

# GE2112 - FUNDAMENTALS OF COMPUTING AND PROGRAMMING

## UNIT II

### **COMPUTER SOFTWARE**

Computer Software –Types of Software – Software Development Steps – Internet Evolution - Basic Internet Terminology – Getting connected to Internet Applications.

### COMPUTER SOFTWARE

#### **Hardware**

Hardware is the machine itself and its various individual equipment.

It includes all mechanical, electronic and magnetic devices such as monitor, printer, electronic circuit, floppy and hard disk.

#### **Software**

Software refers to the set of computer programs, which are used in applications and operating systems. It is the collection of programs, which increase the capabilities of the hardware. Software guides the computer at every step where to start and stop during a particular job. The process of software development is called *programming*.

### TYPES OF SOFTWARE

#### Application Software:

Application Software is a set of programs for a specific application. Application software is useful for word processing, accounting, and producing statistical report, Graphics, Excel and Data Base. Programming languages COBOL, FORTRAN, C++, VB, VC, Java

#### Types of Application Software

**Application software** enables users to perform the activities and work that computers were designed for. The specific type of application used depends on the intended purpose, and there are application programs for almost every need. Three broad types of application software available for business users are individual, collaboration, and vertical programs (see Table 5-1).

**Individual application software** refers to programs individuals use at work or at home. Examples include word processing, spreadsheet, database management, and desktop publishing programs.

**Collaboration software** (also called **groupware**) enables people at separate PC workstations to work together on a single document or project, such as designing a new automobile engine.

**Vertical application software** is a complete package of programs that work together to perform core business functions for a large organization. For example, a bank might have a mainframe computer at its corporate headquarters connected to conventional terminals in branch offices, where they are used by managers, tellers, loan officers, and other employees. All financial transactions are fed to the central computer for processing. The system then generates managers' reports, account statements, and other essential documents.

## **Other Application Software Models**

### **Shareware**

Shareware is software developed by an individual or software publisher who retains ownership of the product and makes it available for a small “contribution” fee. The voluntary fee normally entitles users to receive online or written product documentation and technical help.

### **Freeware**

Freeware is software that is provided free of charge to anyone wanting to use it. Hundreds of freeware programs are available, many written by college students and professors who create programs as class projects or as part of their research.

### **Open Source Software**

An open source software program is software whose programming code is owned by the original developer but made available free to the general public, who is encouraged to experiment with the software, make improvements, and share the improvements with the user community

### **Application Software for Individual Use**

The thousands of application programs that individuals use to perform computing tasks at work and at home can be grouped into four types:

- Productivity software
- Software for household use
- Graphics and multimedia software
- Communication software

### **Productivity Software**

Productivity software is designed to improve efficiency and performance on the job and at home, and is the largest category of application software for individual use. In-depth knowledge and skill in using productivity software applications can make a potential employee more valuable to a business, organization, or agency.

### **Word Processing**

A word processing program can be used to create almost any kind of printed document. Word processors are the most widely used of all software applications because they are central to communication. Whatever the type of document created with a word processing program, the essential parts of the procedure remain the same:

- Create (enter) text
- Edit the text
- Format the document
- Save and print the file

### **Desktop Publishing**

**Desktop publishing (DTP) software** allows users to create impressive documents that include text, drawings, photographs, and various graphics elements in full color. Professional-quality publications can be produced with DTP software. Textbooks such as this one may be designed and laid out with a desktop

publishing application such as *PageMaker*, *QuarkXpress*, or *Adobe InDesign*. Major word processors offer limited desktop publishing features sufficient for creating simple newsletters and brochures.

### **Spreadsheets**

**Spreadsheet software** is an electronic version of the ruled worksheets accountants used in the past. Spreadsheet software provides a means of organizing, calculating, and presenting financial, statistical, and other numerical information. Businesses find spreadsheets particularly useful for evaluating alternative scenarios. The spreadsheet uses “what if” calculations to evaluate possibilities. By entering various data values and formulas into a spreadsheet, questions can be answered quickly and accurately.

