Chapter 7

Broadband Internet

The Internet is a global computer-based telecommunications network consisting of multiple smaller interconnected computer networks using a common language or protocol (TCP/IP). This is the official definition. But what is it really?

Today's Internet isn't susceptible to easy definition, because it is a marriage of disparate technologies, all under rapid transformation. True, it is a communication network that Americans use daily to send some four billion e-mails, but it has also evolved into the most uniquely personalized medium for mass-marketing and selling the world has yet experienced and is rapidly becoming a favorite source of information, education, and entertainment.

U.S. on-line retail sales exceeded $45 billion in 2003, according to the U.S. Department of Commerce. These figures did not include on-line travel or other ticket sales or money spent through on-line brokerages. Even with a depressed economy, terrorist attacks at home, and two wars fought on foreign soil, Americans were still projected to spend in excess of $100 billion buying things on the Internet in 2005.

Hardly anyone doubts that Mom will use the Internet from home to do office work, the kids will use it to do research for school, Dad will use it to listen to international radio stations, and the whole family will use it to watch their favorite movies streamed to in-home playback systems whenever they want. That is, if Mom and her family happen to be lucky enough to be among the elite 10 percent of the world's population with access to the Internet.

The Internet innovation is no longer simply a way to do e-mail, purchase products on-line, or get VoD. It has quickly emerged as its own medium with its own applications. In some ways, the

---

165 "Ecommerce Sales on the Up in U.S.," Nua Internet Survey,
Internet has taken on the broadcast functions of radio, television, and satellite networks. In other ways, it is an interactive medium more closely related to the telephone and data networks on which it is based. The identity that this technology is forging is distinctively its own. And no one believes that the full dimensions of that identity are set already. To think about what the Internet is today, it is helpful to summarize what the Internet seems to do best. For example,

- The Internet is a highly flexible electronic distribution system that can be used for either one-way or two-way communication. In the new era of “always-on, available-everywhere” broadband digital telecommunications, Internet users can be customers at one moment and creators, producers, marketers, and distributors of content at another. What is different is that the act of consuming and the act of creating can be done by the same people using the same medium.

- The Internet medium is not particular whether the user logs on at home, the office, or some remote site. Users can access the Internet by way of a personal computer, television set, or some special communication device, such as an advanced cellular telephone or personal digital assistant. Information exchanged can consist of brief messages or massive files of data. Transmission can be symmetric or asymmetric, with lots of information flowing one way and less flowing the other; it can be synchronous or asynchronous, in real time or not.

- The Internet is a sufficiently versatile network of receiving and contributing devices that it can support very user-centric activities. Users can correspond on-line, make secure telephone calls, hold business conferences, upload large data files, exchange songs, view pornographic movies, play games and gamble, or engage in electronic buying and selling, all from a single location or from multiple locations, interacting as easily with machines as with humans. The time may have already arrived when the Internet is being accessed by more devices than people, as with the highly automated search engines and software robots instructed to give and take from the Internet.

- The Internet is “platform agnostic” in that the service is not wedded to a single transmission medium. Internet traffic can travel over telephone, cable, wireless, broadcast, satellite, or power lines, which means that in one way or another almost everybody in the world is going to have a way to eventually be connected. How and at what cost future users will gain access will depend on factors affected by economics, politics, and culture, both local and global.

What's Happening with the Internet?

Here is a sampling of what is taking place within and around the Internet as illustrated by the categories of players whose innovations are serving to rapidly transform the new medium.

Internet Service Providers

At the turn of the millennium, about 1,600 ISPs were operating in the United States, almost as many as there were local television stations. Because the Internet is a network without a center, and smaller providers are vulnerable to being bought out and run out of the market by larger, better-endowed companies, ISP ownership has been rapidly consolidating. The weak economy has accelerated the pace of this change. The number of U.S. ISPs is now thought to be about 7,000.
By 2003, ISPs AOL (with a 31.5 percent market-share) and MSN (with a 10.5 percent market-share) had managed to capture almost 50 percent of U.S. on-line subscribers. Their parent companies, AOL Time Warner and Microsoft, are among the most powerful media and communications providers of the world; their brand names and market caps exceed those of U.S. broadcasters ABC, CBS, Fox, and NBC.

As the world’s largest ISP, AOL found that its capitalization was strong enough to take over Time Warner Inc., the world’s biggest media and entertainment company. When this $120 billion merger was consummated in January 2001, Chairman Steve Case announced that AOL Time Warner was prepared to face the “Internet Century.” The Internet provider said it would parlay its dominance in on-line access into a host of new businesses taking advantage of Time Warner’s interactive cable networks and its vast print, music, TV, and film holdings.

As early as 1998, AOL was looking to use its mass-market appeal to transform on-line technologies into high-speed digital TV businesses. Acquiring NetChannel, a rival to Microsoft’s WebTV, AOL began developing content for distribution on the digital platforms of telephone, cable, and satellite in a service called AOL TV. In a partnership with Sony Corp., special devices were developed to enable AOL to target the 60 percent of U.S. homes that did not have PCs. Its long-term goal was to facilitate access to its networked resources from almost anywhere, getting ready for public adoption of broadband communication.

AOL acquired Netscape Communications Corp. with $4.2 billion in stock and moved to strengthen its ties to software developer Sun Microsystems. Netscape had developed a popular Web browser and hosted a Netcenter portal (Internet gateway) service. Sun’s Java programming technology helped AOL deliver on its “anywhere” access to Internet services via TV sets, mobile phones, and other terminal devices. Sun was also key to AOL’s e-commerce and enterprise alliances with corporations.

The AOL-Netscape merger, with an unduplicated reach of about 60 million users per week, created a $50 billion on-line powerhouse surpassing in value that of most of the big media companies. CEO Steve Case said the Netscape deal would speed up, by several years, AOL’s becoming a major portal for electronic commerce and an access medium for the Internet as pervasive as television. Case foresaw a time when AOL would be more valuable in everyday life than TV.

By 2000, AOL had experienced six stock splits in seven years with an accumulated market capitalization of $83.5 billion. The trade press was projecting that AOL would be unlike other Internet plays: its solid subscriber growth and revenues would offset the seasonality of e-commerce and ad sales.

This prognosis was tested as the bottom fell out of media and technology stocks and advertisers began to quickly abandon the Internet start-ups, commonly called dot-coms. AOL Time Warner took a 40 percent hit in the softening advertising market; its revenues grew 1 to 3 percent rather than the 20-plus percent projected. At a bleak moment in the summer of 2002 when AOL Time Warner’s accounting practices were under scrutiny by the U.S. SEC, its share price had fallen to $10.

When industry analysts were looking for encouraging things to say about the company’s performance during the recession, it was not the AOL Internet portal but the traditional cable, entertainment, and publishing businesses that they highlighted. Indeed, it was the “brick-and-mortar” businesses of Time Warner that had to save the day for the on-line ventures.

Microsoft Corp. had shown little interest in the Internet prior to mid-1990. It was not until revenues from its core PC software business began to decline and Web computing emerged as a potential competitor that Microsoft built its own Web portal and began putting money into Internet content and services. When AOL raised its monthly on-line subscription rates to $23.95 in 2001, Microsoft held its MSN prices steady at $21.95 and launched a $50 million ad campaign aimed at converting AOL subscribers. The goal of Microsoft’s well-funded .NET strategy was to tailor PC software programs to Web applications for business and build a
loyal following of PC users with a raft of new e-mail, chat, instant messaging, and other revenue-producing ISP offerings.

**Web Portals**

In spite of the dominance of AOL and Microsoft's MSN in the subscription market, the Internet is by no means under the control of just one or two commercial ISPs (in the United States and almost everywhere else). In terms of the total number of users and time spent on-line, Internet destinations are growing, and traffic is spread across many players. Table 7.1 shows an example of monthly user traffic at major Internet Web portals.166

<table>
<thead>
<tr>
<th>Portal</th>
<th>Users (in Millions)</th>
<th>Average Time Connected per Person</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microsoft</td>
<td>93.5</td>
<td>1 hour and 33 minutes</td>
</tr>
<tr>
<td>Time Warner</td>
<td>82.5</td>
<td>3 hours and 59 minutes</td>
</tr>
<tr>
<td>Yahoo!</td>
<td>79.5</td>
<td>1 hour and 57 minutes</td>
</tr>
<tr>
<td>Google</td>
<td>48</td>
<td>18 minutes</td>
</tr>
<tr>
<td>eBay</td>
<td>45.5</td>
<td>1 hour and 25 minutes</td>
</tr>
<tr>
<td>U.S. Government</td>
<td>36</td>
<td>21 minutes</td>
</tr>
<tr>
<td>RealNetworks</td>
<td>26</td>
<td>29 minutes</td>
</tr>
<tr>
<td>Amazon</td>
<td>24</td>
<td>14 minutes</td>
</tr>
<tr>
<td>InterActiveCorp</td>
<td>23</td>
<td>20 minutes</td>
</tr>
<tr>
<td>Terra Lycos</td>
<td>22</td>
<td>9 minutes</td>
</tr>
</tbody>
</table>

**Table 7.1: Average Monthly Traffic at Major Internet Portals**

Internet destinations today represent real variety and competition. Yahoo! is an example of an early high-flying dot-com that crashed in the Internet bubble but later picked itself up and not only became profitable, but also became one of the post-recession darlings of Wall Street.

Yahoo! was founded in 1996. It built its business by providing a fast and free on-line navigational guide to the World Wide Web. Yahoo!'s strategy was to maintain a quick and easy gateway (portal) to information and services that would be attractive to a large population of on-line users, one that advertisers and content providers would look to for reaching a mass audience. "We don't believe we need to create, control, and manage a big part of our content," president and CEO Jeff Mallett told Electronic Media in July 2000, "We believe the open nature of the Web is the best way for us to provide services."167

Yahoo! generated millions of page views per day but was unable to sustain its business. Advertising accounted for 80 percent of the company's income, with about 40 percent of that coming from other Internet companies. When the Internet start-ups got into financial trouble as a result of rapid declines in tech stock valuations, advertising was one of the first up-front expenses those companies chose to cut. Losses from advertising income resulted in declining profitability that led to a 92 percent drop in Yahoo!'s share price. From an all-time high of $237 per share and a market capitalization of $110 billion, Yahoo!'s net worth in the new millennium dropped to $10 billion. Its share price was $15.

Even in the days of its greatest success, Yahoo! executives knew the company needed more value-added premium services for which it could charge a fee. It developed a relationship with Duet, the on-line digital music subscription service created by Universal Music Group and Sony Music Entertainment, two of the world's largest music companies, and it introduced Yahoo! Finance, delivering streamed stock quotes, news, and analysis to desktops and wireless devices for a monthly fee of $9.95. Yahoo! Broadcast Services signed up clients such as Compaq Computer, Ralston Purina, and Texas Instruments for the streaming of interactive corporate conferences and other events over the Internet.

Yahoo! was an early innovator in management of user-generated content, a service it called "personal broadcasting," letting individuals incorporate audio and video into information they developed for use on the Web. In 1999 Yahoo! spent huge sums to acquire personal page publisher GeoCities ($3.5 billion) and the leading Internet broadcaster Broadcast.com ($5.6 billion).GeoCities gave Yahoo! users the means to group their personal

---


publishing sites into "on-line neighborhoods" around targeted communities of interest. Broadcast.com gave the company the infrastructure for streaming the contents of radio and TV stations and the rights to a variety of sporting events that it broadcast in real time over the Internet.

In May 2001 Yahoo! brought in Jerry Semel as CEO, a former Hollywood executive, who took the company even further beyond its roots as a portal business. Semel pushed into broadband services hoping to lure dial-up users into the high-speed (DSL) partnerships the company had established with SBC Communications and with British Telecom in the United Kingdom. Yahoo! signed lucrative contracts to run the telcos' portal and content services.

