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WHITE PAPER

The Next Generation Public Network: Opportunities for CLECs and ISPs

X-CHANGE

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Summary

Competitive Local Exchange Carriers (CLECs), Internet Service Providers (ISPs) and incumbent Carriers will prosper in tomorrow's marketplace to the extent that they master the value-added elements of packet networking and the logic of deregulated markets.

Two shifts are most crucial. The move to all-digital networks is important because it allows virtually all media types (forms of communication) to be transmitted, stored, viewed and manipulated in seamless fashion, at low costs and without regard to constraints of time or distance. The deregulation of markets is crucial because it demolishes the walls between formerly distinct industries, allowing the "poaching" of customers and revenue streams on a massive scale.

Packet networking, based on several key technologies, including Internet Protocol (IP), Asynchronous Transfer Mode (ATM) and Frame Relay is the most-fundamental of several key technology shifts, since all networking-related businesses are based on packet transmission. Where voice now is 80 percent of network traffic, and "data" only about 20 percent, those figures undoubtedly will reverse sometime over the next decade or two. As a result service providers must master packet networking to remain competitive.

At the same time, whatever a service providers' "legacy" business is, the key to the future is the ability to leverage a customer relationship to "upsell" additional services. In a highly competitive environment, while profit margins will be under pressure, attracting new customers is arguably less important than keeping existing customers.

And the surest way to boost margins and reduce customer churn is to provide a full range of services, including full management of complex services under multiple-year contracts at competitive prices. For it is a fairly simple matter to replace a long distance, local or Internet access provider.

But it is no simple matter to swap out a whole range of services, ranging from premises phone switch and local area network support to the full range of data networking services, plus local and long distance support and applications. Certainly, one would not do so simply to save a few pennies a minute on long distance calls, for example. That points out the power of packaging, or bundling.

Service providers that seize the opportunities presented by packet-based networking to provide a full set of communications solutions will prosper. Providers that remain fixated on one legacy application will find their margins and market share squeezed. Providers that emphasize "low cost" will suffer. Carriers that emphasize "value-added applications" will prosper.

The Next Generation Public Network

One cannot underestimate the colossal business opportunities now available to executives from all segments of the telecommunications industry, without exception. It isn't just the existing $200 billion U.S. communications market, but also the $100 billion data networking market, and the as-yet-unknown value of entirely new businesses based on packet networks, which are generating interest.

And everything is driven by two fundamental transformations: data and deregulation. The move to packet networking would be revolutionary were nothing else in motion. For by informed estimates, the amount of data traffic sent over some data networks doubles about every six months. While voice traffic grows at a steady three percent annual rate, data has been growing at a good 30 percent annual rate for several years.

> **"At present, total telecommunications traffic is roughly 80 percent voice to 20 percent data. That will be reversed in the next six years or so."**
> *--Colin Williams, WorldCom International Operations*

But the advent of a new era of networking occurs within a context of shattering regulatory change as well. Not since the 1930s have we so dramatically allowed new firms to compete in new service segments, nor has the confluence of new technology so prepared all Carriers to seize those opportunities. Consider that in just the last six years, the cost of microprocessor power has plummeted from about $230 per MIP (millions of instructions per second) to about $3.42 per MIP, and it is still dropping.

Indeed, something very big, predicted by futurists and industry executives for well over two decades, is taking place. The "all-digital" telecommunications network is being built, and executives who can move their firms forward NOW will reap extraordinary rewards.

So make no mistake, this is not about technology. Rather, this is about changing modes of capital accumulation. Put simply, the emergence of competitive and packet networks is about money: how we make it, how we keep it, how we spend it. That is why scores of billions worth of investment capital have been poured into new Carrier coffers over the last several years.

So much has changed, and so quickly. As recently as August 1994, U.S. Vice President Al Gore was talking about the "information superhighway," and he was not referring to the vast array of intranets, extranets, private networks and the public Internet.

Instead, the widespread consensus was that some combination of local telephone, cable TV and long distance companies would provide the on-ramps and transport. Few were paying attention to the Internet, especially the World Wide Web (WWW), which in 1994 represented about 3,000 global sites, 3.2 million host computers and 30 million users. Today, there are 2.5 million sites, 36.7 million hosts and 134 million users, according to Internet Valley Inc. sources. By 2000 there will be 200 million users, according to Internet Wizards, which studies Web usage.

Indeed, today's popular notion is that "the Internet is everything." The term "Internet Protocol (IP)" has become such a popular acronym that it overshadows other key packet networking technologies, such as Asynchronous Transfer Mode (ATM), for example, as a verbal shorthand for "data." IP and the Internet may not be "Kleenex," but those terms very nearly encompass the public's understanding of what the next wave of communications is all about.

We need to remind ourselves that, in an all-digital network, all media types (voice, video, image, audio or computer files) can be processed, stored and transmitted more easily, and more cheaply. Electronic transactions are easier – and cheaper. New services, based on low-cost computer power, can be offered to more types of end-user devices.

Look for more explosive growth. Driven by growth of the Internet, data traffic is growing 10 times as fast as voice traffic. WorldCom Inc.'s UUnet Technologies Inc. subsidiary, for example, sees no relenting in 1,000 percent-per-year growth in data traffic on its network. No wonder, then, that John Sidgmore, UUNet CEO, sees voice traffic as a "one percent" of all traffic issue in seven years or so.

**"During the latter half of the next decade,
there will be a new driver: billions of devices
attached to the Internet."**
--Vinton Cerf, MCI

Deregulation

But deregulation is a big part of the new story as well. In August 1994, the Telecommunications Act of 1996, which ostensibly opens the local exchange to competition for the first time, was a faint glimmer in the eye. Today, a local market worth more than $100 billion a year in revenue is theoretically up for grabs.

All of which is inspiring new Carriers to jump into the fray. In August 1994, we had not heard about new packet-based long distance networks being built by Qwest Communications, Williams Communications and Level Three, for example.

Drastic times call for drastic measures. And make no mistake, we live in drastic times. The number of new networks is exploding, global markets are deregulating and new packet-based networks are emerging to challenge older circuit-switched Carriers.

Between 1995 and 1998, 2,900 new wireless licenses were issued. By 2000, some 1,500 new wireless networks may be in operation. In 1996 alone, some 80 new Asia/Pacific networks were authorized. Competitive Local Exchange Carriers (CLECs) and long distance Carriers using Internet Protocol and packet technologies are emerging. And all of that dramatically changes the way Carriers operate their businesses.

New Carrier Market Capitalization, $ Billion

IXC Communications	2.36
Qwest Communications	8.36
Level Three	8.79
Sub-Total, IXCs	19.51
Omnipoint	1.56
Western Wireless	1.59
Aerial Communications	0.45
Powertel	0.80
Sub-total, PCS	4.40
Total, PCS and IXC	**23.91**

Source: Janco Partners

Public U.S. CLEC Market Value

Competitive Local Exchange Carrier	Market Cap., $ Billion
GST Telecommunications	0.59
Electric Lightwave	0.94
e.spire	1.15
ICG Communications	1.36
Intermedia Communications	1.61
McLeod USA	3.32
NextLink Communications	1.73
RCN Corp.	0.73
Teleport Communications (AT&T)	10.84
Teligent	1.68
US Networks	0.31
WinStar Communications	.80
Total	**6.75**

Source: Goldman Sachs

But the shift to all-digital networking is occurring at the same timeeveral other key trends, including the deregulation of U.S. and major international telecom markets, the application of microprocessor technology to the public network, and the emergence of exciting new mass market applications, notably the Web. In turn, that has lead to a whole new category of communications provider: the Internet Service Provider (ISP). Consumer-focused (ISP), generated $5.4 billion in revenues in 1997, and will hit $7.8 billion by 2002, according to New York-based research firm Jupiter Communications.

Selected ISP Market Capitalization (in millions)

America Online	15,490
@Home	4,170
Concentric Network	356
EarthLink	796
Exodus Communications	738
Icon CMT Corp.	312
IDT Corp	432
Metricom	198
MindSpring Enterprises	552
OzEmail Ltd	207
PSINet	682
Rocky Mountain Internet	54
Total	**23,987**

Source: company reports, July 1998

Structural Changes

Clearly, the twin forces of industry deregulation and new technology are having the most profound impact on the business. For starters, the very boundaries between discrete industries are vanishing. In our older, highly regulated world, Carriers were protected from excessive competition in a number of ways. Most importantly, Carriers were protected by clear separation of market geography, applications and customers.

Cable TV companies could only provide entertainment video within prescribed geographic boundaries established by municipal authorities. Long distance companies could only operate across "local access and transport area" (LATA) boundaries, under the watchful eye of the Federal Communications Commission. Local telephone companies could only operate within LATA boundaries, under legal purview of state authorities.

Cellular telephone companies were limited to "two per area," using FCC guidelines. Personal Communications Service (PCS) licenses were granted on a somewhat more liberal basis, but even there, the biggest chunks of spectrum were limited to two Carriers per serving area, with lesser allocations for a handful of additional Carriers within each territory. TV and radio broadcast licenses were similarly limited by geography and media type.

In the older world, it was pretty easy to determine "who" a Carrier's customers were, what services could be provided to those customers and what prices and terms of conditions of service were required. None of that will be so easy in the future, where companies will follow a bewildering range of strategies.

Think of this type of world as a "vertical" world, where "silos" of companies compete minimally, if at all, with companies in other silos. The shattering difference between a "vertical" industry and tomorrow's "horizontal" industry is that the walls separating the industry segments become porous. Competitors no longer are geographically bound, and in most cases, no longer prohibited from supplying new types of services.

Hence, long distance Carriers are encouraged to enter the local calling markets, cable TV companies are encouraged to provide high-speed Internet access. Meanwhile, local companies are allowed (after some important procedural issues, related to effective competition, are resolved) to bundle long distance, high-speed data and video services to their existing customers.

Think of the older pattern as a "Line of Business" (LoB) environment. In the LoB universe, "long distance," "cellular," "cable TV" and "paging" companies provide different services, in different areas, to different kinds of customers. The typical organizational pattern is internal provision of all key business processes. Marketing, sales, network construction and maintenance, installation and customer service, for example, tend to be handled internally, by each provider, and vertical integration is the norm. Traditionally, each industry has a characteristic type of information, or "media type."

Industry Dominant Media Types

Telephone	Voice
Computer	Data
Publishing	Books and magazines
Television	Moving pictures
Radio	Audio
Imaging	Photographs, faxes, photocopies

As we move forward with deregulation and all-digital network creation, the walls between industries inevitably collapse, in large part because the cost of digital creation, storage, manipulation and transmission is low enough that "mixed media" endeavors are economically possible for the first time. Once digitally mastered, music can be sent over the public Internet or intranets, for example. So can video, books and magazines. Live telephone conversations can be added to Web browser sessions. Full-motion video can be integrated with voice and image transmission for conferencing.

Line of Business Industry Structure

Functions	Imaging	Publishing	Telecom	Computing	Audio/Video Entertainment
Create content	Photograph	Write	Talk	Calculate	Movies, records, live events
Distribution	Retail, postal service, in-building "sneaker net"	Retail, postal service	Network	Network	"Place-based," retail, broadcast network
Message processing	Chemical processing	Desktop publishing	Voice mail	E-mail	Editing
Storage	Film, paper	Paper	Server, disk, tape	Server, disk, tape	Tape, compact disc, server
Display devices	Cameras, photocopy machines	Book, magazine	Telephone	PC, terminal	TV, radio, tape or disc player, movie screen

Indeed, the much-maligned "convergence" of industries is driven precisely by the digitization of all media types, and the corresponding ability to store and manipulate them at low cost. One likely outcome is a horizontal recreation of "functional" categories, where new firms may specialize in "information content," while others concentrate on "highways," while a third group concentrates on "information appliances."

In the content area, we see new firms such as Viacom (TV stations, radio stations and theaters), which also owns Paramount Studios (movie and TV production) with Blockbuster Video (retail distribution). In the "highways" space, there is a move towards creation of "all-distance" Carriers, supplying a full range of products.

In the "information appliance" area, consumer electronics and PC manufacturers will battle for dominance. This trend is driven by:

- the increasing digitization of all content
- the shift of mass market computing devices toward "communications"
- shift of all media appliances to digital display and storage.

U.S. Internet Appliance Shipments (in thousands of units)

Device	1997	1998	1999	2000	2001	2002	% growth
PC	31,478	36,323	41,576	46,397	51,139	55,590	12.2
Others	1,433	3,634	8,330	16,589	26,439	41,786	96.3
Total	32,911	39,957	49,916	62,986	77,578	97,776	24.3

Source: Dataquest

The upshot: replacement of the "silo" LoB structure with a more-horizontal-looking industry where some firms may develop content for display on any type of display device, delivered over any network. Other companies will develop networks transporting any type of information, while others will develop multi-function display devices.

In such a market, segmentation is almost a necessity. In competitive markets, carries can choose "core competencies" of various types. Before its absorption by Canadian Carrier TeleGlobe, Excel Communications became one of the largest long distance companies in the United States by building a residential-focused multi-level marketing organization, while owning no network assets, installation, maintenance or network operations capacity.

Many CLECs horizontally bundle a wide range of services and sell them to a restricted customer base, likewise emphasizing sales channels rather than ownership of all the underlying network assets.

Some data-centric CLECs, on the other hand, eschew such bundling in favor of a single-minded strategy. NorthPoint Communications just provides high-speed data access, using Digital Subscriber Line technology. Focal Communications just offers local calling services, on the theory that larger customers want to "mix and match" services from numerous providers.

Think of the new pattern as a "Segmentation" pattern, a game of well-defined niches. The emergence of "wholesale" and "retail" strategies; "consumer" and "business" focus; indeed, the whole gamut of "bundled services" approaches are examples.

