the onlookers.

## Graphics File Formats

The computer is so very powerful and flexible compared to a manual drawing by hands of the painter or artist. Computer is capable of designing and creating graphics in as simple as line drawings or as highly complex as three dimensional animations.

There are two categories of graphics files. The first one is the **bitmapped** file and the other one is the **vector** file.

The cells of bitmap are filled with one or more colors, or each cell can contain its own color. The grid of the bitmap is composed of cells. Our computer's monitor displays images as collections of individual colored **pixels**. Each pixel is a cell in the grid of a bitmapped image. In other words, the pixels are the individual pieces that make up a bitmapped image. The bitmapped image is also known as **raster** in the graphics world.

The **vectors** are mathematical equations that describe the shape, size, color, position, or thickness of lines in an image or picture. The *vectors* are ideal to use when you draw an image which you want to resize or tweak, while *bitmapped* is good when you design 3-D images, Web pages, or retouching a photo.

There are many graphics file format. Here are the formats of graphics that we usually encounter. The **BMP** format, which is a short term for BitMaP. This graphics format is native to Microsoft Windows and IBM Personal Computer compatibles.

The **PICT** which is short term for PICTure is a native file format of Apple Macintosh computer. It is widely used and implemented by artists who are "die-hard" Apple Macintosh users. We also see the **JPEG**(or **JPG**) as short term for Joint Photographic Expert Group. This bitmap file format is widely used in World Wide Web application as well as with high-resolution images that will be viewed on the computer screen.

The **GIF** (Graphic Interchange Format) is also the file format that we always encounter. This file format of graphics is very common also in Web application, though GIF has lower resolution compared to JPEG. It can contain only 256 colors or less. The last but not the least is the **TIFF** (Tagged Image File Format) bitmap format which was jointly defined by Aldus (division of Adobe Systems company) and Microsoft Corporation. This format is widely used both by PC and Macintosh artists, due probably with its flexibility in editing the image or picture and for bitmap file exchanges between PC and Mac.

## How to Load Images into Your PC

There are many ways we can load images or pictures or even videos to our computer. We need to load these pictures or images to enhance their presentation by editing some parts of it that are not perfectly captured by our digital camera or digital video camera.

By using a **scanner**, we can scan our picture so that we can transfer it into the PC. The image scanner works like a photocopier machine, however instead of copying a picture onto a paper, it transfers the image directly into our computer.

By using a **digital camera**, we can store digitized pictures which we can transfer into our computer. By using the digital video camera, we can capture and store full-motion video on optical disc or USB drive. We can transfer the content into the computer, so that we can edit it to make the video more attractive and professionally-taken.

We can also load **clip-arts** into our documents to enhance its presentation. Historically, clip-arts are professionally designed graphics and drawings that could be easily clipped from the pages and glued to a paper layout.

## Digital Image Processing

A photograph captured or taken by a digital camera is a bit-mapped image(.bmp). Digital image software allows us to modify and manipulate photographs and other images. We can use painting tools similar to those we can find from **Paint** software.

By using this kind of software, the photographers can easily remove unwanted reflections, brush away facial blemishes, and eliminate a red-eye effect on the pictures.

## Drawing Software

Drawing software stores drawing as collection of lines and shapes. A drawing software stores text as text and shape as shape. Drawing tools are similar to pointing tools used in paint software. Drawing software such as Adobe Illustrator, Adobe Photoshop and Aldus Freehand are using PostScript to store images. **PostScript** is a standard page-description language for describing text illustrations, fonts and other elements of the printed page. PostScript is built into laser printers. That is why laser printer follows and understand PostScript instructions in printing the page. Desktop publishing software is also using PostScript standard. Bit-mapped image editing software helps artists, photographers, and editors to modify and manipulate textures and shading of an image or picture with unsurpassed control and capability.

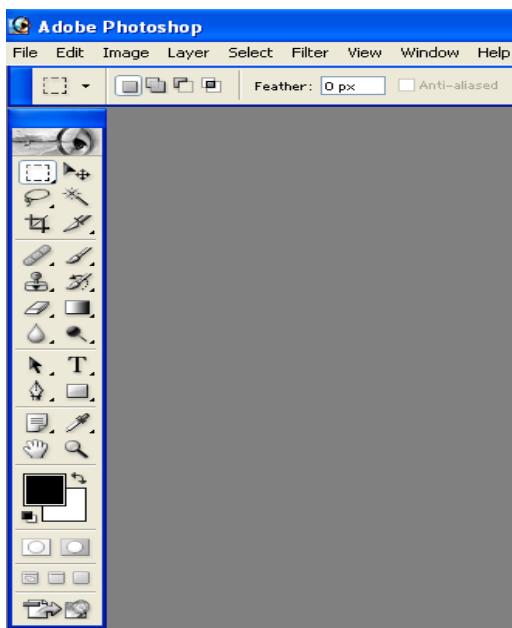


Figure 6.2 Adobe Photoshop Screenshot

## Presentation Graphics Software

Presentation graphics software is developed to computerize the designing of visual aids for seminars, training sessions, sales presentation, and product demonstration. This software includes animation, spreadsheet charts, and video editing. Microsoft **PowerPoint** is one of the best examples of this software category.

It is easy to add or include graphics to our presentation, when we are using PowerPoint. We can simply import an image of a particular object from a clip-art collections that comes with the software package and other third-party clip-art software.

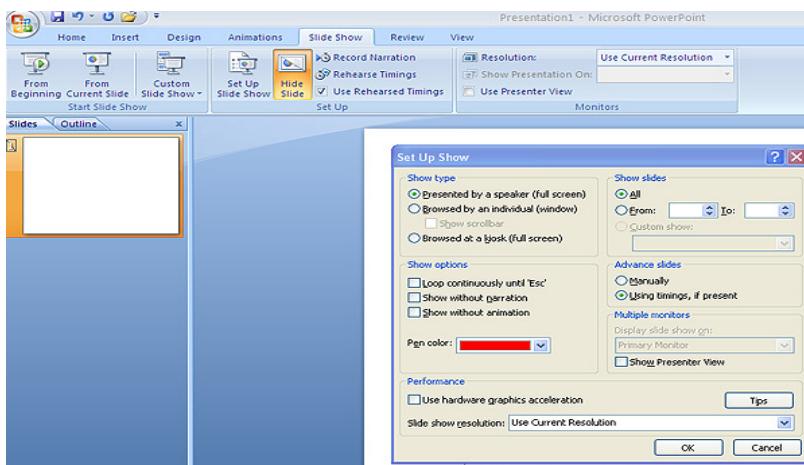


Figure 6.3 Microsoft PowerPoint 2007

### 3-Dimensional Modeling Software (3D)

A 3-D (3-Dimensional) modeling software designer can design three dimensional object using tools similar to those found in drawing software. The designed object can be rotated or viewed from different angles. The designer can “walk-through” a 3-D environment before it can be built in reality. Architects can use 3-D modeling software to design and walk-through with the modeled buildings before they are constructed. Modern televisions and movies special effect involve combinations of simulated 3-D animation and actual live action. One of the best example and one of the most famous 3-D animation software is Autodesk’s **Maya**.



Figure 6.4 Maya 3-D modeling and animation software Screenshot

### Animation Software

Before the invention of animation software, to produce an animated cartoon movie takes many months for a painstaking process of manual drawing by hand to a series of images, and filming them one by one. Today’s animation software that employs the **computer-generated imaging** (CGI) technique automates most of the drawing process for each and every images involved in creating the animated cartoon movie. The former manual drawing of images that would take weeks for an artist to draw can now be accomplished in a matter of seconds. More than this automation of drawing process, the artist can now animate three-dimensional cartoon characters and create photorealistic scenes. Actually, the artist and designer of graphics-rich movies today can incorporate animated characters with real-life actors and sound-effects.

## CAD/CAM Software

Computer-Aided Design (CAD) is the use of computers to design or draw a product. CAD software allows designers and engineers to design a product on screen in three-dimensional model. This model can have physical characteristics, volume, weight, and height. It can be viewed from any angle and can be rotated in different angle.

It is easier and faster to alter a design to meet the specifications and goals of a designed project. In some industrial or manufacturing applications, **computer-aided design** is linked to **computer-aided manufacturing(CAM)**. After designing the product, the computer is connected to a manufacturing machine. This machine will manufacture and produce the products in accordance with the design shown from the computer's screen. They have a new term for this technology, which they call: "Computer-Integrated Manufacturing (CIM)". The CIM is a combination of CAD and CAM technology.

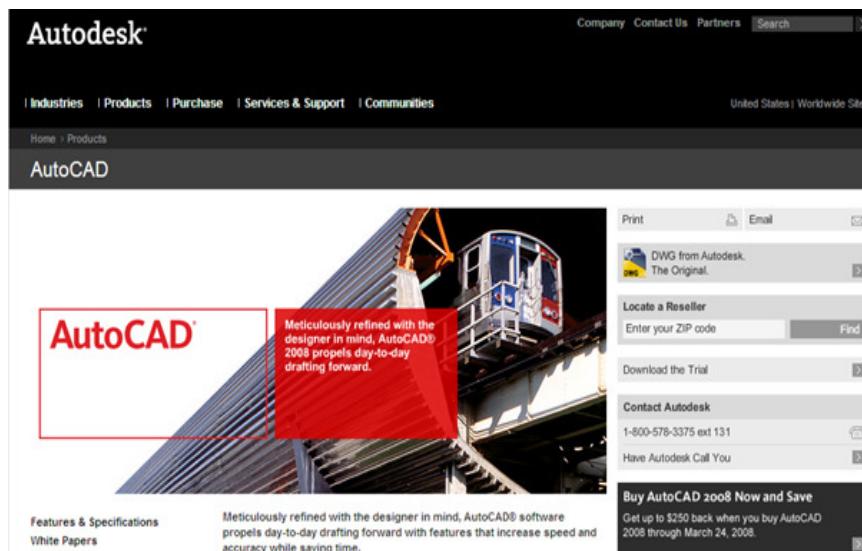


Figure 6.5 AutoCAD software Screenshot

## The HyperCard

The **hypercard** is a combination of database, painting, graphics, and programming language software in one package. A hypercard document might contain graphics, text, animation, sound, video clips, and numbers. A **stack** is a hypercard document that is based on the concept of a stack of index cards.

Each screen can contain command buttons that respond to mouse clicks or key-presses. Clicking on a command button will transport us to another screen. This screen can be the next or previous screen. HyperCard buttons can be programmed to play music, launch other software applications, perform messages and a lot more tasks.

## Defining Multimedia

**Multimedia** is a term used in describing a computer technology that combines graphics, text, video, voice, music, sound, and animation effects to communicate with the user. Multimedia is heavily applied in show business. The entertainment professionals use computers to design animated sequence, construct special video effects, edit sound tracts, synthesize music, and coordinate communication and other tasks in producing modern motion pictures in movies and television programs. Whatever we watch in TV or in movies, whether cartoons or actions, we are enjoying the benefits of multimedia technology.

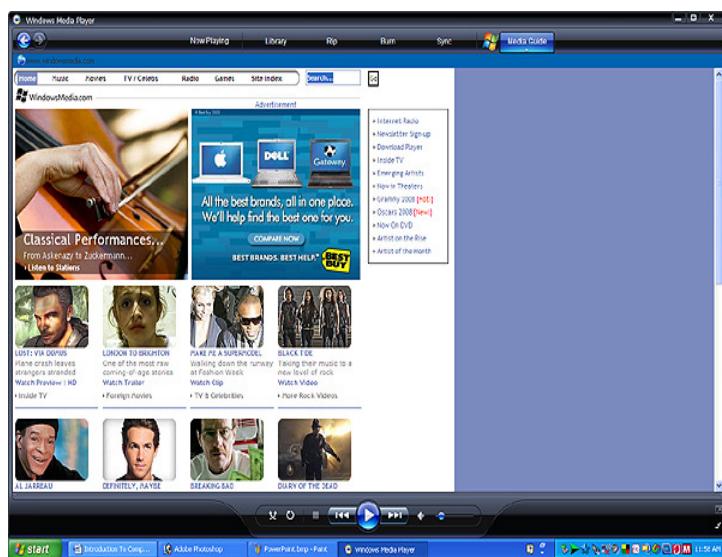


Figure 6.6 Microsoft Media Player 11

### Note:

This multimedia player - Microsoft Media Player 11 is bundled with Windows Vista. You can play movies (.avi) and audio/music files (MP3s) with it.

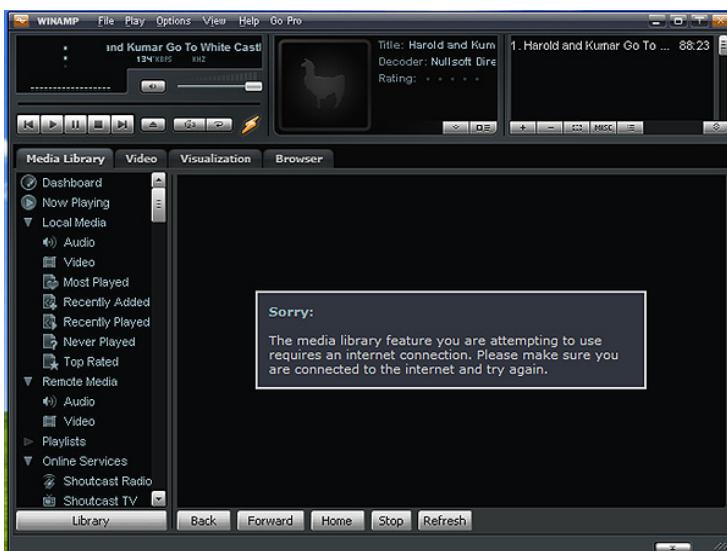


Figure 6.7 WinAmp Multimedia Player

**Note:**

WinAmp multimedia player is very excellent when you want to play your MP3's with it. The sound is so great. You can play your videos (.avi) with it, too.



Figure 6.8 The Apple Macintosh iTunes Multimedia Player

**Note:**

The iTunes Multimedia player is very excellent when you want to play your MP3's with it. The sound is so great. This is the same multimedia player that powers Apple iPod Nano, iPod Shuffle, iPod Video, Apple iPhone, and other Apple products. You can download iTunes free-of-charge at the Apple website. This is my favorite MP3 player at my Laptop. This software is so amazing! Truly, the best thing in life is FREE!



Figure 6.9 The Apple QuickTime Multimedia Player

**Note:**

The Apple QuickTime Multimedia Player is very excellent when you want to play your videos (MP4s) with it.



Figure 6.10 The DivX Multimedia Player

**Note:**

The DivX multimedia player is very excellent when you want to play your videos (.avi) with it. This is my favorite multimedia player when I'm watching videos at my Laptop.

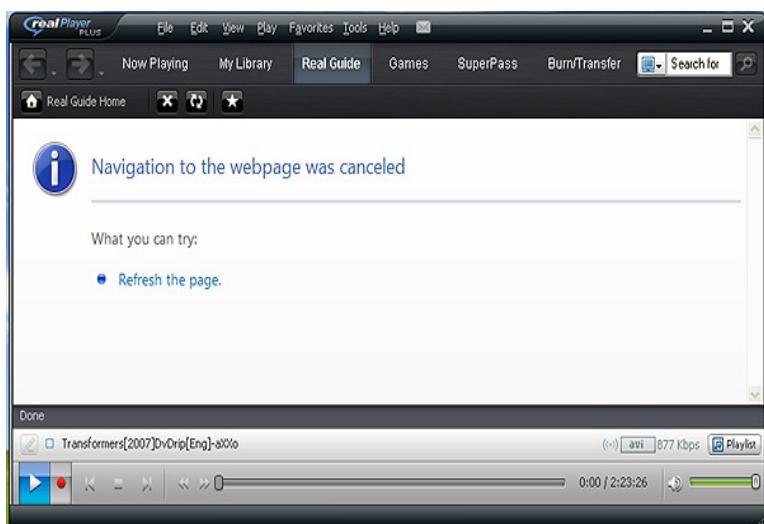


Figure 6.11 The realPlayer MultiMedia Player

**Note:**

The realPlayer multimedia player is very excellent when you want to play your videos (.avi) with it. This multimedia player has a Windows Media Player and DivX multimedia player combined user-interface. At the top of the multimedia player is colored with shining black (color of Windows media player), while at the bottom navigation part is all silver (color of DivX multimedia player). One of the finest multimedia players I had ever seen, so far.



Figure 6.12 The FLV Multimedia Player

**Note:**

The FLV multimedia player is an excellent media player to most of the Internet-downloadable video files. When your multimedia player doesn't work for some video files you downloaded from the Internet, try playing it with FLV Player.



Figure 6.13 The VLC Multimedia Player

**Note:**

The VLC Multimedia Player is an excellent media player to most of the Internet-downloadable video files. Mostly, to the video files that are originated from Open Source Community or playable with Linux Operating System Multimedia Player.

### C.) Simple Input/Output Statement (Formulate Your Own Equation Worded Problems)

In this case, we are presented with the worded problems without any formula given. Using our background in basic mathematics, we can come up with our self-constructed formulas. Some involves conversion or derivation of formulas we had already encountered or learned before. For example, we are given a task to draw a flowchart that computes the radius of a circle. This involves derivation of formula based on the formula of the area of a circle. Let us try it now. Since the formula of the area of a circle is  $A = \pi r^2$ , therefore we have to solve the radius as our unknown, we came up with these derivations:

$$\begin{aligned} A &= \pi r^2 \\ r^2 &= A/\pi \end{aligned}$$

$$r = \sqrt{\frac{A}{\pi}}$$

The programming expression that is equivalent to this formula (which at first seems complicated) is  $r = \text{sqrt}(A/\pi)$  where **sqrt** is a standard mathematical function that can be found in most programming languages. You could observe that it is easy to convert a mathematical expression into its equivalent programming expression, like this one.