For the individual user, spreadsheets fulfill many purposes, including:

- Preparing and analyzing personal or business budgets
- Reconciling checkbooks
- Analyzing financial situations
- Tracking and analyzing investments
- Preparing personal financial statements
- Estimating taxes

### **Database Management**

In a computerized database system, data are stored in electronic form on a storage medium, such as hard or floppy disks or CDs. A **database** is a collection of data organized in one or more tables consisting of individual pieces of information, each located in a **field**, and a collection of related fields, each collection making up one **record** (see Figure 5-1). A commercial database program typically allows users to create a form for entering data. A user can design an electronic form to make entering information into the database easier. The information entered using such a form will become a record in a table. Users can add, remove, or change the stored data.

### **Presentation Graphics**

**Presentation graphics software** allows users to create computerized slide shows that combine text, numbers, animation, graphics, sounds, and videos. A **slide** is an individual document that is created in presentation graphics software. A **slide show** may consist of any number of individual slides. For example, an instructor may use a slide show to accompany a lecture to make it more engaging and informative. Microsoft PowerPoint and Corel Presentations are two popular presentation software programs.

### **Software for Household Use**

Numerous software applications designed for use in the household are available for purchase. Among the many products available are applications for managing personal finances, preparing tax returns, preparing legal documents, playing games, and education and reference.

### **Graphics and Multimedia Software**

Graphics and multimedia software allows both professional and home users to work with graphics, video, and audio. A variety of applications software is focused in this area, including painting and drawing software, image-editing software, video and audio editing software, Web authoring software, and computer-aided design (CAD) software.

## Communications Software

One of the major reasons people use computers is to communicate with others and to retrieve and share information. Communications software allows users to send and receive e-mail, browse and search the Web, engage in group communications and discussions, and participate in videoconferencing activities.

Automatic Multimedia Tagging Software  
Advances in Speech Recognition Software  
Pattern Recognition Software  
Distributed Computing

## System Software:

When you switch on the computer the programs written in ROM is executed which activates different units of your computer and makes it ready for you to work. This set of programs can be called system software. System software are general programs designed for performing tasks such as controlling all operations required to move data into and out of the computer System Software allows application packages to be run on the computer. Computer manufactures build and supply this system software with the computer system.

An **operating system** is the most important piece of software on a personal computer. The location of the operating system identifies the **boot drive** for the personal computer, which is typically the hard drive. Once started, the operating system manages the computer system and performs functions related to the input, processing, output, and storage of information, including:

Managing main memory, or RAM  
Configuring and controlling peripheral devices  
Managing essential file operations, including formatting or copying disks, and renaming or deleting files  
Monitoring system performance  
Providing a user interface

## Windows

**Windows 2000 Professional** Windows 2000 Professional, introduced in late 1999, was designed for use with business computers and was the successor to Windows 98 for office environments. Incorporating the power of Windows NT, Windows 2000 Professional was used to link

**Windows XP Professional** Microsoft's **Windows XP** Professional was designed for the latest computers that are fast, powerful, and have lots of memory and hard disk space. It combined the more powerful features of Windows 2000 and Windows NT and included many cosmetic changes. Windows XP contained many new and improved features and was extremely user-friendly. Icons had a three-dimensional look, and provided impressive features for managing photo and music files. It was the first Windows version to be copy-protected.

**Windows Vista** **Windows Vista**, released in 2007, improves and expands on Windows XP's capabilities. It provides much more robust security features than any earlier version. The centerpiece of this security system is **User Access Control (UAC)**, a protection system that prompts the user for administrator-level credentials whenever an operation is attempted that might affect system stability or security in some way. Home networking is easier than ever with Windows Vista.

## Macintosh Operating System

The Macintosh, the first commercial GUI, was originally released in 1984 and has been updated many times since. It included a virtual desktop, pull-down menus, dialog boxes, and icons representing common commands and programs. With its impressive graphics and ease of use, it quickly became the model for other GUIs.

## OS/2

IBM's **OS/2** GUI operating system was the company's response to the popularity of Microsoft Windows and the Apple Mac OS. The latest version is called OS/2 Warp. In addition to running native application programs, OS/2 can also run programs written for DOS and Windows systems.

## Linux

Linux is a UNIX-based operating system that runs on a number of computer platforms including PCs, servers, and handheld devices. The Linux kernel (the central module or basic part) was developed mainly by Linus Torvalds. Torvalds designed Linux as an **open-source software program**, which means that the developer retains ownership of the original programming code but makes it free to the general public, who is encouraged to experiment with the software, make improvements, and share the improvements with the entire user community. During recent years, many improvements and refinements have been made rendering Linux an extremely popular and functional operating system for both large and small computers.