In fact, such institutional rearrangements seem to be a staple of the deregulation process.

Regulation in Perspective

The U.S. telecommunications industry is not the first to experience widespread deregulation of the type to be felt because of the Telecommunications Act of 1996. Indeed, U.S. airlines, banks, interstate trucking firms, the long-distance telecom and natural gas pipeline industries are a few of the formerly-sedate industries stung by the whiplash of competition. Nor is telecommunications the first industry to experience competition at the same time new technology washes over it (Banking became electronic, long-distance telephony got optical fiber and airlines got new aircraft and computers). So what can we learn from history?

If the new telecom paradigm follows the pattern of other deregulatory efforts, we can expect to see the following trends emerge, since they were characteristic of the previous waves of deregulation to hit U.S. industries:

- Industry boundaries crumble and reform
- New types of companies rapidly emerge, ultimately to be absorbed by larger players
- Firms not previously thought of as competitors enter the market
- Customer segmentation grows in strategic importance
- Customer loyalty grows in strategic importance
- Prices generally drop, but not for all customer segments
- Elaborate new packaging and pricing schemes emerge
- Wide geographic scale and product scope emerging as key weapons
- Service quality drops as costs are squeezed
- Companies struggle to maintain profitability at lower revenue levels
- Customer usage of all telecom services increases dramatically
- Unit prices fall, on average

Evidence already is mounting that the past is prologue. The most-visible pattern is ***collapsing boundaries***. Carriers such as AT&T, Sprint and WorldCom are attacking the local, wireless and Internet access businesses. Cable TV companies such as Time Warner, Tele-Communications Inc. (AT&T), Comcast Corp. and Cox Communications are entering the local phone business. Long distance resellers and call-back firms such as IDT Corp. and Global Link are attacking the international long distance markets using Internet Protocol (IP) technology.

Local telephone companies are getting into long distance, high-speed Internet access, international telecommunications and personal communications service. Local geographic boundaries also are being erased as companies such as SBC Corp. gobble up Southern New England Telephone, Pacific Telesis and Ameritech. New satellite-based Carriers such as Teledesic and Iridium, meanwhile, plan to launch assaults on local markets from huge fleets of satellites.

Entry by new types of firms can be seen in the earlier emergence of competitive access providers, long-distance and cellular resellers. Though margin pressures are causing a new wave of consolidation among long distance resellers, the value of wholesale sales to these resellers will increase from the $5.5 billion level of 1996 to $13.2 billion by 2002, predict researchers at Insight Research Corp. The retail value of reseller minutes will reach $28.7 billion by 2002. Insight researchers argue that the number of U.S. resellers has increased from 500 in 1994 to nearly 1,000 at the end of 1997.

(Still, consolidation is an important trend. Research firm Atlantic-ACM believes that smaller resellers are combining. Indeed, 1997 may have been the first time in history that the number of players with annual revenues under $15 million have declined, rather than increasing, say Atlantic-ACM researchers.)

Specialized Internet access providers providing virtual private network services, commercial Web hosting and Digital Subscriber Line (DSL) access are other examples of firms that are beginning to spill over the traditional boundaries between industry segments. When ISPs offer "Voice over IP" services, or AT&T swallows Tele-Communications Inc., that's an example of collapsing boundaries.

When AT&T offers its "Digital One Rate" PCS service, it is not simply trying to grow its wireless business. It also is trying to move some landline access line customers over to the wireless arena, where AT&T saves money because local access fees it otherwise would be paying to Incumbent Local Exchange Carriers (ILECs) are avoided. The savings range from a penny or so up to three cents a minute in most areas. In a few instances, the savings are as high as a nickel a minute.

Moves by value-added resellers into the Carrier business (Englewood, Colo.-based Convergent Communications is one example), or interconnect firms into the local exchange business, are other examples of ***new firms entering an existing industry segment***. As airline deregulation lead to scores of new start-up airlines, so telecom will witness the birth of hundreds to thousands of new firms, hoping to snare a portion of the already-existing market.

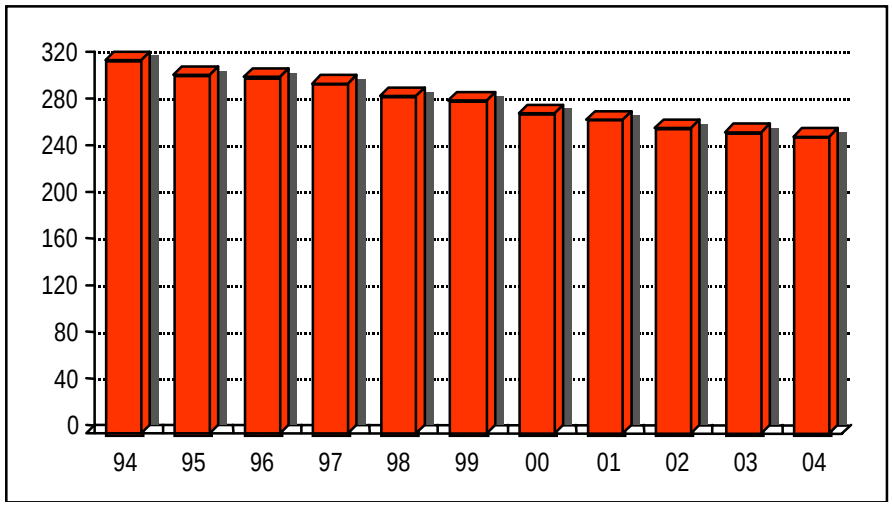
Also, if past is prologue, a likely attack will be by start-up firms offering low prices for existing services and attracting price-sensitive customers. The low-price strategy is a staple of deregulating markets. Over the longer term, economies of scale and scope will be necessary, driving many of these firms from the field, and leading the remaining firms to compete head-to-head on service quality, product scope and price. MCI, for example, began life as a provider of limited services, of demonstrably inferior quality to AT&T. Over time, MCI upgraded its network and offerings, changing the nature of competition from "lower price" to "differentiated services" and equivalent high quality.

Likewise, we should expect an explosion of new Carriers, followed by a gradual absorption of assets by the best-financed players with the most-extensive networks. This fits with the historic pattern, where "low price" is the tactic adopted for the short term, ***while "wide product scope and extensive geographic coverage"*** is the strategy adopted by long-term survivors.

Multichannel Multipoint Distribution Service (MMDS, or wireless cable) likewise began life as a lower-cost alternative to cable TV for price-conscious customers. As the transition to digital technology is made, MMDS could transform, ceasing to be the low-cost alternative to cable TV. Instead, MMDS could compete on product breadth and exclusivity, as well as signal quality, not on price. Cable TV also may lose its historic positioning as the low-cost provider of differentiated video programming, and will need to compete as a full-service wireline telecom network, most likely beginning with high-speed Internet access.

Unit costs will drop, as a direct result of Carrier restructuring. Local exchange Carriers, for example, could see non-marketing expense per access line decline at least 20 percent, from the current $300-plus range to $260 or so, according to Morgan Stanley Research estimates. These reductions will come on the heels of already-significant reductions between 1992 and early 1996. The Regional Bell Operating Companies, for example, already may have sliced 15 percent or so off the $424.45 per access line operating cost in 1992, according to Probe Research, Inc. estimates. In that case, RBOC operating costs possibly averaged $360 per access line in early 1996.

Projected Regional Bell Operating Company
Non-Marketing Expense Per Access Line



Markets also will segment. As "quality of service" and "pricing segmentation" are used by airlines to position services differentially for business and casual travelers, so telecom pricing and services will differentiate. High-volume customers will have one set of prices and features, low-volume customers a different set. As long-distance Carriers have targeted customers (college students, Asian and Latin American immigrants, frequent airline flyers), so all telecom firms will seek to identify particularly important customer niches. Nextel looks to mobile workgroups. Some CAPS target smaller cities and regions. Where United, Delta and American Airlines target the full-service business traveler, Southwest, America West, Frontier and Western Pacific target budget-minded and casual travelers.

Because customers will have more options, Carriers ***will work harder to retain customer loyalty***. That will lead to more-complicated pricing, more-diverse conditions of sale, extensive use of bundled packages of services and shorter-term purchase agreements. As airlines resorted to "frequent flyer" programs to lock in customer loyalty, so Carriers will seek to "glue" customers with a wide variety of services, offered at lower prices than if purchased separately. Additional benefits also will be thrown into the mix, ranging from discount clubs and affinity credit cards to merchandise.

Earlier examples in the banking industry included the proliferation of interest rates paid on accounts, depending on size, terms and service options. Prices will be more directly correlated with values such as security of supply or quality of service.

A ***rapid change in the structure of pricing*** also should be anticipated, with a general end to the notion that there is an "actual" price for almost anything. Services will be unbundled and fragmented into a welter of special packages. As airline "First Class" fares were increased to reflect actual cost, so telecom services of high value and cost will be priced sharply upward. But the commodity-like services will be discounted heavily, much as 91 percent of airline passengers in 1987 were flying on discount fares.

Companies also will learn to compete at price levels they today believe would put them out of business. Larry McLernon, Interactive Multimedia Network Inc. president, is building a full-service hybrid fiber coax network in Chicago, competing directly with Tele-Communications Inc. and Ameritech.

McLernon, a veteran executive from the competitive long-distance industry, recalls that minutes of use were in the 35 to 45 cent range when he first began selling long distance service. "Now it's down to nine cents," he says. "If you had told me anybody could make money at that level, we'd have said you were crazy." The point is that competition will dramatically reshape our expectations about service pricing. Previously unthinkable pricing regimes will emerge, revising our notions about the "cost" of providing services, and the ways business is structured as a result.

"Self provisioning," especially using the Web browser as an interface, will emerge as a major cost-reduction mechanism. So will "electronic billing," where a Carrier may be able to dispense with the preparation and mailing of a paper bill altogether, allowing customers to view all charges online.

Prices will drop, sharply in some cases, especially in the "traffic sensitive" portions of the network (long distance and Internet). Long distance prices have dropped more than 40 percent since the early 1980s, for example. Local business T1 rates likewise have dropped an order of magnitude (or more) since competitive access providers (CAPs, the progenitors of today's CLECs) entered the market. Indeed, long-haul tariffs declined significantly after the 1984 AT&T divestiture and impact of new Carriers such as MCI, Sprint and resellers.

Federal Communications Commission 1995 Reference Book on Telephone Service Rates, Prices, Indexes and Household ExpendituresChange in Interstate/Intrastate Toll Services

Year	Interstate Toll % Change	Intrastate Toll % Change
1980	3.4	-0.6
1981	14.6	6.2
1982	2.6	4.2
1983	1.5	7.4
1984	-4.3	3.6
1985	-3.7	0.6
1986	-9.4	0.3
1987	-12.4	-3.0
1988	-4.2	-4.2
1989	-1.3	-2.6
1990	-3.7	-2.2
1991	1.3	-1.5
1992	-1.3	-2.4
1993	6.5	0.2
1994	5.4	-1.0
1995 (Jan.-Sept.)	-1.1	-4.5

In other areas of the network, historically priced below cost, and typically representing the “traffic insensitive” portions of the network, prices may rise, though new capacity will provide a brake on price hikes.

The local loop is one area where countervailing price pressures will exist. Though new entrants and capacity will put pressure on pricing, rates are artificially low because of subsidies from the long haul and business customer side of the business. The sharp upward spike in local loop pricing in 1984, the year of the AT&T divestiture, with its reallocation of costs, is one example. Pricing also climbed in the local loop between 1984 and 1990, a time when interstate toll services consistently declined, at least in part because of cost reallocation.

Federal Communications Commission 1995 Reference Book on Telephone Service Rates, Prices, Indexes and Household Expenditures Consumer Price Indexes, Local Services

Year	Local Services % change
1980	7.0
1981	12.6
1982	10.8
1983	3.1
1984	17.2
1985	8.9
1986	7.1
1987	3.3
1988	4.5
1989	0.6
1990	1.0
1991	5.1
1992	0.5
1993	1.0
1994	-0.3
1995 (Jan.-Sept.)	2.4

Service quality, overall, may drop, though not for all customers. In other cases, one service element may be optimized at the expense of others. In the airline industry, more-frequent departures may be optimized at the expense of fewer non-stop flights. Total demand, however, will grow. When airline deregulation occurred, passenger volume doubled. That's an example of the volume effect that always occurs when a desired good's price falls as a result of new competition caused by industry deregulation.

If the natural gas pipeline industry is an indicator, deregulation will expose Carriers to more risk, slicing return on company equity and hammering company credit ratings. The Federal Energy Regulatory Commission's Order 436, in 1985, certainly had that effect on pipeline firms when it unbundled interstate transmission and sales of gas.

An earlier example of industry boundaries breaking historic geographic and line of business constraints as a result of deregulation is the banking business. The 1980 "Depository Institutions Deregulation and Monetary Control Act," for example, dramatically changed the framework within which business was conducted.

Prior to 1980 there were clear distinctions between the types of customers and transactions handled by distinct segments of the banking industry. After industry deregulation, those lines began to blur.

Banking Industry Segments, Before Deregulation

Industry Segment	Customer Segment
commercial banks	business accounts
savings and loan firms	home loans
mutual savings banks	farmers, small business
investment banks	corporate finance
credit unions	urban wage earners
insurance and trust companies	commercial, investment banking, estate management, property management, investments

After 1980 there was a rapid consolidation of firms. By some estimates, more than 3,000 mergers happened in the commercial bank area alone, between 1978 and 1988. There were some 1,570 mergers in the S&L area between 1980 and 1988. There also was a dramatic expansion of business lines (in addition to banking, firms added insurance, brokerage, securities underwriting and stock-indexed accounts resembling mutual funds).

