Internet

The **Internet** is a worldwide, publicly accessible series of interconnected computer networks that transmit data by packet switching using the standard Internet Protocol (IP). It is a "network of networks" that consists of millions of smaller domestic, academic, business, and government networks, which together carry various information and services, such as electronic mail, online chat, file transfer, and the interlinked web pages and other resources of the World Wide Web (WWW).

Contents

Terminology. The Internet and the World Wide Web are not synonymous. The Internet is a collection of interconnected *computer networks*, linked by copper wires, fiber-optic cables, wireless connections, etc. In contrast, the Web is a collection of interconnected documents and other *resources*, linked by hyperlinks and URLs. The World Wide Web is one of the services accessible via the Internet, along with various others including e-mail, file sharing, online gaming and others described below.

History. The USSR's launch of Sputnik spurred the United States to create the Advanced Research Projects Agency, known as ARPA, in February 1958 to regain a technological lead. ARPA created the Information Processing Technology Office (IPTO) to further the research of

the Semi Automatic Ground Environment (SAGE) program, which had networked country-wide radar systems together for the first time. J. C. R. Licklider was selected to head the IPTO, and saw universal networking as a potential unifying human revolution.

Licklider moved from the Psycho-Acoustic Laboratory at Harvard University to MIT in 1950, after becoming interested in information technology. At MIT, he served on a committee that established Lincoln Laboratory and worked on the SAGE project. In 1957 he became a Vice President at BBN, where he bought the first production PDP-1 computer and conducted the first public demonstration of time-sharing. At the IPTO, Licklider recruited Lawrence Roberts to head a project to implement a network, and Roberts based the technology on the work of Paul Baran, who had written an exhaustive study for the U.S. Air Force that recommended packet switching (as opposed to circuit switching) to make a network highly robust and survivable. After much work, the first two nodes of what would become the ARPANET were interconnected between UCLA and SRI International in Menlo Park, California, on October 29, 1969. The ARPANET was one of the "eve" networks of today's Internet. Following on from the demonstration that packet switching worked on the ARPANET, the British Post Office, Telenet, DATAPAC and TRANSPAC collaborated to create the first international packet-switched network service. In the UK, this was referred to as the International Packet Stream Service (IPSS), in 1978. The collection of X.25-based networks grew from Europe and the US to cover Canada, Hong Kong and Australia by 1981. The X.25 packet switching standard was developed in the CCITT (now called ITU-T) around 1976. X.25 was independent of the TCP/IP protocols that arose from the experimental work of DARPA on the ARPANET, Packet Radio Net and Packet Satellite Net during the same time period. Vinton Cerf and Robert Kahn developed the first description of the TCP protocols during 1973 and published a paper on the subject in May 1974. Use of the term "Internet" to describe a single global TCP/IP network originated in December 1974 with the publication of RFC 674, the first full specification of TCP that was written by Vinton Cerf, Yogen Dalal and Carl Sunshine, then at Stanford University. During the next nine years, work proceeded to refine the protocols and to implement them on a wide range of operating systems.

The first TCP/IP-wide area network was made operational by January 1, 1983 when all hosts on the ARPANET were switched over from the older NCP protocols to TCP/IP. In 1985, the United States' National Science Foundation (NSF) commissioned the construction of a university 56 kilobit/second network backbone using computers called "fuzzballs" by their inventor, David L. Mills. The following year, NSF sponsored the development of a higher-speed 1.5 megabit/second backbone that became the NSFNet. A key decision to use the DARPA TCP/IP protocols was made by Dennis Jennings, then in charge of the Supercomputer program at NSF.

The opening of the network to commercial interests began in 1988. The US Federal Networking Council approved the interconnection of the NSFNET to the commercial MCI Mail system in that year and the link was made in the summer of 1989. Other commercial electronic e-mail services were soon connected, including OnTyme, Telemail and Compuserve. In that same year, three commercial Internet Service Providers were created: UUNET, PSINET and CERFNET. Important, separate networks that offered gateways into, then later merged with, the Internet include Usenet and BITNET. Various other commercial and educational networks, such as Telenet, Tymnet, Compuserve and JANET were interconnected with the growing Internet.