## Server Operating Systems

Some operating systems are designed specifically for use with local area networks, allowing multiple users to connect to the server and to share network resources such as files and peripheral devices such as printers. The kind of operating system selected for use with a network server depends on network architecture and processing requirements.

## Novell Netware

**NetWare**, developed by Novell, Inc. during the 1980s, is a popular and widely used operating system for microcomputer-based local area networks. Network users have the option of working with or without network resources.

## Windows

Microsoft's **Windows NT Server** was one of Microsoft's earlier entries into the client/server market. It supported the connection of various peripheral devices and multitasking operations in which networked computers could process applications at the same time. Windows NT Server was replaced by Windows 2000 Server.

## UNIX

Developed in the early 1970s by programmers at Bell Laboratories, the **UNIX** operating system was originally designed for servers and large computer systems

**Linux Linux** (pronounced LIN-UKS) is one of the fastest-growing server operating systems. Linux is an open-source software program based on the UNIX operating system  
**Solaris Solaris** is a Unix-based operating environment developed by Sun Microsystems. It was originally developed to run on Sun's SPARC workstations but now runs on many workstations from other manufacturers

**Compiler: It** is a program translator that translates the instruction of a higher level language to machine language

**An interpreter** is another type of program translator used for translating higher level language into machine language. It takes one statement of higher level languages, translate it into machine language and immediately execute it.

## SOFTWARE DEVELOPMENT STEPS

### Software Development Life Cycle

The product developed which achieves customer satisfaction is not done in a single step. It involves series of steps in a software development process. This is needed to develop quality products with error free products to achieve customer satisfaction. There are many models available in the software development process.

But majority of software development process follow the model named as software development life cycle. This software develop life cycle has number of steps in it. The below article describes about the software development life cycle and the steps involved into it.

Software development life cycle model is also called as waterfall model which is followed by majority of systems. This software development life cycle process has the following seven stages in it namely

1. System Requirements Analysis
2. Feasibility study
3. Systems Analysis and Design
4. Code Generation
5. Testing
6. Maintenance
7. Implementation

Let us discuss each of these to have an overview about each of the following steps in software development life cycle.

#### **1. System Requirements Analysis:**

The first essential or vital thing required for any software development is system. Also the system requirement may vary based on the software product that is going to get developed. So a careful analysis has to be made about the system requirement needed for the development of the product. After the analysis and design of the system requirement phase the system required for the development would be complete and the concentration can be on the software development process.

#### **2. Feasibility study:**

After making an analysis in the system requirement the next step is to make analysis of the software requirement. In other words feasibility study is also called as software requirement analysis. In this phase development team has to make communication with customers and make analysis of their requirement and analyze the system. By making analysis this way it would be possible to make a report of identified area of problem. By making a detailed analysis on this area a detailed document or report is prepared in this phase which has details like project plan or schedule of the project, the cost estimated for developing and executing the system, target dates for each phase of delivery of system developed and so on. This phase is the base of software development process since further steps taken in software development life cycle would be based on the analysis made on this phase and so careful analysis has to be made in this phase.

#### **3. Systems Analysis and Design:**

This is an important phase in system development. Here analysis is made on the design of the system that is going to be developed. In other words database design, the design of the architecture chosen, functional specification design, low level design documents, high level design documents and so on takes place. Care

must be taken to prepare these design documents because the next phases namely the development phase is based on these design documents. If a well structured and analyzed design document is prepared it would reduce the time taken in the coming steps namely development and testing phases of the software development life cycle.

#### **4. Code Generation:**

This is the phase where actual development of the system takes place. That is based on the design documents prepared in the earlier phase code is written in the programming technology chosen. After the code is developed generation of code also takes place in this phase. In other words the code is converted into executables in this phase after code generation.

#### **5. Testing:**

A software or system which is not tested would be of poor quality. This is because this is the phase where system developed would be tested and reports are prepared about bugs or errors in system. To do this testing phase there are different levels and methods of testing like unit testing, system test and so on. Based on the need the testing methods are chosen and reports are prepared about bugs. After this process the system again goes to development phase for correction of errors and again tested. This process continues until the system is found to be error free. To ease the testing process debuggers or testing tools are also available.

