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The Worldwide Web and Internet Technology

Technology Note

Introduction

The information resource known as the World Wide Web has grown rapidly in recent years. Private households, universities, and corporations in every geographic region of the world have invested in technology that supports Web use. Web technology enables users to access an immense and growing body of information that resides on tens of millions of computers linked to a vast network known as the Internet.

In the most common arrangement, a person "logs on" to the Internet using a Personal Computer (PC), some PC software, and previously arranged connection services provided by a third party or employer. Once connected, PC software known as a browser provides an interface which allows the computer to access Web content.

This Technology Note is intended to provide background on the evolution of the Internet and the Web, on characteristics of the supporting technology, and on current issues surrounding use of the technology. Designed for nontechnical readers, this Note aims to provide a general overview of what makes Internet and Web technology different from other information technologies and why those differences matter to individuals and businesses who are using the technology (or thinking about using it).

Ways of Connecting to the Internet

Phone	PC connects to phone line
Cable	PC connects to cable TV line
Satellite	PC connects to satellite dish
LAN	PC has direct network access

Types of Connection Services

Internet Connection Provider (e.g., "ISP" or cable company)	Basic connection services
Proprietary Content Provider (e.g., AOL)	Connection services plus subscriber-only content

Research Associate Thomas Rodd prepared this note under the supervision of Professor Robert D. Austin as the basis for class discussion rather than to illustrate either effective or ineffective handling of an administrative situation. Doctoral student Mark Cotteleer and Jose Royo (MBA, 1998) provided assistance.

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A Brief History of the Internet

The Internet evolved from U.S. Department of Defense (DOD) communications infrastructure initiatives in the 1960s. To ensure continuous military communication in the event of an attack on the United States, the DOD sought to develop a system that did not rely on critical communication lines that might be targeted by an enemy. This survivability requirement led to the development of an intelligent process for dividing information into individually addressed "packets" which could then be "routed" via any of a large number of paths to their destination. Routing of information packets along many paths remains a distinguishing characteristic of Internet technology.

The Internet began as a single network in 1969, called ARPANET, and was managed by DOD's Advanced Research Projects Agency (DARPA). Initially, this network linked researchers with remote computer centers, enabling hardware and software resources to be shared by many users. During the 1970s, access to the ARPANET was restricted to the military, defense contractors, and universities conducting defense research. In the early 1980s, the system was split into two networks, ARPANET and Milnet, and connections were made between the two in order to maintain communication. Users began to refer to the interaction between these two networks as "the Internet."

The birth of the Internet as it exists today came with the development of the National Science Foundation Network (NSFNET) in 1986. This network used five supercomputers to link researchers from around the country. NSFNET quickly expanded to include mid-level and statewide academic networks that already existed to connect universities and research institutions. As a result of its replacement for research networking functions, ARPANET was officially dismantled in 1990.

Internet Characteristics

Internet technology possesses characteristics that distinguish it from other information technologies. These characteristics make the technology easy to use, extremely powerful, and economically attractive. Consider:

- *The Internet is based on open standards and "protocols."* Because the Internet is comprised of many different computer networks and many different systems, a common language standard must be used for interconnection. "TCP/IP" ("Telecommunications Protocol/Internet Protocol") is the adopted common language of the Internet. TCP/IP standards define how computers send and receive data packets. The standard was developed for DOD's ARPANET using public funds and, therefore, exists as a public resource. The fact that TCP/IP is a free resource helps make the Internet largely independent from reliance on proprietary solutions that are developed and marketed by private companies. Insistence on open standards and solutions has become part of the ethos of the Internet's community of administrators and developers.

What happens to information when it is sent?

The information is first divided into packets. TCP/IP attaches a "header" to each packet that contains the origin and destination addresses, and a sequence number. Every computer on the network has a unique "IP address"—four numbers ranging from 0 to 255, separated by decimal points (e.g., 19.67.89.134). Packets are then transmitted via a "Router"—a computer that keeps track of addresses— across an available link to other computers in the direction of the destination address. The process is repeated until a packet finds its way to its destination. A packet waits at its destination for arrival of the other information packets. When all the packets arrive, the information is reconstructed using the sequence numbers in the packet headers. If a packet does not arrive, the origin address in the other packet headers is used to request resending of the missing packet.

