

Technologies that change the way we live are rare. Looking back through this century, we can point to the telephone, the television (for good or bad), the automobile, and the computer. These and a handful of other innovations have changed how we interact with the rest of the world.

The Internet ranks among these significant technologies. It promises to change how we buy things, and how we communicate with other people. In the future, it will help determine where we go for our entertainment, news, and weather, and where we work.

Where Does the Internet Come From?

The Internet as we know it today is not the product of a long or sustained effort by any single research team. Rather, it is the amalgamation of the efforts from some very bright people working independently of each other. Take a look at the timeline shown in table below. Most people point to January 1, 1983, as the date when the Internet was born. The following sections describe the most important of those events in greater detail.

Date	Event
1957	USSR launches Sputnik
1968	First Packet Switching Network
1969	ARPANET Starts
1972	First Public Demo of ARPANET Internet Mail Invented
1973	First International Internet Connection

1975	Microsoft Founded
1976	Apple Founded
1979	Usenet Starts
1983	ARPANET Changes Over to TCP/IP ARPANET Splits into ARPANET & MILNET Microsoft Introduces Windows
1984	Internet Exceeds 1,000 Hosts Domain Name Server Introduced
1986	NSFNET Created
1987	Internet Exceeds 10,000 Hosts
1988	Worm Attacks 6,000 of Internet's 60,000 Hosts
1989	Internet Exceeds 100,000 Hosts
1990	ARPANET Dismantled Archie Starts
1991	WAIS Started Gopher Started NSF Lifts Commercial Ban
1992	Internet Exceeds 1 million Hosts Web Invented by Tim Berners-Lee Veronica Introduced
1993	MOSAIC Developed by Marc Andreessen InterNIC Founded by NSF
1994	Netscape Navigator created

ARPA (1957)

In 1957, the USSR launched Sputnik, the first man-made earth satellite. As a result, the U.S. formed the Advanced Research Projects Agency (ARPA) under the auspices the Department of Defense. ARPA's charter was to help the U.S. maintain a technological lead, particularly with regards to the military.

Packet Switching (1968)

In the early 1960s, Paul Baran at the Rand Corporation pondered a very simple problem: How do you ensure that a military network would continue to operate even under nuclear attack? In other words, Paul's job was to establish a way to get information across a network so that there isn't a single point of failure.

The solution that Paul Baran came up with is now called *Packet Switching*. A network of computers sends messages (packets) that contain information about its route so that any one computer on the network knows where to forward (switch) the message. National Physical Laboratory created the first packet switching network in 1968.

ARPANET (1969)

ARPA created ARPANET in 1969 to help ARPA-funded researchers collaborate more effectively. These researchers were education and research-oriented types, not the commercial organizations you see on the Internet today.

ARPA commissioned Bolt, Beranek, and Newman to build Interface Message Processors (IMPs), which were based on the packet switching technology built at the Rand Corporation in the early 1960s. The first IMPs were positioned at UCLA, Stanford Research Institute, University of California at Santa Barbara, and University of Utah in Salt Lake City. IMPs have evolved into what we now call IP routers.

TCP/IP (1983)

The next major event in the evolution of the Internet didn't occur until 1983, when ARPANET changed over to the TCP/IP networking protocol. Between 1969 and 1983, a variety of individual networks sprouted and grew. BITNET and CSNET are among the most notable. Connecting each of these independent networks was difficult, though, because they didn't use the same protocols and therefore couldn't exchange information.

As a result, ARPA commissioned the development of a new protocol called *Transmission Control Protocol/Internet Protocol (TCP/IP)* that would allow different networks to connect. These networks used IP to communicate with each other, and the IMPs that switched packets became known as gateways or routers. Since most computer scientists called a network of networks an "internet," this new arrangement of networks using TCP/IP became known as **the** Internet.

Ironically, ARPANET was late making the change over to TCP/IP. Most other networks had changed to TCP/IP in the late 1970s, but ARPANET didn't make the change until January 1, 1983. Thus, many folks consider that date as the birthday of the Internet.

NSF Creates NSFNET (1986)

In 1986 the National Science Foundation created NSFNET, an Internet backbone with a speed of 56K. This backbone connected five super-computing centers located at Princeton, Pittsburgh, UCSD, UIUC, and Cornell. NSFNET precipitated a large number of connections from various universities.

The following year, NSF signed an agreement with Merit Network, Inc., to cooperatively manage NSFNET. Merit Network, Inc., involved IBM and MCI through their own subsidiary agreements.

NSFNET has been updated continually since 1986. In 1988, two years after going online, the backbone was upgraded to T1 (1.544M). In 1991, it was upgraded to T3 (44.736M); NSFNET gained almost a thousand times more bandwidth than the original NSFNET backbone.

NOTE: The exponential growth of the Internet can be pinpointed to the time that NSFNET went online. Prior to NSFNET, just over 1,000 hosts were on the Internet. Over 10,000 hosts began using on the Internet the year NSFNET went online, and two years later over 60,000 hosts were on the Internet.

