

A BLOOMBERG MAGAZINE FOR SCHWAB SIGNATURE SERVICES CLIENTS

ON INVESTING

SPRING 2001

Tools for Telecom



Old and new
technologies
will renovate the
communications
world

Prsrt Std
US Postage
PAID
Permit #594
East Greenville, PA
18041-2199

CHARLES SCHWAB ON:

- ♦ Choosing bond funds
- ♦ Smart IRA strategies
- ♦ Refinancing your home
- ♦ Schwab Mutual Fund Select List

The new

WAVE

in

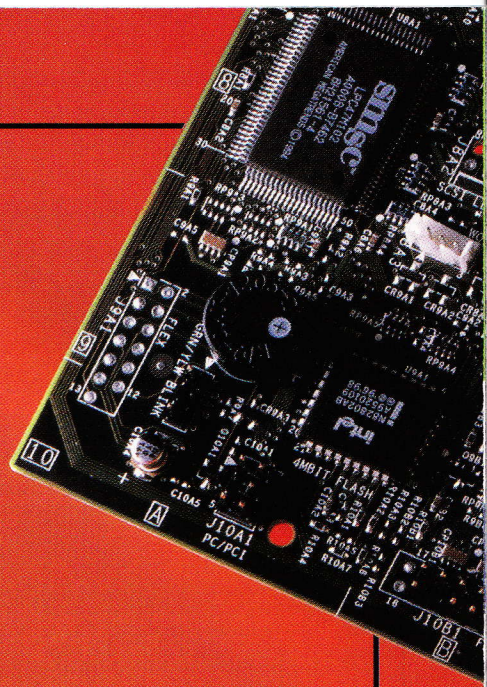
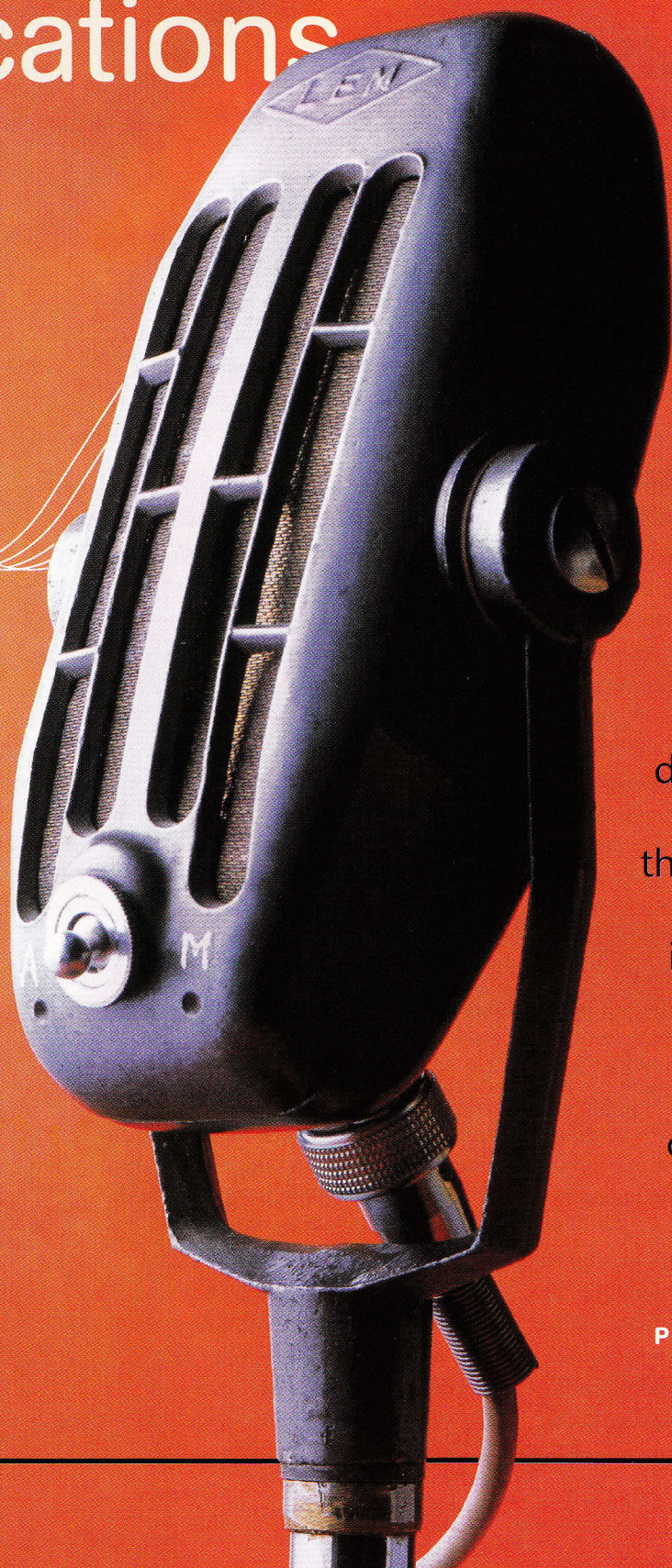
Communi