What you have to do is to research and practice. When this practice becomes a habit, eventually perfection can be attained. As what the saying goes: "Practice makes perfect." In spite of what the *realist* believes and always advocates that there is no such thing as *perfect* in reality. Well if not perfect, at least nearer to it.

Let us have our example now, to test if we are capable of formulating our own equations.

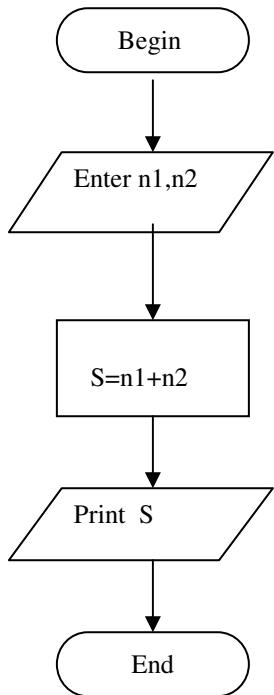
**Example:**

- 1.) Draw a flowchart that computes and prints the sum of two input numbers.

**Solution : In Algorithm**

```
Enter two numbers (n1,n2)
Compute the Sum (S=n1+n2)
Print S (for Sum)
```

**Solution : In Flowchart**

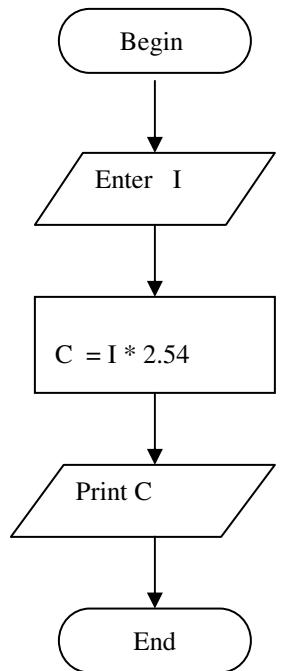


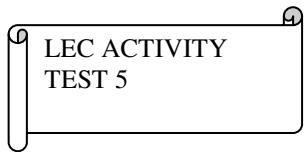
- 2.) Draw a flowchart that converts the input inches into its equivalent centimeters.  
One inch is equivalent to 2.54 cms. Then print the result.

**Solution: In Algorithm**

```
Enter I (for Inches)
Compute Centimeters (C=I*2.54)
Print C (for Centimeters)
```

Solution: In Flowchart





- 1.) Draw a flowchart that computes and prints the difference of two input numbers.
- 2.) Draw a flowchart that computes and prints the product of two input numbers.
- 3.) Draw a flowchart that computes the average of three input quizzes. Then, print the result.
- 4.) Draw a flowchart that converts the input value of dollars into its equivalent value in peso. Assume that one dollar is equivalent to 44.50 (pesos). Then, display the result.

## Chapter 7

# Artificial Intelligence And Information Systems

“Try not to be a man of success,  
but a man of value.”  
-Albert Einstein

The computer scientists and engineers are devoting too much time and effort in making computers to reason, perceive, and act like human beings. Inspite of its ambitious and near to impossible goals, the study of **Artificial Intelligence (AI)** has produced impressive results. This study resulted to the inventions of robots, electronic chess players, expert systems and computers that can communicate in human language (though limitedly).

### AI Defined

**Artificial Intelligence** is the study of how to make computers do things what the human beings can do. Other computer scientist defined AI as the study of the computations that makes it possible to perceive, reason, and act like we do. There are two approaches to AI. The first approach is an attempt to use computers to emulate human mental processes. An example of this approach is about an expert who asks a group of people to explain how they solve a problem. Their solutions are captured by the expert and transform them into a software model. The end-product of this complete software is called “expert system”.

The second approach involves on designing intelligent machines that are independent from how the people think. This approach considers that human intelligence is just one possible kind of intelligence. The methods or procedures on how the machine solve the problems might be different from the methods used by human, but not less intelligent.

AI is already applied in the word-processor application software when its automatic grammar checking feature is trying to correct a language concept that most users cannot fully explain themselves.

### Computerized Language Translation

An AI project known as Automatic Translator was researched and designed as an attempt to develop software that could translate a language into another language. A **parser** (a parsing program) would analyze the structure of a sentence and identify each word according to whether it was a verb, a subject, or other part of speech. Another program would look up each word in a translation dictionary and substitute the appropriate word.

After spending 15 years and millions of dollars in Research and Development (R&D) fund, the team of computer scientists abandoned the project. Their conclusion is that the machine translators could not compete with humans in speed or accuracy.

Besides, translation without understanding will only produce an erroneous result. The translator must know what the sentence means before it can translate it accurately.

The computers have so much trouble in understanding and translating natural-language such as English language. Unlike in programming languages such as Pascal, C, and BASIC, they have few keywords with exact and precise meaning. Part of the problem of natural languages, is its massive vocabulary. It contains thousands of words. In computer application, one word must have only one meaning, otherwise the computer becomes confused and unable to follow the command or instruction correctly.

An **expert system** is a software program designed to emulate the decision-making process of a human expert. The foundation of every expert system is a knowledge-base representing ideas from a specific field of expertise. An expert is a person who has great amount of knowledge and skills on a particular field of study or profession. By confining his or her practice to that field, the expert achieves mastery. Obviously, expert systems derive their knowledge and capabilities from the experts.

A knowledge-base represents knowledge in the form of *if-then else* rules. Along with the knowledge-base, a complete expert system includes **inference engine** which puts the user-input together with the knowledge-base, apply logical principles, and produces the requested expert advice. Expert systems aid the user by providing fast automated data analysis and informed second opinions. In other situation, expert systems assist non-experts (users) by providing advice base on decisions and analysis of one or more experts. Some of the first successful expert systems were researched and developed in medical field. Medical knowledge is orderly and well-documented, that is why the researchers believed it could be captured and modeled in knowledge-base expert systems.

Here are the few real-world examples of expert systems used by the companies today:

- Blue Cross Insurance company in the United States is using an expert system that automates insurance claim processing. The expert system handles up to 200 routine claims each day. The software extracted diagnostic rules from watching and observing human *claim processor* while they apply those rules. The programmers (developers) analyzed and design the manual process and turned into an expert system. The developers analyze how the *claim processor* (an insurance agent) decides and act upon a particular insurance claim request.
- Boeing Corporation an airplane manufacturing company uses an expert system to locate the right tools, parts, and methods for assembling electrical and electronic connectors of an airplane. The workers are able to reduce the average search time from 42 minutes to 5 minutes.
- The Microsoft Corporation uses an expert system to assist product managers to conform to company guidelines on profitability and packaging. Since newly hired managers are not familiar with all the techniques and procedures of putting together a successful software product, this expert system will serve as an advisor to them. Therefore new managers don't need to continually seek advice from senior experienced managers and engineers, because they can get it from using the expert system software.

## The Advantages of Expert System

The **expert system** can reduce the number of human errors, provide expertise when experts are not available and make knowledge available to more people. It can also help train new employees, preserve knowledge of experts after those experts leave the company and take care of routine-tasks so that the workers can concentrate on jobs that need human interaction and understanding.

## Pattern Recognition

Pattern recognition involves identifying recurring patterns in input data with the goal of categorizing or understanding that data. The application of pattern recognition includes face identification, hand writing recognition and fingerprint identification. Other application includes weather forecasting, automatic voice recognition, surveillance, satellite data analysis, robot vision, biological slide analysis, and other scientific data analysis.

One of the best examples of pattern recognition is Partek's Screener's Solution. This is a statistical analysis and visualization software that enables the chemical elements researchers to easily, reliably, and quickly identify promising lead compounds from plate-based high throughput screening. The researcher can simply import the chemical and biological data into it, so that she or he can normalize, filter, and scale the present data being analyzed.

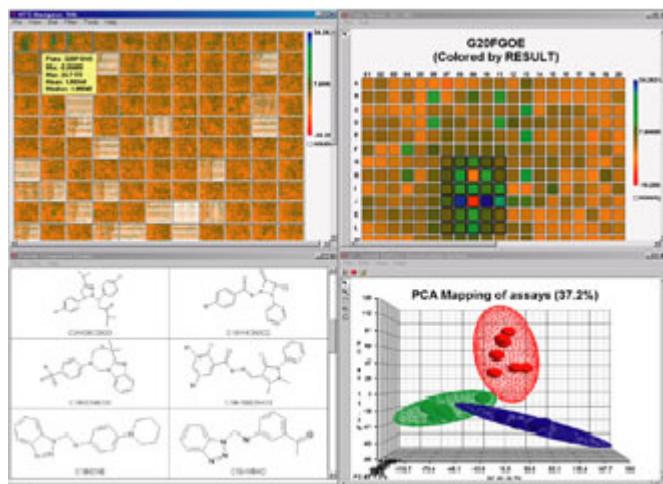


Figure 7.1 Partek's Screener's Solution

## Image Analysis

The image analysis is the process of identifying shapes and objects in an image, picture, drawing or video. This image analysis is applied in piloting cruise missiles, and colorizing old motion pictures.

AI was successful in image analysis software invention for *optical character recognition* (OCR). OCR is commonly used in shopping malls. Sales clerks and cashiers are using wand readers to recognize numbers and words when they input purchases on the *Point of Sale* (POS) terminals. Today's POS terminals are hundred percent computer, meaning they can be programmed like our PCs at home. Inside them are motherboards, microprocessors, RAMs/SIMMS, ROMs, and many more. The difference between PC and POS terminals are the case that housed them and some extra peripherals used by the POS machines such as barcode scanner, a small customer display screen, and cash box.

The OCR scans the image of the page into the memory of the computer using scanner, fax modem, or digital camera. The OCR software identifies and locates printed characters in images or pictures.

Pattern recognition technology is widely used in fingerprint analysis. These benefits had enabled law-enforcers to easily track and capture criminals and put them behind bars. See, computers had made our life even better, and safer. What we have to do is to consider its positive side, rather than to focus on its negative side.

## Speech Recognition Software

Like OCR software, the speech recognition software applied pattern-recognition technique. Many Macintosh (Apple) computers feature PlainTalk software that recognizes speech or voice. We can simply command our computer such as: Open my e-mail or read my e-mail. And the computer will follow our command through our voice. However, it's very difficult for the computer to understand our voice considering the limitation and complexity of how we express it. Like the way we pronounce the words we speak. The other way around is easier for the computer to speak in English than to recognize it. Below is the example of a Voice and Speech Recognition software from e-Speaking.com (<http://www.e-Speaks.com>).

**Voice and Speech Recognition**  
 An easy software solution to enable you to control your computer, dictate emails and letters, and have the computer read documents back to you.

**10 Reasons for Trying e-Speaking's Software**

1. Free Download of software
2. Over 100 commands built-in
3. Ability to add more commands
4. Runs in Windows2000 and WindowsXP
5. Small file size
6. Utilizes latest technologies from Microsoft
7. Seamlessly integrate with Office
8. Many more...

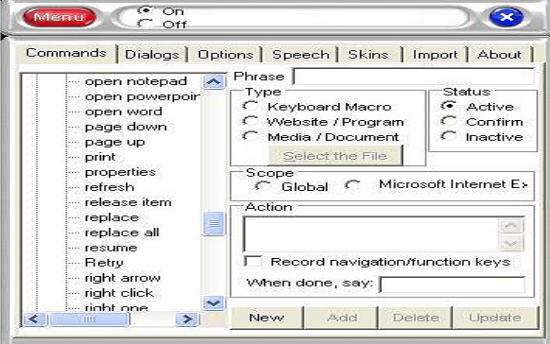


Figure 7.2 Voice and Speech Recognition Software.



Figure 7.3 The Apple Macintosh (Mac) Notebook (Laptop)

## Neural Networks

The neural network is simply an artificial brain that emulates the actual human brain. The human brain consists of billions of neurons. They are connected to each other in massively distributed and parallel structure. The idea of parallel computing technology was inspired by the human brain's structure. A **neural network** is a distributed and parallel computing system that uses a network of a few thousand simpler processors called neurons.

A neural network learns patterns by trial and error like our brain learns, that is why when patterns are often repeated, it develops a habit to recognize it. The neural network can still function even if some of its neurons are destroyed, because it distributes knowledge throughout the network.

The application of this technology is useful for recognizing patterns in scientific research that analyze a large volume of numbers, stock market analysis and bank's loan processing. The neural network is applied in signature analysis in a bank with those signatures that are stored in the database. It is also applied in investment analysis that attempts to predict the movement of stock currencies from previous data. In the airline

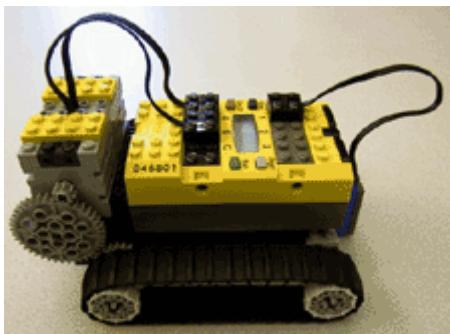
industry, the neural network is applied in monitoring the state of the aircraft engines, vibration levels and sound, and early warnings of engine problems.

## The Robotics Technology

The robots today are computer-controlled machines that are designed to perform specific and routinary manual tasks. The microprocessor embedded in the robot's body is functionally identical to the *central processing unit* (CPU) we can find in a personal computer (PC). We send our commands to a screen when we use our PC, which a robot sends commands to its arms, joints and other moving parts.

The robots have sensing devices to modify or correct their actions based on feedback from the outside world. The application of robots is useful in car manufacturing and other companies that have routinary tasks to perform. The robots can be used to pick up an *integrated circuit* (IC), to see infrared light, or draw pictures. Robots are ideal for jobs that are dangerous for human to accomplish such as picking up hazardous waste, cleaning rooms that are high in radiation. And even searching land mines. Hundreds of robots today are doing welding, part fitting, guiding a herd of sheep, and perform skull drilling for brain surgeons.

The images below are Robots designed and developed by different universities in the United States. All of these robots are programmed using Java programming language.



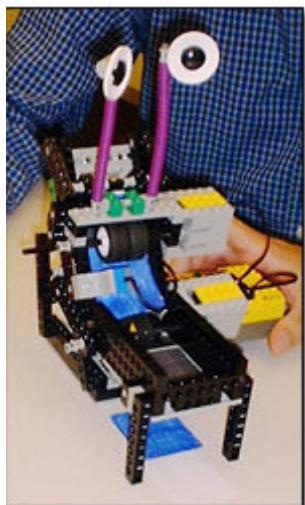
*Figure 5: Simon Ritter's Demonstration  
LEGO Robot*

Figure 7.4 Remote controlled LEGO Robot



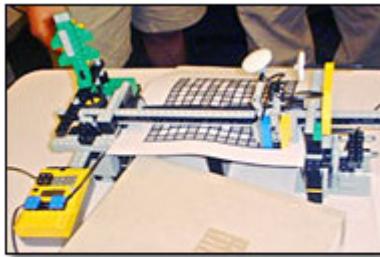
*Figure 2: UC Santa Cruz's Music Playing SlugBot*

Figure 7.5 Music Playing Robot



*Figure 3: UC Berkeley's Paper Sorting PaperBot*

Figure 7.6 Paper Sorting Robot



*Figure 4: Stanford's Maze Solving MazeBot*

Figure 7.7 Maze Solver Robot

## Information Systems (IS) Defined

An **Information System** is simply defined as a mechanism that helps people gather data, store and organize them to produce meaningful information. An information system must be accurate, redundant entries must be eliminated, and keeping important data safe from loss or disclosed to unauthorized people.

## Different Types of Information Systems

### Management Information System (MIS)

The MIS enables managers to decide effectively on how to manage the business by knowing the company's financial status through gathering, organizing, and evaluating information that are important to the company's survival and growth. This type of information systems are based on the different needs of each level of management hierarchy. Meaning, at the different levels, company managers have different types of data that they need.

For a frontline manager, the daily sales reports are more important information he or she needs every now and then. While a senior manager would like to have an information system that deals with the quarterly summary reports of the financial performance of the company. For an MIS to be effective and efficient to the organization, it must be able to summarize vast amount of business data into meaningful information that is useful specifically to any level of managers that need them.

### Decision Support System (DSS)

Like MIS, **DSS** enables managers to become an effective decision makers on the companies daily operation strategies and tactics. Mostly, managers in different levels, use DSS to access and analyze data in the company's transaction processing system to aid them on how to formulate strategies in handling companies operation in the most competitive ways. DSS is not only limited to the company's transaction system, it also involves with knowing competitors data or stock market reports that are vital to companies competitive position in the market and aid the effectiveness of the manager's mission-critical decisions. One of the best examples of DSS is the **e-Prescribing** of the

**OpenClinical.org** (<http://www.openclinical.org>). The main goal of this DSS is to reduce medication errors such as incorrect dosages and drug allergy interactions.

Figure 7.8 e-Prescribing Homepage

## The IS Department

The IS Department is a specialized department that is in-charge of designing and developing the computerized or automated systems needed in the company. The computer operators, encoders, programmers, systems analysts, database administrator, system administrator, network administrator, network engineer, technical support staff, computer technicians, systems developers and architects, are working on this department to serve the needs of all computer users in the company. These breed of employees commonly called an IS professionals are taking care of all the computer hardware and software, maintaining and managing these very important resources to the operation of the company.

Some organizations prefer to use the term MIS department or IT Department instead of an IS department. No matter what term is used to refer to this computer department, they share the same functions and responsibilities.