ARPANET Is Dismantled (1990)

On June 1, 1990, the original ARPANET was dismantled. Newer networks connected the sites that ARPANET connected, and thus ARPANET was no longer useful. It's interesting to note that no one suffered an interruption in service when ARPANET was removed. The technology had proven so effective that when ARPANET went down, the Internet found other paths for the information to travel.

The World Wide Web (1992)

Tim Berners-Lee, a physicist at CERN in Switzerland, invented the World Wide Web (Web) in 1992 as a way to organize information in a more brain-like fashion. His idea was to allow people to make multiple free associations with different bits of information.

His research was based on hypertext, a concept invented by Ted Nelson as part of the "Xanadu Project" in the 1960s. Hypertext allows an author to link a passage of text to another document so that when you activate

that link, the client program opens the document to which it refers. Recent advances have evolved hypertext into hypermedia, which is similar to hypertext but throws multimedia images, videos, and sounds into the mix.

Although Berners-Lee invented the Web for his high-energy physics cronies, it took off and was quickly adopted by many other groups on the Internet. The Web has now outpaced every other service such as Gopher or WAIS. It is so popular now that the Web is what most people think of when one mentions the Internet. In fact, the growth rate of the Web in 1993 was estimated at over 340,000 percent.

NSF Establishes InterNIC (1993)

NSF created InterNIC, a group of businesses that provide a variety of essential services to the Internet. AT&T provides directory and database services. Network Solutions, Inc., provides name registration services, InterNIC's primary role, which you can learn more about in Appendix B, "Registering and Implementing Your Own Domain." General Atomics and CERFnet provide various information services.

The Internet Today

The growth of the Internet has been explosive. In 1985, there were about 2,000 host computers on the Internet. Now there are millions of host computers and many more millions of actual users. All of these users aren't necessarily connected directly to the Internet. However, they can still exchange e-mail with other Internet users via Internet mail gateways.

Whereas the original Internet was intended for research purposes, the Internet is now used predominantly for commercial purposes. As a result, NSF removed from its acceptable usage policies a clause that prohibited commercial use of the Internet. You find organizations selling products on the Internet or providing a variety of services such as news, mapping, searching, and more.

You can attribute most of the commercialism to developments in the Web. In 1992, the Web was only suited to people publishing research information. By the late nineties, however, the Web was fully suited to create dynamic, interactive sites that are as enticing as many multimedia programs purchased on CD-ROMs.

NOTE: Many of the technologies that were invented as the Internet progressed are no longer very useful. WAIS, Gopher, and Telnet were once very important, for example, but they aren't used much anymore. The big four technologies that have stood the test of time include Internet mail, the Web, Usenet news, and collaboration tools such as chat. As you will discover throughout this guide, Internet users rely on these four technologies day in and day out.

Who Can Access the Internet?

Anybody can access the Internet. Schools provide access, as do some churches and employers. You'll even find public access to the Internet in libraries and coffee shops. Of course, if you have a computer and a modem, you can establish a private account with an independent service provider or commercial online service.

The Internet isn't just a North American thing, either. People the all over the world have access to the Internet. I've communicated with users in Russia, Australia, the United Kingdom, Germany, China, Japan, and more exotic locales. Sure, most of the people who connect to the Internet are in the U.S. and Canada, but it's still available all over the world. Here are some interesting observations, though, about the restrictions on Internet usage in some parts of the world:

- Users and Internet Service Providers in China have to register with the police department.
- Internet access in Saudi Arabia is limited strictly to hospitals and universities.
- Singapore requires that political and religious Internet publishers register with the state.

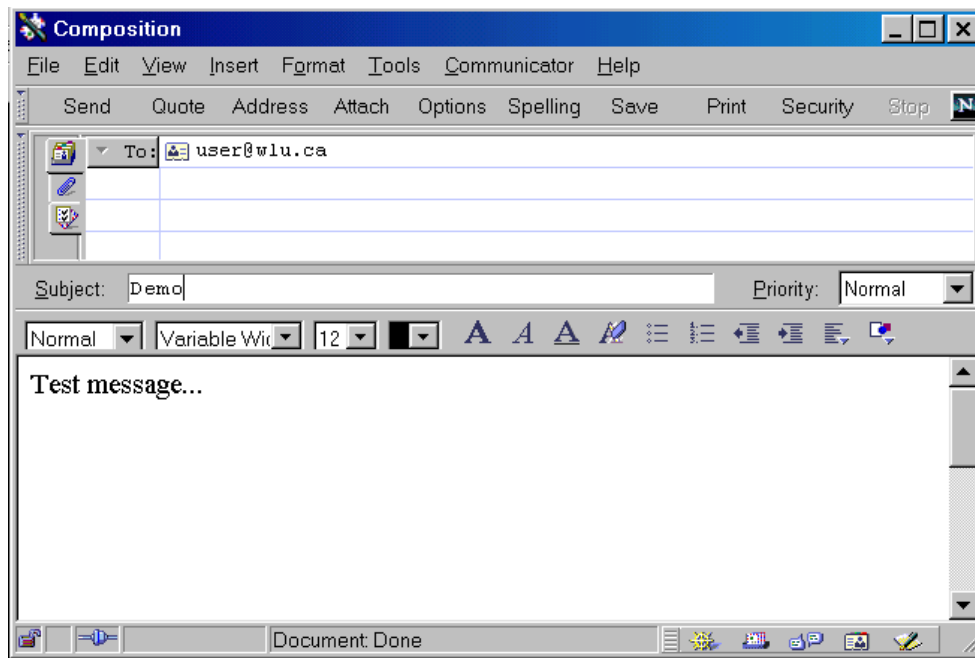
What Resources Are Available on the Internet?