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- *The Internet is "asynchronous."* Communication of information via the Internet does not rely on dedicated, bi-directional connections between sender and receiver, as with a telephone call, for example. Rather, packets are fired off toward their destination without any prior coordination between the sender and receiver. Internet services that involve exchanges of information within small time intervals (e.g., a few seconds), such as the Web, require that sender and receiver be simultaneously connected to the Internet. But Web communication is still asynchronous in that no dedicated link is established. For other services, such as email, the receiver's computer need not even be switched on at the time that the message is sent. Email messages are addressed and sent over the Internet much as physical mail is sent via a postal service. As with postal mail, a recipient has a mailbox where mail can accumulate until it is accessed. Unlike regular mail though, email messages can be sent around the globe almost instantaneously.

- *The Internet has "inherent latency."* The computers that make up the Internet are connected by links of varying "bandwidth" or size. As packets carry information along different paths toward a common destination, some packets flow quickly through wide links while others move more slowly through narrow links. Packets that together comprise a single message do not arrive at the destination in the same moment. Thus, there is variable wait time between the sending of a message and the arrival at destination of the last packet in a message. Because traffic volume is somewhat unpredictable, wait time can also be difficult to predict. Although much can be done to make it likely that latency—wait time—will be within certain tolerances, some degree of latency is inherent in the design of the Internet.

> ***What is bandwidth?***
>
> The bandwidth of a communication link is the maximum rate at which information can be transmitted along the link. The smallest unit of information handled by computers is called a "bit." Bandwidth is measured in bits per second, or bps. Bandwidth capacity is usually referenced in one of three contexts:
>
> - kbps kilobits per second (thousands)
> - mbps megabits per second (millions)
> - gbps gigabits per second (billions)

Technology Bandwidths and Common Users

Communication Technology	Speed (bps)	User Type
Modem	28.8, 33.6, and 56 kbps	Individuals and small businesses
Integrated Services Digital Network (ISDN)	128 kbps–1.544 mbps	Individuals and small businesses
Ethernet LAN	10 mbps–100 mbps	Most medium to large businesses and organizations
Leased Lines (T1 and T3)	1.544 mbps, 45 mbps	Government, universities, and large corporations
Asynchronous Transfer Mode (ATM)/ Gigabit Ethernet	155 mbps–25.6 gbps	Government, universities, and large corporations

- *The Internet is distributed.* There is no central traffic control point within the Internet. Computers that are connected to the Internet do not need to be "defined" to a central control authority, as with some older networking technologies. There is also no central authority which oversees or governs the development or administration of this system (except for one that assigns TCP/IP addresses). As a result, individuals and organizations are responsible for managing and maintaining their own Internet facilities in a way that does not hinder the operation of the network as a whole.

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- *The Internet is "scalable."* Because the Internet communication is intelligently routed along multiple paths, adding to the Internet is as simple as connecting to a machine already connected. Just as the Internet is not significantly affected when a link is removed (packets simply get routed a different way), it is also not significantly affected when another link is added. Additional links can be added in parallel with overworked links, to provide more paths along which packets can be routed. Furthermore, Internet technology allows relatively easy reorganization of sub-networks; if a network segment has become overloaded, the network can be split up into more manageable sub-networks. In general, Internet technology allows more gracefully expansion than most network technologies.

System Architectures

The large-scale computer networks of today are relatively new features of the computing landscape. Today's "network-centric" world evolved from earlier centralized and client-server computing paradigms.

The Mainframe Computing Era: 1960s–1970s

Computers have been used by people and organizations to manage and disseminate information since the 1950s. Until the 1980s, a centralized computing architecture was prevalent, based on a central "mainframe" computer and "dumb" terminals. The mainframe provided computational and storage capabilities, while terminals were used as simple input/output devices. It was not until organizations began to share information and services among mainframes that computer networks were developed. Early networking technologies were proprietary and relatively simple, since they needed to handle traffic between a small number of large mainframe computers.

An Internet Analogy

Imagine a complex highway system on which millions of cars are always moving. There are groups of cars that belong to the same travel party heading to the same place. But individual drivers only know the address where they are heading. They have no maps and no sense of direction. Members of groups make no attempt to stay together. At junctures along the highway network, there are routing stations where cars stop, show their destination addresses, and are told "try going that way." A single routing station may send cars heading for the same destination in different directions. Eventually, though, a car arrives at its destination. It waits for other members of the travel party to arrive, and then they all do something useful together. This is an overly simple, but fairly accurate depiction of how the Internet works.