To develop reliable and good quality Program/Software we need to follow the following 5 steps :

Requirement Specification.

Analysis.

Design.

Implementation.

Verification and testing.

### **INTERNET EVOLUTION**

The Internet is a network of networks. Computer users on the Internet can contact one another anywhere in the world .In Internet a huge resource of information is accessible to people across the world .Information in every field starting from education, science, health, medicine, history, and geography to business, news, etc. can be retrieved through Internet .You can also download programs and software packages from anywhere in the **world** .In 1969 Department of Defense (DOD) of USA started a network called ARPANET (Advanced Research Projects Administration Network ) . Around 1970, NSFNET (National Science Foundation Network) was created. With the advancement of modern communication facilities. By 1990 many computers were looking up to NSFNET giving birth to Internet .Internet is not a governmental organization. The ultimate authority of the Internet is the Internet Society. This is a voluntary membership organization whose purpose is to promote global information exchange. Internet has more than one million computers attached to it. Ten years of research brought Local Area Ethernet Networks (LANs) and workstations were developed to get connected to LAN. Computers connected to ARPANET used a standard or rule to communicate with each other with NCP (National Control Protocol). Protocol is a network term used to indicate the standard used by a network for communication. Rapid change in information technology suppressed NCP and brought TCP/IP (Transmission Control Protocol/Internet Protocol) in to the world of networking. The Internet is a rare example of a large democracy with no state of head, no official censors, no bosses, no board of directors. Nobody controls the Internet and in principle, any computer can speak to any other computer, as long as it obeys the technical rules of the TCP/IP protocol. This freedom of Internet helped it to move out of its original base in military and research institutions, into elementary and high schools, colleges, public libraries, commercial sectors.

## BASIC INTERNET TERMINOLOGY

**Blog** - A **blog** is information that is instantly published to a Web site. Blog scripting allows someone to automatically post information to a Web site. The information first goes to a blogger Web site. Then the information is automatically inserted into a template tailored for your Web site.

**Bookmark** - a way of storing your favorite sites on the Internet. Browsers like Netscape or Internet Explorer let you to categorize your bookmarks into folders.

**Browser** - A software program that allows users to access the Internet. Examples:

**Non-graphical** a user interface for computers which allows you to read plain text, not pictures, sound, or video, on the Internet. It is strictly text based, non-Windows, and does not place high memory demands on your computer. An example is **lynx** (<http://lynx.browser.org/>)

**Graphical** a user interface for computers which enables people to see color, graphics, and hear sound and see video, available on Internet sites. These features are usually designated by underlined text, a change of color, or other distinguishing feature; sometimes the link is not obvious, for example, a picture with no designated characteristic. Examples are **Netscape** and **Internet Explorer**.

**CGI (Common Gateway Interface script)** - a specification for transferring information between a Web server and a CGI program, designed to receive and return data. The script can use a variety of languages such as C, Perl, Java, or Visual Basic. Many html pages that contain forms use a cgi program to process the data submitted by users/clients.

**Chat** - real-time, synchronous, text-based communication via computer.

**Cookie** - Information (in this case URLs, Web addresses) created by a Web server and stored on a user's computer. This information lets Web sites the user visits to keep of a user's browsing patterns and preferences. People can set up their browsers to accept or not accept cookies.

**Domain Name** - A method of identifying computer addresses. Your e-mail address has a domain address. If you have an "edu" at the end of your e-mail address that means your account is affiliated with an educational institution. A "com" extension means you have a business account. A government account has a .gov suffix.

**FTP** - Using file transfer protocol software to receive from (upload) or send to (download) files (text, pictures, spreadsheets, etc.) from one computer/server to another.

**Home page** - Generally the first page retrieved when accessing a Web site. Usually a "home" page acts as the starting point for a user to access information on the site. The "home" page usually has some type of table of contents for the rest of the site information or other materials. When creating Web pages, the "home" page has the filename "index.html," which is the default name. The "index" page automatically opens up as the "home" page.

**HTML** - A type of text code in Hypertext Markup Language which, when embedded in a document, allows that document to be read and distributed across the Internet.

**HTTP** - The hypertext transfer protocol (http) that enables html documents to be read on the Internet.

**Hypertext** - text that is non-sequential, produced by writing in HTML (**Hypertext Markup Language**) language. This HTML coding allows the information (text, graphics, sound, video) to be accessed using HTTP (**Hypertext Transfer Protocol**).