## Managing Data Effectively

Data is the lifeblood of every organization. Therefore, managing them effectively is of prime importance to each and every manager in the organization. **Data warehousing** is the new approach of taking care of these voluminous data that are potential to produce meaningful information for a corporation's competitiveness in the business world.

When the company have these huge collections of data, then the company needs how to access these data and produce meaningful information. This is where *data mining* comes in. **Data mining** is the process of sorting, searching, analyzing and finally producing

useful information mined from a voluminous data stored in the enterprise database system.

## IS Storage System

Since Information Systems functions and responsibilities are gathering and managing data, any loss of it is extremely damaging and costly to the company. Some company would suffer a huge financial loses if their data is unavailable or their computer systems operation is disrupted due to some system errors due to corrupted data.

Storage system plays an important role in preserving the integrity of the data and as well as the effectiveness of recovering them from access failure. The Redundant Array of Independent Disks (RAID) is a storage system that solves the probable problems of data loss due to some unforeseen data access failure. The **RAID** links any number of disk drives or disk arrays so that they act as a single disk. This is done for redundancy of disk so that if one disk drive fails, the other array of disk will take over functioning since they have the same content of data. This technique is called *mirroring* or *stripping with parity*. **Mirroring** is a storage system technique that writes data to two or more disks simultaneously, providing a complete copy of all the data on multiple drives in the event one disk drive fails. This improves reliability and availability, because when one disk fails, the mirrored disk continues to function as expected, therefore it maintains the availability of data as well as its reliability.

The **stripping** storage system technique spreads the data over multiple disk drives which provide the user with fast data access. This technique of storage system stores parity information that can be used to reconstruct data when a disk drive fails. The *stripping with parity* storage system technique also provides error-checking to ensure data integrity.

## Storage Area Network (SAN)

The storage devices are categorized into two categories. One is the **direct attached storage** (DAS) and the other is **network attached storage** (NAS). Our PC and Laptop are belong to the DAS category as well as some servers found in the company that uses only RAID array disks.

The **storage area network** (SAN) composes of storage devices connected directly to a high-speed computer network. These storage devices are free-standing disk system which contain many disk drives, but shared by multiple network servers in the organization. In a storage area network, all the network servers can devote their processing power and resources to the task at hand, and let the microprocessors in the storage area network system handles the storage services.

## Information System Development

All companies in the world rely their decisions heavily on the reports generated by mission-critical applications and decision-support system (DSS). Business leaders and managers can decide effectively if these reports are accurate and timely. The IS professionals must ensure that the computerized system they developed, managed, and maintained is accurate and delivers mission-critical reports in a fast and efficient manner. With this, the IS professionals should analyze carefully the company and its internal business processes, the needs of the employees and customers, as well as the needed technologies to come up with the most dependable and reliable computerized system that a company can count on.

When developing information systems, the system designer and developer use the **systems development life cycle** (SDLC) to aid and guide them in constructing the system effectively. SDLC is a series of five phases. These phases are usually in order when accomplished. Here are the five phases of developing the information system: **analysis, design, development, implementation, and maintenance.**

## Data Warehouse and Data Mining

**Data warehousing** is a new method of storing and managing huge collections of data. This massive collection of corporate information is often stored in terabytes of data. There are two technologies used to control data warehousing. The first one is called massive parallel processing (MPP), and the other one is symmetrical multiprocessing (SMP). These two technologies employ the RAID backup strategy to rapidly collect data, check for possible errors, and retrieve a backup copy of the data whenever a need arises.

Usually, the data warehouse is capable of supplying the data requirements of the tens of thousands users in a large corporation. It is also used to store and support thousands or millions of transactions per day on active Web sites such as the eBay's online auction operation and Amazon.com online retail store transaction.

## Application of Simple If-Else- Conditional Statements & Decision Symbols

Computer has the capability to make choices and decides logical decision based on some conditions. Sometimes, this topic of flowcharting and programming is referred as *selection control structure*, because it involves selection of two or more choices and decide based on a given condition. In this conditional statement, there is a conditional test to be performed by the computer to determine what course of action to be taken. The conditional test produces either a true (yes) or false (no) value.

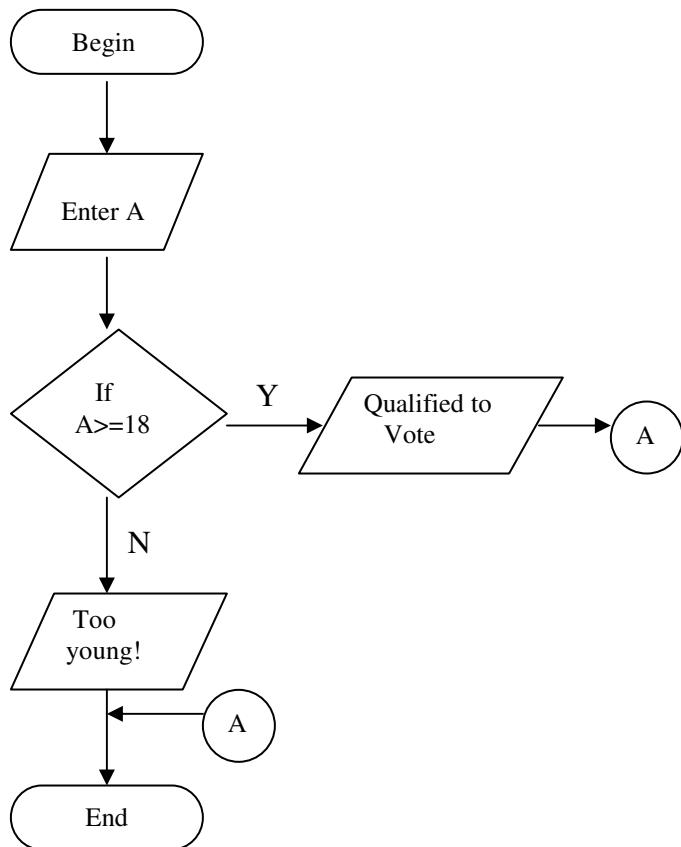
Example:

- 1.) Draw a flowchart that determines if the input age is qualified to vote or not. Qualifying age is 18. If qualified, print “Qualified to vote”, if not (else), print “Too young!”.

Solution : In Algorithm

```
Enter A (for Age)
if (A>=18)  then
    Print " Qualified to vote"
else
    print "Too young!"
```

Solution: In Flowchart

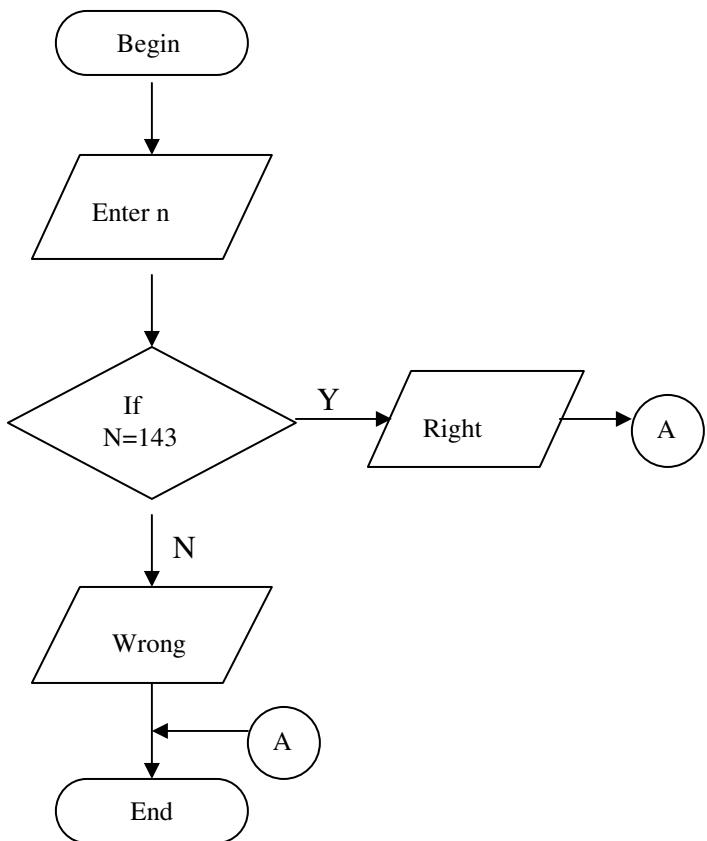


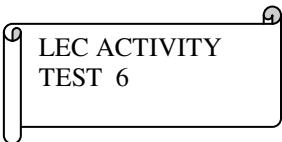
- 2.) Draw a flowchart that determines if the input number is a magic number (143) which is equivalent to the magic words : “I love you”. If it is equivalent, then display the message: “Right”, otherwise, display the message: “Wrong”.

### Solution: In Algorithm

```
Enter a value of n (for number)
If n=143 then
    Print "Right"
Else
    Print "Wrong"
```

### Solution : In Flowchart





- 1.) Draw a flowchart that determines if the employee has to be paid of overtime pay (OT). They will be paid an OT if they exceed 40 hours work in a week, regular pay (RP) if less than or equal to 40 hours only. Display “OT Pay” or “RP pay”, based on this condition.
- 2.) Draw a flowchart that determines if the input grade is “Passed” or “Failed”. The passing grade is 75 and above. Displays “Passed” or “Failed” based on this condition.
- 3.) Draw a flowchart that determines if the input number is ODD or EVEN. Odd numbers are 1, 3, 5, 7...9391, and Even numbers are 2,4,6,8...10000.
- 4.) Draw a flowchart that determines if the input number is POSITIVE or NEGATIVE. Consider 0 as positive number.

# Chapter 8

## Computer Application at Work, School and Home

“I’m an optimist. I believe in progress.”  
-Bill Gates

There is a profound effect of the computer revolution to our work, our school, our home, and our society in general. Consider the following real-life examples of computer application that we are directly or indirectly enjoying right now.

### Computer Application In Airlines and Shipping Industry

Aircraft engineers, developers, and designers are using computer-aided design (CAD) software to design, test, computer-controlled instruments to monitor aircraft systems, and navigate their planes. Computerized air traffic control systems are being used by air traffic controllers on the ground to keep track of incoming and outgoing flights. Computerized reservation systems are used by all ticketing office around the globe to prevent conflict of seat assignments and choices of plane’s flight schedules.

Freight companies need computers to manage the thousands of ships, planes, trains, and trucks that are moving goods at any given time. Computers are used to track vehicle locations and contents. The computers are also used for maintenance, invoices and billings, and even driver schedules.



Figure 8.1 Cebu Pacific Home Page

### Computer Application In Medicine

The computers are used to monitor patient’s vital signs in hospitals and in the ambulance using portable units that analyze signals and transmit warnings to the medical

specialist when problems arise. The doctors use **computer – aided tomography (CAT)** scans to see cross-sectional slices of human bodies.

Today's Health Care Providers are now using computer in health care procedures such as ultrasound and magnetic resonance imaging, and laser eye surgery to fetal monitoring. Modern surgeons today are now using robotic surgical devices to perform delicate operations, and even to conduct surgeries remotely. The new virtual-reality technologies are being used to train new surgeons in cutting-edge techniques, without cutting an actual patient.

Today's hospitals and clinics are using computers to maintain patients records and billings, and even managing schedules. Hospital information system stores medical history and insurance records of the patients, to easily bill them.

In St. Luke Hospital at Quezon City (Manila), they are using Local Area Network (LAN) – based Billing System where the patients are free to know the progress of their bills or charges. With this system, you don't need to go to the cashier's office to ask about your bills. Very convenient, isn't it? Most especially if you were hospitalized due to some vehicular accidents that caused you to have broken legs. Inspite of your misfortune, you can still crawl to the nearby workstation (computer) to look for your bills.



Figure 8.2 Operating Room equipped with computer-assisted medical equipments

## Computer Application In Banking Industry

The banks are using computers popularly known as Automated Teller Machine (ATM) so that we can withdraw cash anytime, anywhere. An ATM machine is a specialized terminal that is connected to a bank's main computer located usually in the main office or headquarters.

We can send money to our loved-ones to their ATM accounts. In a matter of less than a minute, our loved-ones can receive the money we sent. Imagine how convenient our life is, with this kind of computer technology. We can even pay our phone, water and electric bills automatically through the use of our ATM accounts. This financial transaction is popularly known as electronic fund transfer (EFT), a process of transferring money between banking accounts.



Figure 8.3 ATM Machine used for Online banking

## Computer Application In TV and Movies

Computer technology is involved in the production of television programs and movies at every stage of the process. Word-processing software is used by the scriptwriters to write and revise scripts. Technicians and artists use graphics workstation computers to design and produce special effects. These special effects range from scene fadeouts and rolling credits to intergalactic battles and flying heroes in cartoon movies. Computer-controlled mixers are used by sound editors to blend music with digital sound effects and live-action sound. It's like saying that all the highly sophisticated scenes we watch and enjoy in television and movies are possible by the use of computer technology.



Figure 8.4 Create your own animated movie at jibjab.com

## Computer Application In Factory

Computers are part of the workplace. In factory work, **robots** are used for welding, painting, and other repetitive tasks. Robots are computer-controlled machines designed to perform specific manual jobs. Computers are also used in tracking inventory, control the quality of the production, time the delivery of parts, and monitor the wear and tear on machines and schedule its maintenance. Computerization in factory reduces waste in facilities, raw materials, and labor. But, indirectly poses a threat to blue-collar workers whose manual work can be done by robots.

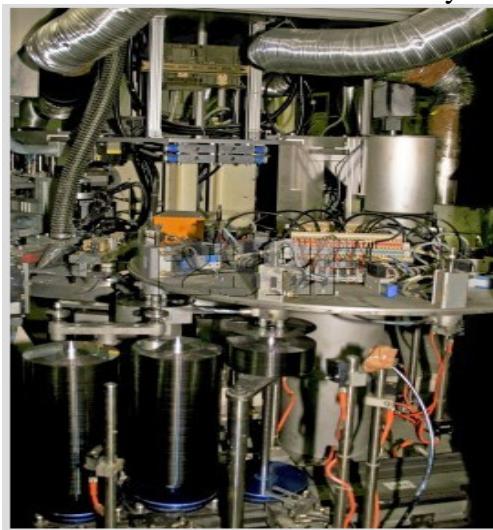


Figure 8.5 Computer-assisted CD manufacturing

## Computer Application in Offices

Today computers are used to speed up the tasks in processing accounting and payroll systems. The employees throughout business organizations use personal computers to accomplish their respective tasks. Secretaries are using *word-processing software* such as **MS Word** to type reports, and memos. Sales and marketing executives are using presentation software such as **MS PowerPoint** to design sales presentation slides and pamphlets, and the accounting people are using spreadsheet software such as **MS Excel** to analyze monthly or annual budgets for the company.

In the case of multinational companies which have offices in different parts of the world, the employees are communicating through e-mail. With **groupware**, a new class of multi-user software, the users can share and work on the same documents simultaneously. These users can be considered as workgroups. The **workgroups** that are working in a particular design project don't need to be in the same place or room to work. This is possible by using the **Microsoft Project** software. They can coordinate changes or modifications since all changes appear simultaneously with their respective workstation (computer).

The **paperless office** is the office of the future in which magnetic and optical archives will replace cabinets. Moreover, it will also replace reference books and journals. Memos and letters will be replaced by electronic communication, such as sending memo through e-mail. There is no need of papers since the employees are reading through computer screens, not paper documents anymore. You can see now, the possibility of a paperless office, because we are now ordinarily using eBooks to study and learn, electronically. See, it has no paper-reading, anymore.



Figure 8.6 The office worker is working with her desktop computer

## Telecommuting: A New Way to Work At Home or at the Road

**Telecommuting** refers to a work that you can do while traveling using a computer. Information workers such as programmers, analysts, encoders and IT managers can do their job even at the comfort of their homes or while they are trapped in a traffic jam. In telecommuting, an information worker can save more time with his or her family. The hours he or she spend each day commuting could be spent working, resting or relaxing with his or her family because he or she can do and finish his or her job at home. He or she can simply download his or her work using a modem, and upload it to the company's *server* computer when he or she is finished.

Information workers can have a flexible schedule of work. They can work in the early morning or late at night, whichever they prefer, as long as they can finish the job on schedule. High-powered portable computers using *wireless telecommunication technology* allow business executives, salespeople, consultants, engineers and scientists to take their offices with them wherever they travel.



Figure 8.7 Telecommuter working at the plane



Figure 8.8 Telecommuter working at the house

## Computer Application in Business Management

Today, computers can be the most effective tool to aid the decision-making of the managers. It can provide them information support and advices on how to run departments, divisions or even the entire company. This software is commonly known as *decision-support system* (DSS).

The managers are also using *management information system* (MIS) to help them in planning, directing, organizing, and controlling the company's different activities. The MIS is commonly defined as a computerized system that includes database management system for storing and retrieving data or information, and software tools for analyzing data. They are used in producing different reports that suit to the needs of different level of management.

Managers can use MIS to produce departmental reports and examine long-term trends and relationships between departments. The other type of software that can help project manager to make effective decisions is the *project management software* such as the **MS Project**. This software helps schedule, coordinate, and track the progress of the project.



Figure 8.9a Business team meeting with Laptop



Figure 8.9b Cisco Systems Teleconferencing Event using LCD Projectors

## Computer Application at School

The **Computer-Aided Instruction (CAI)** software combines tutorial material with drill and practice questions. The CAI software provides an individualized learning for students. They can learn at their own pace. The students can learn in one-on-one basis with the CAI-software and can turn exercises into an entertaining game. This kind of instruction set-up can help timid student become comfortable with computers as well as with the subject matter being taught. This software has an unending patience and uncommon understanding that allows students to commit mistakes.

