4th class

Web programming

برمجة المواقع

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<u>**٢٠١١-٢٠١٠**</u>

1.1: History of the Internet and World Wide Web:

In the late 1960s, one of the others was graduate student at MIT. His research at MIT's Project MAC was funded by ARPA --- the Advanced Research Projects Agency of the department pf defense. ARPA sponsored a conference at which several dozen ARPA---funded graduate students were brought together at the University of Illinois at Urbana-Champaign to meet the share ideas. During this conference ARPA, rolled out the blueprints for networking the main computer systems of about a dozen ARPA-funded universities and research institutions. They were to be connected with communications lines operating at then –stunning 56 Kbps (i.e., 56,000 bits per second)—this at a time when most people (of the few who could) were connected over telephone lines to computers at a rate of 10 bits per second. There was great excitement at the conference. Researchers at the Harvard talked about communicating with the Univac1108 "supercomputer" at the University of Utah to handle calculations related to their computer graphics research. May other intriguing possibilities were raised. Academic research about to take giant leap forward. Shortly after this conference, ARPA proceeded to implement the ARPANET, which eventually evolved into today's *Internet*.

Things worked out differently from what was originally planned. Rather than enabling researches to share each other's computers, it rapidly become clear that enabling researches to communicate quickly and easily

via what become known as *electronic mail* (w-mail for short) was the key benefit for the ARPANET. This true even today on the Internet, as e-mail facilities communications of all kinds among a billion people worldwide.

One of the primary goals of the ARPANET was to allow multiple users to send and receive information simultaneously over the same communications path (e.g., phone lines). The network operated with a technique called packet switching, in which digital data was sent in small bundles called packets. The packets contained address, error-control and sequencing information. The address information allowed packets to be routed to their destinations. The sequencing information helped in reassembling the packets - which, because of complex routing mechanisms, could actually arrive out of order - into their original order for presentation to the recipient. Packets from different senders were intermixed on the same lines. This packet-switching technique greatly reduced transmission costs, and compared with the cost of dedicated communications lines.

The network was designed to operate without centralized control. If a portion of the network failed, the remaining working portions would still route packets from senders to receivers over alternative paths for reliability.

The protocol for communicating over the ARPANET became known as *TCP* (the *Transmission Control Protocol*). TCP ensured that messages were properly routed from sender he Internet evolved, organizations worldwide were implementing their own networks for both intra-organizations (i.e., within the organization) and inter-organization (i.e., between organization) communications. A wide variety of

networking hardware and software appeared. One challenge was to get these different networks to communicate. ARPA accomplished this with development of *IP* (the *Internet Protocol*), truly creating a "*network of networks*", the current architecture of Internet. The combined set of protocols s now commonly called *TCP/IP*.

Initially Internet use was limited to universities and research institutions; then the military began using the Internet. Eventually, the government decided to allow access to the Internet for commercial purposes. Initially, there was resentments in the research and military communities - these groups were concerned that response times would become poor as "the Net" become saturated with uses.

In fact, the exact opposite occurred. Businesses rapidly realized their clients, so they started spending vast amounts of money to develop and enhance the Internet. This generated to meet this demand. The result is that bandwidth (i.e., the information carrying capacity) on the Internet has increased tremendously and costs have decreased significantly.

The World Wide Web allows computer users to located and view multimedia-based documents on almost any subjects over the Internet. Thought the Internet was developed decades ago, the web is a relatively recent creation. In 1989, Tim-Berners-Lee of CERN (the European Organization for Nuclear Research) began to develop a technology for sharing information via hyperlinked text documents. Berners-Lee called his invention the HyperText Markup Language (HTML). He also wrote communication protocols to form the backbone of his new information system, which he called the World Wide Web. In particular, he wrote the HyperText Transfer Protocol (HTTP) – a communications protocol used

to send information over the web. Web use exploded whit the availability in 1993 of the Mosaic browser, which featured a user-friendly graphical interface. Marc Andreessen, whose team at NCSA developed Mosaic, went on to found Netscape, the company that many people credit with initiating the explosive Internet economy of the late 1990's.

In the past, most computer applications ran on computers that were not connected to one another, whereas today's applications can be written to communicate among the world's computer. The Internet mixes computing and communications technologies. It makes our work easier. It makes information instantly and conveniently accessible worldwide. It enables individuals and small businesses to get worldwide exposure. It is changing service. Special-interest communities can stay in touch with one another. Researchers can be made instantly aware of the latest breakthroughs. The Internet and the web are surely among humankind's most profound creations.