Distributed and Client-Server Computing: 1980s

With the introduction of PCs in 1981, individuals could suddenly install significant computing power on their own desktops. Much of the processing and data storage that had occurred on a central mainframe could, therefore, be distributed throughout the organization. Coordination of this much more distributed processing necessitated the development of much more sophisticated and robust networking technologies.

The "client-server" computing model was the eventual result of distributing computer processing. Client-server divides the work done on computing facilities into front and back ends. Client programs are installed on the user's local workstation (usually a PC) and allow the user to interact over a network with back-end computers, also called "servers." User interface and some processing duties are handled by the local workstation. Tasks requiring more power or access to information stored elsewhere are sent across the network to powerful servers, which send back results when they are finished. Sharing processing in this way can more efficiently distribute work, eliminate bottlenecks, and improve performance.

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Network Computing

Network computing is a refinement of client-server. To consolidate and reduce the costs of managing the client-server environment, network computing dictates moving data storage and processing capabilities to the back-end servers, which leaves clients operating mostly as standardized input/output devices. If that seems familiar, it should: in concept, it is a return to the centralized computing paradigm. There are, however, important technical differences. For example, networked clients are usually PCs with powerful graphical, audio, and video interface capabilities, and are thus not much like the dumb terminals of the mainframe computing era.[1] In addition, if the networked clients can be adequately standardized, labor-intensive troubleshooting and repair can be drastically reduced in favor of simple replacement of malfunctioning machines. Because data is stored on servers in the network computing paradigm, there is less need to move data from one client machine to another during replacement. Finally, because processing is handled primarily on servers, changes that would have previously required physically visiting each client machine can be distributed automatically from a central point. On the "back-end," the addition of more computing power by adding extra servers has proven to be significantly cheaper than attempting the same upgrades using traditional mainframes.

LAN, WAN, and MAN?

A Local Area Network (LAN) is a relatively small computer network that tends to use one type of transmission medium and covers an area that is usually within a building. A Wide Area Network (WAN) links LANs to form a larger network. A router defines the boundary between LAN and WAN. A Metropolitan Area Network (MAN) is a hybrid term sometimes used to refer to a WAN that is geographically contained (within a city, for example).

Internet vs. Web: A Distinction

Although the words are often used interchangeably, the "Web" and the "Internet" are not the same thing. Simply put, the Internet is the network upon which the service known as the World Wide Web runs. The Internet supports a wide variety of non-Web services also.

The Web is the assemblage of content documents in browser-accessible formats dispersed throughout the Internet. These documents contain text, data, and sometimes embedded graphics, video, and audio. They are identified by addresses (a.k.a. "URLs") such as "www.hbs.edu." "Hyperlinks" on document pages connect documents to other documents. Hyperlinks appear as highlighted text or graphical figures. Selecting a hyperlink transfers the user to a different document. That different document can be any other document on the network, regardless of where in the world it might be physically stored (unless access is restricted to that document). The tangled and complex nature of these hyperlink connections amounts to a "Web" of information connections—hence the name.

Some Non-Web Internet Services

Electronic Mail (Email): Allows individuals to send and receive electronic messages.

File Transfer Protocol (FTP): Supports copying a file from one Internet location to another.

Telnet: Enables remote access of an Internet connected computer.

[1] Companies like Oracle and Sun have begun building "network appliance" client machines that are simpler than PCs and which are aimed specifically at network-centric environments.

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Creating and Accessing Web Content

"Web content" is the substantive material that is stored on the Internet and gives this medium its energy and life. Content is created using standard presentation languages, the most prevalent of which is the "Hypertext Markup Language" (HTML). Using text editors or more sophisticated authoring tools, content designers lay out pages in a browser-readable format.

Some Sample HTML

How it looks in the HTML document…

```
<HTML>
<HEAD>
      <TITLE>Text placed in browser title bar</TITLE>
</HEAD>
<BODY>
      <I>This is how text is italicized,</I>
      <B>and this is how it is bolded.</B>
</BODY>
</HTML>
```

How it looks through your browser…

Text placed in browser title bar

This is how text is italicized, **and this is how it is bolded.**

Maneuvering around the Web to access information is often called "browsing" or "surfing the web." Browser software, installed on a user's workstation, employs a graphical user interface (GUI) to guide the user so that content files can be located and accessed quickly. The browser is essentially a navigational tool—a web "surfboard"—used to access and display files. Currently, the leading browser software packages are Netscape Navigator™ and Microsoft Internet Explorer™.