Yahoo! further increased its revenues with its HotJobs employment advertising service. It also offered games on demand as a subscription service along with high-volume e-mail accounts and personal ads. Yahoo! Platinum streams live TV shows, news, sports, and other premium Internet content as a paid service for $9.95. The Platinum service launched in the summer 2003 is similar to the approach taken by RealOne SuperPass of RealNetworks. Yahoo! also bought Overture Services Inc. ($1.6 billion) to position advertisements near Yahoo!'s search results. In a search engine marketing process called "lead generation," Overture is delivering specific ads (and ad linkages) to specific users coming to Yahoo! looking for specific things.168

Under Semel, Yahoo!'s shares rose to $35 in 2003 and up to $45 in 2004. Stock analysts Smith Barney and First Albany changed their ratings recommendations to "buy" and lifted their earnings estimates and share-price targets.169 Revenues from fee-based services were estimated at $70 million, up 43 percent, and the company could claim four million paying subscribers.

Search and navigation portal Lycos Inc. established a Multimedia Products Group in 1999 to go after the broadband market using its Web platform for distribution of exclusive or near-exclusive content supplied by a variety of partners. The Lycos approach was to build viewership in the same way television networks attracted viewers with popular programming. Waltham, Massachusetts-based Lycos teamed up with Web broadcast syndicator Westwind Media to launch the Lycos Radio Network, delivering audio programming in five music genres: top 40, country, jazz, rhythm & blues, and alternative rock. This radio network was of a unique sort: it featured music videos. The Lycos' plan was to draw revenues from advertising, but in the longer term also to integrate electronic commerce into its multimedia offerings using clickable buttons that would permit viewers to purchase the CDs of artists featured on the screen without interrupting the video.

Lycos launched Lycos TV, an interactive programmed video network featuring music, sports, movies, animation, and comedy channels to be viewed through high-speed Internet connections. Lycos TV was intended to move the Internet closer to the rich media content of broadcast television.

To carry out its business plan, Lycos acquired Web community builder Tripod Inc. and established partnerships with such start-ups as Web-MD Inc. Atlanta-based Web-MD paid $52 million to be Lycos' exclusive health-care site. A deal to merge Lycos with cable channel USA Networks—to benefit from its interactive unit and its Home Shopping Network broadcast service—faltered in May 1999 when Lycos investors thought the $22 billion offered was too little.

In May 2000 Lycos was acquired by La Telefonica of Spain in a stock deal valued at $12.5 billion. The name was changed to Terra Lycos. Telefonica is the largest supplier of telecom services in the Spanish- and Portuguese-speaking world, providing fixed and mobile telephone lines, pay television services, and content production. The European media giant Bertelsmann agreed to purchase up to $1 billion of services from Terra Lycos over five years.

---

Terra Lycos's goal was to be the dominant Internet content and
access provider for Latin America, competing globally with AOL,
Yahoo!, and Microsoft Network. In the tech economy downturn,
Terra Lycos shares lost two-thirds of their value largely because the
Internet advertising market had disappeared, from which 70
percent of company revenues were derived. During 2002–2003
Terra Lycos was running a network of content sites, both paid and
free, offering Web site building tools and search services. Its
strategy for addressing the poor economy and the advertising
slump was to offer subscription services.

In 2003, in an effort to more tightly integrate Terra Lycos
broadband products and services with its telephony and high-speed
Internet access businesses, Telefonica offered to buy the 62 percent
of Terra Lycos shares it did not own. Shareholders were bristling at
the $2 billion offer that they deemed too low. 170

On-Line Retailers and Traders

Amazon.com Inc. is the Web's most famous seller of books. Three
years after it opened its virtual doors in July 1995, Amazon.com
was offering an easily searchable archive of 3.1 million book titles.
Company technologies were programmed to automatically analyze
past purchases of on-line buyers so that recommendations for
future purchases could be customized for each user. Orders placed
by way of the Amazon.com Web site could be activated with a
single click of the mouse, making the shopping experience quick,
painless, and comparatively economical.

In 1998 the company's inventory was 15 times that of any other
bookstore—without the costly overhead of multimillion-dollar
buildings inhabited by thousands of employees. Its 1,600
employees generated an average $375,000 in annual revenues, more
than triple that of Barnes & Noble Inc. with 27,000 employees.

Amazon.com quickly expanded beyond the book business. By 1999
the on-line retailer was promoting itself as the "world's most
customer-centric company" with its new mission to build a space

where people could go to find anything they might want to buy on-
line. Amazon opened a music store, a video store, and an expanded
gift shop that, in addition to books, offered access to music and
videos, greeting cards, toys, games, software, and consumer
electronics with some 16 million items for sale.

Amazon.com also took a 46 percent stake in Drugstore.com and a
50 percent stake in Pets.com and HomeGrocer.com, and it
announced it would launch an on-line auction service. The
company began using its site as a marketplace for other merchants.
For a $9.99 per month fee and up to 5 percent of revenues,
merchants could offer up to 3,000 products to Amazon's 12
million customers through a service called zShops.

While the value of Amazon.com stock at $29 billion in 1999 was
more than Sears, Roebuck and Co. and K-Mart Corp. combined,
the company had yet to make a profit and had accumulated debt in
excess of $2 billion. By 2001, even though the company was
reporting increasing sales and could show healthy cash flow,
Amazon.com's stock had fallen from a 1999 high of $113 to less
than $13.

Chief executive Jeff Bezos argued that patience was needed. The
six-year-old company was still in a growth and acquisition stage. Its
balance sheet demonstrated that 29 million customers in more than
160 countries were using its services for on-line shopping. Its gross
margins were increasing, its customer acquisition costs were among
the lowest in the industry, and the book, music, and video stores
were operating in the black. Short-term profitability was unrealistic
for a high-volume, low-return business, he said, pointing to
Nielsen/NetRatings that showed 8 percent of visitors to
Amazon.com buying something, double the rate of nonpersonalized sites.

Patience paid off. Amazon beat analysts' expectations in the fourth
quarter 2002 by turning its first profit. By 2004, the company was
clearly operating in the black on the basis of $6.4 billion in sales.
International sales were up 58 percent, getting a boost from the

170 "Telephonica Would Keep Lycos," Jupitermedia,
weak U.S. dollar. Its share price increased to $48. Amazon attributed much of its growth to increased efficiency and price cutting on products, such as providing free shipping for orders of $25 or more.

At least one dot-com start-up found that the on-line marketplace thrives in good times and bad. eBay Inc. calls itself the world's largest on-line trading community. The company celebrated its “500 millionth auction” in the first quarter 2001 by honoring typical users who listed silk dresses, beanie babies, auto parts, Nintendo game players, and books for sale on the auction site. With no warehouses and no inventory, eBay's “flea market to the world” boasted 22 million traders working the site.

The number of active users on eBay climbed to 28 million in 2003. Its profits jumped to $250 million on $1.2 billion in sales. Its revenues were generated almost entirely on the basis of a 5 percent take from auctioned items, estimated at $30 million in transactions per day. Even standard retailers such as IBM and Sears Roebuck and Company are selling their hard-to-move products on the eBay site. In 2002 eBay bought out payment processor PayPal Inc., a step that made it possible for users to pay on-line rather than by check. Based on gross sales, eBay is the top on-line marketplace in Australia, Canada, Germany, Korea, the United Kingdom, and the United States.

**File Sharing**

As eBay and Amazon.com demonstrate, digital connectivity allows customers to buy and sell whatever they like, whenever they like, and they can set the terms. As auctioneers, eBay and Amazon facilitate the process and take a commission from each transaction but the substance of what transpires over the Internet is under the control of the users.

---


The Internet is an ideal medium for distance transactions, the next best thing to face-to-face communication. Computer files stored on hard drives can be uploaded, downloaded, and exchanged at will. There are constraints, however. Such transactions are limited by the processing power and storage capabilities of user devices and the capacities of interconnecting lines. A further limitation has to do with content that has been encrypted or that may not be shared because it is legally protected.

In July 2000 a U.S. District Court issued a preliminary injunction barring Napster Inc., a popular file-sharing site for MP3 music, from trading music files via the Internet. The suit was brought by the Recording Industry Association of America (RIAA) and several individual recording artists. Shawn Fanning, a freshman at Northeastern University in Boston, had developed a software for transforming PCs into servers for the public exchange of music recordings. His Internet company was called Napster. The result was the almost-immediate formation of a global file-sharing community racing to access music stored on individual user hard drives. Napster's Web site drew more than 20 million users. In the days immediately following the injunction, Napster's traffic shot up 71 percent as on-line users rushed to acquire music before the site was closed.

Napster used a cluster of centrally located file servers to hold member registrations, display shared file lists, and account for music searches. Visitors to the site accessed the Napster file directory, which told them which other subscribers had the music they wanted. Napster software helped subscribers organize their music into files and download these from one participant directly to another.

Germany-based Bertelsmann made a $50 million deal with Napster late in 2000 to develop the technological systems by which users could pay for the music they downloaded from the Internet. Bertelsmann held massive investments in content, including broadcasting (the RTL Group was Europe's biggest broadcaster), publishing (Random House, Book-of-the-Month Club and over 100 magazines and newspapers worldwide), Internet (partnerships with AOL, Terra Lycos, and others), and music (BMG
Entertainment, Arista Records, and RCA). Seeing the potential market for on-line music trading, Bertelsmann agreed to withdraw its part in the RIAA suit against Napster, and sought to convince Universal Music, Sony, Warner Music, and MCI to remove their opposition as well.

Bertelsmann's eye was on the 38 million users of the Napster service. Its goal was to help Napster convert the massive copyright infringement capabilities of the file-sharing innovation into a legitimate business for on-line media distribution and e-commerce. By means of a membership fee, a system was sought that would generate revenues so artists and songwriters could be compensated for music files that users shared with each other, while protecting the principle of person-to-person sharing of user-owned files.

In answer to the question, "Has Napster sold out?" Napster's answer on its Web site was "No. We strongly believe that this alliance with Bertelsmann is an important next step for Napster. Napster is a business, and as such, we are taking steps to establish a business model, create value for our users, and push the limits of our technology."  

Napster closed its site in 2001, but other peer-to-peer (P2P) file-sharing start-ups have emerged, including Gnutella, SightSound, Freenet, and Kazaa. Gnutella explained itself on its Web site. "Napster's arrival on the scene spawned development of technology that allows people to find and share information. When the company Napster got sued and eventually shut down, it was up to us to make sure the idea didn't die."  

Gnutella "puts the personal interaction back into the Internet. When you run Gnutella software and connect to the Gnutella Network, you bring with you the information you want to make public. And you choose the information you want to share," it said.

The principal difference between Napster and Gnutella, according to IEEE Spectrum editor Steven Cherry, is that Gnutella has no central file directory. "When you search for a file on the Gnutella network, you search among all the Gnutella members in your network neighborhood. As a peer-to-peer network, Gnutella has no central server to sue, as Napster does, and provides fewer targets for litigation."  

Kazaa, the popular file-sharing site that let some 60 million worldwide users trade music through thousands of "supernodes," sought to remove its operations beyond the reach of the courts by locating its servers in Denmark, its software in Estonia, its domain site in Australia, and its business operations in the South Pacific island of Vanatu.  

To avoid the impression that it was a blatant copyright piracy service and to assume an air of legitimacy for the advertisers it attracted to its site, Kazaa established a partnership with Brilliant Digital Entertainment, whose software let Kazaa introduce authorized, protected, and "for pay" content to P2P users. The new Altnet technology, available free to all Kazaa desktop users, provided the means for users to "go legit."