**Hyperlink** - Text, images, graphics that, when clicked with a mouse (or activated by keystrokes) will connect the user to a new Web site. The link is usually obvious, such as underlined text or a “button” of some type, but not always.

**Instant Messaging (IM)** - a text-based computer conference over the Internet between two or more people who must be online at the same time. When you send an IM the receiver is instantly notified that she/he has a message.

**IP Address** - (Internet Protocol) The number or name of the computer from which you send and receive information on the Internet.

**Modem** - A device that connects your computer to the Internet, when you are not connected via a LAN (local area network, such as at work or on a campus.) Most people connect to a modem when using a home computer. The modem translates computer signals to analog signals which are sent via phone lines. The telephone “speaks” to the computer/server which provides your Internet access.

**URL** - A universal resource locator (a computer address) that identifies the location and type of resource on the Web. A URL generally starts with “http.”

**Intranet:** It is a relatively smaller private network that uses the Internet protocols and connectivity. It is an extension of the Internet and is privately used by organizations.

**Web Server:** A web server is a computer program that accepts HTTP requests from web clients and provides them with HTTP responses.

**IP Address:** It is a way of numerically identifying an entity on a computer network. The original addressing system known as IPv4, used 32 bit addresses. With the growth of the Internet, IPv6 came to be used wherein the addresses are composed of 128 bits. You might want to know [how to find your IP address](#).

**Internet Service Provider:** A company, which provides users with an access to the Internet, is known as an Internet service provider or Internet access provider. ISP, as it is called, offers email accounts and other services like remote storage of files for its customers. Here is a word about choosing a [cheap ISP](#).

## Internet Address

Every page on the Internet has a unique address. This address is used get the web page for user from Internet. The address on the Internet is known as URL (Uniform Resource Locator). A typical Internet address or URL would look like; <http://www.mans.edu.eg/facscim/arabic/>. The URL contains the components that specify the protocol, server, and pathname of an item

## URL parts

The protocol is followed by a colon (**http:**),

The server is preceded by two slashes (**//www.mnmjec.edu**.)

Each segment of the pathname is preceded by a single slash **/facscim/ /english/Tables/Default.htm**).

A protocol is set of rules that tells the computer know how to interpret the information at that address

The first component, the protocol, defines the manner for interpreting computer information.

Many Internet pages use **HTTP (HyperText Transfer Protocol)**. Other common Internet protocols that one might come across are **FTP (File Transfer Protocol)**,

**NEWS** (Usenet news groups protocol), and **GOPHER** (an alternative transfer protocol). Gopher protocol is mostly out of date now. The second component, of the address is the server (**www.mnmjec.edu**), identifies the computer system that stores the information you seek and is always preceded by two slashes.

A server is a computer that has information stored on it and sends it to the client, when a request is made. Each server on the Internet has a unique address name whose text refers to the organization maintaining the server. Most of the Web pages will have **.htm** or **.html** as their secondary or extension name.

## GETTING CONNECTED TO INTERNET APPLICATIONS

### **Types of Internet Connections**

There are two main ways for users to connect to the Internet: through dial-up access or by using a LAN connection.

**Dial-up Access** Dial-up access allows access to the Internet over a standard telephone line by using a computer and a modem to dial into an ISP or VAN connection. Dial-up access is a feature typically included with the software provided by an ISP. Using a regular telephone line is usually the slowest telecommunications medium for setting up an individual Internet account through a dial-up ISP.

**Local Area Network (LAN) Connection** LAN connections provide faster and more direct Internet access by connecting users to an ISP on a direct wire, at speeds 30 or more times faster than can be achieved through a dial-up modem. Because they are more expensive than dial-up access, LAN connections are more commonly found in the workplace. Despite the increased cost there are approximately forty million LAN users in the United States using cable and DSL connections to connect from their homes.

**Cable Modem** Television cable companies provide a special modem and software for broadband (high-speed) Internet access. This service offers the advantage of simultaneous Web access and telephone calls, but is not available everywhere. In addition, the service slows down as more subscribers sign up in a neighborhood or location. The cost is about \$50 monthly, plus a possible installation fee.

