

Executive Summary



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“We are in great haste to construct a magnetic telegraph from Maine to Texas; but Maine and Texas, it may be, have nothing to communicate.”

—Henry Thoreau, 1854

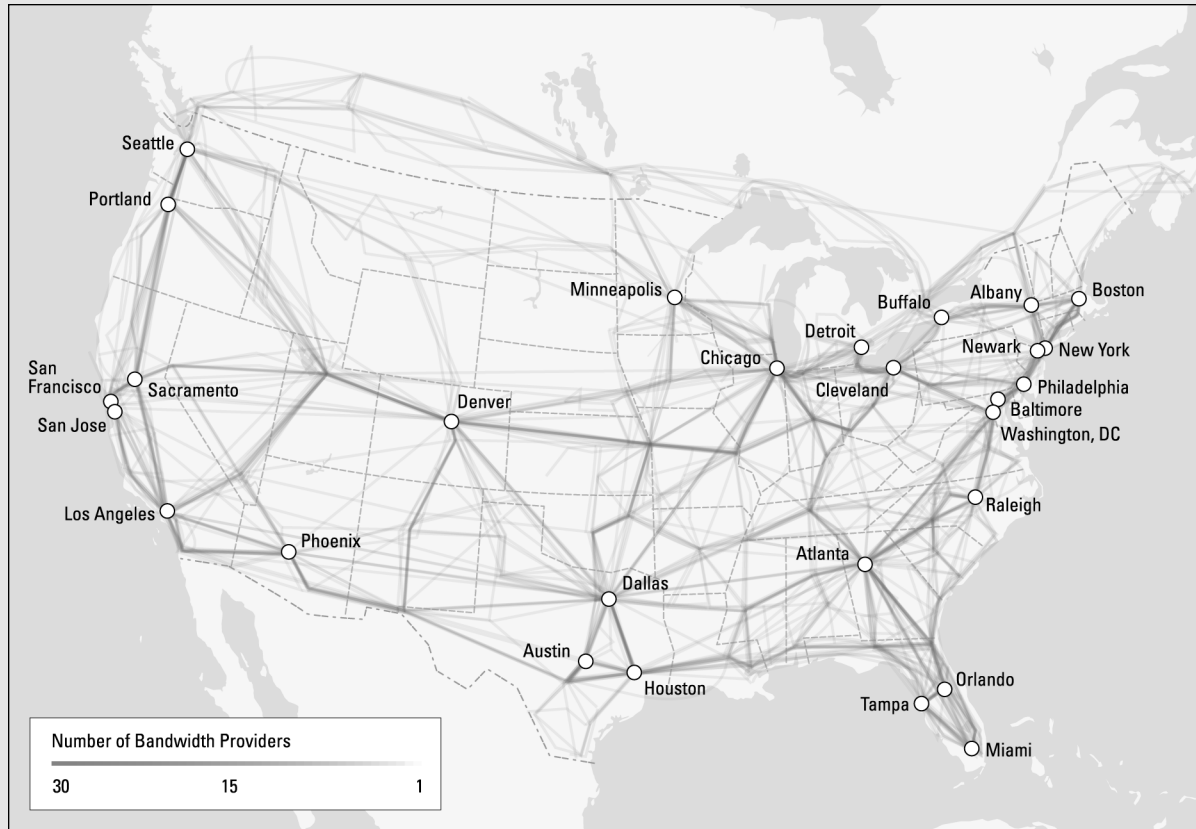
The course of the international bandwidth industry has shifted with remarkable fluidity during the past five years. In the wake of telecommunications deregulation, new providers, backed by investor optimism, spread optical fiber across the globe, pushing capacity supply to unprecedented levels. The explosive growth that had come to characterize the industry, however, soon gave way to another, equally dramatic trend: falling prices. While many carriers had taken price declines into account in their business plans, no one expected prices to fall so far so fast. The corrosive effect plummeting prices had on providers’ balance sheets, in turn, led to another dynamic now almost synonymous with the international bandwidth industry: bankruptcy.