Where customers under regulation were segmented by type (local homeowners, small business and corporations) and geography (local charters), deregulation caused new forms of segmentation, and largely erased geographic barriers to expansion.

In the new marketplace, segments for rural customers, suburban customers with high convenience needs, first-time homebuyers, retired customers, long-term or short-term business borrowing and business trade financing were created.

Just as important was the entry of new non-bank competitors, including American Express, Prudential/Bache, Sears and Merrill Lynch. All of these firms began offering commercial services of a banking nature. Other "non-bank" banks also entered the business, largely by evading the legal definition of a "bank" (an organization accepting demand-withdrawal deposits and making commercial loans). Household Finance, American Express and AT&T (using its credit card business) are other examples. The point is that all sorts of enterprises emerged to make loans of various types, to any type of customer.

The deregulation of long-distance telecommunications, as exemplified by the growth of MCI, Sprint and resellers, illustrates the principle that competition leads to ***lower prices***. Where a median long-distance minute of use might have been about 18 cents before competition, it has declined to perhaps 10 cents per MOU, about a 44 percent decrease since the early 1980s. Likewise, in California, where there is competition in the intra-LATA toll market, prices have declined between 40 and 85 percent.

Airline ticket prices show the same general trend, after deregulation. Airline analysts Barbara Peterson and James Glab, for example, says studies by some researchers indicate a 20-percent overall decline in inflation-adjusted ticket prices between 1978 and 1990, largely because of competition. But ticket prices out of "hub" airports dominated by a single Carrier (where one airline has a 60 percent share of flights in and out, for example) are about 20 percent higher than out of facilities where no single Carrier dominates, according to Peterson.

The ***emergence of new competitors***, in addition to banking, was nowhere so clear as in the airline industry, where dozens of new entrants, commuter, regional or charter airlines attempted to expand at the major Carriers' expense after passage of the 1978 Airline Deregulation Act.

Quality of service is a major hallmark of non-price competition in an entry-limited business. Indeed, service intensity, typically specified by regulators in the form of minimum and uniform operating standards, is one of the few ways Carriers can compete in a regulated market where pricing and operational scope are restricted.

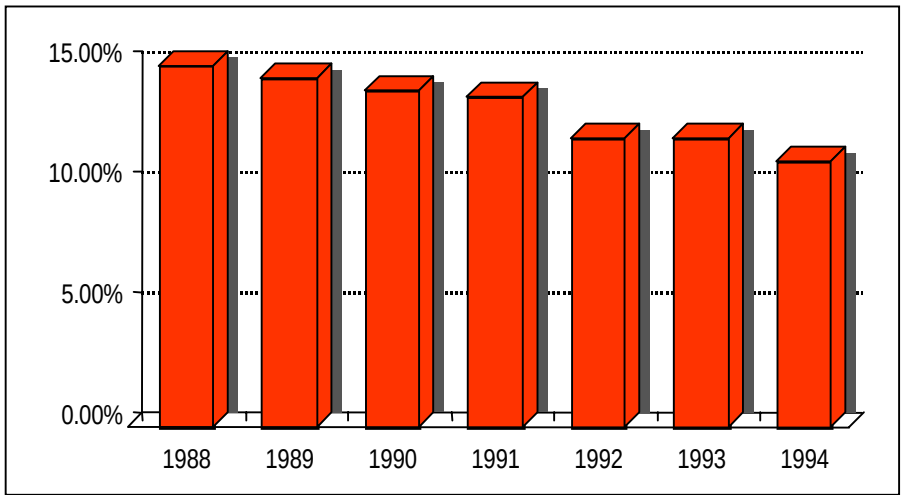
Banks competed, in part, by offering free checking accounts. Airlines added meals, better meals, wider seats, guaranteed reservations and more-frequent departures. Telephone company service standards tended to take the form

of more-reliable network components and equipment, redundant and fail-safe operations, extensive operator services and highest-possible transmission quality.

Since low cost was irrelevant, cost containment likewise was unimportant. Service quality was high, but so was cost. Under "guaranteed rate of return" regulation, the networks were gold-plated in every way. The result was organizational slack, an excess of operating and staff personnel, excess network capacity and overhead. Under competitive conditions, everything is reversed.

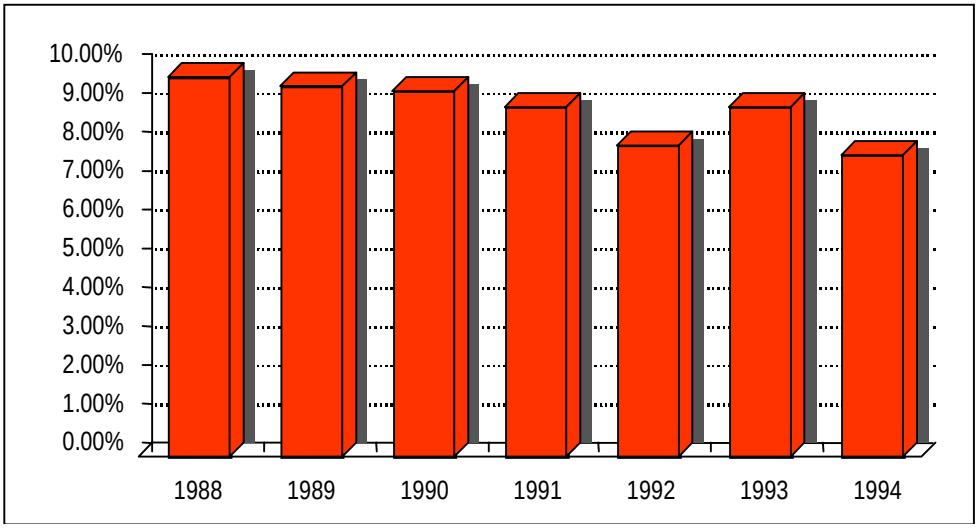
When dramatically better technology and a competitive framework are in place, competitors with a decisive cost or quality advantage can undermine the existing structure of industry leadership. Not only market share and margins, but also existence can be threatened. So unit costs must be driven down, to survive the inevitable price wars which will break out in every segment of the business. AT&T's cost structure in the operations area between 1988 and 1994, for example, provide a clear example of downward pressure.

Change in AT&T Operations/Maintenance Cost, 1988-1994



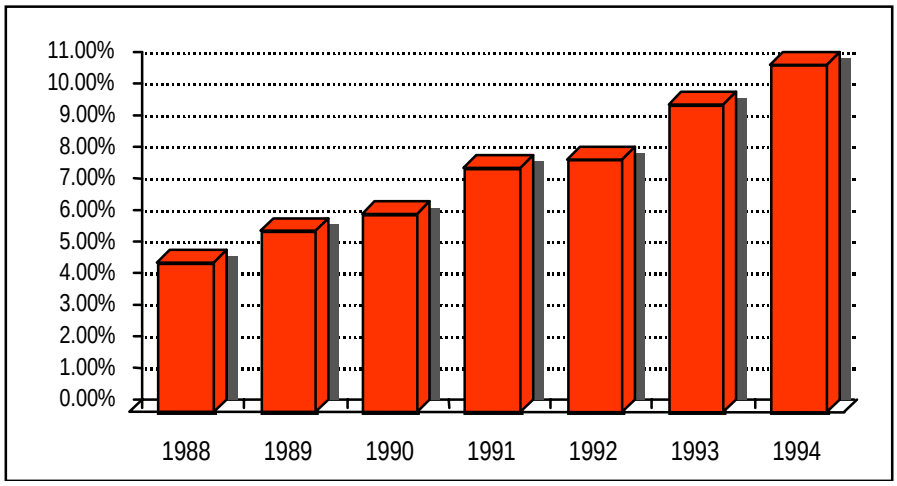
Source: adapted from Morgan Stanley Research Estimates

Change in AT&T Customer Service Cost, 1988-1994



Source: adapted from Morgan Stanley Research Estimates

Change in AT&T Marketing Cost, 1988-1994



Source: adapted from Morgan Stanley Research Estimates

One area where costs may not decline so much is customer service, given the increased intensity of competitive threats, which may lead Carriers to increase efforts. AT&T's costs in this area over the 1988 to 1994 period show a downward trend, but not as sharply as in the area of operations and maintenance, for example.

The one arena in which costs are virtually certain to increase, for all Carriers, is marketing cost, as acquisition and retention of customers becomes a primary focus. In the Direct Broadcast Satellite (DBS) area, for example, PrimeStar Partners, which historically hasn't been known for its aggressive marketing, has dramatically increased its budget since heated competition from DirecTV began in 1994. United States Satellite Broadcasting, for example, poured about $80 million into its 1996 blitz, while Primestar spent $150 million. DirecTV will more than match that amount.

DBS New Customer Acquisition Costs, 1996

Carrier	Acquisition cost/new subscriber, $
DirecTV	150
PrimeStar	150
AlphaStar (now out of business)	30-40
EchoStar	Up to $1,500

Local exchange Carrier marketing commitments also should increase from their present levels. In recent years the Regional Bell Operating Companies (RBOC), as a group, have committed about 4.6 percent of total operating expense, or 3.4 percent of operating revenue, to marketing. Marketing expense per access line has been in the $20 range. Cellular companies have been spending about $200 to $300 per new subscriber. Personal communications service networks may budget about $200 for each new subscriber, and about another $50 per subscriber on current customer retention. Cable TV companies traditionally have spent very little on marketing, committing something on the order of 1.3 percent of revenues for such purposes.

Communications Carrier Marketing Cost Per Access LineAnnual Expense in Dollars

Carrier	$ Per Access Line
Ameritech	19.55
Bell Atlantic	17.27
BellSouth	20.37
Nynex	24.50
Pacific Telesis	21.09
SBC	13.32
US West	22.49
GTE	22.75

Source: company reports and interviews

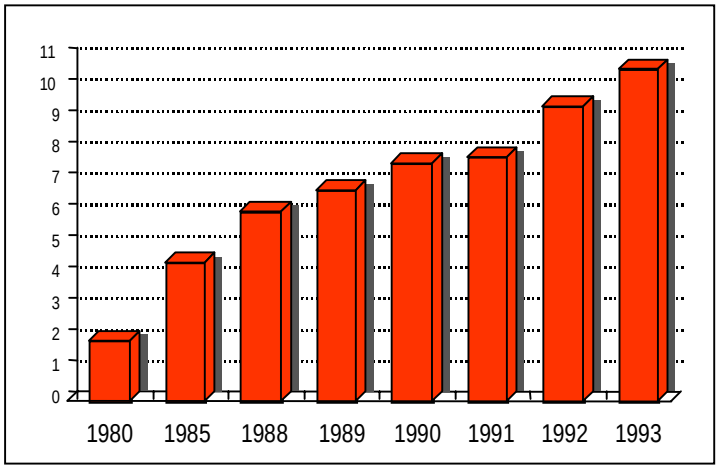
Communications Carrier Marketing Cost Per Subscriber Annual Expense in Dollars

Carrier	$ Per Subscriber
Long-Distance Carriers	45/new sub
Cellular Carriers	200-300/new sub
PCS Carriers	200/new sub
PCS Carriers	50/existing sub
Cable TV Company	5.22

Source: company interviews

As we have noted, deregulation spurs usage. More customers will use more telecom services, much as more passengers took to the air as deregulation restructured the industry. Commuter airlines, for example, saw passenger miles jump three-fold between 1980 and 1990, and five-fold between 1980 and 1993.

U.S. Airline Industry Commuter/Regional Carrier Revenue Passenger Miles Flown, Miles Billions



Between 1978 and 1995, the number of departures at small-community airports increased 49.5 percent, while available seats increased 15.4 percent, according to a report issued by the U.S. General Accounting Office. At airports serving medium-sized communities, departures increased 57.4 percent, while 41.7 percent more seats were available. At the largest city airports, departures increased 22 percent, seats 21.8 percent.

Changes in Airport Departures and Seats

Community size	Departs, 1978	Departs, 1995	Seats, 1978	Seats, 1995	Depart % change	Seat % change
Small	32,744	48,960	2,639,089	3,046,502	49.5	15.4
Medium	40,561	63,854	3,754,122	5,318,123	57.4	41.7
Large	232,695	391,282	25,958,611	41,747,546	68.2	60.8

Source: General Accounting Office, "Airline Deregulation," 1996

Adjusting for inflation, fares were about nine percent lower for small-community airports, 11 percent lower for medium-sized-community airports and eight percent lower for the largest city airports, according to the report.

Similar price declines were seen in Australia's aviation market. According to a 1995 report by the Prices Surveillance Authority, the inflation-adjusted cost of air travel declined 24 percent since deregulation. The biggest changes came in the leisure travel segment.

Before deregulation, about 10 percent of travelers used business fares, the same percentage after deregulation. But where 45 percent of fliers used "full economy" tickets, another 45 percent used discount fares. After deregulation, "full economy" passengers shrunk to about 20 percent of the market, while 70 percent flew on some sort of discount fare.

On the other hand, as we have suggested, service levels may tend to suffer, as many passengers will attest. On the other hand, recent research by the Federal Aviation Administration suggests that ticket prices, in real terms, have fallen in most markets. Recent customer service complaints lodged against US West, though partly a result of massive access line growth in some markets, may be some indication of future trends as well.

The effect on overall industry employment is not so clear. Employment in the U.S. airline industry between 1985 and 1994 actually increased between 1985 and 1993, from 355,000 employees in 1985 up to 537,000 employees in 1994. In telecom, job losses at major established Carriers will be counter-balanced by increases at new entrants into the market.