Telenet (later called Sprintnet) was a large privately funded national computer network with free dial-up access in cities throughout the U.S. that had been in operation since the 1970s. This network was eventually interconnected with the others in the 1980s as the TCP/IP protocol became increasingly popular. The ability of TCP/IP to work over virtually any pre-existing communication networks allowed for a great ease of growth, although the rapid growth of the Internet was due primarily to the availability of commercial routers from companies such as Cisco Systems, Proteon and Juniper, the availability of commercial Ethernet equipment for local-area networking and the widespread implementation of TCP/IP on the UNIX operating system.

Growth. Although the basic applications and guidelines that make the Internet possible had existed for almost a decade, the network did not gain a public face until the 1990s. On August 6, 1991, CERN, which straddles the border between France and Switzerland, publicized the new World Wide Web project. The Web was invented by English scientist Tim Berners-Lee in 1989. An early popular web browser was ViolaWWW, based upon HyperCard. It was eventually replaced in popularity by the Mosaic web browser. In 1993, the National Center for Supercomputing Applications at the University of Illinois released version 1.0 of Mosaic, and by late 1994 there was growing public interest in the previously academic, technical Internet. By 1996 usage of the word *Internet* had become commonplace, and consequently, so had its misuse as a reference to the World Wide Web.

Meanwhile, over the course of the decade, the Internet successfully accommodated the majority of previously existing public computer networks (although some networks, such as FidoNet, have remained separate). During the 1990s, it was estimated that the Internet grew by 100% per year, with a brief period of explosive growth in 1996 and 1997. This growth is often attributed to the lack of central administration, which allows organic growth of the network, as well as the non-proprietary open nature of the Internet protocols, which encourages vendor interoperability and prevents any one company from exerting too much control over the network.

University students' appreciation and contributions. New findings in the field of communications during the 1960s, 1970s and 1980s were quickly adopted by universities across North America.

Examples of early university Internet communities are Cleveland FreeNet, Blacksburg Electronic Village and NSTN in Nova Scotia. Students took up the opportunity of free communications and saw this new phenomenon as a tool of liberation. Personal computers and the Internet would free them from corporations and governments (Nelson, Jennings, Stallman).

Graduate students played a huge part in the creation of ARPANET. In the 1960s, the network working group, which did most of the design for ARPANET's protocols, was composed mainly of graduate students.

Today's Internet. *The Opera Community rack.* From the top, user file storage (content of files.myopera.com), "bigma" (the master MySQL database server), and two IBM blade centers containing multi-purpose machines (Apache front ends, Apache back ends, slave MySQL database servers, load balancers, file servers, cache servers and sync masters).

Aside from the complex physical connections that make up its infrastructure, the Internet is facilitated by bi- or multi-lateral commercial contracts (e.g., peering agreements), and by

technical specifications or protocols that describe how to exchange data over the network. Indeed, the Internet is essentially defined by its interconnections and routing policies.

As of December 30, 2007, 1,319 billion people use the Internet according to Internet World Stats. Writing in the *Harvard International Review*, philosopher N.J. Slabbert, a writer on policy issues for the Washington, D.C.-based Urban Land Institute, has asserted that the Internet is fast becoming a basic feature of global civilization, so that what has traditionally been called "civil society" is now becoming identical with information technology society as defined by Internet use.

Internet protocols. In this context, there are three layers of protocols:

- At the lower level (OSI layer 3) is **IP** (Internet Protocol), which defines the datagrams or packets that carry blocks of data from one node to another. The vast majority of today's Internet uses version four of the IP protocol (i.e. IPv4), and, although IPv6 is standardized, it exists only as "islands" of connectivity, and there are many ISPs without any IPv6 connectivity. **ICMP** (Internet Control Message Protocol) also exists at this level. ICMP is connectionless; it is used for control, signaling, and error reporting purposes.

- **TCP** (Transmission Control Protocol) and **UDP** (User Datagram Protocol) exist at the next layer up (OSI layer 4); these are the protocols by which data is transmitted. TCP makes a virtual "connection", which gives some level of guarantee of reliability. UDP is a best-effort, connectionless transport, in which data packets that are lost in transit will not be re-sent.