According to Brilliant CEO Kevin Bermeister, users can access either the regular, unprotected Kazaa network or the network containing the Altnet files. Altnet "allows media companies to reward customers for swapping (and paying for) copy-protected files." He explained that a feature of Altnet is a metering application that issues points to users who share authorized files. "The points can be redeemed for free music, goods such as DVD players, or a chance to win a million dollars." The fourth most popular term typed into the Terra Lycos search engine in spring 2004 was Kazaa; the first was Weight Watchers.

---

175 Steven Cherry, "Streaming Video à la Napster," IEEE Spectrum, August 2000, p. 73.
SightSound Technologies demonstrated the first Internet-based movie download system, a system allied to the motion picture industry as it sought to be a participant in digital distribution. Movies are encrypted and fed over the Internet using Microsoft's Windows Media Player, an Internet-streaming technology. Customers may share those movies with others, but viewers must go to SightSound for a decryption key. Because of the enormous storage problems of video exchanges (a single movie in digitally compressed format typically requires up to 200 megabytes), SightSound is using the Gnutella exchange to expand the number of servers from which its Hollywood films will be available for downloading for a fee.

Freenet defines itself as "a large-scale peer-to-peer network which pools the power of member computers around the world to create a massive virtual information store open to anyone to freely publish or view information of all kinds." The Freenet is the implementation of a philosophy as well as an architecture. According to the Web site, it is an information publication system that serves as an alternative to the World Wide Web. Unlike the Web, information is not stored at fixed locations nor is it subject to any kind of centralized control. The Freenet consists of a collection of nodes linking independent users, each node running a piece of free software. Each node is made aware of selected files on the hard disks of participating members that can be downloaded. A distinctive feature of this type of peer-to-peer file sharing is that users are anonymous. The files are encrypted in such a way that Freenet nodes are unaware of the nature of the files they are hosting. The downloadable files have no fixed address, thus the file's location has no direct relation to its origin site. In effect, Freenet offers encrypted files for exchange but those files have no fixed URLs.

Peer-to-peer processing has captured the attention of software developers Sun Microsystems, Microsoft Corp., and others. Sun has released a P2P-based product called JXTA for bridging separate P2P applications and linking computing tasks across P2P networks. A part of Microsoft's .NET initiative is to support the creation of distributed Web services that can make information available on any device, anytime, any place.

**Web Hosting**

Getting set up to deliver content—especially media-rich content—over the Internet is no simple matter. Many businesses and public and private organizations, even individual households, have reasons for establishing a presence on the World Wide Web but don't know the first thing about getting started, or haven't the hardware and software to accomplish this task. In the context of this need, Web hosting and Web management firms have sprung up to offer their services.

One of the unlikely companies entering the Internet services area was computer chip-maker Intel Corp. By the end of the 20th century Intel could boast 84 percent market share in PC processors. Looking ahead, however, it had concluded that the manufacturing of microprocessors was going to be a more competitive and less lucrative business. If Intel wanted to sustain its remarkable record of 30-plus percent compound annual growth, it would need to shift the focus of its attention from PCs to the Internet.

Intel executives began a process of positioning the company to not only supply future silicon used in communication devices, networking, and information appliances but to provide communication services such as Internet hosting the running of Web and e-commerce sites for other companies. Intel announced plans to spend up to $1 billion on hardware, software, network capacity, and technology management on behalf of companies wanting to be connected to the Internet, targeting businesses less interested in maintaining their servers in-house.

Intel's new on-line services unit proposed to offer corporate clients an integrated package with a complete operating system and software, with Intel people monitoring the network for reliability and performance. Data centers were opened in the United States, England, Korea, and Japan, some with as many as 10,000 servers. But these technological capabilities proved to be in advance of the

---

global demand. Intel suffered heavy losses in the new millennium economy and backed away from many of these investments.

Even so, numerous other companies are laying claim to the nascent Web hosting market. These include Exodus Communications, Electronic Data Systems, Computer Sciences Corp., Genuity, IBM, and AT&T. Although this sector will take some time to develop, application services and hosting are expected to be future growth businesses.

**Broadband Technologies**

It was only 25 years ago that the Internet was an arcane tool of research scholars and a proprietary communications system of the U.S. government, the military, and a few universities. Today the Internet is a heavily used multimedia network accessible to businesses, schools, and residential users in every country of the world. An estimated 580 million people worldwide were Internet users in 2004.

That number is expected to experience yearly growth for the foreseeable future. Thousands of miles of optical fiber are being laid and superfast routers have been added to handle the additional global data traffic being generated. Billions of R&D dollars are spent by business, industry, and nonprofit organizations each year trying to identify and make available those special applications that might attract Internet users as customers and clients.

What are the principal enabling technologies that make such growth possible?

**Internet Networks**

The majority of Internet traffic, by far, travels over the PSTN. The telephone system of communication has been a remarkably reliable and capable infrastructure. The telephone networks offer the great advantage that interconnected telephone lines are up and running almost everywhere. But these PSTN networks were designed to carry voice traffic of a very limited kind.

To meet the ambitious commercial, educational, entertainment, and communication requirements of the new digital age, more robust and flexible networks are needed. Telecommunication networks that not only connect every home and office and school in a way that is as convenient, economical, and interactive as the narrowband telephone networks, but future-oriented networks that can scale to two-way digital television and support high-data rate services. These solutions are still under development.

At least three major strategies are going forward at once. One is to increase the carrying capacities of the PSTNs, another is to bypass the voice networks with separate but parallel all-digital networks, and a third is to integrate voice networks and data networks so that future-oriented applications can go forward without abruptly abandoning the in-place facilities.

On the data side, the technologies of choice for wide-area networking are mostly optical. Fiber-optic technologies are well-suited to supporting telecommunication transmissions in a variety of formats, including the two dominant protocols used in core packet networks: ATM and IP. Already, superfiber switching and routing over advanced data lines enable carriers to significantly enhance their data pipes connecting metropolitan areas and those connecting distant regions of the world. Terabit-speed routing switches supporting multiple classes of IP service and high-capacity optical interfaces are emerging from the development laboratories. These will be installed in the backbone of the Internet, a major step toward making the Internet more scalable, more reliable, and more application-friendly.

So-called "mediation switches" are helping to bring voice and data together on a single network. Such switches take in a variety of traffic types on the front end and transfer them to one or more networks on the back end. They permit voice traffic to be routed onto the PSTN where telephony carriers maintain voice services on tried-and-true networks until the data network is reliable enough to handle voice traffic. The core network can be the circuit-switched PSTN, an IP-packet network, or an ATM network. Over time, such a multiplicity of approaches will permit network operators to divert voice traffic from the existing circuit-based networks onto
pure data backbones and migrate services from circuit-switched to packet-switched networks.\textsuperscript{179}

Circuit-switched equipment suppliers Cisco Systems, Lucent Technologies, and Nortel Networks have devised solutions to hedge the huge investments the telcos have in voice switches so that either ATM or IP traffic may be carried on their networks. Taking a different approach, Avici Systems sells routers that enable telecommunication carriers to build out IP and ATM networks that operate in parallel. Separated streams of traffic ride on the same fiber but occupy distinct wavelengths created through DWDM technology, a way to multiply the carrying capacities of fiber-optic lines.

Data traffic has been more than doubling every year. 2000 was the approximate moment in history when data overtook voice as the dominant type of traffic flowing over the world’s telecom networks. Data communication networks were once the poor cousins of the PSTN, plagued by delays, breakdowns, and erratic transmission. But data now gets priority attention. Business users, as well as residential users, have come to expect of data carriers a higher quality of service with feature-rich applications, features that incorporate the familiarity, accessibility, and interactivity of the telephone but with the audiovisual power of television.

Much of the global data traffic is now IP traffic. Growth in the IP side of communication-related services has not just been the result of growth in e-mail traffic but the popularity of personal Web sites. It has come about as a result of increased use of imagery and audio in the data stream. On-line advertising and electronic commerce are being made more visually appealing on the World Wide Web. The upgrading of telecommunication architectures leading to increased speed, capacity, and quality of service on the Internet has further stimulated demand.

Among the big U.S.-based Internet carriers are MCI, Williams, Sprint, Qwest, and Level 3. Level 3 Communications Inc. of


Omaha, Nebraska, laid fiber-optic cables along railroad right-of-ways. Its system included 54 North American intra-city networks, 15,000 miles of U.S. intercity links, and a European network connecting 17 financial centers with extensions to 21 other foreign cities in Europe and Asia. Each of its 1.25-inch conduits can hold 384 fibers. Each pair of fiber can carry 150,000 simultaneous phone conversations or their equivalent in video and data. These lines will be further upgraded as the software and hardware for data multiplexing advances, and as business justifies the cost.

Even though Level 3’s broadband network was already big enough to carry all of the world’s existing telecommunication traffic, the carrier was still adding capacity at the millennium’s end in anticipation of runaway growth in Internet demand. The fact that Level 3 had to reduce its workforce in 2001 and 2002 and sell its Asian operations, including ownership in a Japan–U.S. submarine cable and backhaul system, was not because the networks weren’t working properly; the company’s problems were related to its inability to sustain a sufficiently profitable business in a depressed global economy.

There are cost advantages in moving to all-IP transport, but the most attractive features are in simplifying the network end-to-end. IP traffic can be relayed from router to router without being encoded and decoded along the way, as is required on traditional telco networks. Network service providers operating at the core of the Internet and applications service providers operating at the edge can more easily work together.

\textbf{Internet Access}

How to give customers access to the Internet yet control where those customers go and what they see and do is the biggest part of what the competition over broadband communication is all about.

To get connected to the Internet, prospective users have the option of hosting an Internet gateway of their own or using an intermediary. Because accessing the Internet directly is expensive and technologically complicated, the general public has little option but to use intermediaries called Internet service providers (ISPs). The local ISPs are likely to be telephone or cable operators with
The Broadband Millennium

lines into homes or independent providers using local wire or wireless loops for connectivity. The national and international ISPs are also forced to use local telco, cable, wireless, and satellite providers to access subscribers in the last mile.

For the delivery of high-speed Internet services, the telephone companies are rapidly activating DSL access technologies providing 1.5 Mbps or faster service over existing telephone lines. The cable companies are counting on high-speed cable modems and a reconditioned cable plant to bring interactive data services to the home. Although not yet available everywhere, wireless and satellite providers are now also marketing two-way broadband Internet services. Each of these industry groups is still fine-tuning the first- and last-mile technologies that will best serve the clients it is targeting.

About 75 percent of the U.S. population, some 204 million people, has home Internet access. Of these, some 22 million now access the Internet with a high-speed connection. Dial-up modems remain the dominant access mode, but broadband penetration using broadband technologies is growing on multiple fronts.

Dial-up telephone modems connecting to personal computers at maximum speeds of 56/64 kbps have been the way Internet users have traditionally gone on-line. The advent of World Wide Web browsers made searching (surfing) the Internet much easier. The World Wide Web is an organizing system for information stored on remote computers connected to the Internet. In the early days, the fact that most PCs had limited storage and processing capabilities and most telephone lines really worked only for voice communication, the Internet experience was largely limited to text-based e-mailing. These are still constraining factors for the great majority of users.

Internet technologies and the networks over which Internet information travels are nevertheless improving. In the case of high-data-rate exchanges over the Internet, modern computers equipped

with enabling software are now capable of distributing and retrieving media enriched by video and sound. With broadband delivery, this experience can approach that of cable television.

When AOL bought Netscape Communications in 1998, it acquired Netscape Navigator, the most widely adopted Web browser. In this acquisition, AOL gained significant control over the software by which the world’s largest number of users navigated the World Wide Web. Thus AOL attracted increasing Internet traffic to its sites and to the information and services that it hosted.