Users can locate files of interest by typing in a known address (e.g., www.hbs.edu) or they can use "search engines" to look up information by keyword or combinations of keywords. Search engines such as Yahoo and Excite are web sites where a user can stop and ask for directions. They have functionality embedded in the page that permits a user to, for example, find all sites related to "Kansas City Barbecue." Search technologies vary and not all search engines provide equivalent results. But the technology is already very useful and it is getting better all the time.

Internet Security

Security is a primary concern for most people who are considering business uses of the Internet. The same open standards and protocols that make the Internet a powerful communication medium also create a need for systems that govern who has access to what. Unlike mainframe-era systems to which access was denied unless explicitly enabled, Internet access is enabled unless explicitly denied. Further, information exchanged on the Internet can be passively intercepted in the same way that telephone lines can be tapped. In some situations, Internet links can be the entry point for "hackers" who intend harm to an organization's computer systems. While these threats are indeed real, security measures related to memory protection, encryption and runtime verification are used to eliminate these dangers and ensure protection of the computer system.

Internet Commerce

Internet commerce is projected to become a common use of the Internet. Forrester Research estimates that business-to-business commerce will grow to approach $65 billion by the year 2000, while online consumer retail revenues will expand to roughly $6.5 billion.[2] One of the inhibiting factors in this area has been the concern users have had over transmitting sensitive credit information

[2] Bob Chatham, Russ Maney, Julue H. Meringer, and Michael J. Wallace. "Money: Sizing the Internet Economy." *The Forrester Report—Leadership Strategies* (volume two, number one), September/October 1996.

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on the Internet. Banks and merchants are also concerned with this issue since traditional credit card losses cost these companies about $1.5 billion a year.[3] As a result, VISA and have developed the Secure Electronic Transaction (SET) protocol. This technology will use sophisticated "encryption" techniques, as well as "digital certificates" to ensure that information can be sent safely across the Internet.

Encryption and Digital Certificates

Encryption uses mathematical algorithms to alter information so that it is unrecognizable to electronic eavesdroppers or other unauthorized individuals. An encrypted document looks nothing like the original and cannot be interpreted without a digital key that both the user and sender possess for the purpose of decryption. More advanced techniques that use multiple keys, are becoming more prevalent.

Digital certificates work in conjunction with encryption techniques to enhance security. This process uses a trusted third party to assure the identity of an individual who transmits information. In order to obtain a digital certificate, the user must first generate an encrypted key and provide this to the issuing authority. Once the legal status of the organization and the contact names associated with the key have been verified, a certificate is issued which is installed on the user's Web server. This digital certificate is then used to ensure others of the user's authenticity and that the connection is secure.

Firewalls

While encryption and digital certificates are designed to protect transmissions sent across a network from eavesdropping, a "firewall" is a system used to prevent unauthorized access to an organization's internal systems. The firewall effectively blocks message traffic along certain paths, or allows it only after authentication. A firewall is commonly placed between the company's private internal network and the public Internet. The idea is to provide services and access for members of the organization while at the same time making it impossible for unauthorized users to access the private network from outside the company.

Organizational Uses of Internet Technologies

Internet technology and the Web are rapidly being deployed inside organizations and between partner organizations, replacing older technologies in areas ranging from order processing to electronic data interchange (EDI). These applications operate in the same manner as the Internet, generally possess the same characteristics, and have the same system architecture. The difference is in where they are located and how access within the network is governed.

Intranets

An "Intranet" is an Internet technology-based network used within the boundaries of an organization. Intranets need not be connected to the public Internet, but most are. Those that are Internet-connected are protected by firewalls from outside intrusion.

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[3] Penny Lunt, "Will SET kill card fraud on the Internet?" *ABA Banking Journal*, April 1996.

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An Intranet provides a cost-efficient way for an organization to exchange corporate data and files. The most common use of Intranets is to electronically publish company documents, such as employee manuals, product catalogs, brochures, 401(k) information, or engineering drawings. Documents published in this way can be accessed and used by employees around the office or, depending on the size of the organization, around the world. Intranet publication saves printing costs, aids in communication among team members, and helps reduce cycle times. In some cases, it also helps centralize data and reduce redundancy.