1.2: Internet Technology and Architecture

The Internet began as a small group of interconnected LANs and has grown into a world-wide network that spans many thousands of networks and millions of computers. The Internet really is nothing more than a huge wide area networks. It is one of the fastest growing sources of information and a large computer network of networks all connected together and sharing resources and information. No one actually know how many web pages are actually out there – last count was about 4 billion – but this number changes daily even hourly.

1.2.1 Internet and services:

DEFINTION: INTERNET

A Worldwide network of computer and data communications equipment connected by routers that are configured to pass traffic among any computers attached to network.

The Internet is now available to nearly every household in the world. It has enabled us to communicate with anyone else on the Internet—no matter what his or her physical location—in seconds and at virtually no cost. It has enabled us to find information that would otherwise be time-consuming, difficult, or impossible to locate. It has enabled us to shop and buy without leaving home. Traditionally, the Internet had several main applications:

1. E-mail.
2. Newsgroup.
3. E-commerce.
4. E-government.
5. E-learning.

All computers in the Internet communicate with each other using a certain standard or protocols, in this case the Transmission Control Protocol/Internet Protocol (TCP/IP). This protocol allows computer to share files and services.

1.2.2 Internet Protocols

Protocols are the rules that describe how clients and servers communicate across a network. The Internet also had its own protocols; these protocols are as the following:

1. TCP/IP Protocol

TCP/IP was the first set of protocols developed for use in an internet. TCP and IP are two separate protocols through, where TCP relies heavily on IP, but where TCP can be replaced easily with some other protocol such as UDP.

- **TCP**

TCP is a protocol that (together with IP) provides a flow-controlled delivery and a guaranteed full duplex channel between two hosts. This is much like what a telephone does. When packets are not received well, or not at all, TCP itself takes care of retransmission. This reliability without programmer intervention is why most protocols are TCP, and not UDP, based.

- **IP**

IP takes care of low level addressing and transport of data packets over a multi-subnet network. The IP protocol itself is useless without one of it's peers, TCP, UDP, or ICMP. UDP is a datagram protocol that can send a message to certain port on a certain computer without any guaranty of arrival. Its biggest use can be found in multimedia uses such broadcasting, where retransmission is no real option. ICMP is the control protocol that used by IP for internal purpose.

2. Hypertext Transfer Protocol (HTTP)

This Protocol is used to transfer Web pages that written in the HTML language from Web server to a client (commonly called a browser). HTTP requires a client program on one end (a browser) and a server on the other. Both end running TCP/IP protocols.

3. File Transfer Protocol (FTP)

Most widely-deployed Internet file transfer service uses the FTP. This protocol is a general-purpose protocol that can be used to copy an arbitrary file from one computer to another. It includes a mechanism that allows files to have ownership and access restrictions. More important, because it hides the details of individual computer systems, FTP accommodates heterogeneity.

4. Simple Mail Transfer Protocol (SMTP) and Post Office Protocol (POP)

These tow protocols are involved in E-mail. E-mail may sent to other users with SMTP, and received from the mail server with POP. SMTP is the Internet standard protocol for transferring electronic mail messages from one computer to another and, POP is a program that adheres to the internet protocol of the same name, and that resides on the server where a mail account is located, it function to receive mail.

5. Telnet

The Internet standard protocol for remote terminal connection service. Telnet requires two arguments: the name of a computer on which the server runs and the protocol port number of the server.

1.2.3 Internet working

The Internet is decentralized; that is, when a client is connected to one Internet workstation, the entire Internet will be connected to by the client.