AOL had the additional advantage that it could be platform-independent as far as distribution was concerned. In executing its “AOL anywhere” strategy, the company partnered with local ISPs, telcos using ADSL and satellite providers using space-based return signals. By acquiring Time Warner, AOL became a cable provider in its own right. With the growth of the Internet, every home, every school, and every large or small organization found it needed the kinds of services an AOL ISP offered. If potential users wanted to be connected, their choices were to affiliate with a national or local provider or to create a similar service of their own.

Virtual Private Networks

Some organizations use their own computer servers to manage in-house local-area data (LAN) networks equipped with nodes for Internet access via leased lines. With powerful new “thin servers,” corporations can create something resembling a full-service ISP at the corporate site routing data outward toward the global Internet and inward toward the desktop. These “Intranet” servers facilitate speedier file transfer, support e-mail, provide tools for Web page development, simplify IP administration, protect against “spamming,” and ensure information security.

The creation of virtual private networks (VPNs) has proved to be a great boon to communication management within large organizations. Access to corporate networks can be extended not only to on-site employees, but also to employees on the road, to telecommuters, to partner companies, to suppliers, and to customers and clients. VPNs will normally ride on the PSTNs since

the PSTN is globally accessible and comparatively economical in cost, but specially provisioned IP networks are now also used.

The VPN is a way to give direct and priority access to those outside the corporate LAN without companies having to bear all of the leased-line and dial-in costs of remote access connectivity. Remote users can be treated as if they were on the computer systems of the home office, and the thin server can keep up with the number and demographics of visitors who enter the system. As a firewall, the VPN provides the security (encryption, authentication, and access control) needed to protect sensitive internal information.

In most cases, the Internet becomes the default wide-area network to the corporate LAN. Without regard to size and capitalization, organizations can have their own private global network, giving immediate access to distant inquiries through Web searches, e-mail, and faxes (converting paper into IP packets) and providing backup to file transfers. In the foreseeable future, wherever can be done at the office will be possible to do at home or school or while traveling, and done securely.

The big network carriers AT&T, Sprint, and MCI as well as competitors Level 3, Genuity, and Verizon Communications are building out IP networks and installing gateways designed to transition VoIP calling from a niche PC application to a regular customer service. These networks can now connect calls from wherever they originate on the public switched network to an IP-packet-based backbone and back to a location closest to the receiver of the call. VoIP can be PC to PC, PC to phone, phone to PC, or phone to phone. Some Internet voice connections are now indistinguishable in quality from circuit-switched calls.

AT&T, Yahoo!, and AOL joined a coalition investing $1.4 billion in technologies advanced by Net2Phone Inc. in an effort to force an industry standard for voice over the Internet. People in Afghanistan using the Net2Phone service to call the United States are said to pay $1.13 per minute compared to more than $5.50 per minute using international phone services.

Yahoo! introduced voice in its chat rooms, and AOL included phone service in the newest version of its Instant Messenger. Voice service is thought to be as much about creating on-line communities as it is about creating commerce. With the rollout of broadband delivery, as on-line voice technologies continue to improve and moving images are added to Web sites, on-line collaboration, communications, and commercial transactions for consumers and businesses will become a more lifelike experience.

Webcasting

Audio and video streaming over the Internet is already a competitor to broadcast and cable. The evidence of this is 1) that the same ratings services that track viewer behavior for television now track the Internet, 2) that the Internet is now perceived to be a threat to broadcast and cable advertising revenues, and 3) that broadcasters and cablecasters are now hard at work seeing that Webcasting complements rather than detracts from what they do.

Streaming media means that the audio and video information transmitted over the Internet is “played” or “streamed” in real time. Prior to the advent of streaming media technologies, any multimedia programming traveling over the Internet had to be fully downloaded (captured and held on the receiving PC or server) before it could be viewed (see Figure 7.1).
Streaming software chops up the information contained in a multimedia Web site or an Internet-delivered radio or TV broadcast into digital pieces called packets. For delivering audio and video on demand, these packets are retrieved from an Internet-connected media server or other high-capacity storage system and routed to the distant computer requesting the information via an IP or other data network. Digital packets are an efficient way to send lots of data to different people all at once. These data packets can travel by wires and cables or over wireless media.

Streaming is a bit different from e-mail and other data-file transfers in which packets are sent in bursts and then reassembled at their destination. With real-time transmissions there is insufficient time to recognize and retransmit lost data packets. Web users often feel frustrated by the small images, slow delivery, missing frames, and poor audio sync that they experience when browsing the current Internet and come across audio and video clips they would like to view. These problems are exacerbated when viewing live television on the Net; the pictures are coarse and grainy and the motion jerky.

Some of the industry's biggest players are working on the challenge presented by Webcasting. Digitizing content quickly, developing more efficient compression schemes, installing high-capacity delivery systems and interfaces, and providing for convenient storage for on-demand retrieval are all needed to ensure that Internet users have listening and viewing experiences that compare favorably with radio and TV.

With broadband transmissions and sufficiently advanced hardware and software, programming can be played "live" on personal computers, computer-enabled TVs, and handheld devices as if the data were already all there, even though the files are still being transferred. A local buffer is used to capture and hold the arriving bits of data until enough information is available on-site to be played out smoothly.

When many users engage the Internet at once, the PSTNs hosting the Internet become congested and slow down. This is because a single user who clicks to view a Webcast receives a separate and distinct stream.

Several solutions are in development to address this problem. Cisco Systems, Sun Microsystems, and other vendors have developed multicast routers and servers that let many computers share a single video stream. Streaming media providers such as RealNetworks, Microsoft, and Apple QuickTime are working to see that popular Webcasts get hosted and stored at multiple distribution points, known as proxies or caches, to reduce the distance between the video source and its destination (see Figure 7.2). Virtual pathways are also being carved out within the Internet so that audio and video can be kept separate from traffic of lesser priority. Proprietary bypass networks are also being created just for the purpose of managing the burgeoning IP traffic.

---

Broadband Business

The Internet has added a whole new stratum of industry to the society and has infused existing enterprises with new vigor. The rush to apply IP hardware and software to all sorts of purposes and to take the Web everywhere has spurred a tremendous surge in commercial investment and new business creation. These new businesses are in telecommunications, entertainment and information, education and training, and electronic commerce.

Gains in productivity, based on an unprecedented outpouring of innovation focused on the Internet, point up one of the advantages of U.S.-style capitalism: the ability to move human and financial resources to the cutting edge of the economy quickly. Drawn by the possibility of big returns, venture capitalists and other investors were willing to fund new companies of great variety, even very risky ventures, greatly accelerating the pace of social change. Throughout the 1990s, the massive market capitalization of companies such as AOL, Cisco Systems, EMC, JDS Uniphase, Oracle Corporation, and Sun Microsystems were a wake-up call for mainline businesses, forcing them to rethink their operations.

The greatly inflated valuations of almost all of the 1990s Internet start-ups were brought down to earth in the early days of the new millennium. Stock prices for Amazon.com, Excite@home, Priceline.com, Webvan, Web-MD, and Yahoo, some of the Internet’s most spectacular performers, fell precipitously. Numerous Internet and technology companies were delisted by the Nasdaq exchange in 2000 and 2001 as their shares fell to less than $1. More than 150 of these companies went out of business.

Some of the on-line companies found sustainable alliances with off-line “brick-and-mortar” partners, such as AOL’s merger with Time Warner. In some cases, established businesses bought up the faltering dot-coms and incorporated their staff and their technologies in-house.

For the past two decades, the Internet has been in almost daily transformation, the result of a volatile market economy, innovative technologies, increased public demand, and business

---

Figure 7.2: RealNetworks and Apple Streaming Media Players

RealNetworks introduced a new software platform in 2002 that permits media companies to Webcast audio and video content in all the major streaming formats at once. Helix is an open platform, according to CEO Rob Glaser, around which a common standard can be built. This means that a single server running Helix can distribute multiple types of data, whether in MPEG-2 or MPEG-4 formats, or using any of the major proprietary client-server systems on the market. MPEG-2 and MPEG-4 are technical standards for digital compression, transmission, and storage of moving images. Helix will be a step forward in moving live and on-demand streaming beyond the desktop.

entrepreneurship. What the ultimate shape and purposes of the Internet will be are still unclear but it is clear that the Internet and its World Wide Web companion are among our society's most powerful engines of information creation, distribution, and retrieval, and instrument of potential wealth. Many who invested in the Internet saw their dreams evaporate, but it was not the Internet that evaporated.

**Internet Industry Options**

The Internet is a contradiction. It is a mass medium capable of being tailored to individualized applications. Highly differentiated services can be delivered to vast audiences.

The Internet is part “push” and part “pull.” Radio and TV broadcasters, politicians, advertisers, retailers, educators, and communicators of all types can use the Internet to move information around the world. Yet in the act of informing, entertaining, educating, and selling on the Internet the relationship can be one-on-one. The Internet lets people search out what interests them. Users are given the tools for making informed choices, including the choice of who to talk back.

Like no other mass medium or marketplace, the Internet offers content and service providers a way to communicate instantly in a personalized way with each of their customers. By the same means, consumers are given a way to compare products and prices, forcing providers to be more accommodating in terms of cost, time, and place of delivery.

**Consumer Targeting**

As a mass medium, it is no surprise that the same media ratings services that measure how many eyeballs are focused on a particular broadcast and cable program also measure how many surfers visit a particular Web site. Nielsen/NetRatings, the Internet audience measurement service from Nielsen Media Research, provides looker/booker ratios for e-commerce sites. The ratios reflect the percent of site visitors (lookers) who become buyers (bookers).

Nielsen/NetRatings also measures overall Internet usage, such as who is using the Internet for what purpose and the amount of time spent on-line. For example, Nielsen reported in February 2003 that more than 10 million African Americans were on-line. African Americans accessing the Internet via a broadband connection represented almost 32 percent of African Americans on-line. African Americans were spending an average of 44 hours each month on the Web compared to the total U.S. on-line population who were on the Web more than 50 hours.183

AccuStream iMedia Research was reporting that audio and video Internet streams are becoming more commonplace. Its research showed that video events during January and February 2004 covered by the top 10 sites averaged 523 million streams compared to 292 million streams in 2003. Music video captured the largest share of the streaming audience in 2003, followed closely by news, then sports and film viewing. The results of the 2004 studies showed that streaming followed a similar pattern, though the numbers were up.

"Streaming media is very much mainstream content now," AccuStream iMedia Research Director Paul Palumbo told clickz.com. "Audiences over the years have become very educated, there is more residential broadband, there have been so many huge news events, from the JFK Jr. crash to the War in Iraq, that continue to drive up usage. Moreover, there is simply more programming available." 184

Most Web users have no idea of the extent to which their Web visits/transactions are monitored. IBM, Oracle, and others have added site usage reporting and analysis capabilities to the servers they sell so that, in addition to responding to users, service providers can analyze what users are doing. IBM's product is able to deliver user data that has been linked with other user information stored in databases elsewhere.

---

On-line marketing firms DoubleClick, Avenue A, and Engage are in the business of building consumer-interest profiles using technologies that allow them to follow the click stream of individual Web users. These companies are estimated to have compiled lists of some 100 million "unique users" from tracking the Web-based ads and promotions Internet surfers have responded to. These firms know when those users make purchases and what their purchases are. They know how many times surfers and purchasers return to the site later. Because such data is pooled among retailers, composite profiles can be constructed that display consumers' spending habits across multiple sites. The on-line marketers are then able to sell their databases for purposes of targeted advertising.