Since most CAI software contains simulation and games, the students learn to explore artificial environments, imaginary or based on reality. With these features, the students are challenged to learn through experimentation, exploration, and interaction with other students. The students are in control of this kind of learning environment. Simulations and games in CAI allow students to experience the consequences of their actions without taking real-world risks. The trend today in school is clearly toward teaching all students in all courses to use computer as tools.

One of the best examples of this type of high tech learning is the Cisco Networking Academy Program (CNAP) - the world's largest E-Lab.



Figure 8.10 Cisco Networking Academy Online Curriculum

## Virtual School

**Distance learning** is the most important application of computers in the schools. Using computer technology to extend the education process beyond the walls of the school. Satellite video and TV transmissions, computers, modems, fax machines, and Internet connection offers many promising possibilities for this kind of learning set-up. Students can *chat* with the other students in other parts of the world, exchanging ideas

and opinions, and sharing knowledge as well. Telecommunication technology is particularly important for students in remote locations to learn without traveling to the school. Many rural areas can use interactive television networks to keep remote schools from keeping abreast with the new technology and trends that are applied in our present educational system.

One of the best examples of this virtual school is the University of Phoenix , San Francisco (USA). They launched an Online Computer Business School in 1990 as an alternative to business correspondence courses. The students use computers with modems to accomplish everything from taking quizzes, major exams, and ordering books and manuals. This kind of educational system encourages a life-long learning for those older students whose work prevents them from attending more traditional college set-up. Another real-life example of Virtual School is the **E-Learning** (Electronic-Learning) spearheaded by Hewlett-Packard company. The students can interact with their virtual instructor anytime and anywhere in the world through the use of Internet technology.

## Computer Application at Home

Some people all over the world use personal computer for searching information and for educational purposes. They communicate and chat through Internet's IRC (Internet Relay Chat). They send messages or letters through Internet's **e-mail**. There are now CD-ROM versions of dictionaries, almanacs, encyclopedias, and medical references with multimedia capabilities. Multimedia features of CD-ROM versions made it more entertaining to researchers in using computer for research tasks.

Most of the children and youngsters at home are playing computer games for entertainment. Computer games are mostly an emulation of card games, sporting events, street fights, flight simulation games, car racing games, and puzzle solving games. Many of today's computer games are state-of-the-art software which include dazzling graphics, sound and special effects. One of the best examples of online encyclopedia is the Wikipedia. The research work is now going high-tech with Wikipedia!

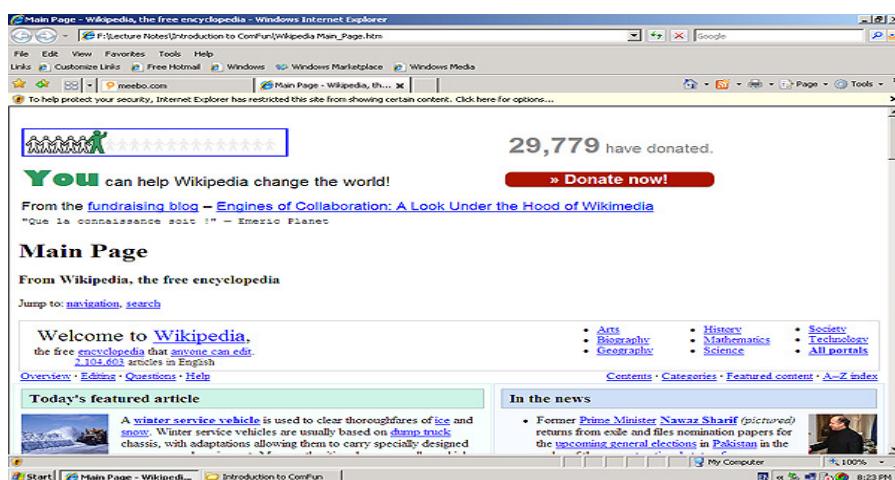


Figure 8.11 The Wikipedia Home Page (An Online Encyclopedia)

## D.) Application of *If/ Else If Statements & Decision Symbols*

In this conditional statement, there are more than two alternatives, options, or choices to which the computer would make a choice. Again there are conditions to be tested, whether *True (Yes)* or *False (No)*. When *true*, the computer would execute the associated statement or statements, otherwise it would continue evaluating the remaining conditional statements (alternatives). Once it satisfies the condition (proven true or yes), the computer executes the associated statement and will ignore all the remaining conditional statements below (if there is any) it. In our flowcharting solutions, Y stands for Yes, while N stands for No.

### **Example:**

1.) Draw a flowchart that will display the corresponding color of the given input letter. The corresponding letter of each color are given below:

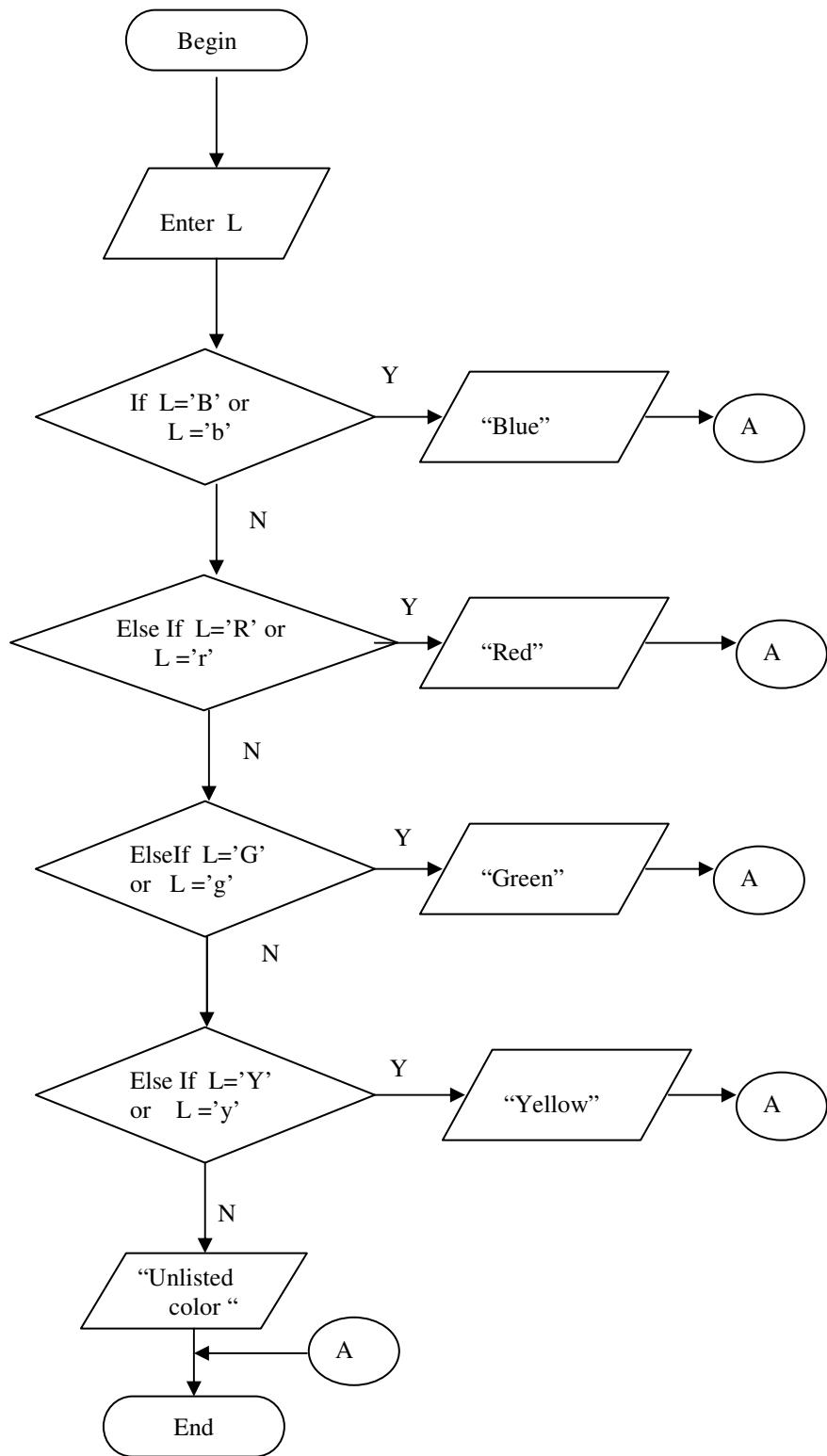
<b>Letters</b>	<b>Colors</b>
B or b	Blue
R or r	Red
G or g	Green
Y or y	Yellow
Other letters	Unlisted color

### Solution: In Algorithm

```

Enter a value for L (for letter)
If L='B' or L='b' then
    Print "Blue"
Else if L='R' or L='r' then
    Print "Red"
Else if L='G' or L='g' then
    Print "Green"
Else if L='Y' or L='y' then
    Print "Yellow"
Else
    Print "Unlisted color"

```

**Note:**

Since we are required to come up with a solution that will accept either the uppercase (capital) letter or lowercase (small) letter, it is necessary to use the logical OR statement.

---

2.) Draw a flowchart that will display the corresponding remark of a given input grade. The range of grades and its corresponding remark are given below:

Range of Grades	Remarks
90 - 100	Excellent
80 - 89	Good
75 - 79	Fair
50 - 74	Poor
other grades	Out-of-Range

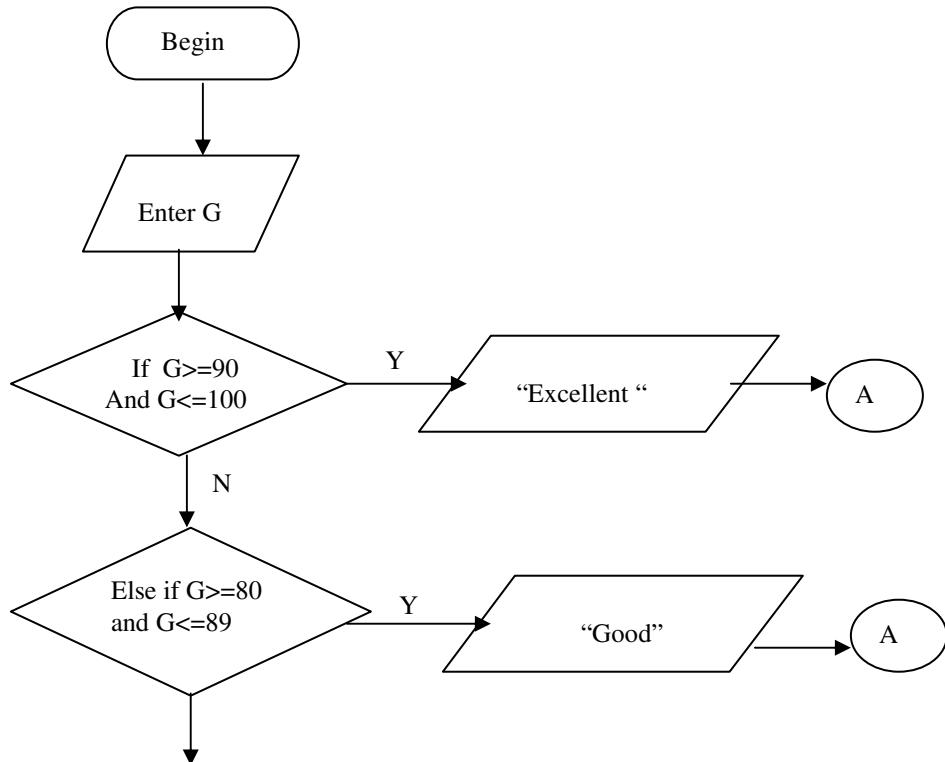
### Solution : In Algorithm

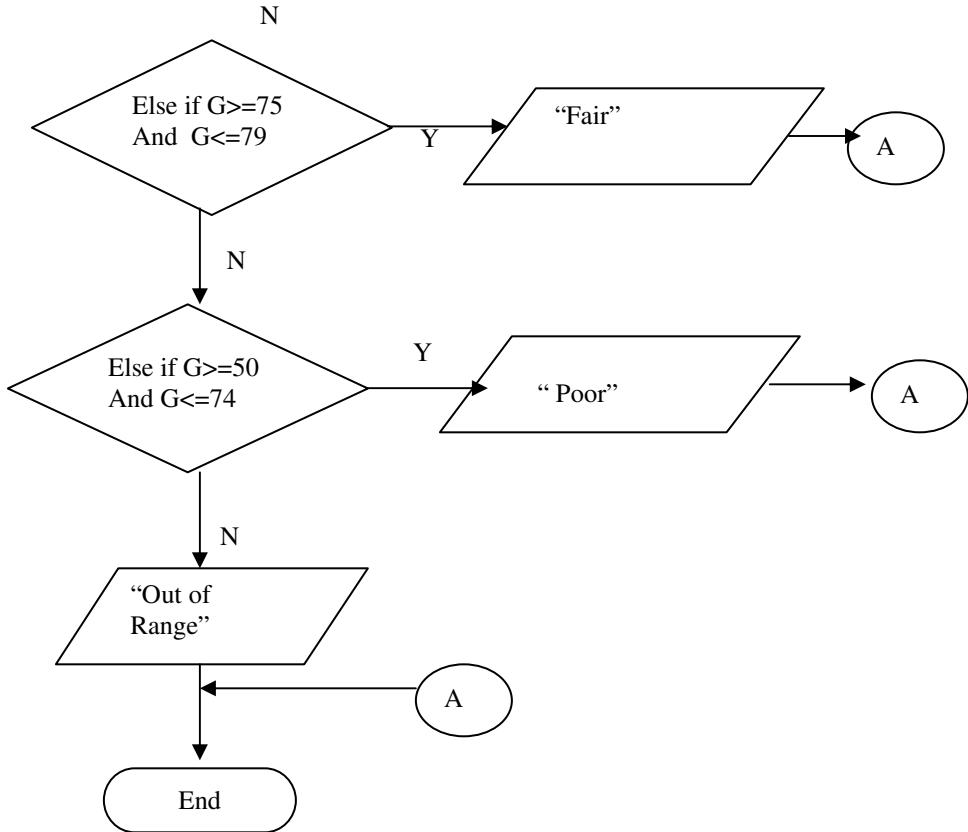
```

Enter the value of G (for Grade)
If G>=90 and G<=100 then
    Print "Excellent"
Else if G>=80 and G<=89 then
    Print "Good"
Else if G>=75 and G<=79 then
    Print "Fair"
Else if G>=50 and G<=74 then
    Print "Poor"
Else
    Print "Out-Of-Range"

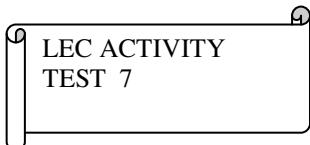
```

### Solution: In Flowchart



**Note:**

In this particular example, we use the logical AND because we have to trap the range of grades, since the output should correspond within it. In logical AND operator, all conditions must be evaluated to true (Yes) in order for the computer to execute the associated statement(s), otherwise the computer will continue testing the remaining conditional statements or symbols below. When all conditional statements were not proven true (or Yes), the computer will execute the last statement which is associated with the ***else conditional statement***.



1. Draw a flowchart that will display the corresponding college level of a given input year level. The year and college levels are given below:

<b>Year Level</b>	<b>College Level</b>
1	Freshmen
2	Sophomore
3	Junior
4	Senior
Other years	Unlisted level

2. Draw a flowchart that will display the corresponding day of the week when a day number is being entered. The day number and its corresponding days are listed below:

<b>Day Numbers</b>	<b>Day of the Week</b>
1	Monday
2	Tuesday
3	Wednesday
4	Thursday
5	Friday
6	Saturday
7	Sunday
Other nos.	“Unknown day”

3. Draw a flowchart that will display the corresponding programming language of an input letter. The languages are listed below:

<b>Letters</b>	<b>Languages</b>
P or p	Pascal
C or c	COBOL
H or h	HTML
J or j	Java
Other letters	“Unknown language”

4. Draw a flowchart that will display the corresponding remark of a given score in 20 items quiz. The range of scores and its corresponding remarks are given below:

<b>Range of Scores</b>	<b>Remarks</b>
16 - 20	Best
10 - 15	Better
5 - 9	Good
0 - 4	Poor
Other scores	“Out-of-Range”

# Chapter 9

## Understanding Basic Computer Security

“But if you took all the benefits  
 that people derive from computers,  
 mixed them together, and distilled them down  
 into a single element, what would you have?  
 The answer is simple: **information.**”  
 -Peter Norton

**Awareness** is the first step to good computer security. This is according to Peter Norton, the author of the book where this book is mainly based and a principal developer of Norton Anti-virus and Utilities. Safeguarding our PC and its valuable information is very important to us and to our work. Imagine if a virus erases or destroys our documents that must be submitted in a matter of few hours. Or attacked by a hacker who slows down our connection to the network, thus put all our online-intensive work to crawl. We should understand all the dangers that specifically threaten our computer system. We need to know how each threat can affect our work and prioritize them accordingly.

### Threats and Countermeasures

A **threat** is anything that can cause harm to our computer resources. In the context of computer security, a threat can be a virus infection or an attack by a hacker. Now if we don't use any anti-virus software, our computer will become very vulnerable to virus infections. If we don't turn-on the Firewall capability of our operating system or did not implement a Firewall to our computer network system, we are vulnerable to a hacker's attack.

How about applying countermeasure posed by a virus infection or a hacker attack? We can apply regular **backup process** of our data. This will be our countermeasure against the threat of data loss caused by virus infection. Putting a **firewall** to our computer network system is our countermeasure against a possible attack by a hacker. In other words, countermeasure is our step to ward off a threat, thus protecting our data from harm.