- The **application protocols** sit on top of TCP and UDP and occupy layers 5, 6, and 7 of the OSI model. These define the specific messages and data formats sent and understood by the applications running at each end of the communication. Examples of these protocols are HTTP, FTP, and SMTP.

Internet structure. There have been many analyses of the Internet and its structure. For example, it has been determined that the Internet IP routing structure and hypertext links of the World Wide Web are examples of scale-free networks.

Similar to the way the commercial Internet providers connect via Internet exchange points, research networks tend to interconnect into large subnetworks such as:

- ✓ GEANT
- ✓ GLORIAD
- ✓ The Internet2 Network (formally known as the Abilene Network)
- ✓ JANET (the UK's national research and education network)

These in turn are built around relatively smaller networks. See also the list of academic computer network organizations. In network diagrams, the Internet is often represented by a cloud symbol, into and out of which network communications can pass.

ICANN. The Internet Corporation for Assigned Names and Numbers (ICANN) is the authority that coordinates the assignment of unique identifiers on the Internet, including domain names, Internet Protocol (IP) addresses, and protocol port and parameter numbers. A globally unified namespace (i.e., a system of names in which there is at most one holder for each possible name) is essential for the Internet to function. ICANN is headquartered in Marina del Rey, California, but is overseen by an international board of directors drawn from across the Internet technical, business, academic, and non-commercial communities. The US government continues to have the primary role in approving changes to the root zone file that lies at the heart of the domain name system. Because the Internet is a distributed network comprising

many voluntarily interconnected networks, the Internet, as such, has no governing body. ICANN's role in coordinating the assignment of unique identifiers distinguishes it as perhaps the only central coordinating body on the global Internet, but the scope of its authority extends only to the Internet's systems of domain names, IP addresses, protocol ports and parameter numbers.

On November 16, 2005, the World Summit on the Information Society, held in Tunis, established the Internet Governance Forum (IGF) to discuss Internet-related issues.

Language. The prevalent language for communication on the Internet is English. This may be a result of the Internet's origins, as well as English's role as the lingua franca. It may also be related to the poor capability of early computers, largely originating in the United States, to handle characters other than those in the English variant of the Latin alphabet.

After English (31% of Web visitors) the most requested languages on the World Wide Web are Chinese (16%), Spanish (9%), Japanese (7%), German (5%) and French (5%). By continent, 37% of the world's Internet users are based in Asia, 27% in Europe, 19% in North America, and 9% in Latin America and the Carribean.

The Internet's technologies have developed enough in recent years, especially in the use of Unicode, that good facilities are available for development and communication in most widely used languages. However, some glitches such as *mojibake* (incorrect display of foreign language characters, also known as *kryakozyabry*) still remain.

Internet and the workplace. The Internet is allowing greater flexibility in working hours and location, especially with the spread of unmetered high-speed connections and Web applications.

The Internet viewed on mobile devices. The Internet can now be accessed virtually anywhere by numerous means. Mobile phones, datacards, handheld game consoles and cellular routers allow users to connect to the Internet from anywhere there is a cellular network supporting that device's technology.

Common uses of the Internet

E-mail. The concept of sending electronic text messages between parties in a way analogous to mailing letters or memos predates the creation of the Internet. Even today it can be important to distinguish between Internet and internal e-mail systems. Internet e-mail may travel and be stored unencrypted on many other networks and machines out of both the sender's and the recipient's control. During this time it is quite possible for the content to be read and even tampered with by third parties, if anyone considers it important enough. Purely internal or intranet mail systems, where the information never leaves the corporate or organization's network, are much more secure, although in any organization there will be IT and other personnel whose job may involve monitoring, and occasionally accessing, the e-mail of other employees not addressed to them.

The World Wide Web. Graphic representation of less than 0.0001% of the WWW, representing some of the hyperlinks. Many people use the terms *Internet* and *World Wide Web* (or just the *Web*) interchangeably, but, as discussed above, the two terms are not synonymous.