As we have suggested, company responses to deregulation will tend to fall into several categories, including:

- Rapid geographic expansion
- Diversification
- Specialization
- Geographical focus
- Low-cost Carrier
- Full-service operations on a wide geographic scale

Rapid geographic expansion might include mergers of local telephone, cellular and cable TV firms, much as Continental Airlines expanded by gobbling up Eastern Airlines, People Express and Frontier Airlines in the 1980s. Diversification already has been tried, with varying degrees of success, in the local exchange market, as Bell Operating Companies branched out into fields such as real estate, systems integration, video and wireless. Specialization might be seen as a strategy pursued by competitive access providers and long-distance resellers.

Several airlines attempted to prosper using a regional approach in the aftermath of airline deregulation. Southwest Airlines is perhaps the best example of the low-fare strategy. In many cases, a competitive assault initially will be based on low cost, but mutates over time to competition based on service, branding and other non-price attributes. MCI initially offered low price, but over a period of time matched AT&T service quality and scope, offering competitive, but not lower, pricing.

Most airline firms were unprepared for deregulation, which hit in 1978. Though significant increases in the cost of aviation fuel contributed (the cost of a gallon doubled), the 1978 to 1980 period was financially brutal for virtually the entire industry, as intense competition led to wild discounting.

During the first half of 1980, for example, virtually all U.S. airlines suffered huge losses, in part because new Carriers assaulting the market did not play by the traditional rules, and slashed prices.

In general, low overhead, nonunion labor, used aircraft, leased facilities and “no frills” service were the hallmarks of such start-ups, which sometimes were attempted by regional commuter airlines, charter airlines or former airline executives. Some examples of expansion by regional Carriers were moves by Air Cal and Pacific Southwest Airlines from their core California markets into the northwest and southwest regions.

U.S. Airline Operating Profits First Half, 1980, $ million

Carrier	Revenue	Expense	Profit/Loss
American	1,746	1,867	(120)
Braniff	741	801	(60)
Continental	497	522	(25)
Delta	1,582	1,508	74
Eastern	1,704	1,700	4
Northwest	740	791	(51)
Pan Am	1,672	1,781	(109)
TWA	1,581	1,633	(52)
United	2,108	2,222	(113)
Western	470	513	(42)
All large airlines	12,845	13,340	(495)

Source: Merrill Lynch Airline Industry Annual Financial Statistics, 1982

To reiterate the point, the historical experience of industry deregulation in the United States suggests that a number of trends will emerge in telecommunications as the process of market opening continues:

- Industry boundaries crumble and reform
- New types of companies rapidly emerge, ultimately to be absorbed by larger players
- Firms not previously thought of as competitors enter the market
- Customer segmentation grows in strategic importance
- Customer loyalty grows in strategic importance
- Prices generally drop, but not for all customer segments
- Elaborate new packaging and pricing schemes emerge
- Wide geographic scale and product scope emerging as key weapons
- Service quality drops as costs are squeezed
- Companies struggle to maintain profitability at lower revenue levels
- Customer usage of all telecom services increases dramatically
- Unit prices fall, on average

The end of "line of business" restrictions will lead to widespread industry convergence. In the absence of entry barriers, many small companies will enter the public networking space, ranging from ISPs and CLECs to value-added resellers. As global markets begin to deregulate, the rush to achieve scale and scope economies will accelerate, re-concentrating the industry on a new pattern where a handful of global players dominate the market. But many small niche players will continue to thrive as specialty providers, in part because the new packet networks will so easily lend themselves to service innovation.

There is one strategic trend virtually all Carriers must anticipate. In all previous cases, unit pricing pressure was a permanent feature of the deregulated industry. In our case, this trend will be pronounced, in large part because so much new technology combines to lower capital and operating cost. Among the key drivers are:

- Dense wave division multiplexing
- Wireless bandwidth
- Client-server and other distributed switching platforms
- Voice-over-"X" technologies
- Signal compression and processing
- The Internet and packet transmission formats (IP and ATM especially)

These developments are important because they all contribute to lower operating costs, and hence the ability to establish new retail pricing points. DWDM essentially allows us to increase the bandwidth of any single optical fiber by 12 to 80 times, simply by increasing the number of wavelengths (literally differing colors of red light) we can push through the waveguide.

Wireless bandwidth is important for the same reason: it dramatically increases the supply of bandwidth, which will decrease its retail price. Though near-term wireless bandwidth is provided mostly in the form of narrowband PCS, other terrestrial broadband microwave technologies, operating at a wide variety of frequencies, already are being deployed in major U.S. cities by firms such as Teligent, WinStar and Advanced Radio Telecom. Longer term, fleets of new satellites launched by the likes of Teledesic and Iridium will supply even more bandwidth.

Client-server switching technologies, which replace mainframe-style central office switches with less-costly platforms, also will drive capital costs downward. Programmable switches, costing hundreds of thousands of dollars, rather than millions, are one step on this path. Long used to provide enhanced services to legacy "Class 5" end office switches, programmable switches will in the future be adapted to provide "core" switching functions as well. The building blocks may include tools such as server-based signal control points, signal transfer points, advanced digital loop Carrier systems and server-based PBX systems.

Signal compression also plays a role by reducing the amount of transmission bandwidth required to send signals through the network. The most-dramatic impact can be seen in PCS and video networks, where voice bandwidth can be reduced from 64 kbps to as little as 8 kbps. In the video business, digital signal compression allows signals to be compressed from 100 Mbps to as little as 3 to 4 Mbps for "movie" quality signals.

Packet technologies also are important, in part because the packet format itself increases bandwidth efficiency, but more importantly because packetized voice lends itself to transmission over existing frame relay, ATM and other private networks. In these cases, where an end user already has paid for transmission bandwidth, and is not using all of that bandwidth, packetized voice can be sent over the network for very little incremental cost.

Ultimately, all Carriers will contend with a possible seismic shift in the direction of "open" networks." Like the older mainframe-based computing environment, the older public network was a "closed" system, using proprietary hardware and software. Slower innovation and higher upgrade costs were the result.

But the Next Generation Public Network increasingly will be built on "open" standards and non-proprietary hardware. That portends faster rates of innovation and should lead to lower overall cost. It also means Carriers and their suppliers are compelled to preserve prior investments to the greatest degree possible, as well as to provide lower-cost enhancements.

At the same time, architectures are shifting. It used to be that distinct network functions—transport, switching, access—were handled by distinct parts of the Carrier organization, while vendors maintained distinct development and sales organizations to match. No longer. The line between switching and access, for example, has begun to blur.

The other background trend we see occurring is that where the older circuit-switched network tightly coupled "applications" and "network transport," the new packet-switched network easily separates, indeed encapsulates and uncouples, network transport from switching and end-user functions.

In other words, where in the older public network, "applications" sit on a closed end office switch, in the Next Generation Public Network, applications can reside anywhere it is convenient and cost-effective. That might be on a user PC or other device, on a LAN server, backbone network server in a gateway, router or edge switch.

At the same time, we are fast entering the era of the Net Generation Public Network, optimized for data, rather than voice. Where Carriers and their suppliers once built systems optimized for constant bit-rate, narrowband and connection-oriented traffic, they now must build variable bit-rate, broadband networks that seamlessly handle connectionless traffic.

The Market Opportunity

No matter how you look at it, CLECs, ISPs and incumbent Carriers all stand to profit enormously from markets on the threshold of exploding growth. Assume for the moment that the Internet did not exist. Underlying access line growth has accelerated in recent years, driven by explosive demand for additional lines. Where the underlying residential growth rate had been in the two percent annual range, it now is closer to four to five percent. Business line growth runs about six percent.

U.S. Access Line Growth, 1997-1998, 2nd quarter numbers (lines in thousands)

Carrier	1997 Access Lines	1998 Access Lines	% Growth
Ameritech	20,018	20,835	4.0
Bell Atlantic	20,972	22,883	4.2
BellSouth	22,717	23,660	4.2
Nynex	18,071	18,613	3.0
Pacific Telesis	17,262	18,065	4.7
SBC	15,345	16,144	5.2
US West	15,684	16,306	4.0
GTE	17,883	18,773	5.0
Sprint	7,298	7,543	3.4

Source: company reports and Gary Kim estimates

U.S. LEC Business Access Line Growth, 1997-1998, 2nd Quarter Figures

Carrier	1997	1998
Ameritech	6.0	5.0
Bell Atlantic	6.3	6.3
BellSouth	6.3	3.9
Pacific Telesis	6.5	5.1
SBC	8.4	7.1
US West	6.5	4.4

Source: company reports

As we already have argued, deregulation of U.S. industries has lead to increased customer usage, so the advent of local competition should likewise stimulate the $103 billion local telephone market revenues booked in 1997 by the RBOCs, GTE and Sprint's Local Telecom Division.

The U.S. long distance market, worth some $108.5 billion annually in 1998, will probably continue to grow at between eight and nine percent a year, according to the Multimedia Telecommunications Association. And most new Carriers, as well as the RBOCs, will seek to acquire some percentage of this business as part of their "bundled services" initiatives.

The nascent U.S. Competitive Local Exchange Carrier (CLEC) business, on the other hand, is just at the beginning of its growth cycle, currently claiming a few billion dollars a year worth of total revenue. Growth rates, however, are very strong, with revenue doubling a virtual certainty in 1998.

U.S. CLEC Industry Growth

	1995	1996	1997
Companies	N/A	78	110
Revenue	$1.2 billion	$2.2 billion	$4.5 billion
Network route miles	N/A	47,061	78,506
Voice switches	N/A	139	328
Access lines	N/A	N/A	1,846,531

Source: New Paradigm Resources Group, Inc.

U.S. CLEC Growth Forecast, in percent

	1997	1998	1999	2000
Switched services	126	124	115	105
Private line	114	53	41	23
Long distance	21	80	71	65
Data	522	245	105	55
Miscellaneous	139	105	92	80
Telecom services	112	111	91	76
Non-telecom	50	60	60	60
Total revenue growth	**109**	**109**	**90**	**75**

Source: New Paradigm Resources Group, Inc.

Some idea of the market potential can be found when one looks at the addressable local market opportunity for selected public CLECs, in their current markets. For some of the CLECs with extensive footprints, such as AT&T's TCG unit, and WinStar Communications, the potential is $75 billion a year.

CLEC Revenue, 1999 estimated

CLEC	Revenue ($ Millions)
Advanced Radio Telecom	20.0
Brooks Fiber (WorldCom)	493.4
U.S. LEC Corp.	125.3
e.spire	303.4
ICG Communications	763.4
Intermedia Communications	1,095.3
McLeod USA	775.4
MetroNet Communications	148.3
MGC Communications	80.9
NextLink Communications	301.4
Teleport Communications Group (AT&T)	1,824.5
WinStar Communications	425.0

Source: Bear Stearns

Selected CLEC Addressable Market, $ Billion

Carrier	Addressable Market
US LEC	8.0
e.spire	17.5
GST	15.0
ICG	35.0
Intermedia Communications	45.0
McLeod USA	20.0
NextLink	25.0
AT&T TCG	75.0
WinStar	75.0

Source: Bear Stearns

The “Voice over X” market also should be interesting, for ISPs and value-added resellers more than for CLECs, in many cases. Though the “Voice over IP”(VoIP) market seems to have gotten most of the recent press attention, the “Voice over Frame Relay,” “Voice over ATM” and “Voice over Private Network” markets are tangible for the business customer base.

VoIP Market Share Forecasts

Atlantic-ACM	$3.5 billion, U.S., 2002
Frost & Sullivan	13% of global traffic, 2002
Forrester Research	$2 billion U.S. Carrier revenue, 2004
Dept. of Commerce	$63 billion global, 2002
Killen & Associates	$8 billion, 2003, U.S. ISP VoIP revenue
Probe Research	Possibly $5 billion, U.S., 2002
Phillips Tarifica	AT&T loses $350 million, 2001

And though few CLECs have made it a priority, keep in mind that the market for data networking equipment represented $45 billion in 1997 sales, according to the Multimedia Telecommunications Association (MMTA). Spending for data communications services, ranging from maintenance and repair to network management was in excess of $63 billion in 1997, says the MMTA. As much as $97 billion in annual equipment, software and services spending markets are theoretically available to new Carriers as well.

1998 Data Communications Revenues (projected)

	Dimension ($ in Millions)
LAN switches	5,927
Routers	3,436
Hubs	1,573
NICs	1,820
Servers	21,325
Wiring	3,100
Network operating systems	2,209
Internet/intranet applications	1,447
Web servers	82
Groupware	549
Network security	1,164
Mainframe peripherals	271
SNA gateways	285
Remote access devices	2,044
Modems	3,489
Frame relay switches	1,033
Frame relay access devices	494
ATM enterprise switches	618
Packet-switching equipment	439
Multiplexers	570
CSU/DSUs	867

	Dimension ($ in Millions)
PBXs	6,117
CTI	1,260
Videoconferencing equipment	1,160
VSAT equipment	529
Network and systems management	3,868
Diagnostic and test equipment	607
Products total	66,280
Network support services	9,220
Leased lines	10,700
ISDN	1,658
Frame relay	4,720
X.25	753
ATM	320
Commercial Internet services	3,087
Content hosting	880
Data/Network services total	22,119
Products/services total	97,625

Source: Data Communications Magazine, December 1997

Some idea of the pace of change can be seen in the U.S. market for telecommunications equipment, which represented $57.7 billion in 1997 sales. Some of the fastest sales growth came from data applications and convergence, according to Global Information, Inc., a market research firm. Sales of computer-telephony integration equipment and software grew 164 percent while data networking equipment and software sales grew at 80 to 85 percent rates, for example.

Networking Equipment Markets, 1997

Category	% Growth, 1997
Computer-telephony integration	164
ATM enterprise	85
ATM WAN	80
Frame Relay switches/access	65
Internet software	55
Communications software	25
Call Centers	25
Wireless infrastructure	21
Network management	20
Data networking	20
Messaging	20
Remote access	18
VSAT	18
Optical networking	14

Source: Global Information Inc.