ty



Despite the hammering the technology sector took last year, many investors still believe the Internet is among the greatest technological advances in recorded history. While the building of the Internet certainly ranks near the top of the advances in communication—on par with the invention of movable type in the Middle Ages, the telegraph and telephone in the 19th century, and broadcasting in the 20th—it is, from a technological standpoint, a more middling achievement than most people think. ♦ The Internet has been described as a patchwork of technologies stitched together to look seamless. Think for a moment about how most of us access it: We connect to a modem that dials into the telephone network, which passes us to a remote computer, known as a server in Internet-speak. Yes, we're talking about *that* telephone network, the brainchild of Alexander Graham Bell, the 100-plus-year-old gaggle of twisted copper wires—OK, there are some glass ones mixed in these days—that runs over, under, and around the globe. Seems kind of "old economy." But what has analysts and investors excited is **not where** the Internet and other telecommunications technologies are now, but where they are going.

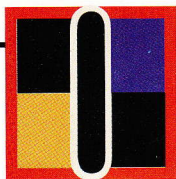
u nications



BY DIANA ASCHER

Advances in communications have driven technology since the printing press. Where is telecommunications headed—and which companies are leading the way?

PHOTOS BY PHILLIP ESPARZA



"In terms of the capability of the Internet, we are only on level one," says David Glaymon, a senior analyst who covers emerging telecommunications technologies for Chase H&Q. "It's just a push-pull technology. We are not yet at the Internet's full multimedia or communications capability."

Glaymon points to "broadband"—the transmission of multiple signals on a single medium at the same time, sharing the entire bandwidth of the medium—technologies that will enable more complex and engaging interactions involving voice, video, animation, and other applications as the kind of emerging technologies that should get an investor's juices flowing. "Broadband captures the evolution from voice to multimedia," he says. "It's exciting. For investors it's not like investing in a traditional business. There is an aspect of science fiction, the future, and growth. It's the Buck Rogers aspect that makes it exciting."

THE TELEPHONE NETWORK

Not Sexy, but It Works The telephone wires lining highways and backyards make up the nation's basic communications infrastructure. This is what is known as the backbone. Over the past 120 years, the telephone network has been built of copper wire and then upgraded to incorporate new advances in transmission and switching technologies, including the replacement of some of that copper wire with cables made from glass filaments—known as fiber-optic lines—which have improved sound quality and increased the amount of traffic the network can carry. The telephone network, says Paul Johnson, a telecommunications-industry analyst with the investment firm Robertson Stephens in San Francisco, "has ubiquity, low cost, and quality of service that is unsurpassed by anything else you can name. The phone always works; it's pretty close to magic."

The challenge for the telephone companies, both local and long distance, is to take their existing business into the future. They currently derive between 80% to 90% of their revenue from voice services, but their future lies in the delivery of data, says Robert Rosenberg, president of Insight Research Group, a Parsippany, New Jersey, company specializing in telecommunications-industry market research.

For example, Verizon Corp., the company that was formed as the result of the merger between Bell Atlantic and GTE, has "plenty of bandwidth" to support fancy new services like interactive games, video conference calls, movies on demand, and other multimedia applications over its backbone, Rosenberg says. "There is tons of capacity in the backbone,

but not a lot from the central office to the user."

In telephone-industry parlance, a "central office" (CO) is the site where the telephone lines running from your home or business are concentrated and from which your calls are routed to their ultimate destination. While high-end service capabilities exist between COs and from the COs to the remainder of the telecom backbone, the local connections are somewhat in the dark ages. Physical distance from the CO affects the quality of service an individual subscriber receives, as does the age and quality of the wiring.