Companies such as Avenue A and Engage keep track of Web users by way of a piece of software called a "cookie" that is downloaded to the user's computer when a particular Web site is visited. The tiny text file remains on the computer and can later be read by an off-site server. By monitoring the traffic on thousands of Web pages, the marketing firms can track users' behavior across the World Wide Web. DoubleClick raised a furor in privacy circles in 1999 when it acquired Abacus Direct, an off-line direct marketing company holding behavioral profile data pooled from 1,700 catalog companies covering 90 million households. DoubleClick proceeded to merge on-line and off-line databases in such a way that consumer anonymity was no longer protected.185

Not all Internet users find cookies intrusive and many see value in the innovation. For advertisers and marketers, the benefits of interacting with consumers when they are closer to making a purchase are opportunities too great to ignore. About two-thirds of Internet users who place items in electronic shopping carts don't follow through and purchase those items. One reason, according to marketers, is that consumers can't get their questions answered or are not looking at the right products. A customized ad at the right time for the right person is a win-win experience for the consumer and for the seller.


Chapter 7: Broadband Internet

Electronic Commerce

Commerce has become an Internet sweet spot. Not only has e-commerce been a stimulus to innovation, it promises to be a huge driver of future Internet traffic. On-line applications include business-to-consumer (B2C) transactions, as in on-line retailing; business-to-business (B2B) transactions, as in automakers negotiating with parts suppliers; and consumer-to-consumer (C2C) transactions, as in home page-to-home page auctions, marketing, and selling.

More businesses are treating e-business as a long-term strategic direction. The Internet is clearly helping improve business functions, in supply chain management and customer relationship management, reducing procurement costs and speeding up response time.

Forrester Research projects that business-to-business (B2B) transactions will increase from less than 1 percent to 22 percent of total business trade within the decade. Europe's three major markets (the United Kingdom, Germany, and France) will transact at least 23 percent of their sales on-line in 2006. Forrester is also forecasting B2C growth to represent three times 2002 sales. Consumer sales over the Web will represent 5 percent of total retail sales, up from 1.8 percent in 2002.186

Despite the troubles in the economy, B2B and B2C Internet exchanges are expected to increase at annual rates of 16 to 18 percent, and the dollar values will be higher than ever. The reasons have to do with convenience, quick turnaround, competitive pricing, reduced overhead, and increased efficiency and productivity. Given the savings that can accrue to companies moving to just-in-time electronic procurement, both large and small companies are expected to automate many of these transactions.

On-line retailers such as Amazon.com and Priceline.com struggled for profitability even when they had lots of loyal customers making

frequent purchases on-line. Although Amazon.com was boasting sales worth $1.6 billion in 1999, on a product line that expanded from books and CDs into toys, electronics, and lots more, the company was warning investors that it could not be expected to reach profitability before 2002, even though its sales had passed the billion-dollar figure. Priceline, the name-your-price dot-com that sold discounted airline tickets and hotel rooms, attracted 6.8 million customers, yet was barely managing to survive. At one time its stock was worth $104 per share; in 2001 the company struggled to keep its stock price above $1. By 2003 the Priceline.com boasted a share price of $21 based on $10 million in profits on sales of $243 million.\[1\]

The terrorist attacks on the World Trade Center and the U.S. Pentagon in September 2001 caused a big crisis in the travel industry, an industry that had greatly benefited from the global Internet. At that time, airline tickets accounted for 6 percent of all e-commerce revenue in the United States. Research firm IDC was forecasting that 31 percent of all air tickets sold in the United States in 2001 would be sold on-line, up from 10 percent the year before. Immediately following this tragedy, the share prices of the major airlines, aircraft manufacturers, hotel firms, rental car businesses, and travel agents took hits. Business volume on the big Internet travel sites, such as Travelocity and Expedia, was also down. But the fact that such a great number of business and private citizens had come to rely on the Web for travel arrangements has meant that the Internet is now a part of the solution in sorting out the travel mess.

The convenience of the Web, its widespread adoption and use by commerce and industry, the large number of people gaining access to the Internet, and increased public confidence in the security of credit card transactions has led to larger numbers of consumers willing to go on-line to buy things. Still, making money from on-line businesses is by no means guaranteed.

---


Dell Computer Corp. built its company selling its PCs and other computer gear over the Web beginning in 1997. By 2000 it had reworked its procurement process so that up to 90 percent of its manufacturing purchases were completed on-line. The Texas-based computer maker was operating on an electronic procurement schedule of just two hours in advance of production, virtually eliminating parts inventory. Dell was claiming that computer orders could be filled and shipped from its factory 15 hours after they were ordered. With the global slowdown in PC sales, however, just-in-time procurement and delivery was not enough to save Dell from major retrenchment.

General Electric, one of the world’s most powerful conglomerates, made headlines in the trade press saying it expected to make every one of its 200-plus businesses Internet-capable so that they all would be set up to do e-commerce transactions. Much of what GE had been doing on paper, such as billing and quality monitoring, the company moved onto the Internet.

Future corporations will undoubtedly figure out how to better personalize their relationships with clients and customers using the World Wide Web. Certainly, sellers will aggregate around popular portals from which linkages can be quickly made to products and services. Greater and greater numbers of surfers will become buyers and users as consumer satisfaction goes up.

Streaming Business

Streaming media is either the big monster under the bed for established media players, or their long-term hope for salvation. Either way, the real-time broadcast of audio and video information as a continuous IP bit stream (and the alternative approach of retrieving media from storage upon user request) will have the effect of transforming the media world as it currently exists. Such a metamorphosis will not happen all at once, but the signs are already in the marketplace to be observed.

The early innovator in streaming media was RealNetworks Inc., founded in Seattle, Washington, by former Microsoft employee Rob Glaser. Since RealPlayer was first released in 1995, its technology has been used by literally millions of unique, registered
individuals throughout the world, the most basic version of which can be downloaded on the Internet free of charge.

RealNetworks continues to upgrade its multimedia streaming technology to support faster delivery of live events and other programming to both broadband and dial-up customers. To better market its media players, the company opened a new digital entertainment center that served as a convenient portal to content of interest to those with the requisite hardware and software.

The RealOne SuperPass service made media news in 2002 by being the first on-line provider in history to draw 1 million subscribers paying between $9.95 and $19.95 per month to access sports, news, and entertainment programming. This was a major milestone and moment of encouragement for those trying to make money on the Internet.

A new multimedia search engine lets registered users access RadioTuner, a software that grants user access to more than 2,500 radio stations; RealOne Rhapsody, a premium music service; RealOne Arcade, an on-line games service; MLB.TV, a live video Webcast of Major League Baseball games; and ABC News Live, a 24/7 on-line news broadcast. RealNetworks entered into agreements with AOL Time Warner Inc., EMI Music, Bertelsmann Music Group, Sony Pictures Digital Entertainment, and others to provide secure content delivery.118

RealNetworks' principal competitors are Microsoft (with more than 100 million licensed copies of its Windows Media Player in the market) and Apple Computer (with 50 million copies of its QuickTime 4 player in use). At one time, RealNetworks was responsible for about 85 percent of all streaming traffic but is rapidly losing market-share to Microsoft, largely because upgrades to Windows software come with the Microsoft Media Player inside. Windows operating systems are installed in 90 percent of the PCs in the world.

Microsoft took an early stake in RealNetworks, buying 10 percent of company shares for $30 million in July 1997. A year later, however, CEO Rob Glaser testified at Microsoft antitrust hearings that Microsoft's Windows Media Player intentionally disabled RealPlayer, making itself the default player. Microsoft claimed a software bug in RealPlayer was to blame. Microsoft has since sold its shares in RealNetworks. It now offers a WindowsMedia.com site on which a variety of content and application-service providers have posted their wares. Microsoft's Digital Broadcast Manager software lets content developers distribute their properties in a pay-per-view or pay-per-download format.

Apple Computer released a real-time streaming version of its video software in early 1999. Previous generations of Apple's QuickTime software took some time in downloading multimedia content before playing it. The newer versions play live audio and video immediately. Apple made its source code available to content developers who prepare QuickTime applications for streaming media. Since a lot of digital video content was stored in QuickTime, that content can now be made accessible via the Internet.

Developers using QuickTime can capture, edit, archive, and deploy streaming media as a single process. Apple chose to adopt the real-time streaming protocol, a standard endorsed by the Internet Engineering Task Force, and has made the RTSP-based plug-in client software available for installation on the personal computers of its own developers. Apple also has moved to multiple compression formats, which makes its streaming applications scalable to the variable capabilities and capacities of user networks and equipment. Multiple compression formats enable developers to take into account different types of content and different qualities of service being conveyed over different media platforms.

Apple's media player employs the new compression technology called MPEG-4. Apple has a deal with the Tokyo-based wireless

phone giant NTT DoCoMo to put improved QuickTime audio and video technology in its new 3G handsets.189

AOL is one of the top audio streamers on the Internet. Its Spinner.com broadcasts some 22 million songs weekly and attracts millions of listeners. Radio streamed over the Internet promises to free listeners from the annoyances of traditional radio broadcasting: limited selections, the chatter of disc jockeys, and incessant advertising. Spinner.com, for example, lets subscribers tailor their music by choosing one of 150 specific channels to listen to.

AOL uses the RealNetworks media player, but in 2003 it came out with a player of its own, AOL Media Player. It is said to support all major media player formats, such as RealNetworks, Microsoft's Windows Media Series 9, and Apple's Quicktime as well as its own proprietary streaming formats. AOL has also licensed the On2 compression technologies that will permit broadband content to be delivered to gaming and wireless devices.100

The On2 player, using a powerful new video compression and decompression software, allows for streaming of programming over the Internet at data rates of 450 kbps and above to produce near-VHS quality (full screen 640 x 480 pixel) full motion video. Bit rates can be adjusted dynamically to accommodate varying Internet-connection speeds. In July 2001 RealNetworks invested $1 million in On2 stock and took an exclusive license for use of On2's VP4 codec that could deliver broadcast-quality digital video at rates of less than 1 Mbps. On2's VP5 and VP6 encoders and decoders can now do better than that.

Cable operators are conflicted about offering full-length Web versions of their programming, since the Internet is good enough to now compete with (even to replace) what their subscribers pay for. Until they sort out these new developments, what the cable providers tend to do is stream short program trailers, promotionalists, and "play-along" visual episodes that they hope will add value to their programming.

**Internet Mergers and Acquisitions**

Partnering across industry sectors is a way of life for those involved in the Internet. With none of the proven assets of established players, the Internet provider more often than not has had to go hat-in-hand seeking recognition, expertise, working relationships, capital investment, and business arrangements. As is the nature of this bizarre business, sometimes Internet supplicant came away from the interview not only with a signed contract but a seat on the board. In some cases the Internet idea thought to be merely a sideline has become a business fundamental and the basis for the renewal and repositioning of some of the world's most well-established businesses.

Are there industry sectors in telecommunications and consumer electronics that have not embraced the Internet? Are there sectors in information, in entertainment, in education, in commerce that have not looked to the Internet to help solve problems? Today, these are very few.

In just five years, Yahoo! came from nowhere to be the international leader among Internet portal players in terms of viewership, traffic, revenues, and profitability. Yahoo! was able to boast of a remarkable 65 million registered users and 310 million page views daily when it passed the $100 million profit mark in 1999. At the turn of the millennium, Yahoo! was more profitable than three of the big four U.S. broadcast networks drawing on the same funding source: commercial advertising. Two years later, according to Nielsen//NetRatings, Yahoo! had become the number one Internet brand globally with 83 million registered users and over 230 million visitors spending an average of 1 hour and 10 minutes per month on the site.193


Cutting deals was one of the ways Yahoo! was able to transform itself into a major media player. In its brief journey to the top, Yahoo! made numerous acquisitions and entered into some 600 partnerships. Many of the companies it acquired in 1998 and 1999 were start-ups themselves, such as Four11 ($85 million), ViaWeb ($48 million), WebCal ($21 million), Yoyodyne ($30 million), Geocities ($4.6 billion), Broadcast.com ($5.6 billion), Encompass ($130 million), and Online Anywhere ($80 million). Yahoo! also made deals with ISPs and cable and telephone operators to ensure higher-speed consumer access to its content.