Intranets are also capable of supporting business and technical computing applications that include all of the functionality that can be produced using older technologies. There is some early evidence that developing computer applications for Intranets is easier and faster than more traditional methods. Some organizations plan to move more and more of their transaction-based day-to-day communications to their Intranets. Sun Microsystems and Ford Motor Company are currently engaged in such an effort.[4]

Extranets

An Extranet extends an organization's Intranet to include outside companies that it interacts with regularly. Use of Extranets enables organizations to have direct interaction with suppliers, dealers, and customers, while maintaining security through the use of a firewall. Authorized personnel from partner companies can exchange information such as proposals, cost estimates, and product specification in a timely manner. This can be accomplished regardless of whether the physical separation between the two locations is across town or across the country. Technology that is now emerging will permit Extranets (and Intranets) to be acquired from service providers as a turn-key purchased service. Aggressive use of Extranets in areas such as Purchasing have resulted in substantial cost reductions and cycle time improvements. General Electric (GE) has used its Trading Process Network (TPN) since 1996 as a way to streamline its procurement process. Since its introduction, it has seen the overall cost of goods lowered by 10%-15% and cycle time reduced by 50%, from 14 days to 7 days.[5]

Current Issues in Internet Computing

The Need for Speed

The Internet is a voracious consumer of network bandwidth. Bandwidth is consumed almost as quickly as it is made available, by evermore bandwidth-hungry Internet applications. New technologies that will permit order-of-magnitude higher transmission speeds are, therefore, of great interest in Internet circles. New high-bandwidth technologies are generally implemented first on the heavy traffic paths along the "backbone" of an Internet, then spread to connect individual machines to the backbone as the costs of the technology come down. It is not yet clear which of the emerging high-bandwidth technologies will become prevalent.

One possibility, called "asynchronous transfer mode" (ATM), incorporates aspects of circuit switching, typical of telephone calls, where a direct, temporary connection is established between two parties. This "virtual circuit," established before information is sent, remains in place for the length of

[4] See "Network Computing at Sun Microsystems: A Strategic Deployment." HBS case No. 198-007, and "Ford Motor Company: Maximizing the Business Value of Web Technologies." HBS case No. 198-006.

[5] Marianne Kolbasuk McGee and Clinton Wilder, "GE: the Net pays off," *InformationWeek*, January 27, 1997, n615 page 14.

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time the transmission requires. The main advantage of such dedicated circuits is that they support transfer of information within (very small) guaranteed time intervals. Hence ATM can be guaranteed to be fast enough to support real-time applications like video teleconferencing.[6] Internet technologies, with their inherent latency, can offer probabilistic assurances (e.g., "the transaction will arrive within one second of being sent with 99.95% probability"), but not guarantees.

Proponents contend that with ATM, because it uses ID numbers instead of complete destination addresses, remote parties can be located faster. In addition, by channeling traffic into defined connections, ATM arguably makes it easier to centrally manage volume on the Internet and provides a way to track and charge users for time online.

Despite these attractions, ATM is being resisted by influential members of the Internet community. Because it relies on synchronous links between sender and receiver, it departs from the routing paradigm that is characteristic of Internet technology. It constitutes a step toward more active management of traffic from a central location, thus it departs in some degree from the distributed management ideal that is characteristic of Internet technology.[7] Also, ATM users may face potential difficulties "dialing" others who are using different kinds of network services, because of inconsistencies between the ATM addressing scheme and the open standard TCP/IP addressing that prevails on today's Internet.

There is evidence that ATM might be losing ground to "Gigabit Ethernet" and other technologies that are faster versions of existing Internet-related technologies. The Internet's inherent latency is the main obstacle to be overcome by these rivals. To support real-time video and other time-sensitive applications, enhanced Internet technologies must develop reliable schemes for giving time-sensitive messages priority as they traverse a network and for assuring that a transmission path will always be available for high-priority messages. As the speed of these technologies increases, and as they evolve to a point where they can make "near guarantees" that are close to the guarantees ATM provides, they may eventually prevail.

High-bandwidth technologies currently being explored for connecting end users to the Internet include ISDN (Integrated Services Digital Network), satellite technologies, broadband cable (such as provides cable TV services), ADSL (Asymmetric Digital Subscriber Line) and other variations on wireless and telephone technologies. Each of these technologies has advantages and disadvantages, and each fits most naturally with a subset of the communication challenge.