In the 18 months preceding 2003, approximately 30 terrestrial bandwidth providers entered bankruptcy, and many more have undertaken financial restructuring measures without filing for bankruptcy protection. As a result, much speculation emerged concerning the market effects of such restructuring. Would multiple bankruptcies prompt carrier consolidation and bring supply back in line with demand? Or would restructured carriers, relieved of substantial debt, offer disruptively low prices and destabilize the market even further?

Terrestrial Networks, the second volume of *International Bandwidth 2003*, examines these questions and provides answers based on TeleGeography’s research into terrestrial bandwidth supply and demand. The first volume of *International Bandwidth 2003*, *Submarine Networks*, provides similar analysis of undersea fiber-optic systems. This volume begins by quantifying the supply of fiber-based capacity—both current and potential—and explores the effect bankruptcies have had on the field of providers. A basic overview of bandwidth products, contracts, technology, and costs provides context for understanding how that supply is bought, sold, and produced. The report then examines the demand side of the equation, charting current demand growth and the determining factors. A thorough review of pricing trends, including the effects of bankruptcy on bandwidth pricing, concludes the analysis. The latter half of the report profiles over 90 terrestrial systems in Europe and the Americas.

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Figure 1. Map of U.S. City Connectivity



Rank	City	Number of Providers	Rank	City	Number of Providers
1.	New York	27	—	Tampa	17
2.	Atlanta	26	17.	Sacramento	16
3.	Chicago	25	—	Minneapolis	16
—	Los Angeles	23	—	Boston	16
—	Washington, DC	23	—	Raleigh	16
6.	Dallas	22	21.	Phoenix	15
—	Philadelphia	21	—	Portland	15
—	Miami	21	—	Austin	15
9.	Seattle	19	—	San Francisco	15
—	Baltimore	18	—	Buffalo	15
—	Newark	18	—	San Jose	15
12.	Houston	17	—	Albany	15
—	Denver	17	—	Cleveland	15
—	Detroit	17			
—	Orlando	17			

Notes: Bandwidth providers include operators offering capacity on their own network build and/or via fiber leased from other network providers. Providers included were those who offered connectivity to three or more states at 155 Mbps (or higher) as part of their standard service offerings. Maps are designed to illustrate intercity connectivity and do not necessarily reflect the exact physical routing of fiber.

Source: TeleGeography research

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Supply

During the latter half of the 1990s, the number of bandwidth providers exploded as telecom deregulation and investor optimism fueled the rapid deployment of fiber-optic networks. Rather than piecing together “half circuits” from multiple monopoly incumbents, customers seeking to purchase cross-border capacity could choose from a host of providers and networks. The onslaught of bankruptcies has, over the past year, reversed the momentum of the industry from proliferation to consolidation. A number of companies have been broken up or liquidated, and many who have emerged from bankruptcy proceedings have done so after dropping some of their network assets. Some carriers have also made tactical retreats where conditions proved unfavorable. With as many as 20 or more providers still serving major routes in Europe and the U.S., however, consolidation has yet to make a noticeable impact (see Figure 1. Map of U.S. City Connectivity).