Telco SBC Communications is the leading provider of DSL for broadband Internet access in the United States. In 2002 Yahoo! and SBC entered into an alliance to deliver "an unparalleled on-line experience, with new levels of personalization and ease-of-use, rich content, superior interactivity, and a bundle of valuable premium services," according to its Web site.

The companies had first launched SBC Yahoo! Dial, a nationwide dial-up service. Later, SBC Yahoo! DSL was introduced for broadband users. Internet subscribers were able to listen to music streamed to their desktops without interrupting their Web surfing. Yahoo!'s SuperWebcam service permitted users to communicate with family and friends using real-time video that was near broadcast quality. The Yahoo!digicam service consisted of about 40,000 hand-picked kid-friendly Websites that allowed parents to customize and limit the content their children view online. Levels of service ranged from downstream speeds of 384 kbps to 1.5 Mbps with prices at $42.95 to $59.95.

In the days when AOL was aggressively pushing for "open access" on broadband cable in the United States, it was also making DSL deals with the telecos. AOL completed multiyear pacts for access to Bell Atlantic, SBC Communications, Ameritech, and GTE subscribers, giving the Internet provider a much larger base on which to roll out broadband services. AOL concluded a carriage agreement for its AOL TV service via digital satellite on DirecTV. When AOL merged with Time Warner Inc., it was guaranteed cable access in addition to access to the audio, video, and print holdings of the world's largest media company.

Cisco Systems Inc. located in San Jose, California, is a dominant provider of the networking equipment that makes the Internet run efficiently. Although technology sectors entered a major slowdown period, Cisco still holds close to a one-third share of the global market for Internet-related equipment, once estimated to be worth $9 billion. The company also sells the devices that direct data around big corporate networks, including those that enable voice and data to travel seamlessly over high-speed optical fibers and over broadband telephone, cable, and wireless systems.

To successfully compete against the likes of Alcatel, Lucent Technologies, Nortel Networks, and Siemens, Cisco made over 50 acquisitions, mostly purchases of infrastructure and networking companies, totaling more than $20 billion. Cisco System alliances reached into almost every industry sector. According to CEO John Chambers, buying companies outright was the best way for Cisco to add products to its repertoire in a hurry. "The acquisitions we make complement our existing internal development and allow us to move quickly in a competitive environment," Cisco senior vice president Kevin Kennedy told Interactive Week in June 2000. "Some of our recent acquisitions may seem pricey, but we are not just buying companies, we are acquiring technologies and the engineers that developed these technologies."192

Digital television and the Internet have each been seen as major drivers of future corporate growth. Media companies Time Warner, CBS/Viacom, News Corp., and Walt Disney were all comparatively slow to get on the Internet track, but they no longer question its value now. Not only do these companies bring new content and creative talent to the medium, but they also use their marketing power to give the medium greater functionality and visibility. The broadband infrastructures make it easier for the content owners and creators to leverage their vast libraries and draw consumers into portals where their information and entertainment, communications, and shopping needs can be met.

192 Joe McGarvey, "Kevin Kennedy: Cisco Storms 'New World,'" Interactive Week, June 26, 2000, pp. 70-71.
InterActiveCorp (IAC), a company whose initial assets consisted of USA Networks and Home Shopping Network run by former media mogul Barry Diller, now operates as an “on-line conglomerate” hosting nearly a dozen businesses including Ticketmaster, Expedia, Hotels.com, CitySearch, and LendingTree.com that are focused on travel, financial services, and direct marketing. “We are serial dealmakers,” founder Barry Diller told Business Week, pointing out that USA Networks had stock and some $4 billion in cash with which to make further acquisitions.193

Internet Industry Constraints
All does not go well in cyberspace. Although the Internet has proven resilient and shows great promise, it has also suffered some high-profile defeats. Its problems seem magnified because it is a newer and less well-defined medium. Performance never quite matches public expectation.

Economic Issues
The old mantra of the Internet centered on its unlimited potential; the new reality centers on cash flow and short-term profitability. In the rosy dawn of the new millennium, Internet entrepreneurs could do no wrong; shortly thereafter, they could seemingly do nothing right.

Lessons are still being learned from the massive loss of confidence in the Internet as a viable commercial enterprise. At the very least, the correction Internet companies must go through will involve a return to business fundamentals: good business plans, reasonable debt, predictable revenues, and credible paths to profitability. Even when business plans were not well thought out, operating capital was relatively easy to raise from public markets and from venture capitalists with money to spend on interesting projects. These sources quickly dried up. After 2001, even very good projects were starved for funding and new ideas got little hearing at all.

The definition of a good Internet business now includes a product or service that users will pay for either through their purchases or through subscriptions. The magic of advertising didn’t work very long as a reliable source of revenue. While on-line advertising revenues grew from $400 million in 1998 to $2.2 billion in 2000, the rate of growth slowed markedly in 2001 and ended the year in decline. It took three more years for the industry to find a set of approaches that advertisers would trust and the audience would accept.

Early Internet advertising consisted mainly of banner ads. When it became clear that click-through rates were less than 1 percent, advertisers demanded more effective models. What they came up with were intimidation ads designed to keep users from ignoring banners, bigger ads which took up one-third of the screen, brightly colored ads with motion that slowed download speeds, and intrusive pop-up and pop-under ads that could not be removed. These innovations made advertising even less attractive than before.

One of the solutions that apparently appeals to users is the search-related ad. These are commercial advertisements matched to what people are doing on-line. Search firms Google and Overture are profiting from the technique of presenting simple, text-based commercial listings that relate to the search terms (keywords) being typed in and the search results produced. Not only are the ads not seen as irritating, they are often relevant. Advertisers pay only when Web surfers click on sponsored links. According to the Economist, this kind of advertising was expected to generate $2 billion in 2003, almost a quarter of all on-line sales.194

Among the mix of forces driving old media and new media into each other’s arms is the ability to cross-promote affiliated brands, to gain access to compelling content, to acquire new technologies and new talent, as well as the sharing of risk, the gaining of speed, flexibility and economies of scale, and learning how be global players.

This is, of course, easier said than done. Managing mergers and acquisitions, especially among former competitors, can pose special


challenges. As can be seen by the troubles of such companies as AOL Time Warner, AT&T Broadband, Bertelsmann, Qwest Communications, Vivendi Universal, and MCI Worldcom, a great loss of momentum can result.

Technological Issues

People are still trying to figure out what the Internet is. Almost everyone compares it to what they have known before. Frequently it comes up short. Internet telephony isn’t as good as regular telephone service. Video over the Internet doesn’t match the quality of regular TV. E-mail is mostly spam.

Quality of service on the Internet was never a big issue prior to 1992 when NSFnet was transferred from the supervision of the National Science Foundation to commercial service. The prime objective and the great achievement of early TCP/IP standards setting was finding workable ways to get data to its destination. Gaining a modicum of predictability and consistency with data traveling over dial-up telephone networks was considered a major engineering feat—which it was. "Best effort" was all that anyone could expect, with success determined by whether the transmissions were received or not, and little more.

Earning higher transport efficiencies and increasing the volume of delivery while maintaining predictable and consistent behavior in a packet-based environment was not—and is not—easy to do. The problem was not just that IP-technologies had to be developed from scratch, but an inhospitable transport infrastructure had to be accommodated. As it has turned out, multiple incompatible infrastructures, namely telephone, cable, wireless, broadcast, and satellite systems—in some cases, electrical power lines—had to be reconditioned for the Internet to work.

The general public does not understand all of this. The public perceives the Internet to be too slow. Actually, the Internet may be fast but end users are comparing the time it takes to click on a Web site and see good video pictures streaming across their computer screens with the time it takes for the picture to come up on the home TV set. With a black-box mentality and an inordinate faith in the cleverness of engineers, the community of Internet users generally expects guaranteed levels of performance. Users want faster, more reliable Internet service and they would prefer that it be made available wherever they are.

The Internet Engineering Taskforce has worked to improve Internet performance. One successful approach has been to segment Internet traffic so that certain types of transmissions are given preferential treatment. Unlike broadcasting, there is a direct relationship between the number of subscribers and the total amount of bandwidth available for use on the Internet. On publicly shared media such as cable television, Internet subscribers behaving as "bandwidth hogs" can consume all the available network resources, or at least significantly interfere with other Internet users.

Where bandwidth is constrained, the IET strategy has been to differentiate classes of data service that can be given higher precedence at the expense of those of lower precedence. Just as e-mail (which can be managed intermittently) places fewer demands on the network than streaming media (that must play continuously in near real-time), service providers need to work out with clients what is a fair allocation of bandwidth per user, per class of service.

Another strategy is to develop better bandwidth management tools for ensuring that users have access to the applications they need when networks get congested. Streaming media helps Web pages appear more lifelike, interactive, and appealing, and the number of these is growing daily. But for the majority of Web users, acquisition of streaming data is not an option. The problem is not with the end-user software or the server sending the data, but insufficient network capacity to handle transmitted packets of such magnitude.

Such approaches as Fast TCP and Internet 2 may help to speed up the Internet. Fast TCP is a method developed at the California Institute for Technology that improves the tracking of transmitted packets (and acknowledgments of arrival) of data sent in the TCP. In effect, a movie downloaded from a video server via the Internet...
will arrive in a matter of seconds. The Internet 2 is a parallel Internet that allows universities and research centers to bypass the public-switched telephone networks.

Storing local copies of frequently requested information helps ISPs make more efficient use of the global Internet. The amount of redundant traffic on Internet backbones is estimated to be anywhere from 40 to 80 percent, the result of citizens in the same communities, children in the same schools, and employees within the same companies being on the Internet accessing similar information from the same cluster of sources. Caching, which is a technique for moving most-needed content closer to users, is a way to reduce some of the traffic on the larger network.

Satellites are well positioned to deliver Web content to special high-capacity cache servers at locations nearer the user, bypassing the intervening terrestrial routers. These locations can be distant ISPs, cable head-ends, or corporate sites, which is one of the reasons each of these has become international satellite customers. International clients can leap over intermediate networks to connect directly to the U.S. backbone, where nearly 80 percent of the information on the World Wide Web has originated.

**Regulatory Issues**

Public policy as well as corporate practice is very much in flux when it comes to cyberspace law and regulation. As one of the most powerful instruments of creative destruction in the new digital age, the Internet has emerged as a lawyer’s Mecca. Opportunities are near endless for legal litigation, legislation, court findings, arbitration, and negotiation, the result of Internet threats to the status quo in almost every sector of media and communications.

The public occasionally gets its ire up over such issues as invasion of privacy, intrusive advertising, insecure commercial transactions, indecent content, and threats to children on the Internet, and Internet providers understand they ignore those concerns at their peril. However, the Internet industry as a whole has been very clear on the matter of government intervention. Most Internet champions want the Internet left alone. The content rights holders, the service providers, and the equipment manufacturers all have been asking for time and space to prove that the market can solve whatever problems there are without government intervention.

With few exceptions, the U.S. government has done just that. The U.S. Congress, the FCC, the FTC, the SEC, and the federal courts have exercised great restraint in tampering with the way the Internet has developed. On both the Republican and Democratic sides of the legislative aisle, elected representatives regularly state their preference for letting the technology and the market develop unfettered, intervening only when absolutely necessary to protect innovation, ensure competition, or respond to onslaughts of pornographic spam.

The “open access” issue played out during 1998–2000 in a four-way clash between cable MSOs, independent ISPs, local franchising authorities, and cable subscribers illustrates this delicate regulatory balance. It started with AT&T’s acquisition of cable providers TeleCommunications Inc. and MediaOne Group and its affiliation deals with Time Warner Cable and other operators. AT&T’s rapid rise to the position of number one U.S. MSO, raised the specter that the former telephone monopolist would reemerge as a monopoly provider of high-speed Internet. The worry was that access to the Internet would be less open because one company (or conglomerate of companies) would be in a position to control the first- and last-mile pipeline serving a majority of American broadband homes.