The World Wide Web is a huge set of interlinked documents, images and other resources, linked by hyperlinks and URLs. These hyperlinks and URLs allow the web servers and other machines that store originals, and cached copies, of these resources to deliver them as required using HTTP (Hypertext Transfer Protocol). HTTP is only one of the communication protocols

used on the Internet. Web services also use HTTP to allow software systems to communicate in order to share and exchange business logic and data.

Software products that can access the resources of the Web are correctly termed *user agents*. In normal use, web browsers, such as Internet Explorer and Firefox, access web pages and allow users to navigate from one to another via hyperlinks. Web documents may contain almost any combination of computer data including photographs, graphics, sounds, text, video, multimedia and interactive content including games, office applications and scientific demonstrations.

Through keyword-driven Internet research using search engines like Yahoo! and Google, millions of people worldwide have easy, instant access to a vast and diverse amount of online information. Compared to encyclopedias and traditional libraries, the World Wide Web has enabled a sudden and extreme decentralization of information and data.

It is also easier, using the Web, than ever before for individuals and organisations to publish ideas and information to an extremely large audience. Anyone can find ways to publish a web page or build a website for very little initial cost. Publishing and maintaining large, professional websites full of attractive, diverse and up-to-date information is still a difficult and expensive proposition, however.

Many individuals and some companies and groups use "web logs" or blogs, which are largely used as easily updatable online diaries. Some commercial organizations encourage staff to fill them with advice on their areas of specialization in the hope that visitors will be impressed by the expert knowledge and free information, and be attracted to the corporation as a result. One example of this practice is Microsoft, whose product developers publish their personal blogs in order to pique the public's interest in their work.

Collections of personal web pages published by large service providers remain popular, and have become increasingly sophisticated. Whereas operations such as Angelfire and GeoCities have existed since the early days of the Web, newer offerings from, for example, Facebook and MySpace currently have large followings. These operations often brand themselves as social network services rather than simply as web page hosts.

Advertising on popular web pages can be lucrative, and e-commerce or the sale of products and services directly via the Web continues to grow. In the early days, web pages were usually created as sets of complete and isolated HTML text files stored on a web server. More recently, websites are more often created using content management system (CMS) or wiki software with, initially, very little content. Contributors to these systems, who may be paid staff, members of a club or other organisation or members of the public, fill underlying databases with content using editing pages designed for that purpose, while casual visitors view and read this content in its final HTML form. There may or may not be editorial, approval and security systems built into the process of taking newly entered content and making it available to the target visitors.

Remote access. The Internet allows computer users to connect to other computers and information stores easily, wherever they may be across the world. They may do this with or without the use of security, authentication and encryption technologies, depending on the requirements.

This is encouraging new ways of working from home, collaboration and information sharing in many industries. An accountant sitting at home can audit the books of a company

based in another country, on a server situated in a third country that is remotely maintained by IT specialists in a fourth. These accounts could have been created by home-working bookkeepers, in other remote locations, based on information e-mailed to them from offices all over the world. Some of these things were possible before the widespread use of the Internet, but the cost of private leased lines would have made many of them infeasible in practice.

An office worker away from his desk, perhaps on the other side of the world on a business trip or a holiday, can open a remote desktop session into his normal office PC using a secure Virtual Private Network (VPN) connection via the Internet. This gives the worker complete access to all of his or her normal files and data, including e-mail and other applications, while away from the office.

This concept is also referred to by some network security people as the Virtual Private Nightmare, because it extends the secure perimeter of a corporate network into its employees' homes; this has been the source of some notable security breaches, but also provides security for the workers.

Collaboration. The low cost and nearly instantaneous sharing of ideas, knowledge, and skills has made collaborative work dramatically easier. Not only can a group cheaply communicate and test, but the wide reach of the Internet allows such groups to easily form in the first place, even among niche interests. An example of this is the free software movement in software development, which produced GNU and Linux from scratch and has taken over development of Mozilla and OpenOffice.org (formerly known as Netscape Communicator and StarOffice). Films such as *Zeitgeist, Loose Change* and *Endgame* have had extensive coverage on the Internet, while being virtually ignored in the mainstream media.