PCs vs. NCs

As information technology becomes more "network-centric," ways are being sought to reduce the costs of maintaining computing services. One debate centers on whether PCs should be replaced by much simpler input/output machines, called "Network Computers" (NCs) or whether PCs should simply be modified to be easier and less costly to maintain. In essence, this issue pits a coalition consisting of companies such as Sun Microsystems, Oracle, Netscape, and IBM, against others, namely Microsoft and Intel, in a struggle to determine the shape of the computing desktop of the future.

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[6] Robert S. Borsi, "Asynchronous Transfer Mode (ATM)—Technology Note." *Harvard Business School Publishing*, October 1996. Reprint No. 397-014.

[7] Steve G. Steinberg, "Netheads vs. Bellheads." *Wired Magazine*, October 1996, Issue 4.10

Network computers are designed to run small chunks of functionality sent to them across the network on an "as-needed" basis. Java™, a computer language developed by Sun Microsystems, has received much attention as one way of creating this kind of network application. The not-yet-proven advantage of Java-based applications is that they are platform independent—that is, they can run on computers made by any manufacturer and running any underlying computer software. If platform-independence can be achieved, choice of operating system and hardware platform could become less important, possibly even irrelevant, and current market leaders (e.g., Microsoft, Intel) could lose some of their power over these markets.

What is JAVA?

JAVA is a programming language with which developers can build applications that potentially run on any computer platform. Java applications can be written in small modules or "applets" that can be sent across the network from server to a client as the functionality they embody is needed. The applications that could be provided include all those typically used on PCs, such as word processing and spreadsheets, as well as customized applications.

Microsoft has developed a set of technologies that offer Microsoft specific enhancements to Java capabilities. These Microsoft enhancements are feature-rich and well integrated with other widely deployed Microsoft products (e.g., Excel); thus they can leverage the knowledge and work of development communities already familiar with Microsoft tools and environments.[8] Critics of the Microsoft enhancements, however, point out that using Microsoft's enhanced functionality makes software once again (Microsoft) platform dependent, and see the company's introduction of these enhancements as a clever effort to head off the benefits of platform independence potentially offered by Java.[9]

Conclusions

The Internet and the Web are changing the way that organizations and individuals work, communicate, and obtain information. Although it is too early to evaluate the full impact, it is clear that the technology is different in at least three important ways from its predecessors.

First, its reliance on open technologies facilitates economic efficiencies that could not be realized using older technologies. Historically, technologies from different companies did not work easily together. Choosing a computer hardware or software vendor locked the purchaser into that company's offerings even in areas where its products were not the best. Computer companies embraced this strategy of locking in clients to proprietary architectures. The Internet has changed the game somewhat by making open technology a priority. Companies that once would have resisted modifying their products to work with others' products now must do it routinely or risk market censure. For users of the technology, this means more product and vendor choices. It also means systems that have not worked well together can be consolidated around the common TCP/IP standard, thus saving the costs of operating and maintaining redundant networks and systems.

Second, because of the scalability and openness of Internet technology, it has become very pervasive in a short period of time. The Internet is, literally, everywhere. Information providers are racing to make their networks speak the same TCP/IP language. There has rarely in history been a comparable race to make information accessible via the same widespread medium.

Third, Internet technology is inherently attractive to a broad cross-section of people. Unlike many technologies that have been implemented in the past, Internet services (especially email and the

[8] For more on this technology see http://www.microsoft.com/activex/actx-gen/awhatis.asp

[9] This claim has been formally made in the form of a lawsuit filed by Sun against Microsoft, alledging that the Java enhancements constitute a violation of the licensing agreement purchased from Sun by Microsoft.

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Web) have been demanded by their prospective users with vehemence even before they could be installed. While "user acceptance" has always been a concern of those who implement new technologies, there is a real sense in which Internet services were accepted before they appeared. People *want* to use this technology. They use it at home as well as at work, and they carry their expertise from home use with them into work.

Eventually, the distinction between Intranets, Extranets, and the Internet may blur. There will be one global network, and everyone will be able to access some places and not other places. Geographically dispersed organizations will work better together. The world will be smaller, in no small part because of Internet and Web technology.

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