The question arose, should cable data networks be opened to unaffiliated ISPs? The cable companies had their own Internet providers, the most powerful of which were Excite@Home and Road Runner. AT&T had controlling shares in the one and a major stake in the other. The video business was profitable. AT&T was counting on the data side of the business, with its great potential for generating e-commerce revenues, to help recover the approximately $4,500 per subscriber costs it paid to acquire cable access to local and long-distance telephone customers.

---

Understandably, the company was unhappy about the prospect of being required to share its hard-won cable facilities with competitors, especially when it must still put more money into making its cable plant Internet-ready.

The FCC's position was that regulation wasn't necessary because high-speed Internet service was still immature. From the FCC's perspective, the real prize was in breaking up the local telephone monopoly, since AT&T's moves on cable represented the country's first best chance to see competition in voice services. So when local licensing authorities began placing "open access" conditions on AT&T Broadband as a condition to transferring franchises from TCI and MediaOne, the FCC chair took AT&T's side, focusing most of his attention on the need to get such decisions out of the hands of locals. FCC commissioners tended to accept cable industry arguments that operators needed to be in control of their networks as incentive to convert their systems to digital and upgrade them to broadband, which was also an FCC priority.

Technology executives, including CEOs from such companies as Intel, Cisco Systems, Novell, Compaq Computer, and IBM lobbied the FCC not to adopt regulations that would force the cable companies to open their networks. "Government intervention is particularly misplaced in the case of new broadband networks deployed by entities that lack the market position of the traditional telephone companies," the executives wrote the chairman in 1998. These companies were among those most likely to benefit from incremental sales of hardware, software, and services in the buildout of the new video, voice, and data networks. From their perspective, regulation might put a damper on cable mergers and force cable operators to back away from plans to upgrade their systems.\[196\]

Internet provider AOL Inc. was among those lobbying for open access. The 20 million subscribers of AOL were all on dial-up access at the time; AOL wanted to move them to broadband. AOL went to the FCC (and to congressional hearings) arguing that a large part of the country could be in danger of being served by a de facto monopoly provider of voice, video, and Internet services, given the fact that some 70 million U.S. households would be served by cable systems with cable owned and operated ISPs.

Once AOL announced it was acquiring Time Warner, much of the heat of the open-access issue shifted from AT&T to AOL. Time Warner. At the time the AOL Time Warner merger review undertaken by the FTC and the FCC, chairman Steve Case and CEO Jerry Levin were arguing that open access was merely a market issue, not something that required government intervention. The company agreed to open its high-speed platform to competing Internet access and content providers, asking that the merger be approved without strings attached.

AOL Time Warner eventually embraced open access as a public relations gesture under the hope that regulatory scrutiny would lessen and that carefully crafted deals with a limited number of outside ISPs would allow it to grow its subscriber base while maintaining some control over where those subscribers went for data services; ideally, they would stay in-house. In the economic downturn, overextended AT&T ran into such financial trouble that it put its entire broadband cable operations on the chopping block. Meanwhile, the Baby Bells consolidated their monopolies in the local loop. FCC hopes and expectations for local telephone competition from cable operators in the near term largely faded.

Social Issues

In thinking about the Internet, it is helpful to keep in mind that only about 10 percent of the world's population has access to a telecommunications network on which the Internet can be accessed. There are only about 600 million telephones on this planet of six billion people. As many as one-half of the people on Earth may never have used a telephone.

Even in the most connected of societies, there is worry about a troublesome gap between those who have access to Internet technologies and those who do not. The extraordinarily rapid buildout of Internet infrastructures; increased Internet access at work, home, schools, libraries, and local cafés; and growth of

digital databases readily available on the World Wide Web has not diminished this concern. Even so, popular culture supports the general hypothesis that the Internet has emerged as a social force for good like no other medium.

Digital-divide issues are political issues. Politicians tend to back high-tech initiatives that they think will help to grow the economy and reduce unemployment. Although Internet investment euphoria was blamed for what seemed to be a growing inequality of income, many of the wealthy benefactors of the dot-com bubble were also taken down in the bankruptcies and layoffs that occurred in the fallout; some (not many) went to jail for fraudulent business practices.

No one doubts that the Internet will be around for a long run, and no one doubts that vigilance will be needed to protect citizens against intrusion; to see that Internet advertising, marketing, and selling does not degenerate into spam; and to ensure that content owners are protected from piracy while keeping the Internet open and innovative. Bad things can happen on the Internet. Children can be hurt; racism can be inflamed. Since anyone with a computer is free to publish almost anything he or she likes, there is the risk that objectionable material will appear on the Internet, or that individuals will be defamed or defrauded, personal privacy invaded, copyrights ignored, and that junk mail will fill e-mail boxes.

As the digital economy kicks in, it will be enormously disruptive of the way people live and work. Whether those changes will on balance be more positive or negative cannot be precisely foreseen.

Applications

What is new and distinctive about the Internet, what sets it apart from other media, is its versatility. The emerging broadband Internet creates new opportunities to communicate, do business, inform and entertain, educate and retrain, do research, form communities, and make work easier and faster. Taken together, no medium known to mankind compares with it for malleability. Illustration of this characteristic is shown in the following sections.

To Communicate

The origins of the Internet lie in data networking and in electronic mail. The concept had its earliest roots in the users of a common machine sharing data files who found they could leave messages for one another. ARPANET, the first packet-switching computer network, developed what we know as electronic mail in the early 1960s. ARPANET e-mail allowed users working on different machines to exchange files.

E-mail is still the single largest application of the Internet today. About 500 million e-mail mailboxes existed worldwide at the turn of the century, and almost one-half of those were based in the United States. The Radicati Group concluded that e-mail traffic averaged 7.3 billion messages a day in 2002 and would grow to 37.3 billion e-mails a day in 2006.\(^{197}\) E-Commerce Times was also reporting in September 2002 that a third of all e-mail sent was spam. By May 2003, according to IEEE Spectrum, “the amount of spam exceeded non-spam for the first time ever.”\(^{198}\) When the number of worldwide wireless users surpasses wireline users, expected sometime in 2005, literally trillions of e-mail messages will be exchanged by way of user mailboxes.

That’s a lot of communication. Even so, IP networks support electronic communication in other forms as well, such as messaging, fixed and mobile IP telephony, and IP audio and video streaming. AOL hosts an estimated 120 million Instant Messenger users, and Yahoo! and Microsoft have similar numbers. For the moment, each of these is a proprietary island. Once Instant Messenger subscribers are permitted to cross-communicate, global usage will be further stimulated.

Corporations that once had to lease bandwidth or build private networks specifically to carry their in-house data traffic are now finding they can meet many of their data-carriage needs using virtual private networks (VPNs) within the public IP nets. Remote


\(^{198}\) Steven J. Vaughan-Nichols, “Saving Private E-mail,” IEEE Spectrum, August 2003, pp. 40–43.
connectivity and reducing telephone and fax costs is one of the drivers of the VPN development, but desktop-to-desktop conferencing is high on the list as well.

OracleExchange.com is a business tool for sharing ideas, collaborating on projects, and developing new products and services on-line. The Oracle innovation operates much like a corporate intranet, yet operates on a global scale. With a Web browser and password employees may access documents from the Oracle site whenever they want, from wherever they are. The Internet greatly facilitates work among distant teams, to include customers and clients, engineers and suppliers, collaborating in real-time or in asynchronous mode.

When AT&T acquired the cable operations of TCI and MediaOne and established alliances with Time Warner, Comcast, Cox, and other MSOs to extend its reach, its business plans were built on the idea of converting cable lines into IP networks capable of delivering not only high-speed Internet but local and long-distance telephony. AT&T’s Broadband service never materialized but VoIP for residential users is a future offering at the top of the list on the plans of the big cable MSOs. Business usage of VoIP has already taken off.

**To Do Business**

Since the original idea of the Internet was to create a Department of Defense communications network sufficiently decentralized that it could survive a nuclear war, it seems unlikely that anyone in 1962 thought much about using the network for business. Forty years or so later, however, the Internet has become a major force in commerce.

E-commerce is a rapidly developing, multifaceted application describing many different kinds of business-to-business and business-to-consumer exchanges on the Internet. These can include on-line marketing and selling, as with the profiling and targeting of consumers for sales pitches and advertising, the collecting of payments, and the tracking of deliveries. E-commerce can include on-line customer support, as with the automation of service tasks such as responding to Web-based questions or e-mail about billing, delivery, and products. It can involve on-line procurement, as with the automation of purchasing systems and coordination with suppliers. It can include content management, as with the organizing and interlinking of Web sites.

After the terrorist attacks of September 2001, the airline industry faced one of the worst markets since the 1930s Depression. These hard times forced airlines, auto rental companies, and hotels to reduce (and eventually eliminate) commissions paid to travel agents. On-line travel reservation companies, already multiplayer competitive businesses, got a big boost from this disaster.

The market for on-line leisure and small business travel is estimated at $28 billion; the market for corporate travel is much larger at $70 billion. Competing in these markets are Expedia.com, Travelocity.com, and Orbitz.com. Expedia is an Internet-based travel reservation service created by Microsoft Corp., now 62 percent owned by InterActiveCorp CEO Barry Diller. Travelocity and Orbitz were creations of the airlines, now publicly owned.199

Not all travel transactions can be conducted on-line, but using the Internet improves performance and cuts processing costs. The on-line cost of booking a ticket by way of the Web is estimated to be about 25 cents, while the on-line cost of handling shoppers via phone is $5 to $6 each. The travel industry concludes that as many as 85 percent of such transactions can be handled on-line.200

The big home-improvement chain stores Home Depot and Lowe’s expressed little interest in the Internet until the economic slowdown of 2001. When earnings fell an estimated 20 percent, each put up Web sites and announced they were ready to do on-line sales nationwide. Less than half of the stock in the two stores is displayed for sale on their Web pages and each company places its greater focus on attracting in-store traffic. But research has told them that a certain percentage of customers will appreciate the convenience of on-line shopping, even for big-ticket items such


as home appliances. Neither retailer wants to miss the potential marketing and sales opportunities that e-commerce offers.

As with other forms of commerce, the entertainment industry is figuring out how to bypass marketing and distribution middlemen to go directly to consumers with their products. On2 Technologies, originally known as The Duck Corp., is a supplier of a proprietary compression and streaming technology that can deliver DVD-quality video over the Internet. Such a service is of interest to VoD providers using DSL, cable modem, wireless, satellite, or other connections with the capacity to deliver full-screen IP-video.

MGM Studios, Paramount Pictures, Sony Pictures Entertainment, Vivendi Universal (now NBC Universal), and Warner Bros. each have announced plans to stream movies directly to subscribers. Analysts are suggesting that with broadband networks extending into more neighborhoods and the availability of more workable encryption systems, a new era of Internet-based VoD distribution of movies will begin.

To Inform and Entertain

The ubiquity of the Internet is having an impact on the way world news is gathered, produced, and delivered. It is also influencing the way news is consumed, even to the extent of reshaping what users perceive to be news.

The Web has changed many of the established rules of the news business, including business strategy, role of subscriptions and advertising, training of staff, working hours, and the targeting of audiences. Newspapers and radio and television stations all have news sites, as do corporations, government agencies, and many individuals. News can appear online from any continent in any language and be potentially available to everyone on Earth.

On the Internet, news takes on a slightly different definition: what news is relevant, timely, and credible is whatever someone thinks it is. The traditional gatekeepers of news have not disappeared, but there are many more gates and those gates can freely swing inward or outward.