U.S. data transport revenues, meanwhile, will hit nearly $20 billion by the end of 1998, according to The Yankee Group, up from $13.4 billion in 1998, according to *tele.com* magazine. And the U.S. information technology professional services market, worth $74 billion in 1998, should grow to $97 billion by 2000, according to Robert W. Baird analysts.

U.S. IT Professional Services Market, $ Billion

Segment	1996 Market Size	2000 Market Size
Consulting	10.7	20.1
Education, training	4.8	7.6
Application development	10.2	16.9
Implementation, integration	8.2	13.9
Management services	19.9	34.1
Outsourcing	2.1	4.1

Source: Robert W. Baird, 1998

The wildest of wild cards is the electronic commerce (e-commerce) market. No fanciful notion, electronic commerce follows on the heels of successful and increasing “information intensity” in the broader retail marketplace. In a recent survey of 120 information technology managers, *CIO* magazine found that 47 percent of respondents thought e-commerce would be the “primary” transaction medium in the distant future, while 31 percent thought it would become predominant in the “near” future.

In 1988, for example, fewer than five percent of U.S. retail apparel manufacturers filled orders using electronic data interchange (EDI) systems. In 1992, more than 30 percent did so. The payback has been dramatic. In the U.S. clothing industry, inventories are down 60 percent since 1985. Retail markdowns are down 40 percent, since retailers are ordering the right merchandise, at the right time, say researchers at the Organization for Economic Cooperation and Development. And sales are up 30 percent. Wal-Mart, for example, ships 90 percent of its merchandise directly from manufacturer to retail locations, without an intermediate stop at a warehouse.

"By drastically reducing transaction and search costs, electronic commerce reduces the distance between buyer and seller, enabling businesses to target very small niches, develop individual customer profiles and essentially provide a means of marketing on a one-to-one basis."
--Organization for Economic Cooperation and Development

"Analysts estimate that businesses already trade well over $150 billion in goods and services using EDI over value-added networks. Companies using EDI commonly save five to 10 percent in procurement costs."
--U.S. Dept. of Commerce

According to studies conducted at General Electric's lighting division, EDI has reduced labor cost 30 percent, allowing redeployment of 60 percent of the procurement staff to other pursuits, while adding six to eight useful days a month for the remaining staff. Material costs, meanwhile, declined 20 percent. By October 1997, eight divisions of GE had adopted similar EDI capabilities. By 2000, when 12 business units do so, GE will have saved $500 to $700 million.

Cisco, which uses the Web for customer service, estimates that productivity is up 200 to 300 percent, saving $125 million a year in CSR costs. Dell estimates its own savings at "several million dollars a year." Indeed, Web-based call centers are poised to make a dent in the cost of handling reservations, taking orders and providing customer support functions.

Typical Call Center Functions, Percent of Usage

Reservation procedures	22
Order taking	22
Customer help desk	35
Handle information requests	9
Internal communications	6
Process claims	5
Credit card validation	1

Source: Team TeleMedia, 1998

Boeing Co.'s spare parts business unit uses the Web to process about 20 percent more shipments a month in 1997, compared to 1996, using the same number of people. At the same time, it avoids 600 phone calls a day to its customer service representatives.

Likewise, W.W. Grainger executives say more than 50 percent of its Web-based orders are placed after 5 p.m. and before 7 a.m., a time when retail outlets might typically be closed. Just as important, about 30 percent of Web sales are either to new customers, or are incremental sales to existing customers.

Each year, U.S. businesses spend about $250 billion on all sorts of consumable supplies not directly related to the production process. Office supplies, PC consumables, cleaning supplies, tissue, paper towels and replacement parts are examples. The rub is that the cost of issuing a purchase order for these sorts of items is between $80 and $125 each – often exceeding the value of the supplies ordered.

About $83 billion worth of those annual purchases are made to vendors that have not already signed volume purchasing contracts with the host firms, and typically that means a cost premium ranging up to 50 percent, according to GE Trading Process Network.

By 2002, some $326 billion in business-to-business commerce may be conducted, according to researchers at Forrester Research. Already, some 66 percent of total FedEx shipments from 550,000 business customers use the FedEx "Ship" or "PowerShip" online booking systems, the company says. As a result, it avoided hiring 20,000 more employees.

Consumer transactions could be equally as big. As recently as 1996, fewer than 40 million people had World Wide Web access. The next year, that figure shot up to 100 million or more on a global basis. According to a survey released in August 1998 by Nielsen Media Research and CommerceNet, 70.2 million Americans over the age of 16 use the Internet. That represents 35 percent of adults. That same study found that 20 million U.S. and Canadian Web users have made online purchases, while 48 million have compared prices or done research on planned purchases online.

And Internet traffic now is doubling about every 100 days. About $4 billion is spent by consumers and businesses on Internet access, a figure that should grow to $9 billion by 2000, predict researchers at IDC. Cowles/Simba Information researchers predict that ISP revenues will climb to $15 billion by 2002. In June 1997 about 25 million subscribers were using online services such as America Online, according to Cowles/Simba researchers. Business Internet users represented about 15.5 million of that total, and will reach 26.5 million workers, or about a third of all white collar workers, the company predicts.

E-Commerce Markets, Business-to-Business and Business-to-Consumer, $ million

	Small business	Small business	Medium business	Medium business	Large business	Large business	Very Large	Very Large
	B/B	B/C	B/B	B/C	B/B	B/C	B/B	B/C
1998	12	5	29	9	61	23	69	27
2000	69	19	168	42	337	95	409	115
2002	228	46	503	95	1,049	214	1,350	275

Source: Forrester Research

Computers, books, travel, flowers, music, toys, food and financial services are a few of the industries to pioneer consumer-driven e-commerce. According to researchers at FindSVP, 11 percent of adult Internet users – about 4.6 million people – actively trade stocks online, while usage increased 150 percent between the second and fourth quarter 1997 alone. Investment banking concern Piper Jaffrey recently estimated that $614 million in U.S. broker commissions were generated by online transactions in 1997. That is about four percent of total commissions and about 29 percent of the value of the $2.1 billion in commissions generated by the discount brokerage segment of the business.

A few firms, including Cisco Systems and Dell Computers, already have made Web-based sales a key distribution channel. In 1996, Cisco booked more than $100 million in sales over the Net. At the end of 1997 it was selling $3.2 billion that way. Dell Computers at the beginning of 1997 sold less than $1 million in PCs over the Net. By December 1997 sales had shot up to $6 million a day.

Amazon.com sold less than $16 million worth of books in 1996. By 1997 it was selling $148 million, and now has a market capitalization greater than that of Barnes & Noble and Borders Books combined.

Market Capitalization, Booksellers, $ Billion (August 1998 data)

Amazon.com	6.2
Barnes & Noble	3.0
Borders Books	2.9

Source: company reports

Likewise, the online business information market was worth about $24 billion in 1997, and will grow to $37.5 billion by 2001, according to Cowles/Simba Information analysts.

And among the obvious beneficiaries are publishers, for whom 30 to 40 percent of the total retail cost of a newspaper or magazine is printing and delivery. But there are additional benefits, including the low marginal cost of sending created content to a few, or millions of users. Also, digitally-created and stored material can be repackaged and used in multiple delivery formats: print, email, Web server access, as a complement to audio or video clips. Of course, there are threats as well, in particular to classified advertising of the type run by newspapers.

The travel industry also is an early convert to Web-based transactions. Though only about $276 million worth of travel was purchased over the Web in 1996, and about $911 million in 1997, Jupiter Research estimates that $11.7 billion worth of travel services will be sold online by 2002. Airline travel will amount to $7.1 billion of the total, Jupiter researchers predict.

Already, Microsoft Corp.'s two-year-old "Expedia" travel service has become one of the largest travel agencies in the United States. And industry sources say a Web-purchased ticket costs $1 to process, compared to $8 for a traditional paper ticket. Indeed, travel agent commissions, marketing and advertising and other central reservations system expenses amount to $12 billion a year, the second-largest operating cost for a typical airline, trailing only fuel.

Banks, long leaders in adopting labor-saving information technology, also will be early adopters of Web-based transactions, since a Web transaction probably costs about a penny, while a "live teller" transaction costs a dollar or more, according to Booz-Allen & Hamilton studies. Already, in 1997, 4.5 million households were banking online. According to Dept. of Commerce researchers, by 2000 that figure could grow to 16 million households.

And as many types of businesses have found, mailing bills to customers can cost between $1.65 and $2.70 per bill.

Even insurance policy sales may benefit from e-commerce. According to Lincoln Benefit Life, agents are less likely to sell policies with face values less than $500,000, because of the cost of sales. In studying sales patterns, Lincoln Benefit found that the "majority" of policies were in the $500,000 or higher range. So shifting to online sales for smaller policies promises to increase sales and market share in smaller policy values segment of the market.

By 2001, predicts the Commerce Department, $1.1 billion in insurance premiums will be generated using the Internet, up from about $39 million in 1997.

Other types of information-intensive retail transactions also are a natural. JD Power & Associates estimates that 16 percent of new car and truck buyers used the Web as part of the shopping process in 1997. The research firm further predicts growth to 21 percent of such purchases by 2000.

1-800-Flowers generates about 10 percent of gross revenue from its Web channel, but that business contributes 20 percent of its total profit, nearly equal to the profit from store-based channels.

In fact, if catalog shopping is any kind of proxy for retail e-commerce, we might be looking at $115 billion in sales by 2006, some analysts believe.

The point is that CLECs and ISPs, as well as other new and existing players in the communications and information technology businesses have many options when it comes to selecting a market segment to attack. Shifting market share is not a bad strategy for starters. But the real upside comes when new services are added to the mix, since that is a "win-win" game based on growing the size of the market, not a "zero-sum" game based on stealing some share of an existing market. And, without question, a shift to packet-based services must be part of the strategy.

The Technological Foundation

"The Internet is just as significant for the telecoms industry as the PC was for the computer business. It brings in new companies and cuts margins."
--Tim Kelly, operations analysis, International Telecommunications Union

Vastly more flexible and cheaper communications is the promise extended by the next generation of packet-based networks. We may question whether Sprint's recently announced "Integrated On-demand Network" (ION) ultimately will turn out to be much more than a clever marketing ploy.

But we can hardly contest the thesis that something dramatically new is underway: a recasting of the traditional public switched telephone network and the emergence, along side it, of a thoroughly modern packet network. In a recent survey of Fortune 1000 data and voice managers in the retail, manufacturing and insurance industries, respondents estimated that 18 percent of total company traffic would be IP-based by 2002, with as much as 33 percent carried in that format by 2005, Killen & Associates found.

Cheaper calls are hardly the issue. The Internet is not, strictly speaking, the issue. Indeed, if IP and the Internet didn't exist, the cost of public network bandwidth would still continue to fall, driven by additional capacity brought online by new Carriers, the entry of Regional Bell Operating Companies (RBOCs) into the long distance market, and by the application of optical networking.

It isn't yet clear whether, in the packet-networking era, voice literally becomes a "free" good. But there is little doubt that retail prices will continue to decline, increasing Carrier incentives to sell "fat" minutes of use. "Fat" minutes are value-added minutes, whether enhanced by messaging features (voice mail, message formatting and device independent retrieval, for example) or quality of service (audio bandwidth higher than the 4 kiloHertz standard for today's "toll grade" calls, for example).

Make no mistake, packet transmission is more efficient than circuit transmission. It's just a fact that less transmission bandwidth is consumed when sessions are handled by an all-digital network. But that's not the whole, perhaps not even the most important issue. Modern networks can take advantage of the application of client-server architecture to the fabric of the core switching network itself.

For starters, innovation on the packet switch side of the business is simply faster. Modern digital switches "double their performance for the same cost every 80 months," says Peter Sevcik, an associate at Northeast Consulting Resources Inc. But ATM switches double performance in half that time, he argues.

The same might be said for other types of data concentration and routing devices. IP routers double performance every 20 months, and frame relay switches double every 10 months. But that is not the only – or even the most strategic – advantage. Programs that run conventional circuit switches have been developed largely in-house by telecom switch vendors. The number of programmers is small. But we are moving towards open platforms, standards-based hardware and software. And the base of C++ programmers, for example, is quite large. And all that translates into faster service innovation and lower prices.

With some Carriers now building "all-IP" networks, we may occasionally become confused about how IP squares with other important public network protocols, especially asynchronous transfer mode (ATM). To put matters simply, both protocols will be used, and the decision as to which is "best" depends on the legacy business a Carrier or end user is in, as well as the importance of the media type which anchors the business.

In other words, if a customer is an ISP, then IP for voice and other media types may make sense. If, on the other hand, a customer is voice-based or video-based (and hence, dependent on isochronous traffic, whose delivery times must be predictable), or if assured quality of service is crucial, that customer may well demand ATM-based services, which can guarantee delivery and provide “Quality of Service” (QoS) guarantees. In many cases, however, IP traffic will ride “on top of” an ATM transport network. That’s what “IP-centric” Carriers such as Qwest Communications are looking at, for example.

There are many good reasons for encapsulating traffic that way, and among them is the fact that ATM is simply the technology of choice for most established public Carriers. Requirements for detailed billing and usage monitoring, as well as support for varied media types, with distinct legal and taxation requirements are other factors leading Carriers to prefer ATM.

“Settlement procedures” (figuring out what payments Carriers owe each other, and are owed by other Carriers) remains a key issue for IP transport systems. So is QoS. So even when public Carriers add IP-based services, they will do so in an ATM context. SBC, for instance, says it is planning for its local networks to be based on IP packets with an ATM switching "fabric" by the year 2002.

SBC Executive Vice President for Corporate Planning Michael Turner says that 98 percent of the company's revenue today comes from circuit-switched voice communications, and he figures that even when data becomes more than half of his company's traffic, it still will account for less than half its revenue. That suggests a need for ATM, even though QoS mechanisms are being developed for IP, and will ultimately be available.