### Identity Theft

**Identity theft** is a technology term used when someone impersonates you. His or her impersonation ranges from using your name, Identification Card, SSS number, or your other personal information in order to get a document or credit in your behalf, without you knowing it.

Now how the identity theft could stole your money in the bank? By **shoulder surfing!** Shoulder surfing is simply watching someone who withdraws on the ATM machine, and getting to know his or her PIN (Personal Identification Number) number.

An identity theft could also use wire-tapping (by using a telephone line extension) so that he or she can listen to your conversation on the telephone as you give your credit

card number or other pertinent personal information to a credit card agent. The technology term for this one is **snagging**.

An identity theft could also use the **dumpster diving** technique where he or she can go to garbage cans or trash bins to get your cancelled checks, bank deposit slips, or credit card statements.

One of the most predominant sources of identity theft technique is called **social engineering** where the theft tricks the unsuspecting victim into providing critical information under the pretext of something legitimate such as pretending to be the one who is in authority. Like for example, someone who claimed to be a webmaster and would like to check if the victim's online record such as SSS contribution is already qualified to make a salary loan. Since the hapless victim has a plan to file a salary loan, he or she would reveal his login-name and password to the decoy's webmaster.

## Computer Viruses

A computer virus is a program that works like a biological virus. It spreads from software to software, from USB drive to hard disk or vice versa, and from one computer to another (in the case of computers connected to a network). So what is a **computer virus**?

It is simply a tiny and powerful program written and developed by an intelligent and malicious programmer. This computer virus program has a destructive power, unpredictable behavior and has a capability to reproduce itself. Depending on how it is intentionally designed and programmed, a **virus** may destroy data files, corrupt software integrity, gobble up computer's main memory storage, or cause serious system failures and errors.

**Virus scanner and cleaner** software is designed and programmed to search and destroy computer viruses in the computer system. The computer subsystems that can be scanned are hard disk, external hard disk, floppy disk, computer's main memory (SIMMs/RAM), CD/DVD ROM drive and USB drive. Once a virus or viruses are found, the virus scanner and cleaner software will notify the users and remove the viruses from an infected disks or quarantined them.

Most of the anti-virus software such as the Norton Anti-virus, AVG, and Mc-Afee Anti-virus utilities have the capabilities or features to continually monitor system activity. This software watches and reports any suspicious virus-like actions detected upon monitoring the system.

The virus scanner and cleaner should be continually updated to be able to detect the newly programmed computer viruses. This means that you have to have a newest version of this software always. Remember that an old version anti-virus software won't be able to detect newer viruses. For example, your anti-virus software is copyrighted 2009, it means that those viruses created in the year 2010 can no longer be detected or cleaned successfully by your anti-virus software.

Computer viruses have some brothers too. They are called **Trojans** (Trojan horses), **Worms**, and **Logic bombs**. A *trojan* is a program that performs a useful task, however it carries out some secret destructive motive and cruel intention. In other words, **Trojan horses** introduce malicious software under the pretension of being a useful

program. Usually these Trojan horses can be found in the Internet with filenames that make them sound like utilities or games. When a user downloads and runs such program, it might change data, erase files or folders, or cause some other kinds of trouble.

*A worms* are like viruses, they can reproduce themselves. There difference is that a worm can travel independently over computer networks to search out uninfected workstations to occupy. This worm program resides in a workstation's memory, not on the network disk. The worm can be eliminated by turning off all the workstations connected on the network.

*Logic bombs* are program triggered to perform a task or mission when it encounters some sequence of events or activities or after a certain amount of time elapses or when a date came. Like for example, the Friday the 13<sup>th</sup> viruses , and April Fool's day virus. These viruses can be classified as logic bomb type, because of the nature of how they are activated and when they will be activated, and what triggers them to activate. Most of the textbooks treated all of these programs as viruses. Well, whatever these programs are called, they are designed with the same purpose: to destroy or make troubles to our computing tasks. We must try our best to avoid or eradicate them. And denounce them as evil or bad.

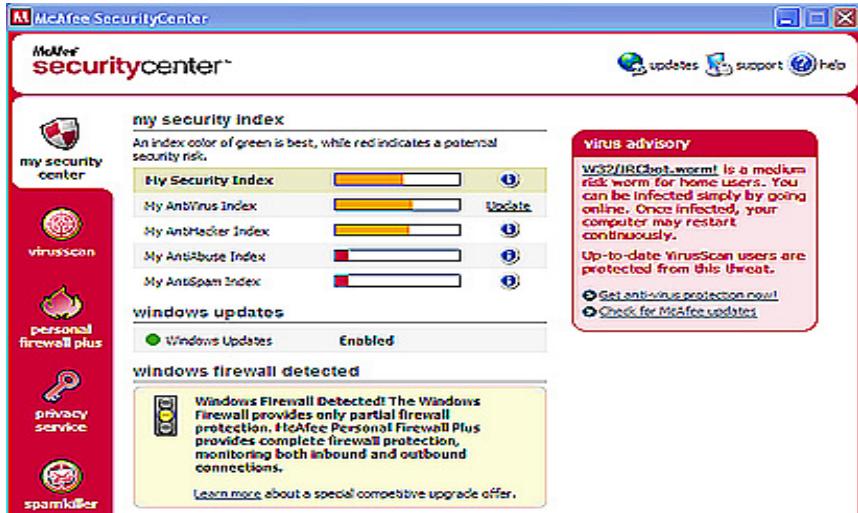


Figure 9.1 The McAfee Antivirus Main Menu



Figure 9.2 The AVG Antivirus Main Menu

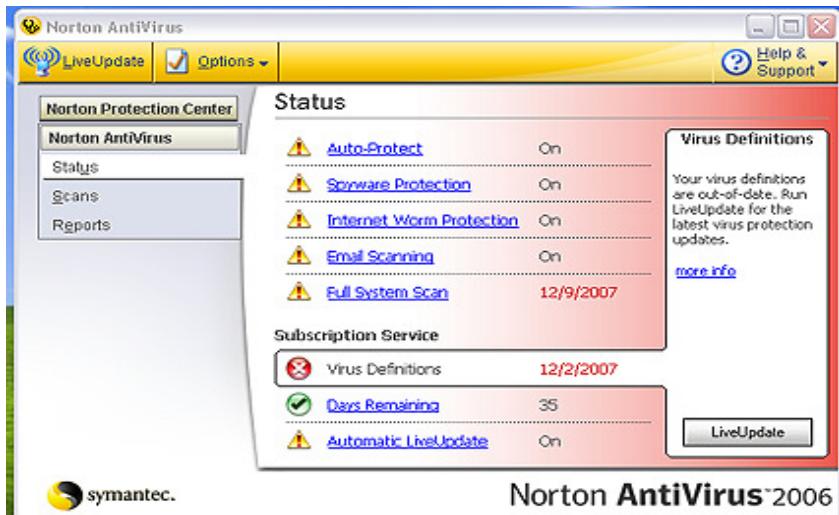


Figure 9.3 The Norton Antivirus Main Menu

## Online Spying Tools

The software developers have created a lot of tracking programs that continuously monitor our online activities in accessing the Internet. Some of these are useful to Webmasters who want to determine the kind of visitors who are surfing their websites, but some tracking programs intrude our privacy and preference. Here are the online spying tools - **cookies**, **spyware**, **spam**, and **web bugs**.

## Cookies

So what is a *cookie*? We heard this one many times over. Like for example, when you study Java programming language, programming a cookie is always a prerequisite to learn Java programming. A **cookie** is a small code that a Web server asks your Web browser such as Internet Explorer or Mozilla Firefox to place on your computer. The cookie contains pertinent information that identifies your workstation's IP address, your login name, e-mail address, and some information about your visit to the Web site. For example, the cookie might list the last time you visited the Web site, which Web page you downloaded, and how long you were at the web site before leaving from it.

## Spyware

The *spyware* is also known as **adware**. Like the cookie, the spyware can track a computer user's activities and report them to someone else. The **spyware** collects and record secretly your e-mail address, web usage, individual keystrokes, and even your personal information. The spyware can land on your laptop from many sources: e-mail messages, web pages, and pop-up adds (advertisements).

## Spam

If we receive an e-mail or e-mails that is coming from different sources or people that we do not know, then probably, we received a junk mail called **spam**. Usually, a **spam** offers products or services that usually we don't need or want. Almost all **spam e-mails** are classified as commercial advertisements. Spam is completely defined as unsolicited commercial e-mail.

### Notes:

**Malware** is the term used to destructive software such a computer viruses, Trojan horses, and Worms, as well as also some attack scripts that turned data into garbled or unusable.

## Cybercrime

Any act of stealing hardware and software resources are classified as **cybercrime**. But a cybercrime is more than just stealing the physical resources of the computer, it is also about a fraudulent act. A fraud such as stealing account information from unsuspecting customers, non-delivery of services or merchandise that are ordered online, or an online auction of something that did not exist, or some ATM card debit fraud or an international credit card debit fraud. Imagine if you are charge with a big amount in your credit card of the things you didn't purchased? Or losing a lot of money from your ATM card, because someone is withdrawing from it.

## Hacking

**Hacking** is an illegal act of accessing the computer resources of some people without their knowledge or permission, or unauthorized access into company's network system. Usually, a hacker uses a network or Internet connection to connect to some other people's computer or a particular company's computer network, in order to corrupt, change, or destroy data.

Hacker employs the **sniffing** technique where he or she tries to guess the password of the hapless victim. Or in a more highly sophisticated way, he or she would capture the password of the victim using some type of **malware**. This malware would capture the password, then it will send the password to him or her.

The other technique used by a hacker is the **IP spoofing**. In this technique, the hacker intercepts the data while it is transmitted or gain access to the computer network system by posing as an authorized user. The hacker was able to gain entry because he or she pretends to be using a legitimate computer or workstation connected to the network with an IP address that is belong to the network where he or she was accessing.

Another technique used by the hacker is called **phishing**. In this technique, the hacker may contact the unsuspecting victim by e-mail, and ask the victim to provide password information for an apparent legitimate reason. Like for example, the hacker wanted to get your name as well as the CD key of the software you purchased or it's registration number. In this way, the hacker can use the software you purchased since he or she would be required by the software company to enter the name of the one who purchase the software as well as the registration number, because only the legitimate purchaser of the software can enjoy the free updates and technical support.

## Cyberterrorism

Cyberterrorism is an act of attacking the mission-critical information technology infrastructure and government network system of a particular country. One of the goals of cyberterrorism is to gain control to key computer network systems that control and monitor electric power grids, telecommunication system infrastructure, power plants, and water treatment plants. Their plans could be to disrupt electric power grid operation or shutting down telecommunication control system.

## Firewalls

Putting **firewalls** in our computer system network is our best defense against the possible attack of a hacker. This is the countermeasure that we can apply in our computing task.

Firewalls can be both a hardware device with a software on it or purely a software that runs in your Personal Computer (PC), Laptop, or in a company's main computer called Server, or in powerful Internet device called Router.

The Microsoft Internet Connection Firewall, Norton Firewall, CheckPoint Firewall are the type of software that we can use to set restrictions on the information that is communicated between your PC at home or in a company's server.

The “stateful” firewall like the Microsoft firewall, monitors and tracks all aspects of communications that cross its path and examines the source and destination IP (Internet Protocol) address of each packet or data that the firewall handles. The firewall keeps a table of all communications that have originated from the computer that is running the firewall, in order to prevent unsolicited or malicious traffic from the public side of the connection from entering the private side of the connection. The firewall compares all inbound traffic from the Internet to the entries in the table. The inbound Internet traffic is permitted only to reach your PC or in the computer network of the company, if and only if there is a matching entry in the table that shows that the data communication exchange began in your PC or in a company's private network such as the Intranet or Local Area Networks (LANs).

The **firewall** automatically drops or discards any unsolicited data communications it detected. In this process, the firewall will be able to stop common hacking attempts of the hackers and intruders through port scanning technique.



Figure 9.4 Firewall Depiction

## Did You Know That?

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### The Millennium Bug (The Y2K Problem)

The Year-2000 (Y2K) problem which is popularly known as “Millennium Bug” existed because majority of the computers have been designed and programmed to record, use, and manipulate dates with only the last two digits of the year.

For example, the short-cut of year 1998 is represented as “98”. In our daily lives this is always a practice, as though its already understood that “98” means 1998. Most of the computer systems are designed with the same concept in mind, to accept the last two-digits of the year. Moreover, the computer has been programmed that the number 19 is the default value that precedes the supplied last two digits of the year, like the way we write the date in our normal manual system. The question here is what if we input a number for year 2000? Surely, if we follow the same old procedure, we will type the last two digits, which is 00. Now since the computer systems have been programmed that the number precedes the supplied “00” is 19, thus, the resulting value is 1900. And we know that this is wrong, because what we

mean for 00 is year 2000, not year 1900. Many of the common Year-2000 problems do involve incorrect calculations within business-oriented computer systems.

The other reasons why there are only two digits to accept for the year date is to conserve storage (memory) space. In early and late 60's, memory storage conservation is a practice because of the high cost of the memory storage device. Furthermore, most of the system developers (programmers) during that time had not expected that their programs mostly in COBOL would last for 3 decades. They don't worry about the possibility when it comes to the year date 2000. In other words, they were not able to anticipate this kind of problem. This lesson should serve as "charge for experience" to all of us who would be application developers in the near future. We have to be able to anticipate what might happen in the years to come; though, this is a case of software engineering practice. Let us think like software engineers in action, every time we design, develop and maintain our business application system.

---

## E.) Application of Looping Statement

The computer has a capability to perform a task repeatedly, based on a given condition, limit, or range. In programming term, this is called a *loop*. **Looping** involves repeating a particular portion or segment of the program. The repetition of the task depends on a specified number of times or until a particular condition is met or has been satisfied (evaluated or proven true).

To learn the topic of looping easily, we will consider only one looping statement here in our discussion. This is the famous "while loop statement". Majority, if not all, programming languages are using this popular looping statement. Maybe because of its elegant and well-defined structure.

Example:

1. Draw a flowchart that will generate and display the given sequence numbers:

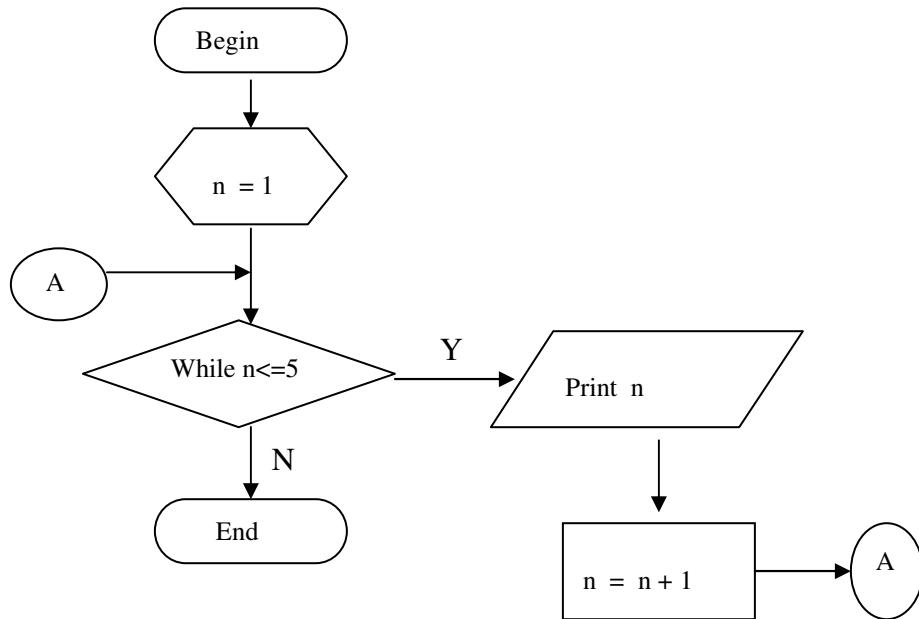
Sequence numbers

1  
2  
3  
4  
5

Solution : In Algorithm

```
Initialize n=1 (For Sequence Number)
While n<=5
Begin
    Print n
    n = n + 1
End
```

Solution : In Flowchart

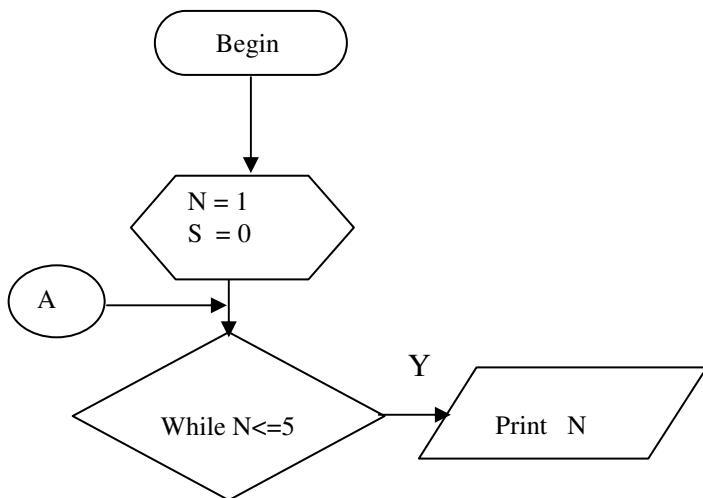


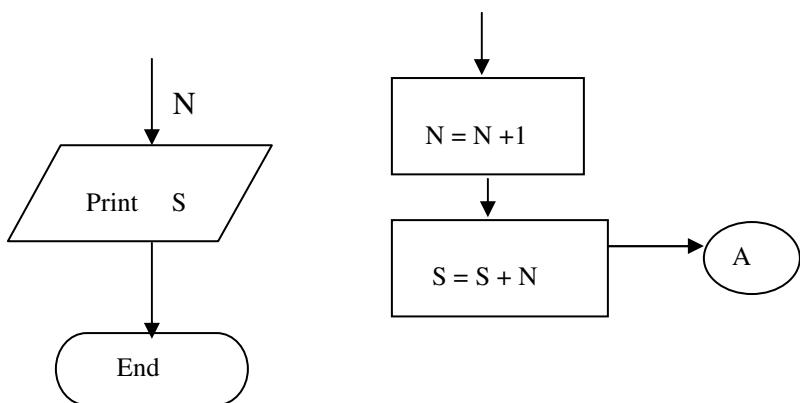
2. Draw flowchart that will compute the sum of the generated given sequence numbers in example number 1. Then display the sequence numbers and the computed sum.