Internet communication is made possible by the (TCP/IP) protocol on the computer. This protocol sends information to the connected computer, which then passes information onto other computers until it reaches the destination. TCP/IP protocol does not have a map of the entire Internet, and does not know the route sent the transmission will take. Figure 2-1, can illustrates well that there are numerous possible routes between any two workstations; in essence, all paths through the Internet lead to the specified destination.
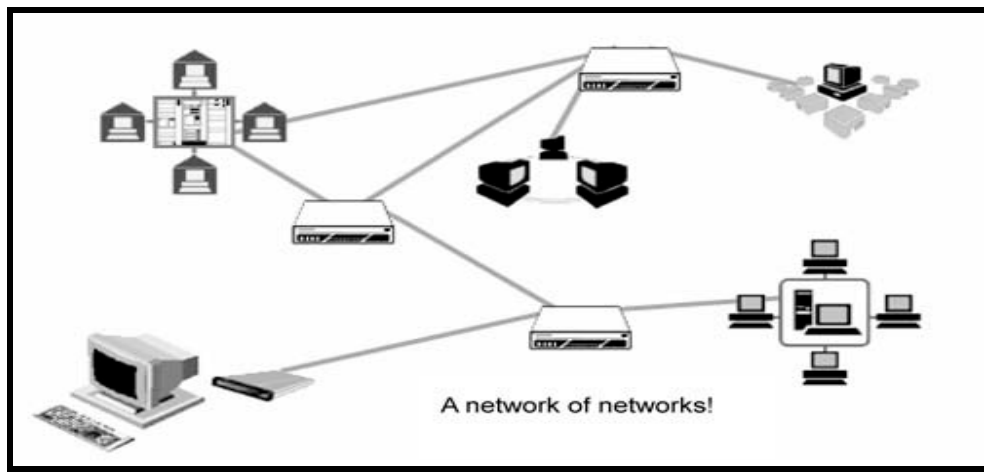

Figure 1-1 Multiple Connections among hosts

The message breaks into **packets** of information (*each packet includes the ship-to address*) and sends each packet separately. If a packet is lost, the entire transmission does not need to be repeated; the TCP/IP process simply resends the missing packet. If one of the connections between two computers is not working, there is no need for all computers on the Internet to be informed; the nearby computers simply stop using that route until the connection is repaired. The Internet protocol recognizes the damage and routes around it. The routing flexibility of TCP/IP protocol assures an accurate and steady flow of information, regardless of any one user's connection.

Businesses with solid Internet connections and good providers thrive in this environment. If a connection is lost, a site need only arrange a connection with any other Internet site.

Another assurance provided by the routing flexibility of the TCP/IP software is that censorship is almost impossible. An Internet site administrator may decide not to receive or transmit information to and from a particular site, but the information will be continue to be accessible to other Internet users as long as there is a path around the censoring site. The Internet interprets censorship as a damaged connection, and routes around it. This design decision to ensure a continuous flow of information was made when the Internet was much smaller and consisted of a group of like-minded people and organizations.

To be the idea of how the Internet is work and how it is connected clear, it is very important to know the role of the most main parts, Browser, Provider, server and router:

1: The Browser's Role

The first step in Internet communications is when the browser calls a program to make a dial-up connection to the local ISP access number. The browser accesses the modem and instructs it to dial the number specified in the Dial-Up Networking settings. The modem dials and establishes a physical connection (an electronic signal that goes from the source modem to the destination modem) to the ISP modem.

Once the physical connection is established, the communications program establishes a software connection based on specific communications protocols.

2: The Provider's Role

In the second step of the communication process, a server on the provider's end runs a program that constantly checks for incoming calls. These programs are called daemons. When a call is received, the server establishes the connection. Because of the huge amount of traffic a provider has to handle, the server that the user end connects to may only have the job of maintaining the communications link. This server may then route each asked task to perform to specialized servers that handle specific tasks, such as e-mail or a Web page request. Most likely the request may be asked for a Web page by name, like www.phunmen.com.

The provider translates this physical name into an Internet protocol type name. For example, 208.234.16.25 is the same as www.cintronics.com. Once the numerical Internet address obtained routing can be start.

3: The Router's Role

The Internet has a lot of routers on it. These routers use the numeric address to route traffic from source to destination and back. In fact, messages do not always get routed all together. They are broken up into pieces and these pieces do not necessarily all follow the same path to get to their destination, but they do get there. At times the user may wait until the browser says it cannot establish a connection with the server. In this case, it could be that the server is down or simply that the reply is taking too long because of a traffic jam.

4: The Server's Role:

The final step is the destination server. This is set up much like the server at ISP. It runs programs that wait to receive, or listen for, an incoming request. When this occurs the destination server sets up a connection, delivers the requested information, and terminates the connection with the ISP server. This all happens very fast.

1.2.4 IP Address

The original creators of the Internet recognized the need for a flexible addressing system powerful enough to accommodate the enormous number of current and future users.