But core network protocols are only part of the dynamic network environment. As fast as new networks are built by the likes of new Carriers such as IXC Communications. Qwest, Level 3 Communications and Williams Communications, the stubborn fact remains that local access is the bottleneck. We may be able to shoot 80 different optical wavelengths down a single fiber, at blistering rates in the gigabit range. But everything slows down again when we hit the local telephone network and its 64 kbps-optimized voice-grade loops.

So local high-speed access alternatives, especially Digital Subscriber Line (DSL) and cable modems are key enabling technologies for Carriers wishing to overcome local transmission bottlenecks. Both technologies offer important advantages aside from capacity, however. Using either technology, customers can have access to high-speed IP/packet services while at the same time having access to multiple voice lines.

That has important implications for the growth of second line markets, which in some cases have been built on the fact that conventional local access lines can handle a voice call, or a Web session, but not both simultaneously. The traditional exception has been Integrated Services Digital Network (ISDN) services access, which does allow for use of multiple voice lines plus data, at the same time. Most likely, though, slow-starting ISDN services will quickly be eclipsed by DSL services.

Wireless access, provided by CLECs like Winstar Communications, Teligent and Advanced Radio Telecom also are important new technologies, since they allow new Carriers to circumvent the lack of incumbent Carrier optical fiber access to business customer sites. According to Hamid Akhavan, Teligent vice president, optical fiber only reaches about three percent of the 750,000 U.S. office buildings with 10,000 square feet of capacity or greater. Granted, about 35 percent of the accessible base of lines and revenue is captured by that small fiber penetration, but fully 65 percent of the market opportunity lies outside the currently-fibered local network base.

“Voice over data” technologies also are strategic, especially those platforms which integrate traditional “circuit network” signaling (Signaling System 7) with packet network transport. SS7, quite simply, is the mechanism used in modern telephone networks to set up and tear down circuits, as well as supply enhanced services, ranging from 800 calls to caller identification and conference calling. Near term, voice over data is an important technology for business customers since it allows them to make more efficient use of any private network or dedicated access facilities they already are buying from Carriers.

Though arcane, SS7 support is crucial for ensuring communications between the legacy circuit-switched and new packet-based networks. It makes possible applications such as “Internet call waiting,” for example, where a call routed to a standard telephone gets routed to an IP-based or other packet device.

If a Carrier's customers are offered the ability to dial long distance calls using a "one plus" format, SS7 support must be provided. SS7 also ensures that network resources are not tied up unless it is possible to complete a call. Billing and authentication support all is enabled by the SS7 network.

The ability to provide unified messaging systems likewise is made possible by SS7 technology. The "laundering" of messages from one format to another, so they can be retrieved by any type of customer premises equipment, is one example of an SS7-enabled messaging application. The ability to retrieve faxes or emails as voice mail is one example.

The premise of integrated voice and data assumes that voice is just another client-server application on the data network. And can provide significant cost savings. The ability to gainfully employ excess bandwidth on existing data pipes is part of the attraction. So is the possibility of eliminating duplicate wiring for voice and data networks. Also, support organizations can be consolidated, since voice and data run over the single "data" infrastructure.

Though "Voice over IP" (VoIP) seems to garner much of the attention, there actually are several significant "Voice over data" transmission technologies, including Voice over Frame Relay (VoFR) and Voice over ATM (VoATM). VoFR is important because of the huge global installed base of frame connections, which generally have supported lower-bandwidth data connections between business locations. Commercial Frame Relay service has been available for almost six years, is supported by most major regional and interexchange Carriers, and has achieved mainstream implementation.

Its major drawback is bandwidth. And that's where Vo ATM comes in. Available in several flavors, ATM is the packet transport technology of choice for global telecom companies because it expressly is designed to handle all media types voice, video, and data. The basic flavors, with differing throughput capabilities, are:

- Constant bit rate (CBR)
- Variable bit rate--real time (VBR-RT)
- Variable bit rate--nonreal time (VBR-NRT)
- Unspecified bit rate (UBR)
- Available bit rate (ABR)

Both CBR and VBR-RT classes provide for real-time traffic such as voice or videoconferencing; CBR, in particular, is used by connections requiring a fixed amount of bandwidth and allows the amount of bandwidth, end-to-end delay, and delay variation to be specified during the call setup. UBR and ABR are more suited to bursty data traffic.

ATM has several mechanisms for controlling delay and delay variation through its support for QoS, virtual circuit (VC) queuing, and small, fixed-length cells. QoS enables CBR traffic to be provisioned with specific bandwidth and delay-variation guarantees. VC queuing treats each traffic stream differently; thus, for example, voice traffic can be allocated priority over delay insensitive traffic. The 53-byte ATM cells reduce queuing delay and delay variation associated with variable-sized packets. Such a format, in contrast to the variable-length nature of IP packets, helps reduce signal delay when packets are forwarded through intermediate switches

Still, the proliferation of Internet usage and emerging dominance of the IP protocol have created the backdrop for the newest "voice over data" application--Internet telephony. Up to this point, there have been two key issues. First, bandwidth is notoriously sporadic over the public Internet. So while VoIP might be suitable for casual PC to PC communications, it is not generally suitable for mission-critical business communications, or even consumer use. Quality of service is the biggest issue, though other issues, such as payment, usage monitoring and regulatory compliance will be increasingly important as VoIP moves out of the "hobbyist" stage, and into widespread use. There is, in fact, no reason to believe VoIP calls will be regulated differently than traditional circuit-switched calls, over the longer term.

The quality problem can be rectified when the packets are carried over private backbone networks, with controlled bandwidth parameters. The other issue is that people generally prefer to initiate phone calls using telephones, and terminate those calls the same way. So IP must be made to interface with the core telephone network if it is to become a mass market service.

Several new protocols for VoIP signaling, including the call signaling control channel of the H.323 protocol, the Real-Time Transport Protocol (RTP) and the Resource Reservation Protocol (RSVP), are under development, and will help IP transmissions gain QoS capabilities. The issues have to do with cost and availability of such features.

In any event, a transition from Time-Division Multiplexing to Asynchronous Transfer Mode signaling is underway. TDM, developed to meet the latency requirements of voice, provides allocated time slots to each user connected to a multiplexer. The issue is that such a system cannot allocate bandwidth dynamically. And that translates into “wasted” resources as multiple media types are carried over the single infrastructure, at different times of day.

Putting matters simply, data traffic is “bursty,” while voice is more constant in its requirements. So when the two media types are carried over an integrated infrastructure, it is quite helpful to have dynamic control of the pipe, to smooth out “bumps” in network demand. TDM networks, though adequate for data applications, are not optimal for mixed-media networks.

As the convergence of separate data and voice networks is gaining momentum, so does ATM. The broadband network must scale to higher speeds and offer bandwidth on demand (switched virtual circuits), but at the same time it must meet the low and predictable latency requirements (quality of service) of voice applications. From the beginning, ATM was designed to support both of these functions.

The initial applications CLECs and ISPs will encounter in this regard are private business networks. In the past, such networks were dedicated, meaning that the end user paid for fulltime use of a specific set of resources and bandwidth, paying on a flat fee basis for 100 percent use of those resources. The new trend, however, is for shared use of common facilities by a number of users. That provides lower cost to the end user, and more efficient use of network facilities for the service provider.

Commonly known as “Virtual Private Networks (VPNs),” these flexible, lower-cost services are enabled by ATM. A "VPN" is a “managed service,” offered by a service provider, in which secure connectivity, management and addressing, equivalent to that available on a private network, is provided on a shared public network infrastructure.

Key VPN applications include:

- Remote Access (Access to corporate networks from dispersed locations)
- Intranets (Internal company communication networks)
- Extranets (Networks that connect a community of users, such as a company and its suppliers and customers)
- Enterprise VPNs (Networks providing integrated voice and data applications on a single platform between the customer premises and a telephone network central office)
- Enhanced Voice/IP VPNs (Networks delivering enhanced voice services over the Internet or intranet using an IP/ATM infrastructure, as an alternative to traditional voice VPNs)

VPNs also can be used to extend large-office telephone capabilities to small office and home office users. Using a simple local ISP connection, small offices can access corporate data and voice networks from remote locations. Web-enabled call centers, Internet teleconferencing and voice-mail/e-mail integration are other value-added services VPNs can enable.

The ISP connection makes the home office a node on the corporate IP network and passes through all the features of the corporate PBX: conference calling, voice-mail and call-forwarding. The remote worker appears to be "in the office" from the perspective of inbound callers. And long-distance billing is reduced and vastly simplified because the remote worker's outbound phone calls are simply switched through the central PBX.

There is much talk in the technical trade press about “Layer 2” and “Layer 3” switching techniques. Though not central to our discussion of CLEC/ISP strategies, here is a brief discussion of these techniques, and how they relate to VPNs. The key characters are the:

- Overlay VPN: a network in which restricted secure connectivity is provided over a public router network by employing one of a number of IP tunneling techniques. A separate tunnel is generally required between every pair of user sites. IP address translation or encapsulation is performed at the customer located device. The network routes all packets without any consideration of an individual extranet or enterprise users VPN requirements. Layer 3 VPNs enhance the service provider's ability to offer differentiated services and to monitor, troubleshoot and generate reports on a per customer basis.
- Layer 2 VPN: a network in which restricted secure connectivity is provided by using configured frame relay or ATM (Layer 2) Virtual Circuits (VCs). A separate VC is generally required between every pair of user sites. IP address translation or encapsulation is performed at the customer located device using RFC 1483/1490. The network is only aware of Layer 2 connectivity and switches all frames or cells on a given PVC without any knowledge of an individual enterprise's VPN requirements.
- Layer 3 VPN: a network in which restricted secure connectivity is provided through a network which routes IP packets (i.e., operates at Layer 3) while keeping the traffic segregated on a VPN basis. Layer 3 VPNs also have the attribute that native (potentially overlapping) IP address from d users can be supported without conflict. Strictly speaking, Layer 3 VPNs could be supported by dedicating individual CO routers to each VPN, but this is cumbersome form a management perspective and not cost effective. A key advantage of Layer 3 VPNs is that scalability can be significantly greater through the application of hierarchical routing (Note: it is well understood that the way to build large router networks is to introduce hierarchical routing and thus result in fewer routing adjacencies or router neighbor relationships.)
- Layer 2/3 VPN: a network in which restricted, secure routing of IP packets is provided (at Layer 3) while keeping the traffic segregated on a VPN basis, and which uses configured frame relay or ATM (Layer 2) virtual circuits for voice, video and non-LAN based data traffic. Traffic aggregation is performed through customer located devices typically provided by the Carrier. This type of VPN service explicitly caters to enterprise users who would like to outsource their entire networking environment.

Data-centric CLEC, Voice-centric ISP Opportunities

So, what is our point? Simply that deregulation and the shift to packet networking offer enormous business opportunities for CLECs and ISPs. There is significant willingness on the part of business customers to switch service providers. And residential consumers have been conditioned by years of intense marketing to the idea that a change of long distance provider can be done with minimal discomfort.

Were that not enough, the growth of packet-based services such as the Internet, Intranets, Extranets, VPNs, e-commerce and “voice over X” create new opportunities for ISPs as well. When Deloitte & Touche Consulting Group recently interviewed 380 managers of telecom services at small, medium and large businesses (October and November 1997), researchers found that 37 percent of users intended to switch accounts from the current incumbent local telephone company.

Before such users will actually make the switch, however, equivalent service reliability, availability and price are required. The good news is that customer willingness to switch Carriers is increasing.

Just a year earlier, researchers found 30 percent of managers willing to make such moves. Those managers expected to give about nine percent of their business to CLECs (Deloitte & Touche Consulting Group, “Fourth Annual Telecommunications Competition Survey”).

Preferred 1997 Local Telecom Services Provider

Type of Carrier	Telecom Managers' Preferred Choice, %
Long distance Carrier	80
CLECs	9
Cellular/PCS	5
Out of region LEC	3
Cable TV company	3

Source: Deloitte & Touche, 1998

Demand for business-oriented IP services also is exploding, for a number of reasons, financial and technical. Indeed, Virtual Private Networks (VPNs), which offer all the advantages of dedicated intra-company connections, but run over shared facilities, offer significant savings. An IP-based VPN, with access at T1 (1.544 Mbps) rates, can often be had for 35 to 40 percent of the cost of a dedicated T1 connection between New York and Chicago, for example, according to executives at UUNet.

Why Businesses Find VPNs Attractive

IP-based access is available almost everywhere
Most large companies have IP access capability in place
Distance-insensitive pricing lowers costs
No delay in setting up sessions, as with many dedicated links or frame relay connections
Easy to dial in, so ideal for remote access
IP is becoming the protocol of choice for corporate networks

On international routes, the savings are potentially even greater. One example: the U.S. headquarters of a European-based company is connected by a T1 intranet, which achieves effective throughput between 400 and 500 kbps, but costs one-tenth the price of a fully-dedicated T1 link to the Netherlands.

One large New York consulting firm, for example, saves 50 percent over the cost of expanding its in-place frame relay network by using a VPN for additional capacity, instead of adding dial-in data networking lines in several European and Asian countries. A Bellevue, Wash.-based software firm saves $15,000 to $20,000 a month in telephone charges by running a VPN, at an out-of-pocket cost of about $1,000 a month.

ISPs providing VPN service can expect to charge two to four dollars an hour for remote access to a VPN, for example, or about five cents a minute. Some VPN providers bill in 10-minute or 15-minute increments, so the gross revenue contribution can be greater than actual minutes used.