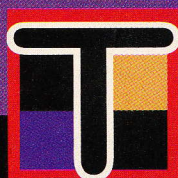
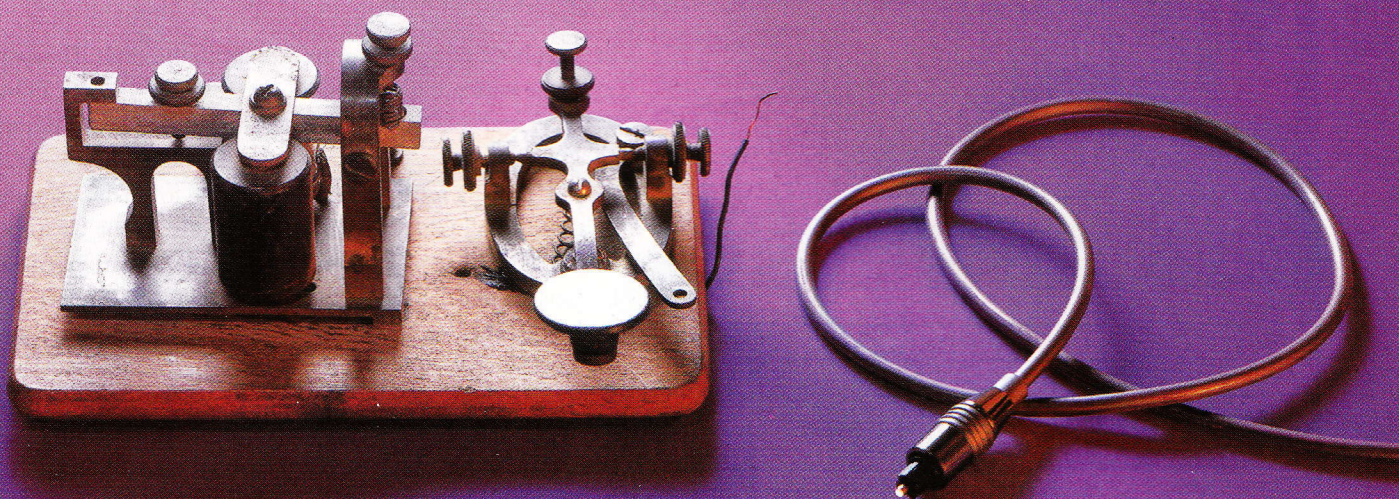
While lightning-fast broadband connections such as ISDN are common today on college campuses and in large corporations, they are a bit expensive for the average Joe. If a consumer wants similar capability at home, the choices include signing up for a digital subscriber line (DSL), buying a cable modem, looking at the new generation of wireless devices, or simply investing in a higher-speed dial-up modem.

CABLE

Widely Available, but Subject to Overload Stepping in to break the perceived bottleneck of local telephone connections are the cable operators. Currently about 69 million U.S. households have cable TV service. The same wire that brings this signal into your home can provide Internet access at speeds more than 100 times faster than current dial-up modem access. Cable modems are installed by cable-company technicians and connect subscribers to a network. The total amount of bandwidth is shared by all users, making it like a neighborhood Local Area Network (LAN).

Like any LAN, cable performance degrades as usage increases. But the cable networks offer speeds greater than any other option, even under worst-case scenarios of high neighborhood usage. As this type of access grows in popularity, cable companies may not be able to maintain the same speed and level of service they can now provide. There is also a question of reliability. Rosenberg thinks cable companies "are not service oriented. If you really depend on e-mail, not having e-mail is worse than not having a phone at this point. You simply cannot tolerate outages. That's not the way [the cable industry] is used to operating. AT&T would have made a difference. They would not have tolerated the degree of service problems that tarnish the cable industry."

But not all analysts agree. Marvin Shapiro, managing director of Veronis Schuler & Associates, a New York-based investment bank and private-equity fund manager, thinks cable Internet access represents a considerable growth business. Shapiro expects cable Internet access to become "a significant



THE CHALLENGE FOR THE TELEPHONE COMPANIES IS TO TAKE THEIR EXISTING BUSINESS INTO THE FUTURE

part” of the revenue streams of cable companies like Comcast, Cablevision, Charter Communications, and even AT&T, which acquired cable operators TCI and Mediaone.

“In terms of the quality of their operations and the systems they own, probably high on the list would be Comcast,” Shapiro says. “Comcast has outstanding management that has done an excellent job of consolidating its locations.” Shapiro also cites Cox Communications as a solid cable and broadband company that has succeeded in bringing in new technology and putting it to work. “Cox Communications has done as good a job as anybody, but they have a lower profile. But they are very well run and managed.”

Charter Communications, which is backed by Microsoft co-founder Paul Allen, has grown by acquiring “diverse cable companies and it takes time to bring them all on line to the level they want them to be at. Where they’ve done it, they have done a good job,” Shapiro says.