DEFINITION: IP ADDRESS

IP means Internet Protocol. It is a unique 32-bit binary number assigned to a host and used for all communication with the host.

Internet addresses are also referred to as dotted quads, because the series of numbers is broken into four segments. A sample IP address is 204.115.34.10. Each of the four numbers in an IP address is between 0 and 255. Some number values are reserved, but there are roughly 256.256.256.256 different IP addresses possible --- approximately 4 billion.

Nevertheless, there are not enough IP addresses for every one who wants to join the Internet community. Since commercial enterprises have become involved, IP address demand has quadrupled. Many companies reserve entire blocks of IP addresses to simplify connecting their Local Area Network (LAN) to the Internet.

1.2.5 Uniform Resource Locator

The Uniform Resource Locator (URL) is used to identify an exact page of information on the World Wide Web, and it can be broken down into five parts. Figure 1-2 illustrates these parts

The structure of a URL is   *Protocol://host/path/filemane.extension*

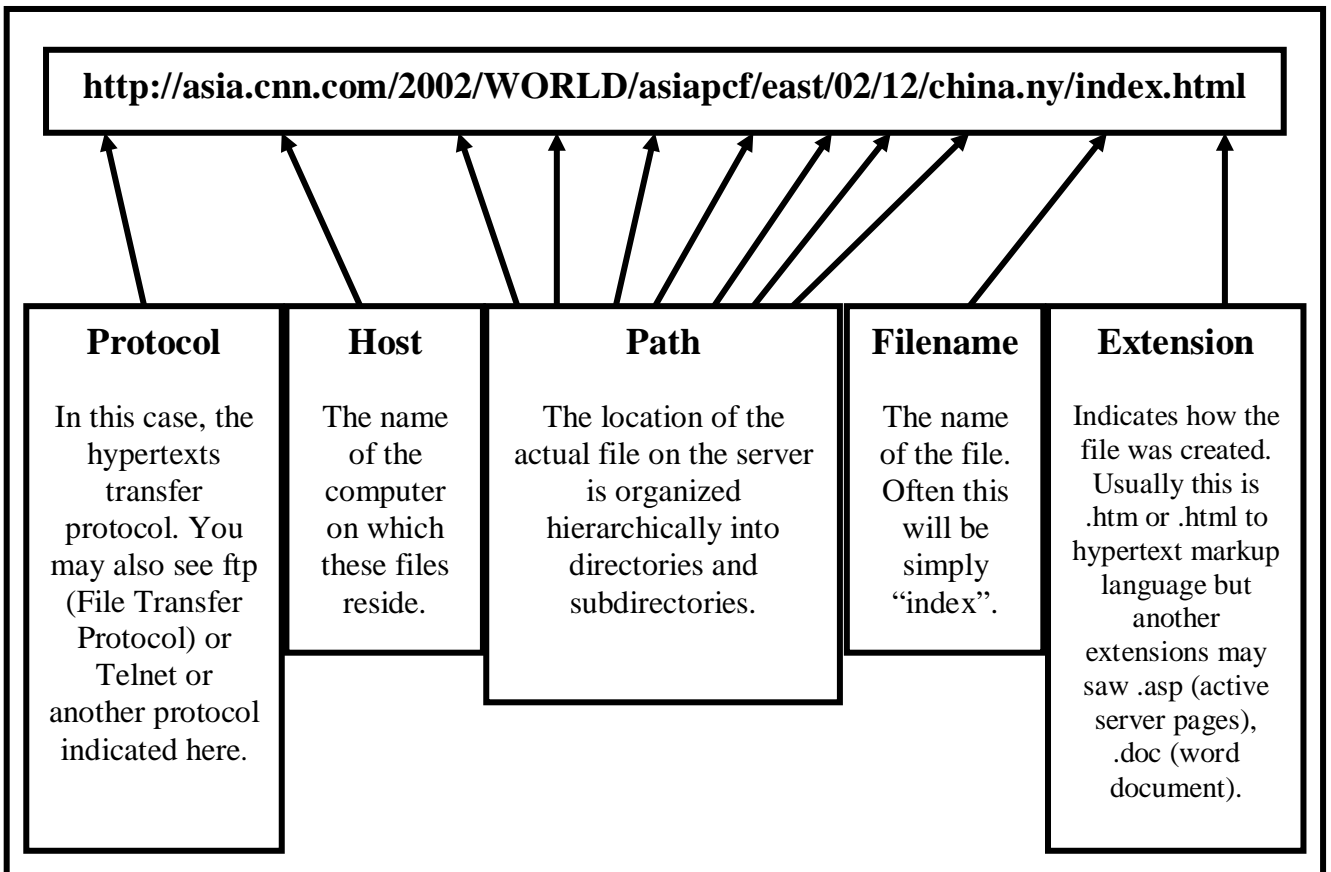| Protocol	Host	Path	Filename	Extension
http://asia.cnn.com/2002/WORLD/asiapcf/east/02/12/china.ny/index.html				
In this case, the hypertexts transfer protocol. You may also see ftp (File Transfer Protocol) or Telnet or another protocol indicated here.	The name of the computer on which these files reside.	The location of the actual file on the server is organized hierarchically into directories and subdirectories.	The name of the file. Often this will be simply "index".	Indicates how the file was created. Usually this is .htm or .html to hypertext markup language but another extensions may saw .asp (active server pages), .doc (word document).