Internet "chat", whether in the form of IRC "chat rooms" or channels, or via instant messaging systems, allow colleagues to stay in touch in a very convenient way when working at their computers during the day. Messages can be sent and viewed even more quickly and conveniently than via e-mail. Extension to these systems may allow files to be exchanged, "whiteboard" drawings to be shared as well as voice and video contact between team members.

Version control systems allow collaborating teams to work on shared sets of documents without either accidentally overwriting each other's work or having members wait until they get "sent" documents to be able to add their thoughts and changes.

File sharing. A computer file can be e-mailed to customers, colleagues and friends as an attachment. It can be uploaded to a website or FTP server for easy download by others. It can be put into a "shared location" or onto a file server for instant use by colleagues. The load of bulk downloads to many users can be eased by the use of "mirror" servers or peer-to-peer networks.

In any of these cases, access to the file may be controlled by user authentication; the transit of the file over the Internet may be obscured by encryption, and money may change hands before or after access to the file is given. The price can be paid by the remote charging of funds from, for example, a credit card whose details are also passed – hopefully fully encrypted – across the Internet. The origin and authenticity of the file received may be checked by digital signatures or by MD5 or other message digests.

These simple features of the Internet, over a worldwide basis, are changing the basis for the production, sale, and distribution of anything that can be reduced to a computer file for transmission. This includes all manner of print publications, software products, news, music, film, video, photography, graphics and the other arts. This in turn has caused seismic shifts in

each of the existing industries that previously controlled the production and distribution of these products.

Internet collaboration technology enables business and project teams to share documents, calendars and other information. Such collaboration occurs in a wide variety of areas including scientific research, software development, conference planning, political activism and creative writing.

Streaming media. Many existing radio and television broadcasters provide Internet "feeds" of their live audio and video streams (for example, the BBC). They may also allow time-shift viewing or listening such as Preview, Classic Clips and Listen Again features. These providers have been joined by a range of pure Internet "broadcasters" who never had on-air licenses. This means that an Internet-connected device, such as a computer or something more specific, can be used to access on-line media in much the same way as was previously possible only with a television or radio receiver. The range of material is much wider, from pornography to highly specialized, technical webcasts. Podcasting is a variation on this theme, where – usually audio – material is first downloaded in full and then may be played back on a computer or shifted to a digital audio player to be listened to on the move. These techniques using simple equipment allow anybody, with little censorship or licensing control, to broadcast audio-visual material on a worldwide basis.

Webcams can be seen as an even lower-budget extension of this phenomenon. While some webcams can give full-frame-rate video, the picture is usually either small or updates slowly. Internet users can watch animals around an African waterhole, ships in the Panama Canal, the traffic at a local roundabout or their own premises, live and in real time. Video chat rooms, video conferencing, and remote controllable webcams are also popular. Many uses can be found for personal webcams in and around the home, with and without two-way sound.

YouTube, sometimes described as an Internet phenomenon because of the vast amount of users and how rapidly the site's popularity has grown, was founded on February 15, 2005. It is now the leading website for free streaming video. It uses a flash-based web player which streams video files in the format FLV. Users are able to watch videos without signing up; however, if users do sign up they are able to upload an unlimited amount of videos and they are given their own personal profile. It is currently estimated that there are 64,000,000 videos on YouTube, and it is also currently estimated that 825,000 new videos are uploaded every day.

Voice telephony (VoIP). VoIP stands for Voice over IP, where IP refers to the Internet Protocol that underlies all Internet communication. This phenomenon began as an optional two-way voice extension to some of the instant messaging systems that took off around the year 2000. In recent years many VoIP systems have become as easy to use and as convenient as a normal telephone. The benefit is that, as the Internet carries the actual voice traffic, VoIP can be free or cost much less than a normal telephone call, especially over long distances and especially for those with always-on Internet connections such as cable or ADSL.

Thus, VoIP is maturing into a viable alternative to traditional telephones. Interoperability between different providers has improved and the ability to call or receive a call from a traditional telephone is available. Simple, inexpensive VoIP modems are now available that eliminate the need for a PC.