The industry has made a significant infrastructure investment in its bid to capture its share of the data communications business. The National Cable Television Association reports cable operators will have spent \$33 billion before this year to upgrade systems to deliver fast Internet access. Forrester

Research predicts cable modems will have 80% of the broadband market by 2002. The cable industry has been the most aggressive in offering two-way broadband access. Morgan Stanley Dean Witter predicts there will be almost 12 million cable modem subscribers by the end of 2003.

DSL

A New Use for Old Phone Lines The local telephone companies and other entrepreneurs aren’t about to cede high-speed Internet access to cable operators without a fight. DSL is a high-speed data service offered by the Baby Bell companies and upstarts known as Competitive Local Exchange Companies (CLECs), which have targeted business users. What makes DSL technology attractive to local telephone operators is that it works on existing telephone lines, making it possible to provide this service without costly upgrades. Because DSL uses a different part of the frequency spectrum than voice, it can operate over your existing phone line without disturbing your telephone service.

There are many versions of DSL, but the most common is Asymmetric Digital Subscriber Line (ADSL) service. It is con-



THE PLAYERS

There are many players—old and new—in the telecommunications business. Here are the publicly traded companies mentioned in this article. (Prices are as of market close on January 31, 2001.)

COMPANY	TICKER	EXCHANGE	PRICE
Alltel	AT	NYSE	58
AT&T	T	NYSE	23
Cablevision	CVC	NYSE	87
Charter Comm	CHTR	Nasdaq	22
Comcast	CMCSK	Nasdaq	42
Covad Comm	COVD	Nasdaq	4
Cox Comm	COX	NYSE	46
Ericsson	ERICY	Nasdaq-ADR	11
Global Crossing	GX	NYSE	22
Handspring	HAND	Nasdaq	43
Intel	INTC	Nasdaq	37
Level 3 Comm	LVL	Nasdaq	41
Microsoft	MSFT	Nasdaq	61
Motorola	MOT	NYSE	22
Nokia	NOK	NYSE-ADR	34
Palm	PALM	Nasdaq	27
Openwave	OPWV	Nasdaq	69
Qwest	Q	NYSE	42
Rhythms NetConnect	RTHM	Nasdaq	2
SBC	SBC	NYSE	48
Sprint	PCS	NYSE	30
Teligent	TGNT	Nasdaq	3
Verizon	VZ	NYSE	54
Williams Comm	WCG	NYSE	18
Winstar	WCII	Nasdaq	18
WorldCom	WCOM	Nasdaq	21

sidered asymmetrical because it provides two different bandwidths—a smaller slice for outgoing messages and a larger piece for incoming ones. That's perfect for the average Internet user. The outgoing communications are usually small, like a hyperlink request or an email message. The incoming messages, on the other hand, can range from graphics-heavy Web pages, software upgrades, or, in the case of your teenage children, music files. ADSL works well for interactive video and high-speed data services, including Internet access and remote LAN access. There are no per-minute charges, and you get an "always on" connection.

On the negative side, there are distance limitations to DSL. A residential DSL installation has to be within 18,000 feet of

the telephone company's nearest central office hub. The quality of the wiring is also an issue. If you live close to a CO but are connected via deteriorating telephone cable, your DSL service can be degraded until those physical lines are replaced.

DSL is being most aggressively pushed to small businesses by three small CLECs: Covad Communications Group of Santa Clara, California; NorthPoint Communications of San Francisco; and Rhythms NetConnections of Englewood, Colorado. They're collectively wiring dozens of cities and selling services wholesale to Internet service providers (ISPs) and local exchange carriers. But all three are struggling with revenue problems, significant capital-development costs, the consolidation or collapse of their ISP partners, and a lack of profitability. (In fact, NorthPoint filed for Chapter 11 in January.) These companies, and their customers, have also had to deal with the fact that the final connection—that line running between the user and the phone company central office—still belongs to the local phone operator.

"It's obvious that the CLECs have been in a fair amount of trouble lately," notes Pat Hurley, an analyst with TeleChoice, a Tulsa, Oklahoma, telecommunications consultant. "The whole idea that Wall Street isn't very hot nowadays on companies that don't make a profit in a short period of time has certainly hurt them. The DSL market is still growing pretty fast, and the three big CLECs are all at different points in terms of how much cash they have left. But they do have pretty big networks already built out."

Pioneer Consulting forecasts over 12 million DSL subscribers by the end of 2003. "DSL and cable will both continue to be successful moving forward," Hurley believes. "DSL has been growing faster than cable over the last year because the local phone companies have gotten really aggressive about DSL and they have good marketing. They make a pretty compelling statement for themselves versus cable."