Three applications tend to dominate current thinking about IP-based VPNs:

- Virtual Private Networks, which connect company local area networks (LANs)
- Extranets, which allow a company to link its data bases and applications to those of its customers and suppliers.
- Remote access, allowing branch offices and out-of-office workers to connect to company data bases and e-mail systems.

When 124 information technology managers were asked this year whether they planned to use VPNs for internal company communications, 52 percent responded affirmatively, according to research firm Infonautics.

Global VPN Service Revenue, $ Billion

Year	Revenue
1998	0.55
1999	2.37
2000	5.50
2001	11.91

Source: Infonetics Research

Business customers are relying more and more on IP technology because of the interoperability and ubiquity of WWW browser platforms, plus an increasing number of multimedia applications (for example, voice and video) accommodated by the IP protocol and browser client software.

Given the increased importance, complexity, and cost of implementing an IP solution, enterprises are outsourcing more and more applications to service providers who can offer a turnkey managed services solution. And that's another business opportunity for ISPs.

Service revenues for Internet-related technologies are projected to be $9.4 billion with a cumulative annual growth rate (CAGR) of 98 percent. This is 72 percent higher than revenues from Frame Relay services and 17 percent higher than Asynchronous Transfer Mode (ATM), Integrated Services Digital Network (ISDN), and X.25 service revenue combined, according to one industry analyst.

And though much is made of the potential for "IP telephony," either as a PC-PC, PC-phone or phone-phone service, the more-immediate opportunity is probably for voice over frame relay or voice over ATM on VPNs run by business customers.

And do not overlook long distance services. Though primarily aiming to secure share in the $100 billion local exchange business, U.S. Competitive Local Exchange Carriers (CLECs) have developed a wide range of strategies for securing immediate cash flow, and long distance revenues remain an early favorite.

GST Telecommunications, for example, long has used a strategy of acquiring long distance resellers, in large part to acquire immediate cash flow and customer base, says Lisa Miles, director. "It's a fast way to gain customers, and if you're late to market, it gives you a place to start," she says. Cross selling of local services into the existing base is but one advantage.

Aside from the tactical advantage of gaining crucial revenue and a customer base, long distance also is a strategic issue for nearly all CLECs. That's because a focus on "all-distance" services stands as the primary positioning approach taken by most U.S. CLECs.

The reasons are many. For starters, the old distinction between "local" and "long distance" Carriers is fast disappearing. So there's little sense in structuring their new competitive businesses on outmoded regulatory models. A clearly significant trend among competitive Carriers of all types "is the convergence of multiple product offerings and skill sets among individual Carriers," says James Henry, Bear Stearns & Co. director.

"What were once discreet segments of the industry are now being blurred as Carriers attempt to develop full-service product portfolios that include local, long distance, data, and Internet services," Henry notes. "Companies clearly need to develop full-service portfolios and skill sets in order to optimize the leverage of their network assets and sales channels, and to reduce customer churn."

Another key factor is the type of customer most CLECs are chasing. Smaller and medium-sized businesses, with as few as six or as many as several hundred access lines or desktops, are highly inclined to prefer a single invoice, from a single provider, for local and long distance service. So it just makes sense to bundle both services, with Internet access, as a way of prying customers loose from incumbent Carriers that typically don't have a direct sales force targeting this customer segment.

U.S. CLEC Long Distance Revenue, 1997/1998

Carrier	97 Rev., $M	% of total	98 Est. Rev.	% of total
e.spire (ACSI)	0	0	3.6	2.4
Brooks Fiber (WorldCom)	30.7	23.7	78.3	20.0
Electric Lightwave	8.1	8.6	8.4	8.9
GST	61.0	67.4	77.5	49.0
ICG Comm.	72.6	26.6	58.7	10.4
Intermedia Comm.	113.2	45.6	270.1	35.8
McLeod	55.0	15.6	N/A	27.7
MFS (WorldCom)	543.7h	31.4	N/A	31.4
NextLink	16.4	28.5	41.1	28.8
TCG (AT&T)	4.2	0.8	215.8	18.9

Source: Deutsche Bank

It is also true that the key asset for a CLEC, as for any other "all-distance" Carrier, is a paying customer. Once that customer is obtained, with an anchor service of almost any type, the service provider stands positioned to sell additional services to the same customer. That's advantageous because it reduces customer acquisition costs and boosts margins, since multiple services often can be delivered over a single "pipe." Indeed, that's the idea behind most CLEC-related mergers and acquisitions: create a service bundle and sell that bundle using a single sales force, equipped with a broad product line.

Still, few CLECs have gotten very far down that road so far. US LEC, for example, "is just beginning to offer long distance service," says Tansukh Ganatra, US LEC Corp. COO. So only about two percent of gross revenues come from toll services. One problem, Ganatra notes, is that customers frequently have long-term contracts in place, so US LEC has to wait for agreement expiration before it can switch a customer.

But tactical reasoning also drives CLECs to offer long distance and data services, especially Internet access. Because a key factor in account profitability is the length of time any single firm remains a Carrier's customer. And, as Carriers in any number of markets have discovered, customer churn is dramatically reduced whenever any single customer buys two or more services from any single provider.

That is a key reason why cable TV operators offer telephony in the United Kingdom, why AOL sells long distance, and why AT&T attempts to sell Internet, local or wireless services into its existing customer base. Bundling reduces churn.

ICG's Netcom division, which offers Internet access and hosting services, experiences high customer churn, like most of its peers. "Netcom churns two to six percent of its customer base per month," notes company CEO Shelby Bryan. "And the bulk of the churn happens in the first 90 days."

So ICG looks to its bundled product—featuring local, long distance and Internet access—as a "killer" product for its small business customers. As it moves more traffic over to its own facilities, margins get a big lift. And there are real economies when all the services are delivered over a single T1 line.

Customer demand is an important factor as well. Smaller businesses "want local and long distance on one invoice, from one provider," says David Ruberg, Intermedia Communications CEO and Chairman. "And data customers want more services delivered over one pipe." So Intermedia's watchword is "never sell local without long distance."

"Almost all our local service customers take our long distance as well," Ruberg notes.

McLeod USA, whose typical customer buys five to six access lines, finds that 95 percent of customers buy both local and long distance, says Blake Fisher, CFO.

Sheer economics underscore the importance of long distance and other revenue sources. For whether a CLEC uses its own facilities or resold access, the simple fact remains that most medium-sized businesses are connected over T1 facilities that are not filled on a constant basis.

And means a CLEC can leverage a sunk cost – the T1 connection—by driving more services over the single pipe. So adding Internet access, frame relay or long distance over the local services pipe improves the efficiency of any in-service facilities by generating multiple revenue streams.

Typical Monthly Local Access Revenue Per Line, $

US LEC Corp.	68
ICG Communications	57-60
McLeod USA	70
e.spire	50

Source: company reports, interviews

So many CLECs who have not historically focused on the bundled approach can look forward to lots of financial upside as they roll out long distance services. So far, for example, only about 10 percent of customers have bought two or more services from the company, says e.spire CEO Reich.

CLECs also can use long distance revenue and customer bases to balance near-term cash flow needs with long-term strategy. Local service resale, for example, "is proving to be an uneconomic solution," says Michael Ma, Deutsche Bank analyst. In a local resale environment "our margins are negative to bad," notes Rob Manning, Intermedia Communications CFO.

Especially when a CLEC is offering local access using resold incumbent facilities, margins are slim. So adding long distance, even at unexciting margins, meaningfully improves the revenue generated by each line. "We generally earn about $50 a month, per line, in local access revenue," says Jack Reich, Intermedia CEO. "As long distance rolls out, that goes to $80 a month."

Indeed, Reich expects that revenue per line will reach the $85 to $90 a month level as long distance is offered in all markets. The other important factor is that, as traffic is shifted from resold lines to e.spire on-network facilities, margin jumps to the "upper 30s or possibly 40s," Reich says.

Intermedia Communications Product Line Operating Margin, in Percent

Enhanced data services	"mid 30s, headed to 40 or more
Internet access and hosting	50 to 60
Local resale	"negative to bad"
Long distance	mid 20s
Shared tenant services	Almost 50
Premises equipment	Low 30s

Source: Intermedia Communications

In fact, the drive to acquire wider geographic footprint and additional product lines may be factors driving a wave of CLEC mergers and acquisition over the next year or so, say analysts at Bear Stearns. Up to this point, many CLECs have acquired other CLECs to broaden their reach into new services and new geographies. Such "horizontal consolidation" will be driven by the fact that in order to be a long term success in an industry as competitive as telecom, players must either focus on a specific niche (product, service, or geography). Or, they must attempt to become large-scale companies that can offer full-suites of telecom and data services to business customers nationwide, says James Henry, Bear Stearns Vice President.

In recent days, high market multiples have been earned by firms with (1) truly national or global reach, (2) a presence in the larger tier-one markets, and (3) full-service product portfolios that include data and Internet in addition to the core local and long distance voice skill sets, Henry notes.

Carriers that offer all these attributes have commanded premium multiples, while smaller-scale companies have been acquired at substantially lower multiples. So "it clearly seems to make sense for smaller CLECs to 'bulk up' in order to become better positioned businesses and more attractive as acquisition candidates," says Henry.

CLEC Acquisition Multiples

CLEC	Multiple of gross plant	Valuation Factor
Worldcom-MFS	8.8	Global, integrated services
AT&T-Teleport	6.6	National focus, integrated services, limited data
WorldCom-Brooks Fiber	5.2	Regional, tier 2 cities
Teleport-Eastern Telelogic	3.4	Single tier-1 city
Brooks Fiber-Phoenix Fiber	3.0	Tier-3 cities
Brooks Fiber-Metro Access	2.6	Regional, CAP only
Teleport-KC Fibernet	2.5	Single tier-2 City, CAP only

Source: Bear, Stearns & Co. Inc.

For some CLECs, such as GST Telecommunications, long haul also is a revenue generation tool. With a “Pacific Rim” orientation, and key operations in California, GST wants to capitalize on the fact that "sixty percent of California's long distance traffic is intrastate,” says Joseph Basile Jr., president, chief operating officer, and acting chief executive officer. About 40 percent of worldwide Internet traffic also originates or terminates in the state," says Basile Jr.

Owning its own facilities, such as a recently-activated 500-mile network linking Los Angeles and the San Francisco Bay area, allows the company higher margins on a huge amount of traffic moving back and forth between northern and southern California.

But the network also supports operations, since GST believes in connecting all its regional networks throughout the western United States. Better cost control and support for high-bandwidth packet network services are key advantages. For example, GST is building a "converged network" using a combination of packet, frame, and cell technologies across its existing western city rings and long haul fiber routes Hawaii, California, Arizona, New Mexico, Oregon, Washington, Idaho and Texas. And consolidating all types of traffic over that single network will reduce operating costs, according to Kevin Wright, company chief technology officer.

That’s the same sort of thinking which drove Electric Lightwave to buy capacity from Qwest Communications. Though a regional CLEC focused on the western United States, Electric Lightwave needs “landing rights” on the east coast and in mid-western markets if it is to aggressively pursue data transport and Internet services opportunities.

NextLink’s agreement to buy 24 fibers, a whole conduit, and rights to additional capacity on future Qwest conduits, is driven by the same sort of calculus. Packet-based services, especially as used by larger businesses, inherently require continent-wide connections. Indeed, the largest accounts require global connections.

NextLink initially has emphasized local access lines, though it always has believed that “data and high-bandwidth services were the future,” says Wayne Perry, company CEO. “We’ll build out higher-bandwidth services underneath our access line growth.”

In Canada, MetroNet Communications likewise is activating a nationwide asynchronous transfer mode (ATM) network, and for many of the same reasons. Companies use packet networks to connect disparate company sites and branch offices, so no truly useful service can be limited to local connections.

Indeed, infrastructure to support packet networks and customers, who typically require connections all over the major population centers domestically, is a key factor driving many CLECs to build long-haul capacity. Intermedia Communications, for example, resells frame relay network connectivity to Regional Bell Operating Companies US West and Ameritech. And that capability is “our most distinguishing product offering,” says Ruberg.

Intermedia’s long-haul network supports frame relay access nodes in 4,320 cities, and provides the foundation for Intermedia’s “managed services” initiative.

Still, even for companies with strong enhanced data strategies, long distance revenue will continue to represent a larger revenue stream, simply because the data market is in its formative stages, while long distance represents a huge installed base of customers. Indeed, of the roughly $200 billion annual U.S. telecom Carriers earn each year, only about $3 billion is directly attributable to data services.

In the Canadian business and government market, which represents about $10 billion in annual spending, local services represent $5 billion, while long distance represents another $5 billion, according to executives at Metronet Communications Corp. Buried within those numbers are private line and data services, at $211 million.

U.S. and Intermedia Communications Addressable Markets

	1997 $	% of total	1998 first quarter $	% of total
U.S. local	$87 billion	39		
U.S. access	$36 billion	16		
U.S. data	$3 billion	01		
U.S. long distance	$96 billion	43		
ICI local	$42 million	17	$34	25
ICI data	$87 million	35	$36 million	27
ICI long distance	$113 million	46	$45	33

Source: company reports

Though the U.S. CLEC industry ultimately stands or falls on its ability to capture switched local services market share, long distance remains an important tactical and strategic product offering for nearly all Carriers, competitive or incumbent. And packet networking will be a key weapon in that regard.

According to Killen & Associates, ISPs and smaller telecommunications Carriers can seize an early position in a $9.3 billion market (by 2002) for Internet telephony services. Since traditional long distance leaders risk cannibalizing existing revenue streams, they necessarily will be cautious about introducing packet-based voice and fax services, for example.

"To date, the most aggressive IP voice offerings have come from ISPs and new entrants including Qwest Communication and IDT," said Karl Duffy, Killen & Associations director, telecommunications services. "These companies have a lot to gain and nothing to lose in contrast with the incumbents who risk cannibalizing their own PSTN revenues, and also must contend with the relative inertia characteristic of large organizations."

