TeleGeography

Executive Summary

IP Networks Research Service

Findings

In our *IP Networks Research Service,* we analyze the meaning of our robust internet capacity and traffic data sets. We also discuss factors impacting IP transit pricing, and the role individual backbone operators play. Based on primary survey data gathered from dozens of regional and global network operators around the world, we conclude that COVID-related expansion of internet traffic and bandwidth was largely a one-off phenomenon, and that the trends we had been observing in recent years have reasserted themselves. International internet bandwidth and traffic growth have been gradually slowing in recent years, but they remain brisk. IP transit price declines continue globally, but significant regional differences in prices remain.

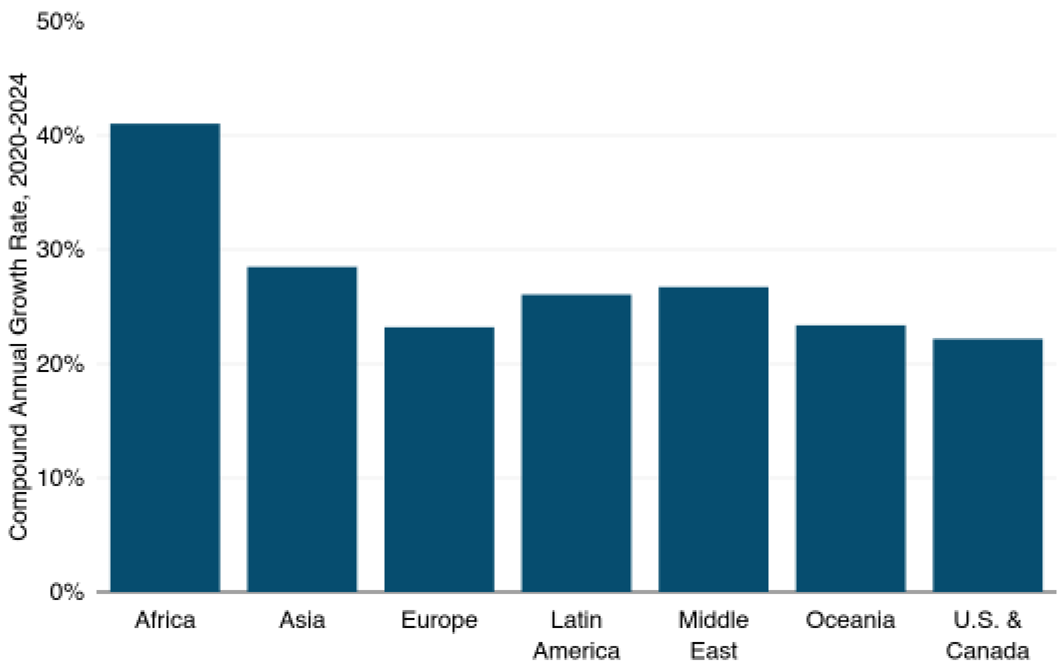
Internet Traffic and Capacity

Global internet bandwidth rose by 22% in 2024, continuing its slow but steady decline over the past few years. Total international bandwidth now stands at 1,479 Tbps, representing a 4-year CAGR of 25%. Clearly, the pace of growth has been slowing recently. Still, bandwidth has more than doubled since 2020.

Capacity growth varies across regions. Once again, Africa experienced the most rapid growth of international internet bandwidth, growing at a compound annual rate of 41% between 2020 and 2024. Asia is a distant second, rising at a 28% compound annual rate over the same period.

FIGURE 1

International Internet Bandwidth Growth by Region



Notes: Data as of mid-year.

Source: TeleGeography

International internet traffic growth largely mirrors that of internet bandwidth. Average international and peak international internet traffic increased at compounded annual rates of 24% and 25%, respectively between 2020 and 2024—about the same as the 25% compounded annual growth rate in bandwidth over the same period.