Ted Turner used to say, “I always wanted to own my own network,” referring to one of the big three U.S. broadcast networks. In 1985 Turner almost lost his own company TBS trying to acquire CBS. By the 1990s Turner had a dozen networks in his stable, only some of them devoted to news. Today, via the Internet, almost anyone can have his or her own news or entertainment network. Internet start-ups such as Yahoo! have proven they can reach far greater audience numbers and achieve higher financials than traditional broadcasters such as CBS.

Turner was among the first to establish a news presence on the Internet and CNN is today the number 1 news destination for online users. In 1996 CNN’s interactive unit employed 130 people, up from a total of six people in August 1995. The CNN Interactive Web site in 1996 was averaging 12 million hits (visits by Web users) a day, second only to the Netscape site. In 1996 CNN’s managers were acknowledging the importance of the Internet and devoting capital and staff time to it, even though no one at CNN was prepared to predict the ultimate impact of the Internet on the news business.

At the time AOL was negotiating a merger with Time Warner, the owner of Turner Broadcasting, CNN Interactive employed over 400 people working on 11 Web sites. In addition to CNN.com, CNNfn.com was a financial news and information site that was the companion site to CNNfn, the financial news network, AllPolitics.com was a U.S. political news site produced in conjunction with Time magazine, My CNN was a customized news site, and there were seven international sites. The company also hosted CNNNSL.com, a joint venture between CNN and Sports Illustrated, which was the home of Sports Illustrated on the Web and the sports site featured on CNN.com. “The CNN Web sites are an integral part of the mission of the CNN News Group,” CNN founder Scott Wooley said in an interview in April 2000. “Our goal is to deliver news and information to anyone, at any time, in the manner most convenient to that person. In a single

day, the most convenient outlet may range from television to a
desktop computer to a mobile phone.”

As is usual when big news events occur around the world, CNN
television viewer numbers significantly rose during the war in Iraq.
The same thing happened on its Internet site. According to
Nielsen//NetRatings, as reported in TelevisionWeek, “CNN.com’s
unique audience rose 58 percent for the week ended March 23, the
first full week of the war in Iraq, to 10 million users in the
workplace.” AOL was leading in at home usage with more than 7.4
million visitors for that week compared to CNN’s 7.2 million.

MTV360 is the music network’s effort to integrate its cable
channels with the Internet. The idea is to attract more viewers and
to keep them tuned in to the television network by scheduling and
cross-promoting its programming on-line and off-line. MTV.com,
a top-five music site, is a place music fans can go to connect with
each other and learn about artists and music and MTV’s
programming. Visitors are invited to create personal profiles, sign
up for e-mail news updates, check out behind-the-scenes footage,
chat via message boards, exchange instant messages, and listen to
40 different streaming radio stations. Fans may subscribe to
MTV.com’s on-line music service or download music from five
major recording labels for a fee.

To Train and Educate
As access to high-speed Internet increases by way of DSL-
conditioned phone lines, cable modems, wireless, and satellite
services, so will the number of training and education applications
directed at homes, businesses, and on-the-road on-line learners.

Corporations, universities, government bodies, professional
associations, homeschoolers, and others are already putting
Internet-based teaching and learning systems to work. The state of

202 Don M. Flourney, “Coverage, Competition and Credibility: The
CNN International Standard,” in Global News: Perspectives on Information
203 Daisy Whitney, “CNN Rules On-line,” TelevisionWeek, April 21, 2003,
pp. 9, 12.

North Carolina’s technology development authority is offering
small-business owners in remote corners of the state interactive
business education services. Managers of small businesses plug into
courses and seminars broadcast over the Internet from the Raleigh-
Durham research complex.

Students can interact with their fellow students and with their
instructors through text chat, and they can ask questions by raising
a virtual hand. With Learnline software, instructors control
PowerPoint-generated presentations and multimedia and Web-
based content on students’ computers. Instructors can incorporate
video streaming, take their classes to a Web site, launch and share
applications, and deliver tests and assignments.

The Internet represents only one of many techniques used by U.S.
corporations for on-the-job training and earning advanced degrees,
but its share continues to grow. Corporations now look to Internet
contractors for a full range of services, including the writing and
publishing of training materials, supplying technology to deliver
and manage on-line training, and providing learning-related
services, such as consulting and Web hosting. Technical courses are
delivered to General Motors offices worldwide from an
international roster of universities, including the Carnegie Mellon
University in Pittsburgh, Pennsylvania, Shanghai Jiao Tong
University in China, and Chalmers University of Technology in
Sweden.

Among the companies that have sprung up to serve the emerging
K–12 market for digital learning is Apex Learning, a Bellevue,
Washington–company providing advanced placement (AP) courses
over the Internet for the college bound. Investors include Paul
Allen, Edison Schools, and Warburg Pincus. Classroom Connect is
a Brisbane, California–based company offering an on-line
curriculum in which teams of scientists direct interactive learning
projects from remote locations, such as the Galapagos Islands.
Intel, AT&T, and others have put more than $70 million into this
project. Zapnet is a company in San Ramon, California, installing

204 Scott Kariya, “On-line Education Expands and Evolves,” IEEE
Spectrum, May 2003, pp. 49–51.
free computer labs with Internet access in public schools in exchange for the opportunity to show students on-screen advertisements. Private investors include Dell Computer and Sylvan Learning Systems.

More than 3,000 families belong to the Family Unschoolers Network that dispenses information and provides support for at-home learners via Web sites, newsletters, and e-mail. For homeschooling parents and children, the Internet is a place to turn for research, course work, and outside help. Traditional publishers, correspondence schools, and dot-com start-ups have rushed in to help parent-teachers for a fee, offering everything from interactive classes, reading lists, worksheets, and books to one-on-one tutoring. Education portals such as EdGate.com and Family Education Network aggregate learning sources on a single site.

A Pew Internet & American Life Project study found that 86 percent of college students use the Internet, compared to 59 percent of the overall U.S. population. The report concluded that the Internet is “the information cornerstone of their lives, not just on school projects but on every subject that matters to them.”

To Form Communities
An organizing principle of the Internet is relationship building. For all its practical uses to sell people things, broadcast the news, provide on-line training, and keep users entertained, millions still use the Internet to get together with others around common areas of interest.

On Forums.talkcity.com, Internet users can find a smorgasbord of community events, discussion groups, and lots of people who want to chat. The site hosts 20 major interest groupings, including business and finance, cities and travel, movies, TV and radio, and romance and social categories, each with multiple subgroupings. Talk City chat rooms have titles like Canada, Chronic-illness, Ebony-singles, Intellectual-chat, Lesbian-oldies, Motorcycle-talk, and Married-but-flirting. Tips on vacation and travel deals often come from locals and visitors to the Talk City travel site from people in Europe, Asia, and South Texas who then strike up conversations.

Many of these conversation sites are user-created with a very narrow focus, such as those focusing on parenting, teenagers, genealogy, or stock car racing. Some entertainment-related discussion groups go on and on, as with the regular viewers of such TV Soaps as Days of Our Lives and Another World. Some fans develop long-term attachments to the characters.

Several of the popular Internet portals and on-line services run chat rooms, but site maintenance and monitoring for unacceptable content has become a problem. CNN.com dropped its chat option for this reason.

Advertising was the funding source for many of the early user groups and not all were successful. Cupertino, California-based Lipstream Networks hosted a voice-enabled chat service in partnership with Excite@Home. Its unique feature was that an Internet user who downloaded the Lipstream plug-in software could speak to others logged into the same chat room. Using a 28.8 kbps modem, it took about 45 seconds for the download. The user spoke into a microphone hooked up to the PC. Lipstream’s servers routed the voice to other PCs logged into the same chat room. Lipstream folded its business, but its technology was incorporated into Yahoo!’s AnswerMeNow service for connecting business representatives with customers for real-time sales, training, and service needs using text chat, VoIP, and live streaming audio and video.

Quokka Sports Inc., the Australian company that partnered with NBC in providing Web coverage of the 2000 Olympics, was an example of a company that attracted a lot of traffic but could not sustain itself financially. Quokka found a unique way of drawing spectators into live sporting events on-line. Its first major sporting event was the 1997–98 Whitbread Round the World sailing race that drew an average of five million hits a day. In 1998–99 it covered the “Around Alone,” a 200-day solo yacht race, and in

1999 it covered “First Ascent,” an expedition up an 8,000-foot summit in China.

Quokka linked what TV broadcasters offered with more immersive coverage, letting the athletes be the ones to tell the story. The company encouraged on-line participants to get involved. Quokka coverage equipment and people went along with each event using computers, cameras, video editing systems, telemetric sensors, and satellite transmitters to collect, write, edit, and deliver the digital information that would give on-line followers the timeliest information available from the location site.

To Do Work

Computers have made many kinds of work easier. By putting computers on networks has made working at a distance easier. When the network is the Internet, the reach of computers can be faster, more universal, and cost less.

In the case of specialized computing devices such as portable laptops and Internet phones, software can be downloaded with the application. When the task is done, the software is removed. This eliminates the necessity to maintain “fat PCs.” The latest software release can be made instantly available. Computers can be made simpler and smaller, yet greatly enhanced in power and flexibility. In many cases, computers can entirely disappear behind the scenes into information appliances where specialized tasks are performed without human intervention.

E-Gate is a highly automated stock-trading software system for the Web created by Canadian start-up AlphaTrade.com. The technology provides for the general public the kind of high-end financial analysis applications used by professionals, allowing them to trade stocks and manage portfolios on their own. AlphaTrade’s programmers have employed artificial intelligence, including fuzzy-logic techniques, to analyze the user's work patterns so that just-in-time financial news and transaction software arrive at the desktop. Java software enables users to move dynamic graphs and videos from their browsers to their desktops with a click on a button.

The Internet has transformed work and living spaces so rapidly that having the latest hardware is no longer the central barrier, since computing can be delivered directly to users. Like telephone receivers, Internet devices will be simpler to use. One way this will happen will be to push the complexity back into the network. Future business, whether at home, at work, or on the road, will be transacted and information more readily retrieved using networked computers. The ubiquitous Internet will provide lower-cost, higher-bandwidth networks for doing the kind of work that will be too expensive, too technically difficult, and too slow to do any other way.

Conclusion

The personal computer brought to ordinary citizens computing capabilities available only to technical gurus. By interconnecting computers, the Internet put into place the architecture for widespread public computing, which in 21st-century parlance means more efficient ways of doing business, keeping people informed and entertained (or conversely, allowing people to inform and entertain themselves), providing for education and training, forming communities, and getting all sorts of work done.

Distant desktops, digital libraries, on-line radio and TV stations, weather reports, stock markets, shopping centers, classrooms, and communities of common cause have become more accessible to everybody. The TV set, digital video recorder, games player, laptop, and mobile phone are also being transformed into consumer terminals for two-way exchanges. By way of the Internet, both one-to-one and one-to-many exchanges using video and other high-bandwidth data forms have become more common.

The broadband Internet is truly a medium for the new millennium. Whereas radio and television, geosynchronous satellites, personal computers, and mobile phones were distinctively 20th-century technologies, and the basis for the dawning of the information age, the Internet is positioned to be “the single thing” that is omnipresent in the knowledge-based communities of the 21st century. The Internet will ride on all platforms.
Via the Internet, the planet is rendered smaller and more navigable for all its citizens—environmentalists, clerics, bards, politicians, or business entrepreneurs. By making information digitally accessible in a standardized format and interconnecting local and distant media, information needed for solutions to problems is more readily at hand.

Bridging distances instantly, the Internet is a great time-saver. For the coming generation, the supporting technologies of the global Internet will be faster, higher in capacity, and more personal. For those segments of society who are lucky enough to have such access—and vast numbers will be left out—the Internet will be symbolic of the new age of open information exchange.