**Digital Subscriber Line (DSL)** DSL Internet service is as fast as cable modem and provides simultaneous Web access and telephone use, but the service is usually available only to users within three miles of the telephone carrier's central switching office. The line is dedicated to one household, and is not shared with neighbors. DSL service costs around \$50 monthly, plus an installation fee.

**Wireless** The fastest growing segment of Internet service involves wireless connections to the Internet. Thousands of Wireless "hot-spot" portals are springing up, allowing access in public places and even aboard airplanes.

#### **(i) Gateway Access**

Gateway Access is also known as Level-One connection. It is the access to the Internet from a network, which is not on the Internet. The gateway allows the two different types of networks to "talk" to each other. But the users of the Gateway Internet have limited access to the Internet. They might not be able to use all the tools available on Internet. The local Internet Service Provider (ISP) normally defines this limitation.

#### **Dial-up Connection**

'Dial-up' connection is also known as Level Two connection. This provides connection to Internet through a dial-up terminal connection. The computer, which provides Internet access is known as 'Host' and the computer that receives the access, is 'Client' or 'Terminal'. The client computer uses modem to access a "host" and acts as if it is a terminal directly connected to that host. This type of connection is also known as 'Remote Modem Access' connection. And the host to which the client gets connected is actually connected to the Internet by a full time connection (See Leased Connection). In dial-up connection to Internet, Host carries all the command that are typed on a client machine and forward them to Internet. It also receives the

data or information from the Internet on behalf of the 'Client' and passes it to them. The client computer acts as a 'dumb' terminal connected to remote host. This type of connection can further be divided into two categories.

### **Shell Connection**

In this type of Internet Connection, the user will get only textual matter of a Web Page. This connection does not support Graphics display. However the user will be able to surf the Internet, do FTP, receive mail. Shell Accounts were the only type of Internet access available for many years before the Internet entered in to the world of graphics and became more users friendly.

### **TCP/IP Connection**

Today's graphical World Wide Web browsers provide easier access with multimedia sound and pictures. The major difference between Shell and TCP/IP account is that, Shell account can only display text and does not support graphics display, whereas TCP/IP can display both. Hence it is more popular Internet connection. Shell accounts are slowly phasing out from the Internet scenario.

### **To access any of these dial-up accounts you need the followings;**

Computer, WebTV, personal digital assistant (PDA), or Web phone  
Dial-up modem, digital subscriber line (DSL) modem, or cable modem  
Telephone line or cable connection  
Telecommunications software  
Web browser  
An account with an Internet Service Provider (ISP)

### **Leased Connection**

Leased connection is also known as direct Internet access or Level Three connection. It is the secure, dedicated and most expensive, level of Internet connection. With leased connection, your computer is dedicatedly and directly connected to the Internet using high-speed transmission lines. It is on-line twenty-four hours a day, seven days a week. Leased Internet connections are limited to large corporations and universities who could afford the cost.

### **Newer Internet Applications**

Not only does the content of the Internet change daily, but they very way in which the Internet is used and understood as a communication medium is constantly evolving.

### **Peer-to-Peer File Sharing**

Peer-to-Peer (P2P) file sharing allows people to download material directly from other users' hard drives, rather than from files located on Web servers. Napster is famous for pioneering P2P file sharing.

### **Internet Telephony**

Internet telephony is another increasingly popular way to use the Internet. By using this technology, also called **Voice over IP (VoIP)**, two or more users with sufficiently good connections can use the Internet to make telephone calls around the world. Once their voices are digitized and broken down into packets, they can be transmitted anywhere, just like any other form of data. There are no long distance telephone charges, and users only pay their normal ISP connection fees.

### **Streaming Audio and Video**

An alternative to downloading a piece of music or video is to access it using **streaming techniques** (also known as webcasting). Streaming sends a continuous stream of data to the receiving computer, where it is immediately displayed. Old data is erased as new data arrives.

### **Webcams**

Tiny video cameras called **webcams** allow conversations over the Web through live video transmission. Often mounted on top of a computer monitor, the cameras automatically create and transmit video to the PC. Despite the fact that the images are a bit grainy and jerky, millions are in use. As the technology improves, their popularity is sure to increase even further.

### **Audio Mail**

**Audio mail** is a fledgling type of electronic mail that allows people to transmit messages by voice. As with e-mail, attachments can be included. The technology can be compared to voice mail, without telephone charges.