Prices

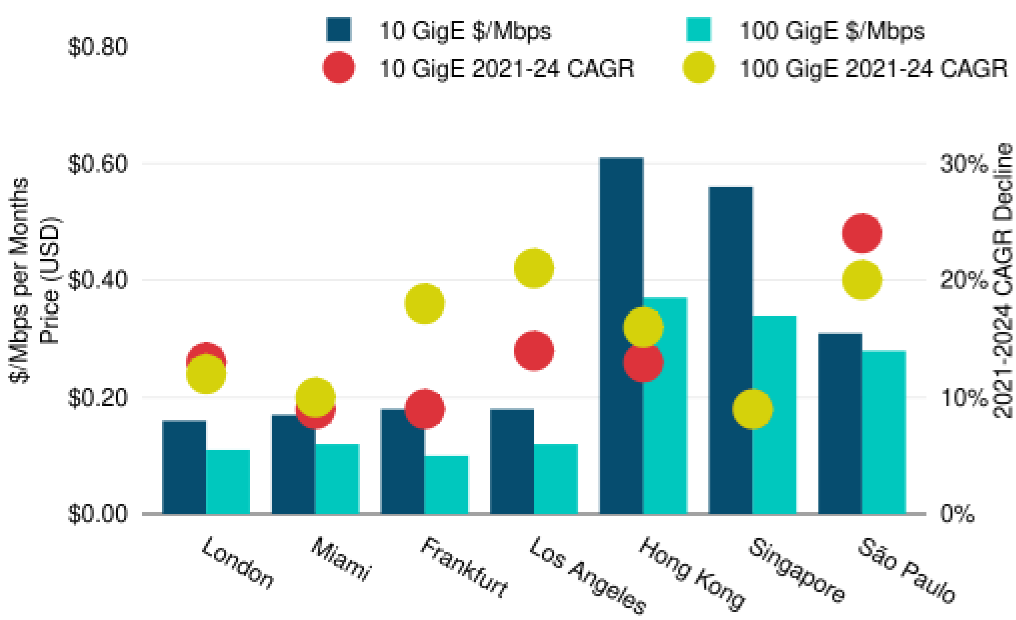
Providers' shift to predominantly 100 Gbps internet backbones continues to reduce the average cost of carrying traffic and enables profitability at lower prices. As a result, price erosion remains the universal norm. It reflects the introduction of competition into new markets and the response of more expensive carriers to lower prices. Trends in the IP transit market generally follow regional trends of the transport market. And while some have suggested that price erosion may slow as a result of recent inflation and supply chain constraints (as it has in the wavelength market), we have not seen this trend make its way into the IP transit market.

Across the cities included in the figure below, 10 GigE prices fell 13% compounded annually from Q2 2021 to Q2 2024. Over the same period 100 GigE port prices fell 15%. In Q2 2024, the lowest 10 GigE prices on offer in the most competitive markets were at the brink of $0.07 per Mbps per month. The lowest for 100 GigE was $0.05 per Mbps per month.

The sharper decline in 100 GigE reflects increased availability and competition at port size and the advanced maturity of 10 GigE. While 10 GigE remains a relevant increment of IP transit, particularly in more emerging markets, its share of the transaction mix continues to yield to 100 GigE. In 2024, providers indicated that a majority of their sales mix in key U.S., European, and Asian hubs were now 100 GigE. On average, across the cities noted, the Monthly Recurring Charge (MRC) for a 100 GigE port was 6.8 times the MRC for a 10 GigE port.

FIGURE 2

Weighted Median 10 GigE and 100 GigE IP Transit Prices & Three Year CAGR Decline in Major Global Hub Cities



Notes: Each column represents the weighted median monthly price per Mbps in the listed city. The circle represents the percentage decline of the weighted median price calculated as a three year compound annual growth rate. Prices are in USD and exclude local access and installation fees. 10 Gigabit Ethernet (10 GigE) = 10,000 Mbps and 100 Gigabit Ethernet (100 GigE) = 100,000 Mbps

Source: TeleGeography

Prices in developing markets that activated large scale subsea systems saw the greatest change. As 100 Gbps wavelength prices between Europe and South Africa fell 38% post the activation of the Equiano cable, 10 GigE IP transit prices in South Africa decreased 45% over the past year. This clearly supports a correlation between network scale, competition and price.

In developed markets, carriers are in the process of rolling out 400 GigE services across their network and customer demand has started to materialize. At the moment, providers report that the service represents a very small portion of their sales mix (think single digits) and is mainly limited to the largest global hubs in Europe and the U.S. Across key cities in the U.S. and Europe, 400 GigE prices range from $0.07 to $0.08 per Mbps. That's an average of 2.8 times the price of a 100 GigE port across key cities. As networks scale to meet increasing demand, price erosion for IP transit remains a certainty in nearly all markets for the foreseeable future.