Figure 1-2 the structure of the URL

To find a web page, an address or URL can be entered into the browser and go directly to the web page. URL specifies the Internet address of a file or page stored on the web server. Every file on the Internet has a unique URL.

1.2.6 Domain Name System

The naming scheme used in the Internet is called the *Domain Name System (DNS).* Syntactically, each computer name consists of a sequence of alpha-numeric segments separated by periods. For example, a computer in the Computer Science Department Purdue University has the domain name:

mordred.cs.purdue.edu

Domain names are hierarchical, with most significant part of the name on the right. The left-most segment of the name (mordred in the example) is the name of an individual computer. Other segments in the domain name identify the group name of a university.

The domain name system neither does specifying an exact number of segments in each name nor does it specify what those segments represent. Instead, each organization can choose how many segments to use for computers inside the organization and what those segments represent. The domain name system does not specify values for the most significant segment, which is called the *Top-level* of the DNS.

Top-level domain names are the character extensions (2 or more letters) at the end of a web address. Usually, they will indicate something about who put this page up on the web. Not all top- level domain names, however, are strictly regulated, so that a .org extension often means a non-profit organization but not necessarily.

Table 1.1 Top-Level Domains	
DOMAIN	**MEANING**
.edu	Educational institutions, usually college or university
.gov	U.S. Government web pages
.com	Commercial sites
.net	Internet service provider
.org	Non-profit organization

When an organization wants to participate in the domain name system, the organization must apply for a name under one of the existing top-level domains. Most corporations choose to register under the .com domain for example; a corporation named Foobar might request to be assigned domain *foobar* under the top-level domain *com*. If it approves the request, the Internet authority responsible for domain names will assign Foobar Corporation the domain:

foobar.com

Once an organization has been assigned a domain, the suffix is reserved for the organization- no other organization will be assigned the same name suffix. For example, once *foobar.com* has been assigned, another organization named Foobar could apply for *foobar.edu* or *foobar.org* but not *foobar.com*.

A Domain Name System (DNS) translates the dotted quad IP addresses into easily recognizable server names. For example, ICII has a web server at HYPERLINK "http://www.icii.ie" www.icii.ie, which can also reached through 193.120.211.43. Both the name and the dotted quad refer to the same Web server. But the former is much easier to remember. Without DNS, end users would be forced to enter long numerical string every time access was needed to any part of the Internet [10].

1.3: World Wide Web Consortium (W3C):

In October 1994, Tim Berners-Lee founded an organization called the World Wide Web Consortium (W3C) – devoted to developing nonproprietary, interoperable technologies for the World Wide Web. One of the W3C's primary goals is to make the web universally accessible – regardless of ability, language or culture. The W3C home page (www.w3c.org) provides extensive resources on Internet and web technologies.

The W3C is also standardization organization. Web technologies standardized by the W3C are called Recommendations. W3C Recommendations include the Extensible HyperText Markup Language (XHTML), Cascading Style Sheets (CSS), HyperText Markup Language (HTML – now considered a "legacy" technology) and the Extensible Markup Language (XML). A recommendation is not an actual software product, but a document that specifies a technology's role, syntax rules and so forth.