Voice quality can still vary from call to call but is often equal to and can even exceed that of traditional calls. Remaining problems for VoIP include emergency telephone number dialling

and reliability. Currently, a few VoIP providers provide an emergency service, but it is not universally available. Traditional phones are line-powered and operate during a power failure; VoIP does not do so without a backup power source for the electronics.

Most VoIP providers offer unlimited national calling, but the direction in VoIP is clearly toward global coverage with unlimited minutes for a low monthly fee.

VoIP has also become increasingly popular within the gaming world, as a form of communication between players. Popular gaming VoIP clients include Ventrilo and Teamspeak, and there are others available also. The PlayStation 3 and Xbox 360 also offer VoIP chat features.

Internet access. Common methods of home access include dial-up, landline broadband (over coaxial cable, fiber optic or copper wires), Wi-Fi, satellite and 3G technology cell phones.

Public places to use the Internet include libraries and Internet cafes, where computers with Internet connections are available. There are also Internet access points in many public places such as airport halls and coffee shops, in some cases just for brief use while standing. Various terms are used, such as "public Internet kiosk", "public access terminal", and "Web payphone". Many hotels now also have public terminals, though these are usually fee-based. These terminals are widely accessed for various usage like ticket booking, bank deposit, online payment etc. Wi-Fi provides wireless access to computer networks, and therefore can do so to the Internet itself. Hotspots providing such access include Wi-Fi cafes, where would-be users need to bring their own wireless-enabled devices such as a laptop or PDA. These services may be free to all, free to customers only, or fee-based. A hotspot need not be limited to a confined location. A whole campus or park, or even an entire city can be enabled. Grassroots efforts have led to wireless community networks. Commercial Wi-Fi services covering large city areas are in place in London, Vienna, Toronto, San Francisco, Philadelphia, Chicago and Pittsburgh. The Internet can then be accessed from such places as a park bench.

Apart from Wi-Fi, there have been experiments with proprietary mobile wireless networks like Ricochet, various high-speed data services over cellular phone networks, and fixed wireless services.

High-end mobile phones such as smartphones generally come with Internet access through the phone network. Web browsers such as Opera are available on these advanced handsets, which can also run a wide variety of other Internet software. More mobile phones have Internet access than PCs, though this is not as widely used. An Internet access provider and protocol matrix differentiates the methods used to get online.

Social impact. The Internet has made possible entirely new forms of social interaction, activities and organizing, thanks to its basic features such as widespread usability and access.

Social networking websites such as Facebook and MySpace have created a new form of socialization and interaction. Users of these sites are able to add a wide variety of items to their personal pages, to indicate common interests, and to connect with others. It is also possible to find a large circle of existing acquaintances, especially if a site allows users to utilize their real names, and to allow communication among large existing groups of people. Sites like meetup.com exist to allow wider announcement of groups which may exist mainly for face-to-face meetings, but which may have a variety of minor interactions over their group's site at meetup.org, or other similar sites.

Political organization and censorship. In democratic societies, the Internet has achieved new relevance as a political tool. The presidential campaign of Howard Dean in 2004 in the United States became famous for its ability to generate donations via the Internet. Many political groups use the Internet to achieve a whole new method of organizing, in order to carry out Internet activism.

Some governments, such as those of Cuba, Iran, North Korea, Myanmar, the People's Republic of China, and Saudi Arabia, restrict what people in their countries can access on the Internet, especially political and religious content. This is accomplished through software that filters domains and content so that they may not be easily accessed or obtained without elaborate circumvention.

In Norway, Denmark, Finland and Sweden, major Internet service providers have voluntarily (possibly to avoid such an arrangement being turned into law) agreed to restrict access to sites listed by police. While this list of forbidden URLs is only supposed to contain addresses of known child pornography sites, the content of the list is secret.

Many countries, including the United States, have enacted laws making the possession or distribution of certain material, such as child pornography, illegal, but do not use filtering software.

There are many free and commercially available software programs with which a user can choose to block offensive websites on individual computers or networks, such as to limit a child's access to pornography or violence.