Solution : In Algorithm

```

Initialize  N = 1  (for Sequence Number)
Initialize  S = 0  (for Sum)
While  N<=5
Begin
  Print N
  N = N + 1
  S = S + N
End
Print S
  
```





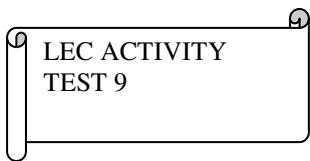
### Note:

You could notice that we have our pairs of “begin and end” after our *while loop statement*. The purpose of this technique is to group the associated (compound) statements so that when the computer had evaluated (proved or tested) that the condition is still **True (Yes)**, then all the statements within the body of the loop (statements within the pairs of these: *begin and end*) will be executed. The looping process only stop when the condition becomes **False (No)**.

These two examples illustrate the two common equations or formulas in programming (the increment formula and accumulator formula). The **increment formula** simply adds the  $N$  by 1 (in our example), or by 2s, by 3s and so on) while the computer executes the looping statement, the incrementing variable will add 1 until the condition is evaluated to *false* or the condition is being met(satisfied). This is the time the computer stops performing the looping operation (iteration process).

In real-world programming tasks, the *increment* and its opposite the *decrement* formula has many useful application ranging from animation, graphics propagation and of course repetitive calculations. The *accumulator formula* is also popular in the programming field because of its usefulness. Accumulator formula is oftenly use in determining and calculating the item stocks inventories, employees’ salaries and deductions, and many more.

You would find out its importance when you are already embarking to your programming job in the near future. Believe me, it’s important to know and learn the application of these simple yet useful formulas.



1. Draw a flowchart that will generate and display the given sequence numbers:

5  
4  
3  
2  
1

2. Draw a flowchart that will generate and display the given sequence numbers:

2  
4  
6  
8  
10

3. Draw a flowchart that will compute the sum of the generated given sequence numbers in Test number 2. Then display the sequence numbers and its computed sum.
4. Draw a flowchart that will compute the sum of the generated sequence numbers in Test number 1. Then display the sequence numbers and its computed sum.

**Bonus Question:**

Draw a flowchart that will generate and print the given sequence numbers. (This is about squaring a number).

1  
4  
9  
16  
25

# Chapter 10

## The Future of Information Technology

“What we anticipate seldom occurs;  
what we least expect generally happens.”  
-Benjamin Disraeli

I should have dropped this chapter entirely, because I have a hard-time researching about this topic called “the future of information technology”. Most especially that I am not a frustrated “fortune-teller”. It is my attitude to always give myself a chance whenever I encountered some difficulties such as researching about this topic. So I said, “one more chance, to surf on the Internet, hoping to find something interesting to put on this chapter.” And by luck, I got something to share with you these high-tech predictions I found in the Internet, that deserves our attention. Here are the technologies we will enjoy in the not so distant future.

### **A.)The Promise of a NanoComputers**

The nanotechnology is about designing an ultra-tiny chips and electrical conductors. One of the best applications of **nanocomputer** is the design and construction of a nanorobot. A **nanorobot** can be program to serve as antibodies. This will help humans and hospital patients to be protected against pathogenic bacteria and viruses that keep mutating. The mutation of these bacteria and viruses will render many remedies ineffective against new strains. Nanorobots are predicted to be part of the future in the field of medical science.

### **B.)Optical Computers**

In today’s computer, electrons travel between transistor switches on copper wires to store and process information. In **Optical computer**, photons travel on optical fibers or thin films to store and process data. This will make an optical computer to have faster speed and processing capability and more compact, and with larger bandwidth compared to our modern computers today. In the near future, optical computers will eliminate the enormous copper wires used in the printed circuit board (PCB) of our computer.

### **C.)Holographic Storage**

The holographic storage technology leverages the advances across a number of technologies from micro-mirror arrays to new non-linear polymer recording media. This storage technology offers high storage capacity and very high speed data access, because the **holographic access methods** read an entire page of data in one access operation. Our present storage technology today that uses the optical storage technology only reads and writes data by altering an optical medium on a per bit basis, while holographic storage technology records an entire interference patterns all at once.

#### **D.) Protomic Memory**

The Protomic memory technology solves the usual dilemma of losing your hours' of work when accidentally the electrical power outage happens or in the event of a system crash. The photonic memory technology retains electrical power even such unusual occurrence happen while you work with your computer. The **photonic memory** device uses embedded protons which remain where they are when the power turns off, thus preserving the data.

#### **F.) Next Generation Internet**

The new generation Internet has a capability to split the spectrum of light traveling the Internet's optical networks, allowing high priority traffic to pass at the highest and least uninterrupted frequency, while passing low priority traffic along at a lower frequency. The new generation Internet employs ultra high speed switching and transmission technologies and end to end network connectivity at more than 1 gigabit per second(Gbps), approximately **1000 times faster** than today's Internet. This is not only the goal of the new generation Internet, it will attempt to come up with 1 Terabyte per second (Tbps) high speed network connection.

#### **E.) The Orbiting Internet**

The Teledesic was created to provide affordable access to an advanced Internet connection to all parts of the world that will never get such advanced capabilities through existing technologies. Basically, the **Teledesic** is an orbiting Internet that provides advanced digital broadband connections to all those parts of the world that are not likely to get those capabilities through wire-based telecommunication infrastructure. The **Teledesic** uses the wireless technology to access advanced network connections and will send signal vertically to solve the problems of rain attenuation and signal-blocking by terrain, building, and foliage.

### **The Future Yesterday Becomes Our Present Technology**

During the time when I write the draft of the first edition of this book, it was way back 1990's (late 1990', specifically). Though eventually the first edition was published in 2002 (due to the slow process of publishing a book, we cannot help it!), most of the predictions outlined on this short chapter becomes actually our present technology today. Take for example, the Xerox Corporation researcher's prediction (first bulleted discussion). It predicted that in the near future, we will be using **1000 x 800 pixel computer monitors**. The Compaq Presario Laptop I used to write this second edition is configured with a Display (Monitor) setting at 1280 x 800 pixel. So Xerox Corporation's prediction is right. I enjoyed now the technology they predicted decades ago.

The second bulleted discussion was also now our present technology because it predicted that we will be using an **affordable low-power rewritable storage** devices, instead of using diskettes or CD/ROM to store our data or software. My main storage device that I used to write this book this time is a Kingston USB Drive which I bought from CD-R King. See? The prediction of a decade ago was so accurate.

Now let us go to the third bulleted discussion. The prediction is that we will use a computer with more than one microprocessor (**Parallel processing technology**). It is also

true today, because my Compaq Presario Laptop is a Dual Core microprocessor. The Quad Core desktop computer is common today. See again? Parallel processing technology is our present technology. A decade ago, it is but just a dream. Yesterday's dream is today's reality.

The **Wireless Telecommunications and Network** prediction is exactly what we are enjoying right now starting from Laptop computer with Centrino (wireless) technology and Wireless Broadband technology. It is an anywhere, anytime network computing.

The remaining predictions are still yet to be realized. But we know for sure that these predictions about the technology revolution will sooner become a reality. So wait and be excited, for the future holds some great technology to offer for us, to enjoy life better and easier.

For the sake of knowing and reviewing the first edition's technology predictions, I retained the following discussions (written in smaller font-size):

No one can stop the on-going revolution of computer technology. We are now growing into a future shaped by this revolution. Here are some of the fearless predictions of computer scientists and engineers who are now presently working with their ambitious inventions:

- Xerox (Corporation) PARC researchers predicted that by the early year 2000, we will be using **1000 x 800 – pixel computer monitors**. They are thin enough and power-efficient to run on batteries for days.
- Sooner, **low-power rewritable storage devices** will become **affordable**. This will make our software to be stored on rewritable cards rather than on diskettes or CD/ROM.
- **Parallel processing technology** will make our computer to use more than one micro-processors (CPUs) to work on several tasks at the same time. Pattern recognition, vision detection, and speech recognition can be performed very well by this technology inspite of its high demand on speed and voluminous data.
- **Gallium Arsenide (GaAs) chips** are ten times faster in moving impulses or signals than silicon chips. Furthermore, it emits less heat. In the near future, our computers are made of this kind of hybrid integrated circuit (IC). Optical computers transmits information in light waves rather than electrical pulses. This kind of computer technology can process information hundred of times faster than our present computer today.
- **Fiber optic cables** can transmit television signals, telephone calls, and data communication at the same time. We can enjoy a true digital TV, clearer voice over the telephone, and high speed Internet access.
- **Wireless Telecommunications and network** will allow mobile workers, to send and receive computer data from cars, boats, and planes easily. Like the way we make it by cellular phone calls today. Our laptop contains an internal modem with a little antenna to dial-up the office's **server** or through the company's intranet system.
- **Virtual Reality** Computer Aided Design (CAD) software allows architects and engineers to walk-through a buildings and mechanical assemblies before they are constructed. This technology creates an illusion that we can be immersed in a fantasy world that never exist in reality.
- **Intelligent software agent** can ask questions, respond to commands, and pay attention to the work patterns of its user. It can also serve as a guide and a coach and has reasoning capabilities. An intelligent software agent can be instructed to deliver our morning paperless newspaper via Internet, reset our alarm clock or turning our coffee maker.
- **On-demand Online Automobiles;** with this technology , you can design and order customized car based on your personal taste through Internet. The ordering process requires manufacturers, suppliers, distributors, and retailers to be connected in the Internet so that the user can reach them out wherever they are in the world and whatever the customer would like to buy it.
- **Embedded Intelligence;** with this technology, computer capabilities are embedded in most of the electronic gadgets which we are using now such as CD players, VCRs, microwave ovens, car

electronic systems, and other household appliances and tools. Actually in reality and present technology, we are already enjoying this benefits without knowing it. No wonder why our appliances today seems so highly sophisticated and behaved as though they know how to do their tasks. Well its because inside them is a computer embedded with intelligence (intelligent program). In the near future, most of our home appliances will be these smart.

- **Active badge** is a clip-on computerized ID-badge which continually reports its location for record-keeping purposes in the **database server**. When employees are equipped with active badges, doors will open for them, rooms can greet people by name, receptionists and secretaries will know the employees' whereabouts and telephone calls can be forwarded to wherever the recipient might be at the moment.
- **Micromachines** is a product of microtechnology. This machine is in a scale of a million of a meter. Microscopic moving parts are etched in silicon chip. It has a microsensor, a tiny device that can detect temperature and pressure. Microsensors are used in spacecrafts, planes, and cars. According to the scientists speculation and brave prediction, someday this tiny machines may be able to roam around our bodies to search and destroy cancer cells and other deadly bacteria. When that time comes, computer will become our living hero. Who said computer is nothing?

## And Lastly, My Final Suggestion

The computer will become more and more powerful as the years go by. We can use it to empower or imprison, to create or destroy, or to explore or exploit. It's up to us to chose and decide how to use it, whether for evil or for good. I wish and pray that may you use it for good and always for good, to make this world a better place to live in, again and again. God bless.

## F.) Application of Subroutines or Subprograms

In real-life programming practice, application programmers and business systems developers alike, break down large program into smaller programs called "subroutines" or subprograms. In this way, the programmers can tackle the task one at a time. Some IT professionals call it *modules, functions or procedures*.

The flowcharting symbol for subroutine or subprogram is a rectangle with a bar across the top. The name of the subroutine is placed inside the rectangle.

### **Example:**

Draw a Flowchart and write its equivalent Algorithm in modular (subroutine) approach that will compute the salary of an employee in a weekly basis. If the number of hours worked by an employee exceeds 40 hours a week, the excess hours should be considered as overtime, thus, its computation is 150 percent from its base salary of 100 pesos per hour. An SSS contribution for every employee is 200 pesos ,while the withholding tax is 10 percent (%) of the employee's gross salary.

### Solution: In Algorithm

```
Enter HW (for Hour's work)
If (HW>40) then
```

```

        Perform OPay Procedure
Else
    Perform RPay Procedure

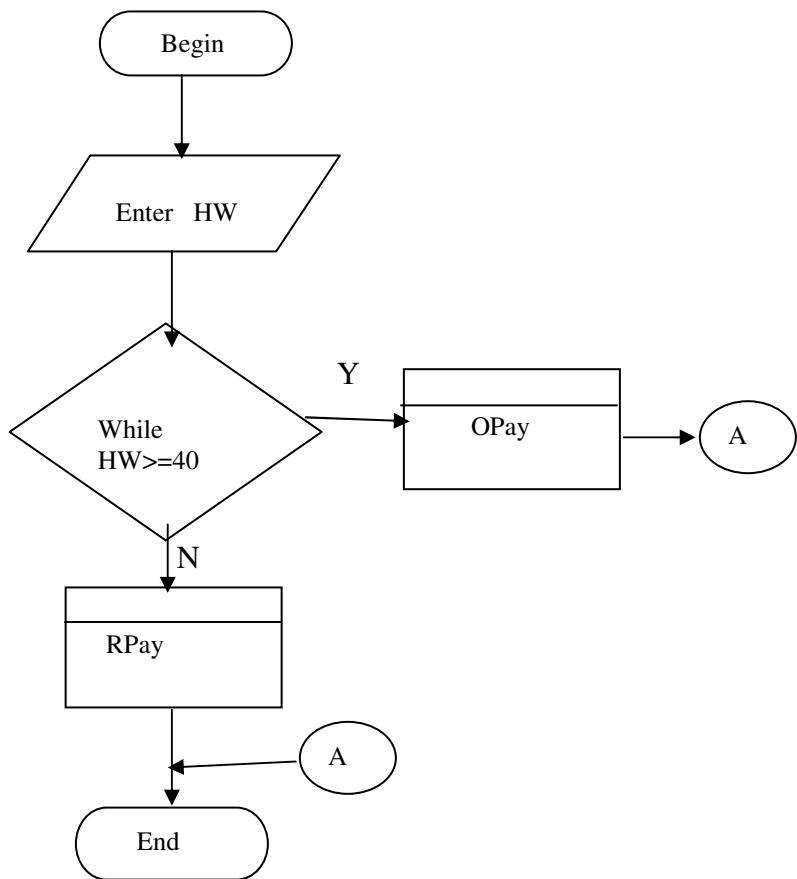
Procedure RPay
Initialize
    RPH = 100, SSS = 200
Compute
    RP = RPH * HW
    T = RP * 0.10
    S = RP - T - SSS
Print "You Salary", S

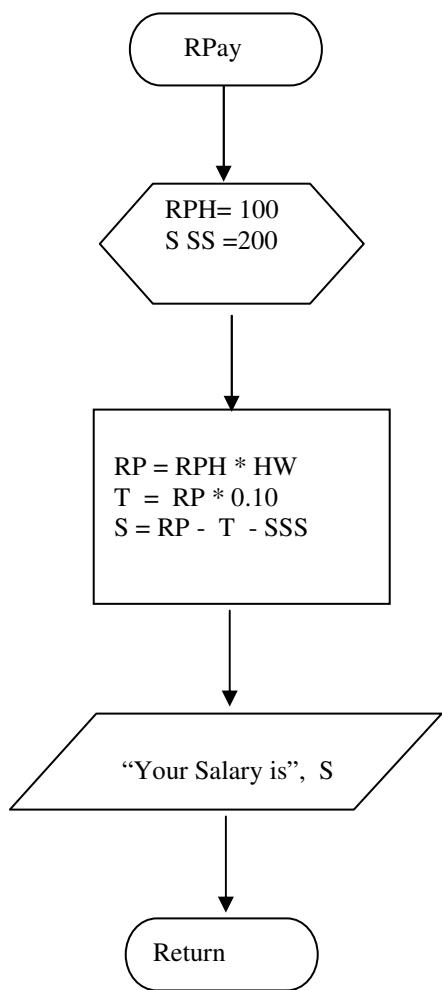
Procedure OTPay
Initialize RPH = 100, SSS = 200, RH=40
Compute
    RS = RPH * RH
    OH = HW - 40
    OPH = RPH * 1.50
    OP = OH * OPH
    S = OP + RS
    T = S * 0.10
    S = S - SSS - T
Print "Your Salary is:", S

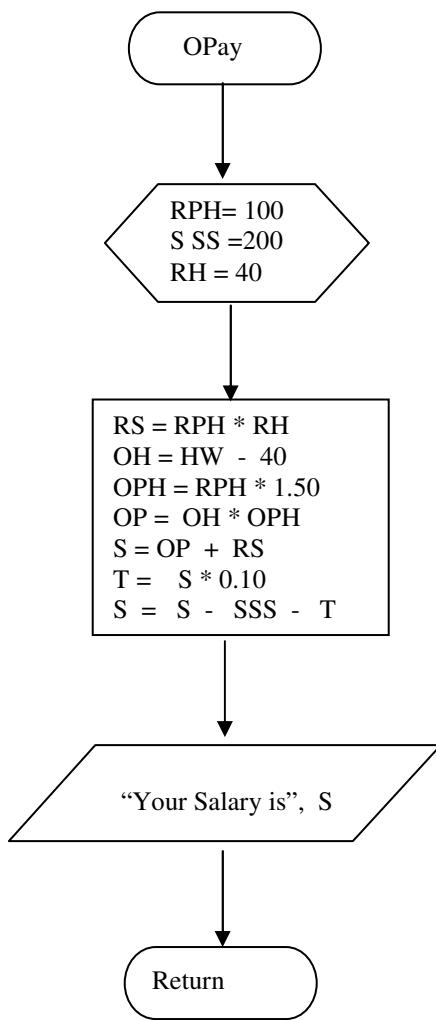
```