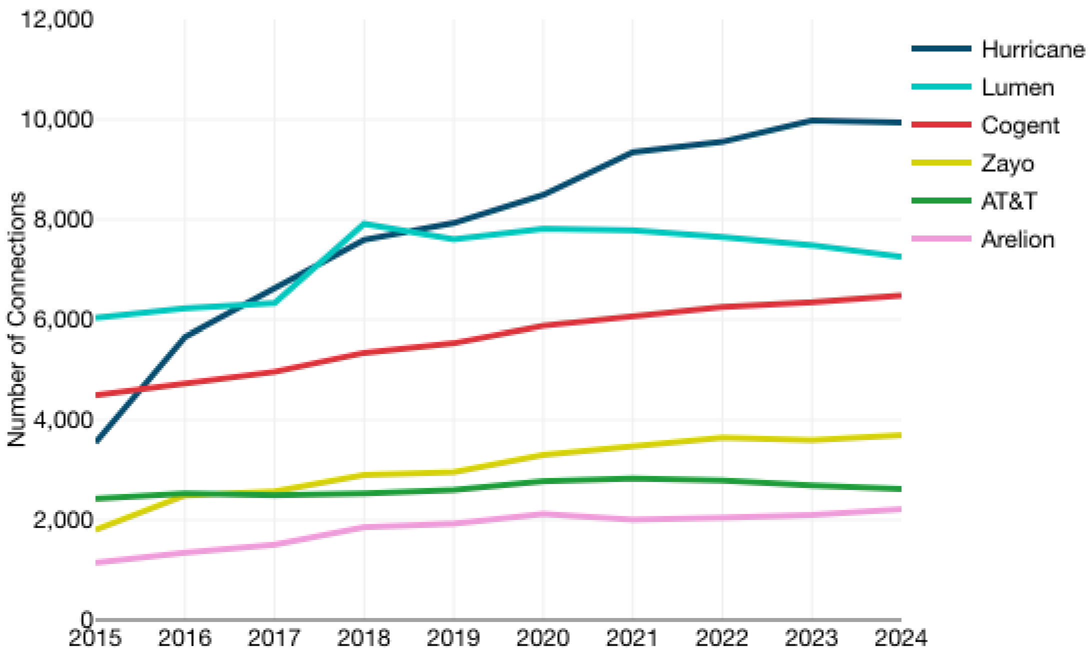
Provider Connectivity

Our rankings of provider connectivity includes analysis based on BGP routing tables, which govern how packets are delivered to their destinations across myriad networks as defined by autonomous system numbers (ASNs). Every network must rely on other networks to reach parts of the internet that it does not itself serve; there is no such thing as a ubiquitous internet backbone provider.

If you want a single, simple number to identify the best-connected provider in the world, you may come away disappointed. There are several ways to measure connectivity, and each highlights different strengths and weaknesses of a provider's presence. One basic metric is to count the number of unique Autonomous Systems (AS) to which a backbone provider connects, while filtering out internal company connections. The results are presented in the table below.

Hurricane Electric has experienced consistent gains, and now ranks as the clear number one in terms of connections. Cogent has also experienced steady growth. Lumen and Hurricane Electric had swapped the top spot back and forth for several years. Lumen (the rebranded CenturyLink) experienced huge gains a few years ago when the company bought Level3. Since then, the number of ASNs connected to Lumen has stagnated.

FIGURE 3
Number of Connections for Selected Providers



Notes: Data shows the number of connections to other ASNs. The line indicating Lumen's number of connections reflect Level 3 (parent ASN 3356) rather than Lumen (formerly parent ASN 209) prior to 2018.

Source: TeleGeography

In addition to examining overall number of connections, we also used our analysis of BGP routing tables to look at the "reach" (a measure of the number of IP addresses an upstream ASN has been given access to from downstream ASNs) and "share" (which compares an upstream provider's reach to all other upstream providers of a downstream ASN.) The results of this analysis paint a different picture. In some cases, an ISP might end up high-ranked in terms of number of connections but low-ranked in terms of share or reach when the number of IP addresses passed from its customers is relatively small.

Finally, to focus on which backbone providers best serve the end-user ISP market and corporations, we compare upstream provider connections to downstream broadband ISPs, calculated the top providers to Fortune 500 companies, and examined connectivity to specific industry sectors such as hosting, medical, and finance.

Outlook

The combined effects of new internet-enabled devices, growing broadband penetration in developing markets, higher broadband access rates, and bandwidth-intensive applications will continue to fuel strong internet traffic growth. While end-user traffic requirements will continue to rise, not all of this demand will translate directly into the need for new long-haul capacity. A variety of factors shape how the global internet will develop in coming years:

- **Artificial Intelligence (AI).** This is the most hyped demand driver in recent years, but its impact on international internet capacity is not entirely clear. The impact of AI will not solely be felt in the networks of the large cloud providers who are involved in AI, such as Amazon, Google, Meta, and Microsoft. The impact of AI will not solely be felt in the networks of the large cloud providers who are involved in AI, such as Google and Microsoft. Many companies are offering GPUs-as-a-Service (GPUaaS) which allows anyone access to GPUs to train their own models or use for inference. As users deploy AI models and inference clusters using these GPUs, the traffic will end up running through the networks of many operators, not just those of the major cloud providers.

- **Bypassing the public internet.** The largest content providers have long operated massive networks. These companies continue to experience more rapid growth than internet backbones and they are expanding into new locations. Many other companies, such as cloud service providers, CDNs, and even some data center operators, operate private backbones that bypass the public internet. As a result, a rising share of international traffic is carried by these networks.

- **International requirements of new applications.** While there's little doubt that enhanced end-user access bandwidth and new applications will create large traffic flows, it is not clear how much of this growth will require the use of international links. In the near-term, the increased reliance on direct connections to content providers and the use of caching will continue to have a localizing effect on traffic patterns and dampen international internet traffic growth.

- **IP Transit Price Erosion.** International transport unit costs underlay IP transit pricing. As new international networks are deployed, operational and construction costs are distributed over more fiber pairs and more active capacity, making each packet less expensive to carry. We already see a major shift from 10 GigE requirements to 100 GigE requirements, and expect that 400 GigE will emerge in two to three years as a significant part of the market. The introduction of new international infrastructure also creates opportunities for more regional localization of content and less dependence on distant hubs. As emerging markets grow in scale, they too will benefit from economies of scale, even if only through cheaper transport to internet hubs.

TeleGeography

A Division of PriMetrica, Inc.

Washington, D.C. / San Diego / Exeter

U.S. tel: +1 202 741 0020 / U.K. tel: +44 (0) 1392 493626.

www.telegeography.com