Leisure activites. The Internet has been a major source of leisure since before the World Wide Web, with entertaining social experiments such as MUDs and MOOs being conducted on university servers, and humor-related Usenet groups receiving much of the main traffic. Today, many Internet forums have sections devoted to games and funny videos; short cartoons in the form of Flash movies are also popular. Over 6 million people use blogs or message boards as a means of communication and for the sharing of ideas.

The pornography and gambling industries have both taken full advantage of the World Wide Web, and often provide a significant source of advertising revenue for other websites. Although many governments have attempted to put restrictions on both industries' use of the Internet, this has generally failed to stop their widespread popularity.

One main area of leisure on the Internet is multiplayer gaming. This form of leisure creates communities, bringing people of all ages and origins to enjoy the fast-paced world of multiplayer games. These range from MMORPG to first-person shooters, from role-playing games to online gambling. This has revolutionized the way many people interact and spend their free time on the Internet.

While online gaming has been around since the 1970s, modern modes of online gaming began with services such as GameSpy and MPlayer, to which players of games would typically subscribe. Non-subscribers were limited to certain types of gameplay or certain games.

Many use the Internet to access and download music, movies and other works for their enjoyment and relaxation. As discussed above, there are paid and unpaid sources for all of these, using centralized servers and distributed peer-to-peer technologies. Discretion is needed as some of these sources take more care over the original artists' rights and over copyright laws than others.

Many use the World Wide Web to access news, weather and sports reports, to plan and book holidays and to find out more about their random ideas and casual interests.

People use chat, messaging and e-mail to make and stay in touch with friends worldwide, sometimes in the same way as some previously had pen pals. Social networking websites like MySpace, Facebook and many others like them also put and keep people in contact for their enjoyment.

The Internet has seen a growing number of Internet operating systems, where users can access their files, folders, and settings via the Internet. An example of an opensource webOS is Eyeos.

Cyberslacking has become a serious drain on corporate resources; the average UK employee spends 57 minutes a day surfing the Web at work, according to a study by Peninsula Business Services.

Complex architecture. Many computer scientists see the Internet as a "prime example of a large-scale, highly engineered, yet highly complex system". The Internet is extremely heterogeneous. (For instance, data transfer rates and physical characteristics of connections vary widely.) The Internet exhibits "emergent phenomena" that depend on its large-scale organization. For example, data transfer rates exhibit temporal self-similarity. Further adding to the complexity of the Internet is the ability of more than one computer to use the Internet through only one node, thus creating the possibility for a very deep and hierarchal sub-network that can theoretically be extended infinitely (disregarding the programmatic limitations of the IPv4 protocol). However, since principles of this architecture date back to the 1960s, it might not be a solution best suited to modern needs, and thus the possibility of developing alternative structures is currently being looked into.

According to a June 2007 article in *Discover* magazine, the combined weight of all the electrons moved within the Internet in a day is 0.2 millionths of an ounce. Others have estimated this at nearer 2 ounces (50 grams).

Marketing. The Internet has also become a large market for companies; some of the biggest companies today have grown by taking advantage of the efficient nature of low-cost advertising and commerce through the Internet, also known as e-commerce. It is the fastest way to spread information to a vast number of people simultaneously. The Internet has also subsequently revolutionized shopping – for example; a person can order a CD online and receive it in the mail within a couple of days, or download it directly in some cases. The Internet has also greatly facilitated personalized marketing which allows a company to market a product to a specific person or a specific group of people more so than any other advertising medium.

Examples of personalized marketing include online communities such as MySpace, Friendster, Orkut, Facebook and others which thousands of Internet users join to advertise themselves and make friends online. Many of these users are young teens and adolescents ranging from 13 to 25 years old. In turn, when they advertise themselves they advertise interests and hobbies, which online marketing companies can use as information as to what those users will purchase online, and advertise their own companies' products to those users.

The name *Internet*. *Internet* is traditionally written with a capital first letter, as it is a proper noun. The Internet Society, the Internet Engineering Task Force, the Internet

Corporation for Assigned Names and Numbers, the World Wide Web Consortium, and several other Internet-related organizations use this convention in their publications.

Many newspapers, newswires, periodicals, and technical journals capitalize the term (*Internet*). Examples include *The New York Times*, the *Associated Press*, *Time*, *The Times of India*, *Hindustan Times*, and *Communications of the ACM*.