Where:

HW = Hour's Work  
 OPay = Overtime Pay  
 RPay = Regular Pay  
 RPH = Rate Per Hour  
 HW = Hours Work  
  
 T = Tax  
 RP = Regular Pay  
 S = Salary  
 RS = Regular Salary  
 RH = Regular Hour  
 OH = Overtime Hour  
 OPH = Overtime Pay Hours  
 OP = Overtime Pay





**Note:**

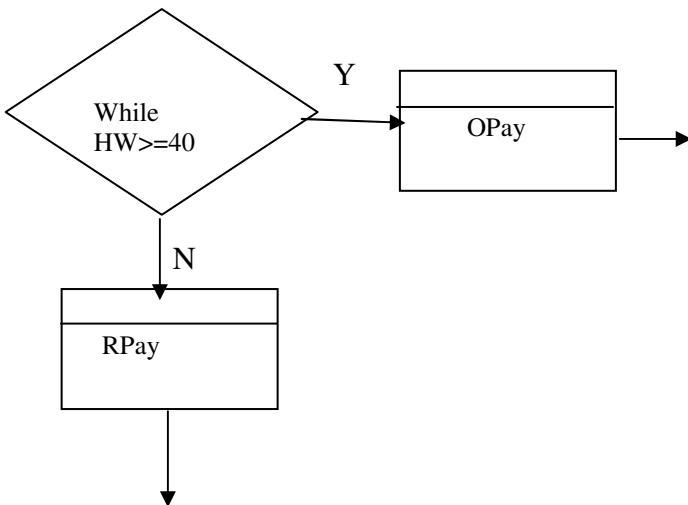
You could notice that a subroutine will begin with its name, not with the word “Start”. For example, the subroutine for Regular Pay starts with RPay written on its Terminal Symbol:



It is also the same with the Overtime Pay where it starts with the word “OPay” instead of the word “Start”. Now the Terminal Symbol for the ending part of our Flowchart has the word “Return” on it, instead of the word “End”. This is because the subroutine should return to the calling main program, or to return a value to the calling main program. You will notice also that if the conditional expression:

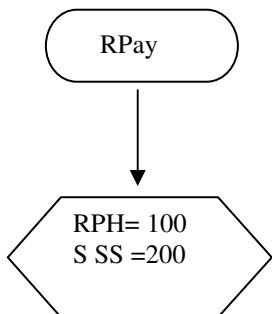
*While HW>=40*

is evaluated to True (Yes), then the subroutine: OPay will be executed, otherwise the RPay subroutine will be executed. We can see it with the following flowchart depiction:



Within the subroutine is another group of flowchart symbols with more equations and calculations are being performed. With the use of subroutine, we can simplify our very large flowchart or algorithm by breaking them into subroutines where each subroutine performs a specific task. With this technique, we can easily concentrate in one subroutine at a time. Like for example, we really have a hard time formulating the equations to compute the overtime pay. So, we have to focus on it. Our flowchart and algorithm reflects the complexity of our solution. As you could noticed , understanding alone on how our equations calculate are for a moment, pose already a complexity in our solution. One thing also to consider is that within our subprogram, we initialize the variables we used within the subroutine. Remember that the values of these initialized variables are local to the subroutine. Meaning, that their values will not conflict to other variables in other subroutines. Therefore, it is very safe to use the same name of variables from one subroutine to another.

Let us now dissect the initialization happened in the first subroutine that we have, the Regular Pay subroutine. First, we initialize the Rate Per Hour (RPH) variable, then the Social Security System (SSS) contribution.



After this, we construct the equations we need to calculate the Regular Pay. So, we come up with the following equations inside our Process symbol.

$$\begin{aligned} RP &= RPH * HW \\ T &= RP * 0.10 \\ S &= RP - T - SSS \end{aligned}$$

The equation:

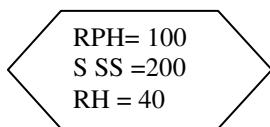
$$RP = RPH * HW$$

is an equation that computes the gross regular pay. Now to get the net regular pay, we need to deduct the gross pay from the withholding tax and SSS contribution of the employee. In real life, there are more deductions to the employee salary than withholding tax and SSS contribution. But this two is always present to any payroll system in any private company or public offices.

For the sake of simplicity, in our simple payroll system, we assign a fix tax to each employee to 10 percent. In reality again, this is not the case. Though, consultants and authors have this kind of tax (only 10 percent deduction, based on my experience as an author and training consultant. I think, other practicing professionals have this kind of tax too.). To compute for the Salary (S), we simply formulate this simple equation:

$$S = RP - T - SSS$$

In the Overtime Pay (OPay), the equations are more harder to formulate. Let us now have our discussion about this one. First, we have to initialize the variables with constant values. The values for these variables are for the moment, will not change. The Regular Hour (RH) is a maximum of 40 hours. In excess of 40 hours work, it is already considered as an overtime. So there must be an added income that an employee can get from his or her salary.



Next is the discussion on how to compute the overtime pay. Here is now the equations that calculate it:

RS = RPH * RH
OH = HW - 40
OPH = RPH * 1.50
OP = OH * OPH
S = OP + RS
T = S * 0.10
S = S - SSS - T

To compute for the Regular Salary (RS), we have the equation:

$$RS = RPH * RH$$

where:

RPH is the Rate Per Hour,  
while RH is the Regular Hour

To compute for the Overtime Hour, we have to subtract the number of Hours Work (HW) from 40 (the regular number of hour's work). Let say an employee has rendered 47 hours in a week, then his or her overtime hour is 7 ( $47 - 40$ ). Here is the equation:

$$OH = HW - 40$$

Where:

OH is Overtime Hour  
HW is Hour's Work

This time, we need to get the rate of the overtime pay. Since an overtime pay per hour is 150 percent from the present regular pay, then we have to multiply the present regular pay (RP) to 1.5 (for 150 %). Our equation is:

$$OPH = RPH * 1.50$$

Where:

OPH is the Overtime Pay Hours  
RPH Rate Per Hour

This time, it is easy to compute the Overtime Pay. Here is our equation to get it:

$$OP = OH * OPH$$

Where:

OP is the Overtime Pay  
OH is the Overtime Hours

To compute for the gross salary, we have this equation:

$$S = OP + RS$$

Where:

S is the Salary (gross salary)

OP is the Overtime Pay

RS is the Regular Salary

And to compute finally the net salary, we need to deduct the gross salary from withholding tax (T) and the SSS contribution. Here is now the last equation:

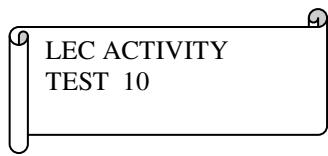
$$S = S - T - SSS$$

Where:

T is the Tax

S is the Salary (net salary)

Wow! This time we are through discussing. It is but a very long and winding discussion on the Subroutine topic. But it's worth the effort. Isn't it?



1. Draw a Flowchart and write its equivalent Algorithm in modular (subroutine) approach that will compute the salary of an employee in a monthly basis. If the number of days worked by an employee exceeds 20 days a month, the excess days should be considered as overtime, thus, its computation is 200 percent from its base salary of 1000 pesos per day. An SSS contribution for every employee is 500 pesos, while the withholding tax is 20 percent (%) of the employee's gross salary.

## Answer Key to Odd Nos. Problems

### For Chapter 1

a.) Binary Nos. Conversion to Decimal Nos.

1.)  $3_{10}$

3.)  $7_{10}$

5.)  $11_{10}$

b.) Decimal Nos. Conversion to Binary Nos.

1.)  $1000_2$

3.)  $11010_2$

5.)  $1101110_2$

### For Chapter 2

Decimal Nos. Conversion to Octal Nos.

a.) Decimal Nos. Conversion to Octal Nos.

1.)  $13_8$

3.)  $34_8$

5.)  $2231_8$

b.) Octal Nos. Conversion to Decimal Nos.

1.)  $56_{10}$

3.)  $117_{10}$

5.)  $1678_{10}$

c.) Octal Nos. Conversion to Binary Nos.

1.)  $100111_2$

3.)  $001011010_2$

5.)  $010011.110001_2$

d.) Binary Nos. Conversion to Octal Nos.

1.)  $7_8$

3.)  $7.5_8$

5.)  $747_8$

## For Chapter 3

a.) Decimal Nos. Conversion to Hexadecimal Nos.

- 1.)  $3E_{16}$
- 3.)  $EF_{16}$
- 5.)  $2CF_{16}$

b.) Hexadecimal Nos. Conversion to Decimal Nos.

- 1.)  $138_{10}$
- 3.)  $244_{10}$
- 5.)  $63906_{10}$

c.) Hexadecimal Nos. Conversion to Binary Nos.

- 1.)  $10011010_2$
- 3.)  $1110\ 0011.0101\ 1101_2$
- 5.)  $0001\ 1100\ 1110_2$

d.) Binary Nos. Conversion to Hexadecimal Nos.

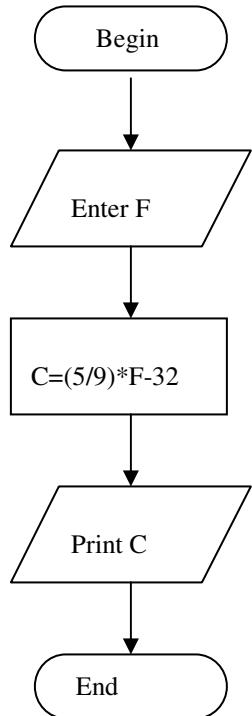
- 1.)  $AC_{16}$
- 3.)  $CF_{16}$
- 5.)  $77_{16}$

## For Chapter 4

1.) Solution: In Algorithm

```
Enter the value of F (for Fahrenheit)
Compute Celcius (C=(5/9)*F-32)
Print the value of C (for Celcius)
```

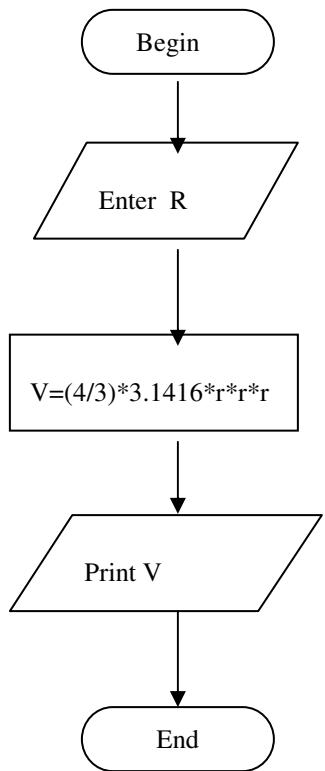
Solution : In Flowchart



3.) Solution : In Algorithm

```
Enter the value of R (for Radius)
Compute the volume (V=(4/3) * 3.14159 * r * r * r)
Print the value of V (for Volume)
```

Solution : In Flowchart



For Chapter 5

1.)  $100/2 == 21 \% 3$   
 $50 == 0$   
 F

3.)  $(15 >= 15) \&\& (7 == 7) || (1001 != 1001)$   
 T      &&    T      ||      F  
       T              ||      F  
                         T

5.  $(W * Z) < (X * W) || (Z > W)$   
 $(10 * 40) < (20 * 10) || (40 > 10)$   
 400 < 200    ||    T  
   F              ||    T  
                     T

## For Chapter 6

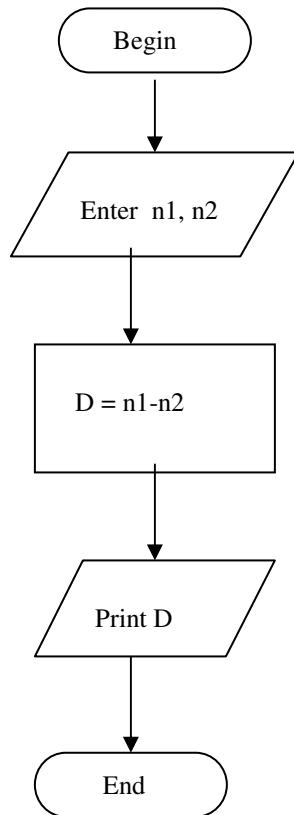
### 1.) Solution: In Algorithm

```

Enter two nos.  (n1,n2)
Compute the Difference (D=n1-n2)
Print D (for Difference)

```

### Solution: In Flowchart



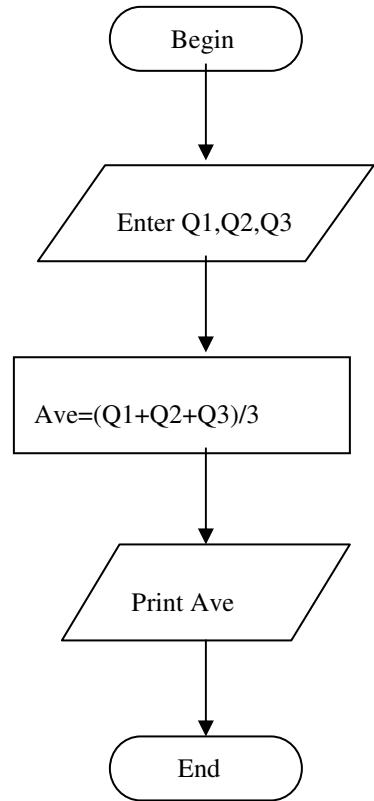
### 3.) Solution: In Algorithm

```

Enter three quizzes (Q1,Q2,Q3)
Compute the Average (Ave=(Q1+Q2+Q3)/3)
Print A (for Average)

```

Solution : In Flowchart



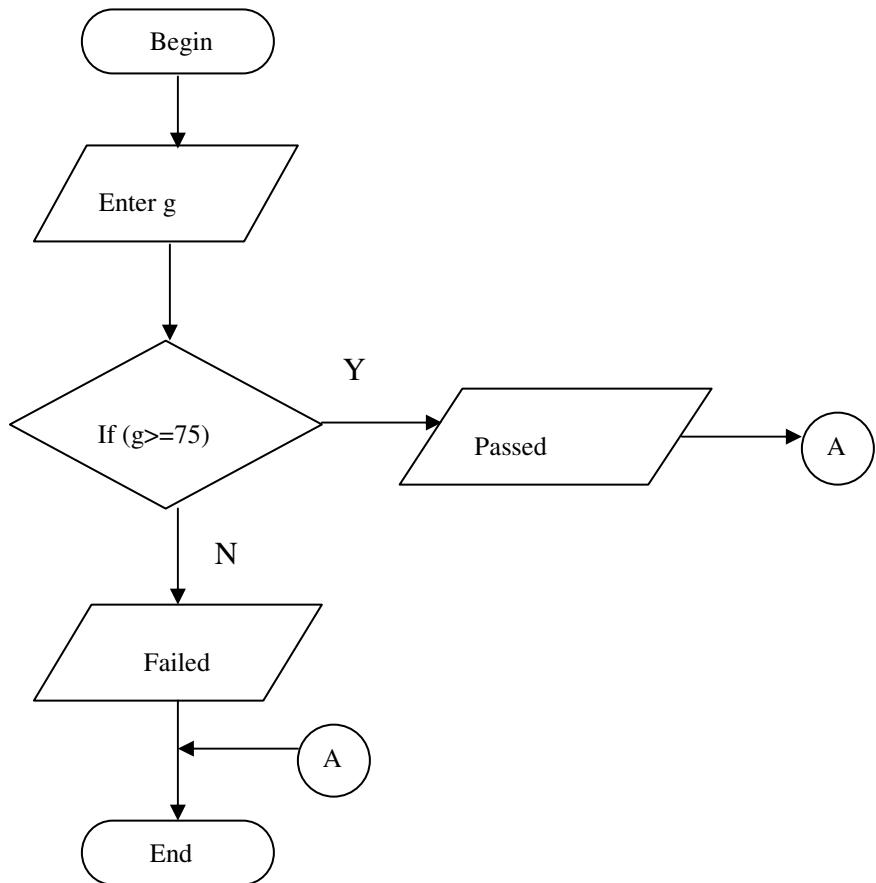
For Chapter 7

1.) Solution: In Algorithm

```

Enter a value of g (for Grade)
If (g>=75) then
    Print " Passed"
Else
    Print "Failed"
  