But simple long distance, even when based on use of packet networks, does not hold the key to long-term success. Instead, use of packet platforms to provide value-added services will be distinguishing features of new market leaders. In the important business markets, for example, where widespread use of private networks provides the incentive to adopt new “voice-over-X” technology, externally-focused applications such as marketing and customer support are now merging with intranet applications such as e-mail, accounting, and collaboration. And that sets the stage for broad electronic commerce applications.

The key is to move rapidly, bringing robust new services to market quickly, while bundling value-added services. Given that packet technology is replacing traditional telecom services, the best approach to growing revenue is to offer individual retail packet-based services while incrementally adding more value to each service. In most cases, the objective is to migrate customers to a “fully-managed” service, where the Carrier essentially functions as an “outsourced” information technology department on behalf of the customer.

For ISPs, the migration path is probably from simple Internet access to intranet support and Web hosting. Voice and fax over the private network might come next. Fully managed, value-added services such as remote access, server hosting, security services, content development, and systems integration are possible follow-on services.

For CLECs, the migration path is probably from simple local and long distance to Internet access and Web hosting. For network integration firms the path leads from premises data networks to public network connectivity. For interconnect firms a shift from voice CPE and systems to data CPE and systems, though difficult, offers a similar growth path.

Managed services are key, over the long term, since the profit margin and growth rates for these services are higher than from more-commoditized Carrier and CPE sales. Demand for ISP services, for example, may grow at annual rates of 40 percent, but value-added services (including security and hosting) are projected to grow at 174 percent. As a percentage of business access, value-added service revenue will increase from 18 percent in 1997 to 105 percent in 2000, Killen executives predict.

And one of the best opportunities lies in providing Virtual Private Networks (VPNs). The worldwide VPN market represented only about $205 million in 1997 service revenue, but will climb to between $ 8.8 and $10 billion by 2001, according to Infonetics Research Inc. Virtual Private Networks are IP-based networks that use encryption, tunneling and authentication to securely connect users to their own corporate network. VPNs save companies money by reducing remote access and branch-office connectivity telecommunications costs.

For example, in many remote access settings, VPNs eliminate long distance connect-time charges typically billed at a rate of $4 to $10 per hour. Instead, users dial a local telephone number to reach an ISP and is billed a flat monthly rate for Internet access. VPNs also cut management overhead, since the remote access equipment that companies use today is now maintained by most major ISPs, rather than by the end users' company.

Virtual Private Networks offer organizations a new level of flexibility in the way they deploy corporate data networks, and at less cost than for private leased-line connections. VPNs are implemented through tunneling, in which the data to be transmitted and header information are encapsulated inside standard IP packets, usually after encryption and sometimes after compression as well. Three tunneling protocols currently are vying to become industry standards: PPTP (point-to-point tunneling protocol), L2TP, and IPSec (IP Security). Security is a critical component of a VPN implementation, especially for those implemented over the public Internet.

Infonetics researchers estimate that 44 percent of the U.S. organizations already planning VPNs will outsource some phases of their implementation, from determining requirements or designing the VPN all the way to complete outsourcing of the entire VPN operation and help desk.

Service providers can offer multiple levels of VPN implementation, from simply supplying the Internet or IP network bandwidth needed to handle VPN traffic to offering more products and services, including design, management, service and training. Typical services include:

- Internet access and bandwidth
- Internet or IP network services
- VPN hardware and software bundled with VPN bandwidth and services
- VPN design and implementation
- Outsourced operation of the total VPN solution for the customer, including design, equipment installation and service, and help desk support.

The Bottom Line

The bottom line is that ISP and CLEC success, long term, hinges on the ability to deliver services over all-digital networks. In part, that is because all-digital networks are less expensive to build and operate, more flexible and a better platform for introducing high-value new services.

But integrated networks are expensive, so new service revenue growth is essential. No single service provides an adequate return for an integrated, all-digital network. Only multiple services, and multiple revenue streams, can do that.

So the key asset is a customer relationship, sustainable over some period of time (three years, for example), that creates a platform for selling additional digital services over the infrastructure you have decided to deploy. That's the sales and support infrastructure, not just the network.

For starters, the way we price services will change dramatically when digital networks, extending all the way to the end user, are in place. I don't know that metrics based on network resources consumed (bandwidth, especially, but also distance) make much sense. When consumers have choices, the key issue is "how much do I think a reasonable customer will pay for the service I intend to deliver over my network?" Then you have to figure out what percentage of customers will actually buy additional services from you.

"Cost," in other words, isn't the way you set "price." And there is no way "bandwidth cost" can determine "price," for example, when multiple services are delivered over a single network.

Consider today's analog world, where Carriers operate (de facto) in protected markets, even if we are slowly moving to "open" markets. Residential local services typically are offered "flat rate per month," while long distance voice increasingly is billed on a flat rate per minute. Only recently has this "postalized" approach (a first class letter costs 32 cents, no matter where in the U.S. the letter is going) become the main trend in long distance.

Cable TV is billed on a flat rate per month basis, while cellular and PCS are someplace in between (most plans offer a base number of minutes for a flat fee, then charge an additional fee on a per-minute basis. Internet access tends to be offered on a flat rate per month basis.

What makes this more complicated in an all-digital world, where virtually any service can be delivered over a single pipe, is that the bandwidth actually used by the various services is dramatically different. So, to the extent that pricing is related in some direct way to "network resources consumed," we have a major discontinuity.

The big deal is that the amount of bandwidth (capacity) consumed by one minute worth of ISP traffic, voice or video is so hugely disparate.

Bandwidth Consumption Parameters, 1 second of network use

Media type	Bandwidth consumed
Voice	64,000 bits
ISP	33,600 bits
Digital full-motion video	2.5 to 4.0 Million bits (depending on quality required)
Digital cellular or PCS	8,000 to 32,000 bits
Cable TV channel (analog, uncompressed)	6.0 Million bits

The economic values we attach to these services in the retail marketplace also are quite different. We leave long distance aside, for the moment, since it is a variable cost per month type of service, totally dependent on usage.

Media Type Pricing Metrics

Media type	Pricing metric
Voice (local)	$25/month
Cable TV	$27/month
PCS/digital cellular	$40/month (400 minutes of use)
Internet access	$20/month

The other variable is that we consume these services differentially. TV can be on, continuously, for eight hours a day. Residential phones rarely are used more than 20 minutes a day. Cell phones might be used 13 minutes a day, while ISP access might be used 60 minutes a day. Holding that constant, for the moment, consider the wildly different amount of bandwidth consumed for one minute of use for various services.

Cost Per Minute Metric

Media type	Throughput, one minute of use	Price/MoU
Voice (local) 600 minutes of total monthly use	3.84 million bits	4.2 cents
Voice (long distance) monthly 100 MoU	3.84 million bits	10 cents
PCS/digital cellular (32 kbps channel, 400 MoU)	1.9 million bits	10 cents
Internet access (33.6 kbps, 1,800 MoU)	2.02 million bits	1.1 cents
Video (compressed to 3 Mbps, 14,400 MoU)	180 billion bits	0.2 cents

We need to take note of two things here. First, the "price per minute" metric shown above understates the bandwidth consumption, since we show only the retail cost to the consumer for a minute of use.

The bandwidth consumed is vastly more disproportionate when video is compared to any of the other media types. We're talking about the difference between ***a few million*** bits per second of capacity required for any media type other than video, and 180 ***billion*** bits for one single minute of full-motion, broadcast-quality video.

Keep in mind that one minute of analog video, carried over a plain vanilla cable TV system (CNN, ABC or Disney Channel, for example), consumes the equivalent of ***360 billion bits***.

So the cost of one second of consumed bandwidth is wildly different. And the task of an accounting system is not just to track what kinds of bits are flying through the pipe, but also to charge the customer what the customer expects to pay for that one second of use.

Cost Per Thousand Bits Metric

Media type	Throughput, one minute of use	Price/MoU	Price/ transmitted bit
Voice (local) 600 minutes of total monthly use, 64 Kbps	3.84 million bits	4.2 cents	0.0000011
Voice (long distance) monthly 100 MoU, 64 Kbps	3.84 million bits	10 cents	0.0000026
PCS/digital cellular (32 Kbps channel, 400 MoU)	1.9 million bits	10 cents	0.0000052
Internet access (33.6 Kbps,1,800 MoU)	2.02 million bits	1.1 cents	0.0000005
Video (compressed to 3 Mbps, 14,400 MoU)	180 billion bits	0.2 cents	0.000000001

So here's the rub. Assume one has a convenient, reliable and affordable way to label each type of bit, and charge it correctly. None of those things can currently be taken for granted.

How does one justify the dramatically different retail price of a bit? Are video bits charged at the much-higher PCS rate or the nominal local telephone rate? If so, nobody can afford cable TV service delivered over a single digital pipe.

Or, if voice is charged at the video rate, then local and long distance calls ought to be "too cheap to meter." So that makes nonsense of the notion that we can charge for access based on network bandwidth consumed. Instead, Carriers are only able to charge a "reasonable and expected" retail rate for different types of services. Video and voice services carry with the totally different "what is it worth" expectations. ISP access is far closer to cable TV than to voice of any type.

So the measurement metrics have to be based on financial return for delivering all the different services over a single integrated network, understanding that the actual profit margin will be wildly different for cable and IP services, compared to voice.

So one has to begin with the fundamental strategic tasks for Carriers operating in a competitive, data-centric marketplace, which is to maximize overall return for using a single network to deliver many different types of services, with differing profit (or revenue contribution) margins.

One way to do so is to look at the customer relationship as the key business asset, and the services only secondarily. The notion is that once a Carrier has a relationship with a customer, the incremental cost of selling one additional unit of an additional service is vastly lower than would be the case for application-specific networks.

In other words, costs for selling services over an integrated approach ought to be lower than for separate providers selling discrete services over different networks. That's why everybody is emphasizing bundling of services, for example.

So the key thing is to maximize total return, from all services, delivered over the single, integrated infrastructure. An example from the business world makes the point. When a Carrier can get a "desktop" under contract (three to five years, for example), that Carrier has a convenient sales platform for selling other services.

Maybe you start with the PBX contract, and then add the LAN maintenance contract, Web hosting services, long distance, wireless services, Internet access and conferencing services (audio, data and video). This might be the case for an interconnect firm.

Or, go the other way. Get the LAN installation contract, follow with maintenance and upgrades and support, then add long distance, local telephony, ISP access, wireless and Web hosting. This might be the case for a system integrator or data value-added reseller.

For an Internet Service Provider, maybe the chain looks more like Internet access first, followed by Web hosting, then LAN maintenance, local and long distance, then wireless or other enhanced telecom services.

If you are a long distance Carrier, maybe the logical way to grow is to add local telephony and ISP services, followed by wireless, then value-added data services.

If you are a local telephone company, then long distance and high-speed ISP access lead, followed by wireless. Only later, if ever, do you add video or enhanced data services.

If you are a cable TV company, high-speed ISP access is logical, followed by long distance or local, and only later enhanced data services.

The key strategic metric is customers under some form of longer-term contract. That does two things. It makes the task of getting a return on network investment much easier. DSL connections often require a one-year contract, for example. Some PCS or cellular contracts use the same principle.

Second, the longer contract helps build an active customer relationship that allows the Carrier to "upsell" additional services. In fact, nearly all analyses suggest that no provider of a "full-service" digital network can earn a return, in a competitive market, unless it provides a suite of services.

No single revenue stream does that when you assume you never attain high market share in the new services. In fact, going forward, under robust competitive conditions, no single Carrier ever gets market share approaching 20 to 30 percent in any single product category. ISPs compete against other ISPs, not just against voice providers, video providers, wireless providers, interconnect firms, VARs or other providers who may emerge (shared tenant services, high-speed DSL specialists, high-density residential services specialists, for example).

The point, in other words, is that the key asset is a live customer, who likes you and is committed to buying any service you offer for some period of time. The relationship you have determines the cost effectiveness of your efforts to sell additional products.

No other metrics – access lines, phones in service, PBX ports, DSL subscriptions, calling cards in use, routers in use, or T1 revenue – are the ultimate objective. Granted, every product line manager will be focused on attaining some quantitative subscriber number and revenue number (gross revenue, net revenue, cash flow, profit margin or rate of sales growth). But none of those tactical measures help a Carrier do what it really must achieve strategically.

And that, quite simply, is a relationship with a paying customer that creates the basis for selling new services at the lowest-possible cost. So "gross customer additions" aren't ultimately so important. What percentage of your existing customers do you retain? What percentage of new customers do you keep for three years? What revenue contribution do you expect from any single customer, or from any single port or device in service, over a three-year period?

In a data-centric world, where a single network can deliver many services, Carriers or service providers should not simply focus on the tactical measures (revenue growth, net customer additions or ports/lines/accounts in service). They must concentrate on long-term relationships and accounts that provide the foundation for selling new services to those customers with whom you have a superior relationship.

Summary

During periods of industry stability, a rational profit center manager will rightly concentrate on “process” innovations that rationalize and streamline business processes. Since market positions are stable, revenue models understood and demand is highly predictable, there is little to gain from dramatic changes in product design, distribution channels or pricing.

However, during times of extreme industry instability, such as we now experience with the combined pressure of massive industry deregulation and blistering technology change, managers must behave differently. Since products are unstable, revenue models changing and demand as yet unknown, a rational manager will move quickly, despite incomplete knowledge, to seize new opportunities before a new industry pattern can establish itself.

Often referred to as the “first mover” advantage, disproportionate rewards will accrue to those firms – especially CLECs who can adopt data-centric service models, and ISPs who adopt voice-enabled data models – who move quickly to occupy new positions in the data-centric new world.