1.4: Web 2.0:

In 2003, there was a noticeable shift in how people and business were using the web and developing web-based applications. The term Web 2.0 was coined by Dale Dougherty of O'Reilly® Media in 2003 to describe this trend. Although it became a major media buzzword, few people really know what Web 2.0 means. Generally, Web 2.0 companies use the web as a platform to create collaborative, community-based sites (e.g., social networking sites, bloges, wikis, etc.).

Web 1.0 (state of the web through the 1990s and early 2000s)was focused on a relatively small number of companies and advertisers producting content for users to access (some people called it "broucher web"). Web 2.0 involves the user – not only is the content often created by the users, but users help organize it, share it, remix it, critique it, update it, etc. once away to look at web 1.0 is as a lecture, a small number of professorsinforming a large audience of students. In comparison, web 2.0 is as conversation, with every one having the opportunity to speak and share views.

Web 2.0 is providing new opportunities and connecting people and content in unique ways. Web 2.0 embaraces an achitecture of perticipation – a design that encourages user interaction and community contributions. The users are the most important aspect of Web 2.0 – in fact, several blogs now compete entirely on user-generated content. For websites like Myspace®, Facebook®, Flickr®, YouTube®, eBay®, and Wikipedia®, users craet the content, while the companies provide the platforms. These companies trust their users – without such trust, users cannot make significante contributions to the sites.

The architecture of the participation has influenced software development as well. Open source sofware is available for any one to the use and modify with few or no restrictions. Using collective intelligence – the concept that a large diverse group of people will creat smart ideas – communities collaborate to develop software that many people believe is better and more robust than proprietary sofware. Rich Internet Applications (RIAs) are being developed using technologies (such as Ajax) that have the look and feel of desktop software, enhancing user's overall experience. Software as a Service (SaaS) – software that suns on a server instead of a local computer - has also gained promunence because of sophisticated new technologies and increased broadban Internet access.

Search engines, including GoogleTM, Yahoo! ®, MSN ®, Ask TM, and many more, have become essential to sorting through the massive amount of content on the web. Social biikmarking sites such as del.icio.us and Ma.gnolia allows users to share their favorite sites with othrs. Social media sites such as Digg TM, Soptplex TM, and Netscape ® enable the community to decide which news articles are the most significant. The way we find information on these sites is also changing – people are tagging web content by subject or keyword in a way that helps anyone locate information more effecitvly.

Web service have emerged and, in the process, have inspired the creation of many Web 2.0 businesses. Web services allow you to incoperate functionality from existing applicatios and websites into your own web applications quickly and easily. For example, using Amazon Web Services TM, you can create a specialty bookstore and earn revenues through the Amazon Associates Program; or, using Google TM Maps web services with eBay web saervices, you can build location-based "mashup" applications to find auction item in certain geographical areas. Web Services, inexpensive computers, abundant highspeed Internet access, open source software and many other elements have inspired new, exciting, lightwieght business models that people can launch with only a small investment. Some types of websites with rich and robust functionality that might have required hundredsof thousands or even millions of dollars to build in the 1990s can now be built for nominal amounts of money.

Nowadays, we see computers learn to understand the meaning of the data on the web – the beginning of the Semantic Web are already appearing. Continual improvements in hardware, software and communications technologieswill enable exciting new types of applications.

1.5: Personal, Distributed and Client / Server Computing:

In 1977, Apple Computer populaized personal computing. Computers become so economical that people could buy them for their own personal or business use. In 1981, IBM, the world's largest computer vender, introduced the IBM Personal Computer. This quickly legitmized personal computing in business, indusrty and government organizationswhere IBM maniframes were heavily used.

These computers were for the most part "stand-alone" units – people transported disks back and forth between them to shate information (thia was often called "sneakernet"). Althogh early personal computers were not powerful enough to time share several users, these machines could be linked together in computer networks, sometimes over telephone lines and sometimes in local area networks (LANs) within an organization. This led to the phenomenon of distibution computing, in which an organization's computing instead of being performed only at some central computer installation, is distibuted over networks or the sites where the organization's work is performed. Personal computers were powerful enough to handle the computing requirements to individual users as well as the basic communications tasks of passing information between computers electronically.

Today's personal computers are as powerful as the million-dollar machines of just a few decades ago. The most powerful desktop machines – called workstations – provide individual users with enomous capabilities. Information is share easily across computer networks, wjere computers called servers (file servers, database servers, web srevers, etc.) offer data storage and othe capabilities that may be used by client computers distibuted thrightout the network, hence the tr\erm client / server computing. Today's popular operating systems, such as UNIX,

Lnux, Mac OS X and Microsoft's Window-based sustems, provide the kinds of capabilities.