When someone asks you what the Internet is, what do you tell them? Do you talk about Web pages and interactive content? How about online shopping and services? If you do, you're describing the World Wide Web

to them, not the Internet. There's much more to it like Internet mail and Usenet discussion groups. You'll learn about these tools in the following sections.

Internet Mail

Internet mail was one of the first services developed for the Internet. You use Internet mail to exchange text messages and file attachments with others that are connected to the Internet. It's changed considerably over the last year, allowing you to create rich text messages that contain formatting, images, and even HTML. Figure 1.1 shows you the latest Internet mail client from Netscape.



There are a variety of uses for Internet mail, too. You can subscribe to news services that deliver content to your mailbox each day. These services deliver current events, weather, sports, stock quotes, and more. You can also configure your Web browser to send a mail message that lets you know when your favorite Web sites change.

One of the most important uses for Internet mail is mailing lists. You use a mailing list to collaborate with people on the Internet who share your interests. When you post a message to a list server, the list server forwards your message on to everyone who subscribes to that list. You

can reach hundreds or even thousands of people with a single Internet mail message.

Usenet Discussion Groups

Like mailing lists, you use Usenet discussion groups to collaborate with other people on the Internet. You don't do it through Internet mail, however. You do it through the collection of NNTP news servers that are scattered all over the world. When you post a message to a Usenet newsgroup, that message finds its way to all of the news servers on the Internet so that other people can read it. Just about every person who has an Internet account has access to a news server and thus can read your message.

In order to read posts on a Usenet newsgroup, you must use a newsreader. These days, most Internet mail clients are also capable of reading the news.

File Transfer Protocol (FTP)

FTP was the first service developed for the Internet. It was developed so that government and educational institutions could easily exchange files, and it hasn't changed much since its original form. Many Internet services use some form of FTP behind the scenes in order to move data from host to host.

You use an FTP client to browse the files on the host, and then download or upload a file. These files can be text or binary. An FTP client works similarly to your file manager (or Explorer for all you Windows 95 users).

Chatting and Conferencing

Some form of chat program, such as IRC, has been available since the beginning of the Internet. Now, using recent conferencing software, you can actually have audio and video conferences over the Internet. Microsoft's NetMeeting is a client program that allows you to participate in audio and video conferences; collaborate on documents; or share a virtual whiteboard. In order to participate in an audio conference, your computer must be equipped with a sound card, speakers, and a

microphone. To participate in a video conference, your computer must also be equipped with a video camera.

World Wide Web

The World Wide Web is a massive collection of static and interactive documents that are linked together. You use a Web browser to view these Web pages. You find these Web pages on the hundreds of thousands of Web servers scattered throughout the world. To move from one document to another, you click a link that opens that document in your Web browser.

You'll spend most of your online time on the Web. That's because most of the services and information that you'll find useful on a daily basis are on the Web. You use the Web without even thinking about it. For example, you can subscribe to content that you put on your desktop. Because you don't browse the content yourself in a Web browser, you might forget that you connected to the Web to get that desktop content.

The Web is the most brutally competitive part of the Internet. It gets the most attention from the media, venture capitalists, and big corporations like Microsoft and Netscape. This is where they are hoping to make their mark and their profit.

There is an upside to this competitive battle, however: innovation. Nobody wants to be caught on the sidelines as the technology and standards determine the shape of the Web. As Microsoft has demonstrated with the Windows operating system, those driving the standards have the greatest amount of control over the technology. The result is an onslaught of new technology from Microsoft and Netscape over the last few months. As these companies risk their business on new technology, you, the consumer, only stand to gain. The Internet gets better and you get more useful products and services.

The technological advances are only part of the story, though. The content and services you find on the Web keep getting better and better. As most organizations predict that the greatest opportunity for revenue is content, they're investing more money into it. You'll find news feeds to which you can subscribe, services such as Federal Express' package tracking, and very impressive main stream magazines online such as HomeArts.