```

Solution: In Flowchart

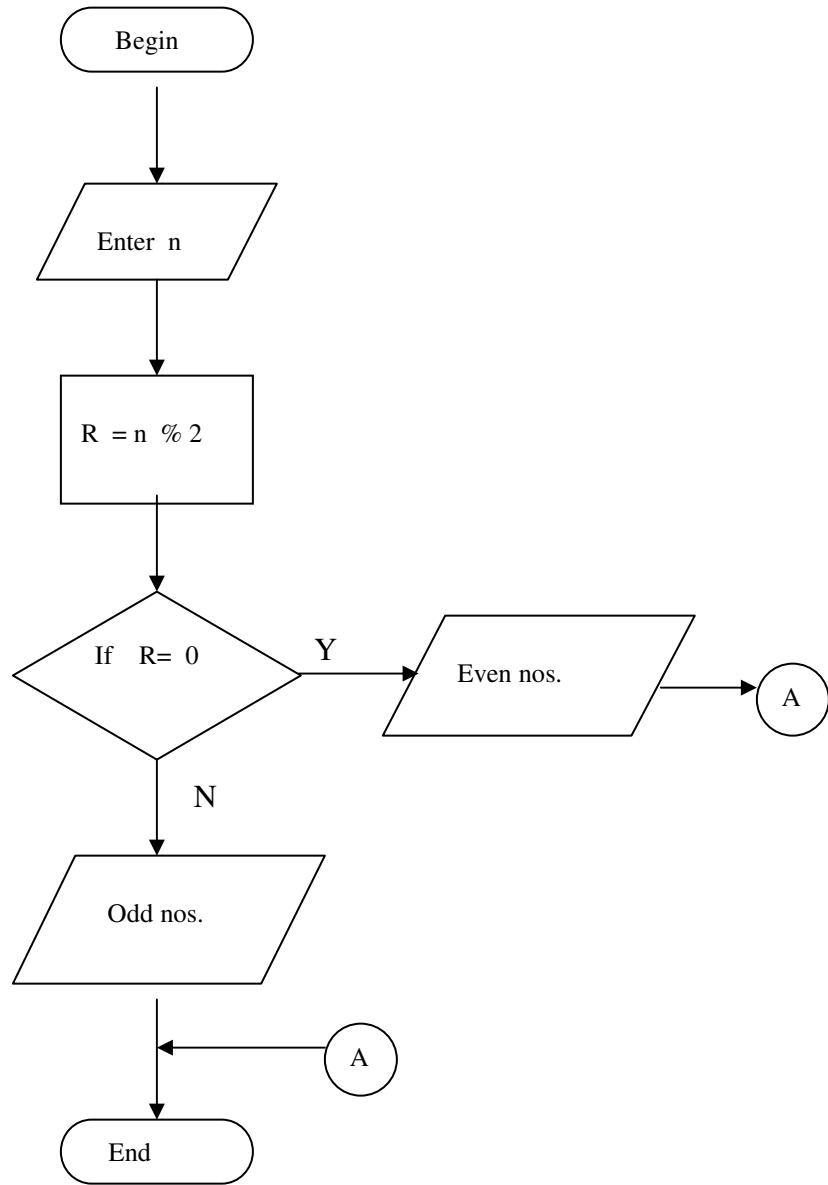


3.) Solution: In Algorithm

```

Enter a value of n (for Number)
Compute the remainder (r=n%2)
If (r=0) then
  Print "Even nos."
Else
  Print "Odd nos."
  
```

Solution : In Flowchart



For Chapter 8

1.) Solution: In Algorithm

```

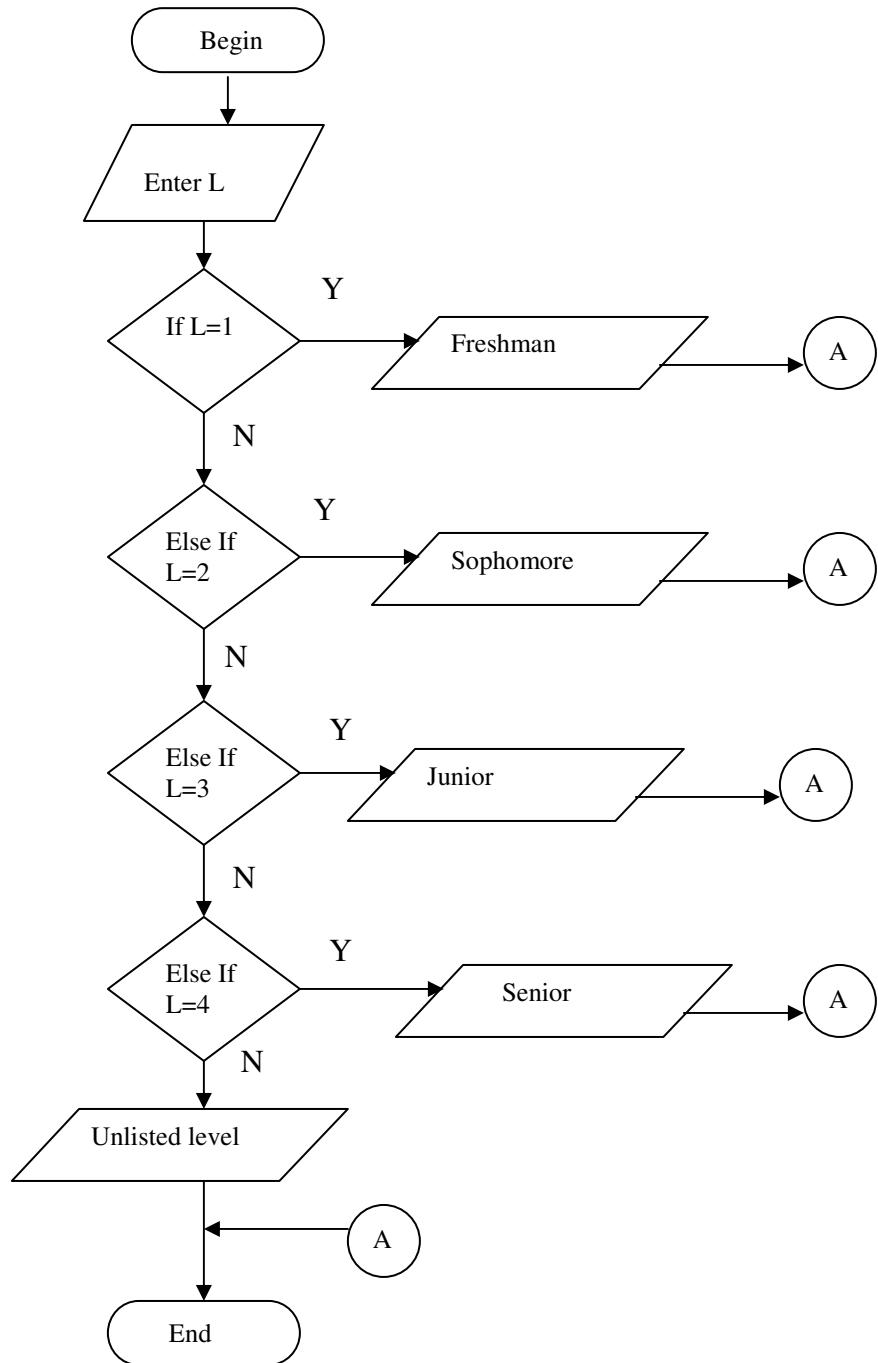
Enter the value of L (for Level)
If (L=1) then
  Print "Freshman"
Else if (L=2) then
  Print "Sophomore"
Else if (L=3) then
  Print "Junior"
Else if (L=4) then
  Print "Senior"
  
```

```

Print "Junior"
Else if (L=4) then
    Print "Senior"
Else
    Print "Unlisted-level"

```

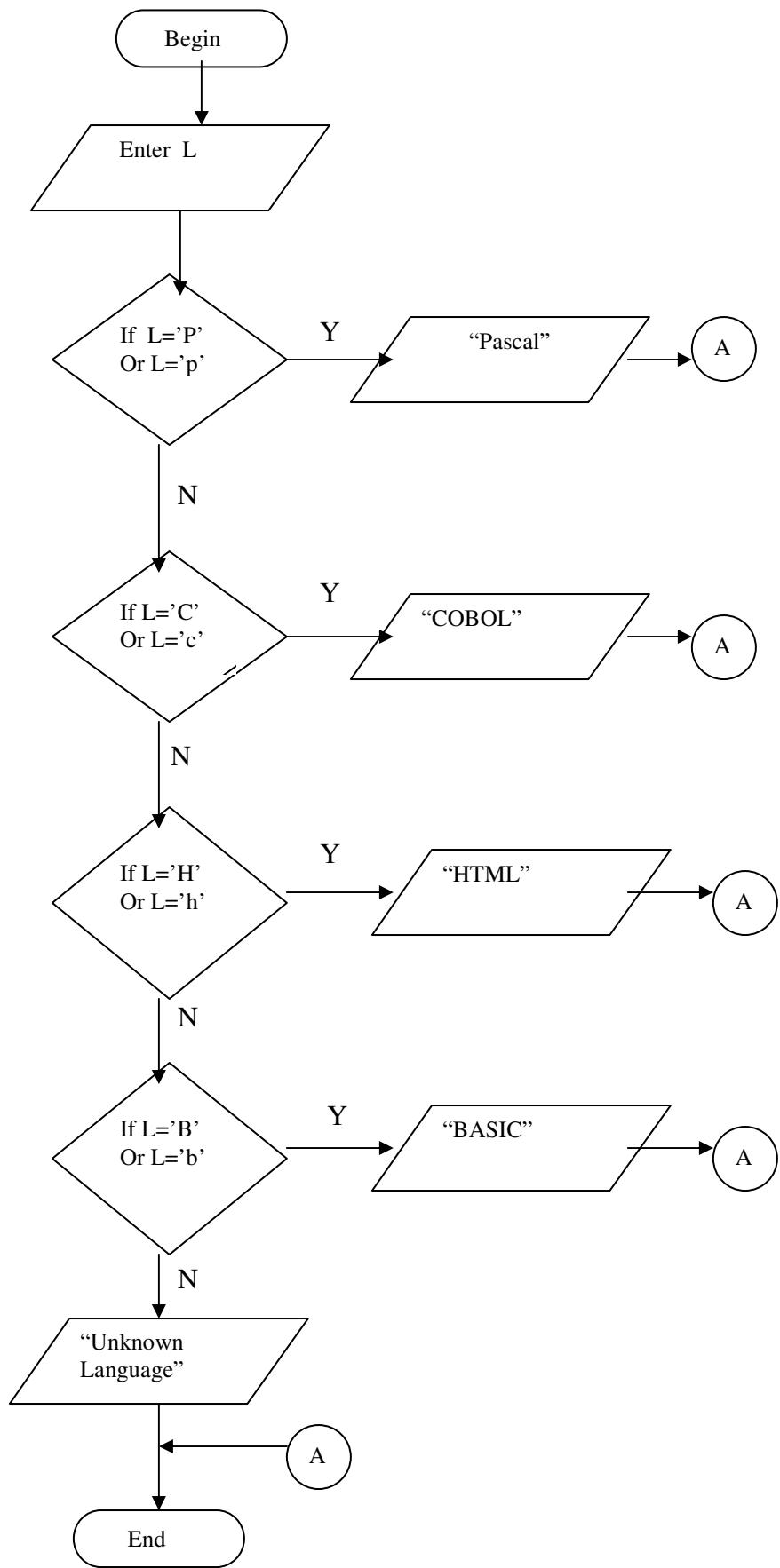
Solution : In Flowchart



### 3.)Solution : In Algorithm

```
Enter the value of L (for Letters)
If (L='P') or (L='p') then
    Print "Pascal"
If (L='C') or (L='c') then
    Print "COBOL"
If (L='H') or (L='h') then
    Print "HTML"
If (L='B') or (L='b') then
    Print "BASIC"
Else
    Print "Unknown-Language"
```

Solution : In Flowchart

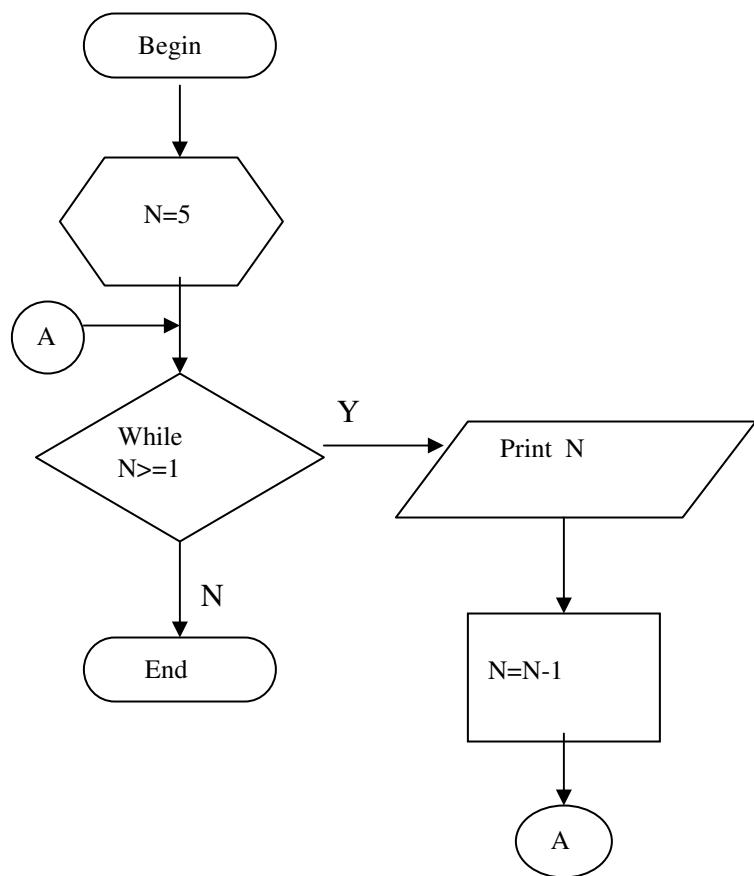


## For Chapter 9

### 1.) Solution : In Algorithm

```
Initialize N=5 (for sequence no.)
While N>=1
Begin
    Print N
    N=N-1
End
```

### Solution : In Flowchart



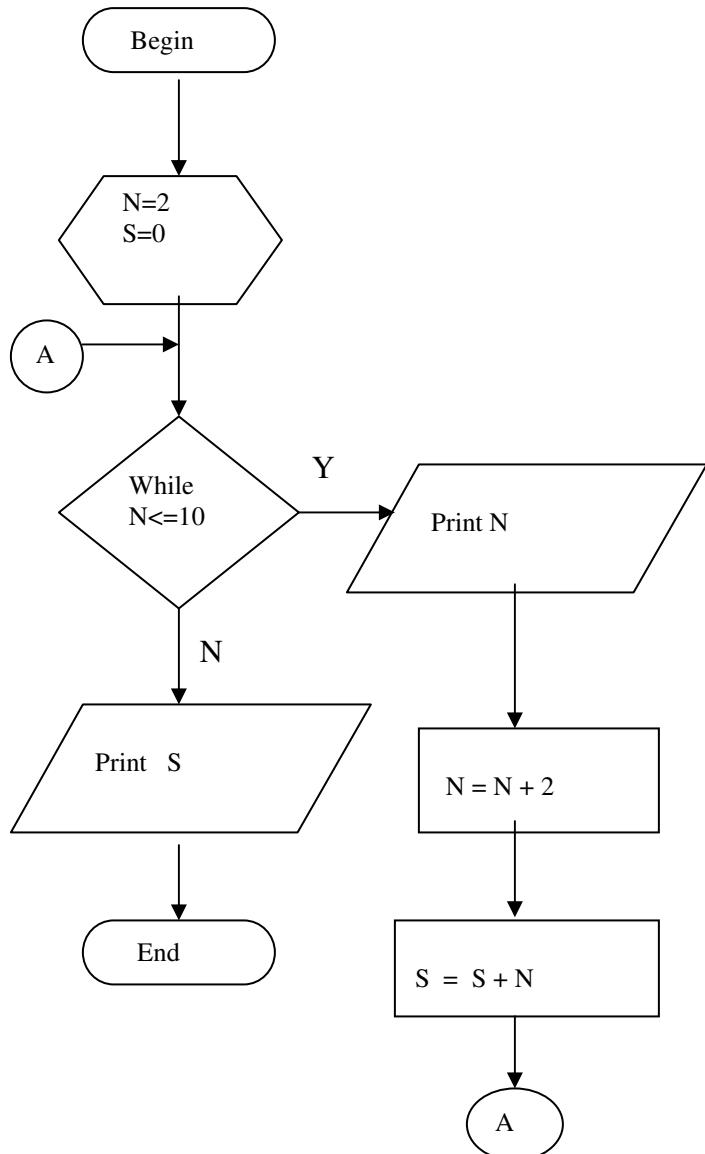
### 3.) Solution: In Algorithm

```

Initialize N=2 (for Sequence no.)
Initialize S=0 (for Sum)
While N<=10
Begin
    Print N
    N=N+2
    S=S+2
End
Print S

```

### Solution: In Flowchart



**Note:**

Chapter 10 has no answer, since it has only one Practice Test.

## ERRATA?

When I read my own book, especially the first edition of this book, I found many errors, mostly in the way I spell the word such as “Celcius” when in fact it should be written as “Celsius”. This is actually not a typographical error, but my own error. I’d like you to know that I owe you an “apology”. Whew!!! At least, I spell the word “apology”, correctly. Afterall, this is a book not a cellular phone. Meaning, mispelled or erroneous words (worst of all, wrong discussions) are unusual in book writing and communication. Communicating knowledge with you – students, must be correct and factual. With this, I am guilty of my own errors. Though, I have my Technical Reviewers and English grammar editors who did their very best to ensure the accuracy of this book, still, I am the one who wrote this book, therefore an error or errors are mine alone (originally). This further means, that my error or errors are originally mine, it cannot be faked by someone else...joke. If you find errors in this book, please don’t hesitate to communicate with me through my e-mail address: [coperpepito@hotmail.com](mailto:coperpepito@hotmail.com). But, I’d like to warn you, make no mistake in your spelling when writing your e-mails (remember, you are writing an e-mail not sending short text messages in a cellphone). Just kidding, buddy. Good luck to all of you (...and to me too.)!