1.6: Client/Server Technique

Most businesses operate Client/Server systems. In a client/server environment, programs run on many desktops at once and interact with a server program that runs on a single central computer. So, if the user is on a computer network, its workstation is the client, and the network file server is the server. A common misconception is that client/server systems are a relatively recent innovation. In fact, the Internet is client/server system that has been in use since 1968. This strong embrace of the Internet by businesses needing to transmit large files, or many small files, is filling the limited Internet bandwidth quickly. Client programs conserve bandwidth by processing information locally before sending it out to the network [10, 20].

The special thing that makes client/server a term worth remembering is that it describes the concept in software in which a running program on the end-user workstation called a client, which communicates with a program running on the server, again called a server. These two programs are made to work with each other. For example, it can be there a client/server database in which the client and server work together to maximize the speed and accuracy of data access and updates.

Server: is becoming a term used for too many things. A server can be a computer that holds files in a central location, delivering up information when requested. A server can be a program running on a server computer. A server can be a program that interfaces with a client program. A server can be a waiter [20].

1.7: Hardware Trends

The Internet community thrives on the continuing stream of academic improvements in hardware, software and communications technologies. In general, people expect to pay at least a little more for most products and services every year. The opposite generally has been the case in the computer and communications industries, especially with regard to the hardware costs of supporting these technologies. For many decades, and with no change expected in the foreseeable future, hardware costs have fallen rapidly. This is a phenomenon of technology. Moore's Law states that the power of hardware doubles every tow years, while the price remains essentially the same. Significant improvements also have occurred in the communications field, especially in recent years, with the enormous demand of the communications bandwidth attracting tremendous competition, forcing communications bandwidth to increase and prices to decline. We know of no other fields in which technology moves so quickly and costs fall so rapidly.

When computer use exploded in the 1960s and 1970s, there was talk of the huge improvements in human productivity that computing and communications would bring about. However, these productivity improvements did not immediately materialize. Organizations were spending vast sums on computers and distributing them to their workforces, but without immediate productivity gains. On the hardware side, it was the invention of microprocessor chip technology and its wide deployment in the late 1970s and 1980s. on the software side, productivity improvements are now coming from object technology.

Recently, hardware has been moving toward mobile, wireless technology. Small handheld devices are now more powerful than early 1970s supercomputers. Portability is now a major focus for the computer industry. Wireless data-transfer speeds have become so fast that many

Internet users primary web access is through wireless networks. The next few years will see dramatic advances in wireless capabilities for personal users and businesses.

1.8: Key Software Trend: Object Technology

Improvements to software technology did emerge, with the benefits of structured programming (and the related disciplines of structured systems analysis and design) being realized in the 1970s. not until the technology of object-oriented programming become widely used in the 1990s, though, did software developers feel they had the necessary tools for making major stride in the software developments process.

What are objects and why are they special? Actually, object technology is a packaging scheme that helps us create meaningful software units. These can be large and are highly focused on particular applications area. There are date objects, time objects, paycheck objects, invoice objects, audio objects, video objects, file objects, record objects and so on. I fact, almost any noun can be reasonably represented as an object. We live in a world of objects. There are cars, planes, people, animals, building, traffic lights, elevators and the like. Before object-oriented languages appeared, procedural programming languages (such as Fortran, COBOL, Pascal, BASIC and C) were focused on actions (verbs) rather than on things or objects (nouns). Programmers living in a world of objects programmed primarily using verbs. This made it awkward to write programs. Now, with the availability of popular object-oriented languages such as C++, Java, Visual Basic and C# programmers continue to live in an object-oriented world and can program in an object-oriented manner. This is more natural process than procedural programming and has results\d in significant productivity gains.

A key problem with procedural programming is that the program unites do not effectively mirror real-world entities, so these units are not particularly reusable. It's not unusual for programmers to "start fresh" on each new project and have to write similar software "from scratch". This wastes time and money, as people repeatedly "reinvent the wheel". Whit object technology, the software entities created (called Classes), if properly designed, tend to be reusable on future projects. Using libraries of reusable componentry can greatly reduce effort required to implement certain kinds of systems (compared to the effort that would be required to reinvent these capabilities on new projects).