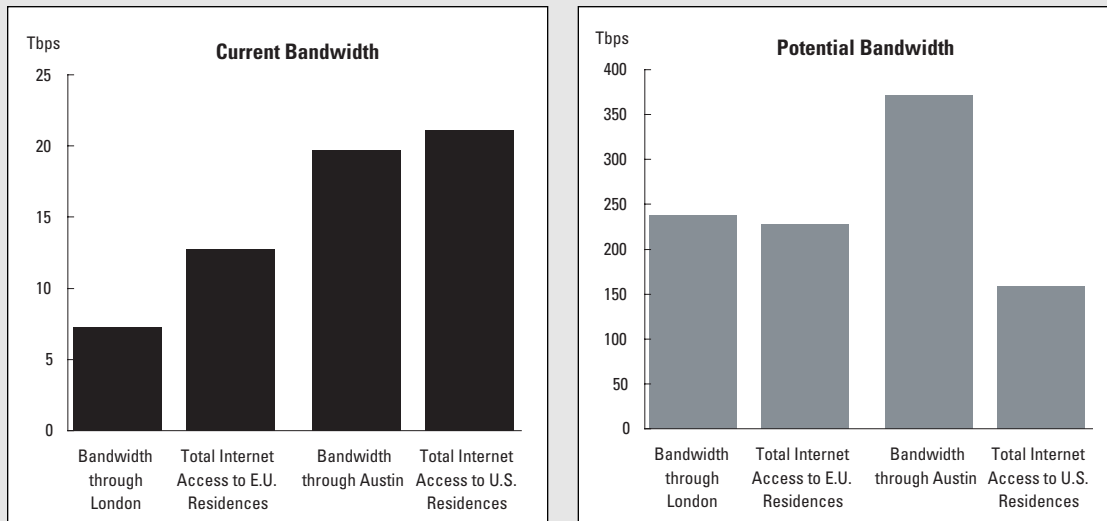
Aggregate bandwidth supply on many routes remains staggering. Major cities in the U.S., for example, are routinely traversed by a thousand (or more) pairs of optical fiber while pan-European networks have laid hundreds of pairs through population centers. Only a small portion of those fibers are actually lit: on average, one-quarter of potential wavelengths on 15 percent of available fiber pairs in North America. As a result, only five percent of potential bandwidth is active in North America (only three percent of international bandwidth in Europe). However minor that proportion might seem, the amount of lit capacity it represents is more than substantial. Chicago, for example, has 23.6 Tbps running through it on domestic networks; London has 7.3 Tbps on international networks alone. Such tremendous bandwidth isn't the exclusive domain of international commercial centers, as second-tier cities (e.g., Cleveland and Basel) along important routes also boast terabits per second of capacity. The potential capacity is even more astonishing, reaching into the hundreds of terabits per second.

Demand

The current state of the bandwidth market (and the bankruptcies of many carriers) stems from the radical disjuncture between supply and demand. The assumption, so fundamental to many carriers' business plans, that increased supply would spur proportionate demand growth has proven false, leaving a massive glut of both dark fiber and lit capacity on the market. How severe is the supply-demand mismatch? In 2002, bandwidth deployed for Internet, voice, and private data traffic combined for only 2.1 Tbps of capacity to and from the top 40 European metropolitan areas (as ranked by international circuit usage). Total lit bandwidth available through London alone, however, totaled 7.3 Tbps at the end of 2002. Similarly, total intercity Internet bandwidth to the top 20 U.S. cities (ranked by Internet connectivity) totaled 5.7 Tbps—barely equal to one quarter of lit bandwidth connecting through Chicago.

After years of rapid growth, deployments of voice and data networks are slowing significantly. The primary cause has been slowed backbone deployment by Internet service providers, which account for the largest portion of bandwidth utilization. At mid-year 2002, Internet backbones accounted for 82 percent of bandwidth usage for the 20 best-connected European cities. Internet bandwidth between these cities grew 416 percent between 1999 and 2000 and 193 percent from 2000 to 2001. Between

Figure 2. City-to-City Bandwidth versus Local Access



Notes: Current bandwidth equals lit bandwidth traversing through a city. Potential bandwidth equals capacity on unlit wavelengths and unlit fibers at currently attainable bit rates. Bandwidth through Austin, Texas includes domestic networks while London bandwidth includes only cross-border networks. As a result, the two data sets are not directly comparable. Current Internet access equals local access bandwidth to residences and small businesses as of mid-year 2002. Potential Internet access equals total local access bandwidth if each household had 1.5 Mbps of connectivity.