BROADBAND

Wired or Wireless? Web pages with complex graphics, video, and other components are data intensive, but they are just part of the traffic load. Modern businesses need pipes big enough to send and receive the increasingly large amounts of data that are being sent electronically. Companies such as Level 3 Communications, Teligent, and Winstar are pursuing wired broadband technology to address this need.

Chase H&Q's Glaymon called Level 3 "the pure broadband play in the market" in a December 2000 report. But while he likes the company and its management, he noted in the same report that "Level 3 is not the only company with a

network coming online during 2001. Emerging carriers Global Crossing, Williams Communications, and 360 Networks [acquired by Alltel in 1998] will also see significant pieces of their networks being completed. Coupled with AT&T's new network coming online, the market for broadband services could get crowded."

Local Multipoint Distribution Service (LMDS) and Multichannel Multipoint Distribution Service (MMDS) are the players in wireless broadband. LMDS "is typically deployed in big cities with lots of high-rise buildings," says Bob Larribeau of RHK, a telecom-industry analyst in San Francisco. "It's also used in dense suburban industrial-park areas"—businesses that are located near an LMDS antennae. MMDS allows a single base station to communicate with multiple subscriber locations—a way to provide high-speed data and voice services to customers without having to lease capacity from the local phone company or build out a wired network. MMDS technology, Larribeau says, "is going head-to-head with DSL in the consumer market."

The individual also wants wireless service—for Internet access, cellular phones, pagers, and personal digital assistants (PDAs). Wireless penetration in the U.S.

Yet another technology, the Wireless Application Protocol (WAP), was intended to help wireless-device manufacturers, networks, content providers, and application companies achieve compatibility, but its growth has been disappointing. It resulted from the WAP Forum, which was founded in 1997 by Motorola, Nokia, Ericsson, and Phone.com (now Openwave Systems) and now includes companies like AT&T Wireless, Microsoft, Intel, Sprint PCS, and Palm. "WAP has been a dismal failure in Europe," says Kevin Calabrese of Argus Research. "So WAP never really got rolling here in the U.S. WAP kind of died at the starting gate."

The new new thing in wireless is 3G—the third generation or Universal Mobile Telecommunications System (UMTS), with transfer rates 26 times faster than the current rates of North American digital networks. But does anyone care? "We're a long way from figuring it out," says Kerr. "There doesn't appear to be any pent-up demand for interactive multimedia-to-wireless, which is what 3G is supposed to deliver."

Regardless of the forms they take, communications and access will be instantaneous, says independent telecommunications industry analyst Jeffery Kagan. The big industry players, he says, will be the companies with advanced networks. "SBC, Verizon, BellSouth, and Qwest have an early advantage because



HANDSET PLAYERS AND NEW **WIRELESS** DEVICES ARE **BREAKING** THE RULES AND DEFINING **NEW** MARKETS

is 37% today and the Yankee Group expects that to grow to 62% by 2005. By those estimates, wireless subscribers will number 177 million by 2005 from over 100 million today.

However, the competing types of wireless broadband digital standards—Time Division Multiple Access (TDMA), Code Division Multiple Access (CDMA), and Global System for Mobile Communications (GSM)—could impede development. In North America each is being pushed by different companies: TDMA is used by AT&T Wireless and Southwestern Bell; CDMA is used by Sprint PCS, GTE, and Verizon; and GSM is used by Pacific Bell and Omnipoint. The systems differ in how they process messages, but the end user can't hear a difference.

"It's really a two-horse race in the U.S." between CDMA and TDMA, explains David A. Kerr of Strategy Analytics in Boston. Six operators account for 75% of the wireless communications market, and the split among them is about even. "We're destined to have a two-tier system in the U.S. for the foreseeable future," Kerr believes. "Worldwide, GSM is 70% of the market, but in the U.S. it will remain a niche market."

they have a direct connection to the customer already that AT&T, WorldCom, and Sprint don't have," says Kagan. "Companies with national wireless networks—Verizon Wireless, Cingular [a joint venture between SBC and BellSouth], AT&T, and Sprint PCS are poised to dominate the wireless market. The handset players—Nokia, Motorola, and Ericsson—and a whole new breed of wireless devices—Palm, Blackberry, and Handspring—are breaking the rules and defining new markets," he continues. "Qwest is a hybrid—the best of the new and the old. They've got the customers, revenues, and traffic of a Baby Bell, but they also have state-of-the-art local and national data networks." Kagan remains committed to technology. "This is all going to have a happy ending," he says. "We're just in the middle of the biggest buying opportunity of our lifetimes." Stay tuned. ◀

Diana Ascher is the associate editor of On Investing. Additional reporting for this article was done by Evelyn Goldin and James A. Ambrosio.