Others assert that the first letter should be in lower case (*internet*), and that the specific article *the* is sufficient to distinguish "*the* internet" from other internets. A significant number of publications use this form, including *The Economist*, the Canadian Broadcasting Corporation, the *Financial Times*, *The Guardian*, *The Times*, and *The Sydney Morning Herald*. As of 2005, many publications using *internet* appear to be located outside of North America – although one U.S. news source, *Wired News*, has adopted the lower-case spelling.

Historically, *Internet* and *internet* have had different meanings, with *internet* meaning "an interconnected set of distinct networks", and *Internet* referring to the worldwide, publicly available IP internet. Under this distinction, *the Internet* is the familiar network through which websites exist; however, *an internet* can exist between any two remote locations. Any group of distinct networks connected together is *an* internet; each of these networks may or may not be part of *the* Internet. The distinction was evident in many RFCs, books, and articles from the 1980s and early 1990s (some of which, such as RFC 1918, refer to "internets" in the plural), but has recently fallen into disuse. Instead, the term *intranet* is generally used for private networks, whether they are connected to the Internet or not (see also extranet).

Some people use the lower-case term as a medium (like radio or newspaper, e.g. *I've found it on the internet*), and first letter capitalized as the global network.

Computer Words

ARE YOU SOMEONE who practically lives in front of the computer – a mouse potato? Or are you nervous about new technology – a technophobe? In either case, if you want to master the English language, you will need to be familiar with those new computer words that seem to be popping up everywhere.

Are computer words difficult?

Luckily, most computer words are easy to learn. For one thing, many of these words probably already have similar forms in your own language. For example, the German word for computer is Computer, in South American Spanish it is computador, and in Japanese we find konpyuta.

Another reason why computer words are easy to learn is that many of them are so colourful. They often make us smile when we first hear them such as snail mall (traditional post rather than Internet-based mail) or Wysiwyg (what-you-see-is-what-you-get).

Computer words and cyberculture

To get a feeling for computer words, it helps to understand the world that created them - cyberculture, as it is often called. The computer industry is full of young people who think of themselves as very different from traditional business-people in suits. It is a world that avoids heavy scientific-sounding language in favour of words that are simple, fresh, and playful.

Above all, it is a culture that promotes user-friendliness in everything, including its language. This means using simple familiar words to describe technical concepts. For example, it is surely nicer to talk about a mouse, rather than an X-Y position indicator, which is what the computer mouse was originally called.

Metaphors in computing

One reason why computer words are so user-friendly is that many are metaphors. Metaphors make a comparison between two things. For example, mouse compares a pointing device to a small animal because they have similar shapes.

We find all kinds of metaphors in computing language. For instance, a computer menu offers you a list of things to choose from, just like a menu in a restaurant. A computer virus spreads quickly and causes harm in the same way as viruses spread disease among people. The computer's memory holds, information, just like people's memories do.

Comparing a new technical concept to an old familiar one helps those of us who suffer from technostress. Because many people are afraid of using computers, metaphors play an important part in making users feel comfortable with technology For example, when we cut and paste computer data, we are reminded of working with pieces of paper. When we see words like desktop, file, folder, recycle bin – even wallpaper – we are reminded of our familiar offices.

How are computer words formed?

Computer words are easy to learn and remember because many of them use a few word forms that occur again and again:

-ware refers to products used for running a computer: software, hardware, shareware, freeware

~~cyber~~ and e- mean "relating to the Internet": cyberspace, cybercafe, e-mail, e-commerce, e-cash

~~techno~~ means "relating to computers": technobabble, technostress, technophobia.

Shortened forms

Most computer words are short and simple, so it is not surprising that longer words are often abbreviated. Many abbreviations are so commonly used that full forms are rarely found:

CD-ROM: compact disc read-only memory

IT: information technology

DVD: digital videodisc or digital versatile disc

HTML: Hyper Text Markup Language

LAN: local area network

RAM: random access memory

Other computer words are commonly shortened:

The Net: the Internet

The Web: the World Wide Web