Source: TeleGeography research

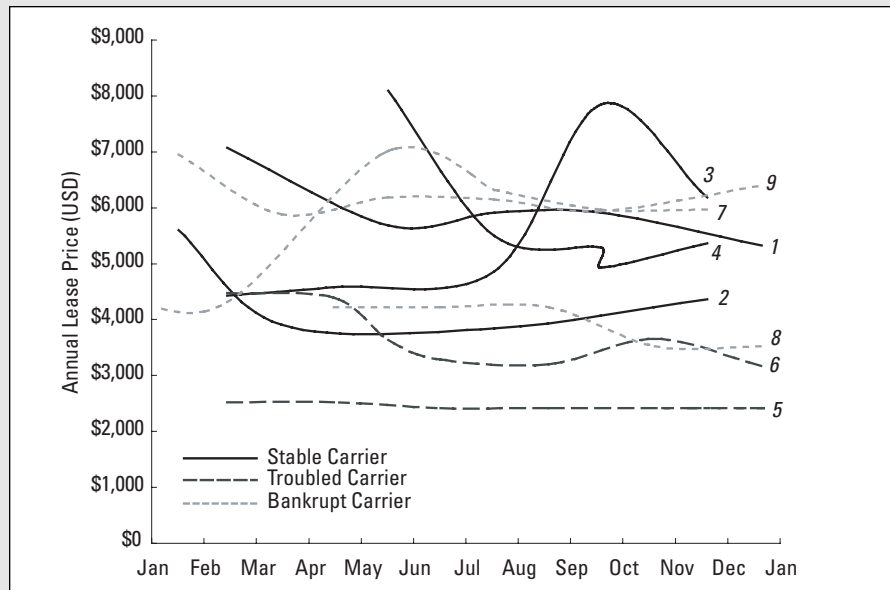
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2001 and 2002, however, Internet backbone deployments between these cities grew just 42 percent. Utilization growth followed a similar curve, dropping from 272 to 159 and then to 31 percent over the same period. Given global economic conditions, persistent local bandwidth bottlenecks, and slowed end-user growth, the near-term outlook for long-haul bandwidth demand looks sluggish.

Pricing

Long-haul circuit prices in both the U.S. and Europe have plunged by 80 to 90 percent in just the past three years. A 155-Mbps STM-1 circuit between New York and Los Angeles, which cost \$1.75 million per year in early 2000, can now be purchased for as little as \$150,000 per year. Fortunately, for bandwidth providers, the rate of decline on most terrestrial routes has slowed, and prices appear to be stabilizing, albeit at dauntingly low levels. While median prices have become more stable, the twists and turns that individual carrier's prices have taken throughout the year demonstrate that the market remains far more complex than median price trends would suggest (see Figure 3).

The combination of low prices and weak demand has pushed dozens of network operators into bankruptcy. The recent emergence of many carriers from bankruptcy has raised fears that these restructured companies would use their reduced debt loads to engage in a renewed prices war. TeleGeography's analysis of pricing data from more

Figure 3. London-Paris STM-1 Annual Lease Price by Carrier, 2002-2003

Notes: Prices reflect STM-1 annual lease prices offered by major carriers from January 2002 through January 2003.

Source: TeleGeography research

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than 30 carriers has found no evidence to support this claim. In fact, as Figure 3 demonstrates, bankrupt or recently restructured carriers are among the highest priced providers on many routes—hardly an indication of a price war.

What Next?

The volatility that has characterized the international bandwidth market has left many in the industry somewhat jaded. The astronomical levels of potential supply and the technological advances which produced them no longer inspire awe on the part of industry participants. Plummeting prices, as well, seem a quotidian feature of the bandwidth market. Even bankruptcy has lost the stigma it once had—the first major bankruptcies were considered headline material while more recent bankruptcies have trouble making it to the front page. Perhaps the most shocking market characteristic at this point is relative stability. With network construction almost non-existent, demand slowing, and price declines easing, the bandwidth industry seems more static now than it has during the past five years. Indeed, no news may be good news. 🗝️

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