# Executive Summary

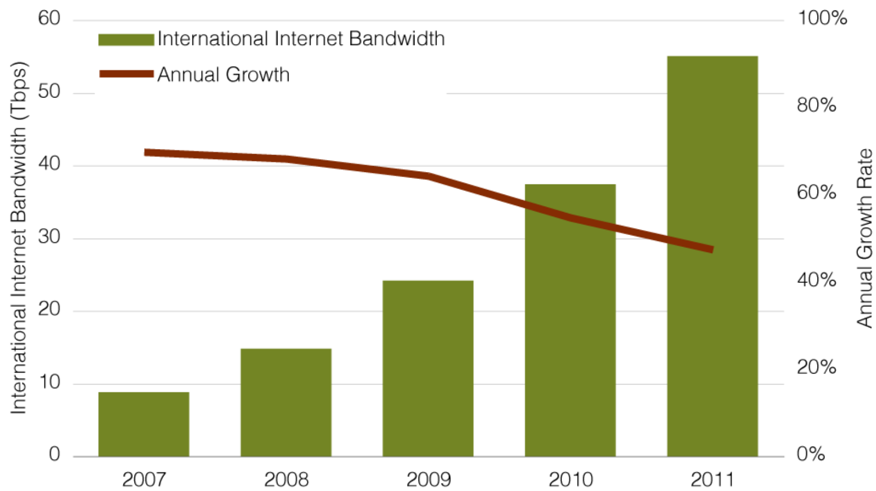
The global Internet continues to expand at a remarkable pace. While surging traffic volumes compel operators to add capacity at a rapid pace, the plummeting price of IP transit prices challenges their quest for profitability. TeleGeography's *Global Internet Geography Research Service* provides analysis and statistics on Internet capacity and traffic, IP transit pricing, and backbone operators.

## Internet Traffic and Capacity

TeleGeography's annual survey of Internet backbone operators tracks Internet capacity deployments as well as peak and average network traffic volumes. International Internet capacity increased six-fold between 2007 and 2011 to 55 Tbps. The annual pace of growth slowed each year since 2007, but remained a brisk 47 percent in 2011 (see Figure: International Internet Bandwidth Growth, 2007-2011).

**FIGURE 1**

## International Internet Bandwidth Growth, 2007–2011




Notes: Data represent Internet bandwidth connected across international borders as of mid-year. Domestic routes are excluded.

Source: TeleGeography

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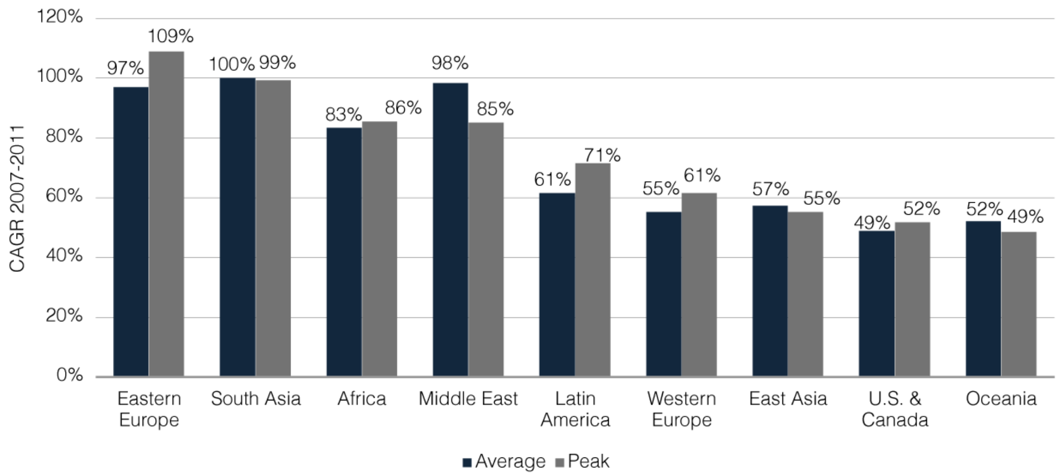
International Internet traffic continued to grow rapidly in 2011. Average traffic rose 37 percent and peak traffic increased 53 percent. Africa, eastern Europe, the Middle East, and South Asia lead regional Internet traffic growth. These four regions experienced compound annual growth rates exceeding 80 percent between 2007 and 2011 for both average and peak international traffic (see Figure: Average and Peak Traffic Growth by Region, 2007–2011 (CAGR)). The pace of growth in other regions was also strong. Between 2007 and 2011, average and peak traffic on international links connected to western Europe and to the U.S. & Canada increased nearly 50 percent.

**FIGURE 2**

Average and Peak Traffic Growth by Region, 2007–2011 (CAGR)




Notes: Data reflect utilization of Internet bandwidth connected across international borders including links between countries in each region. Data show the compound annual growth rate between mid-2007 and mid-2011.

Source: TeleGeography

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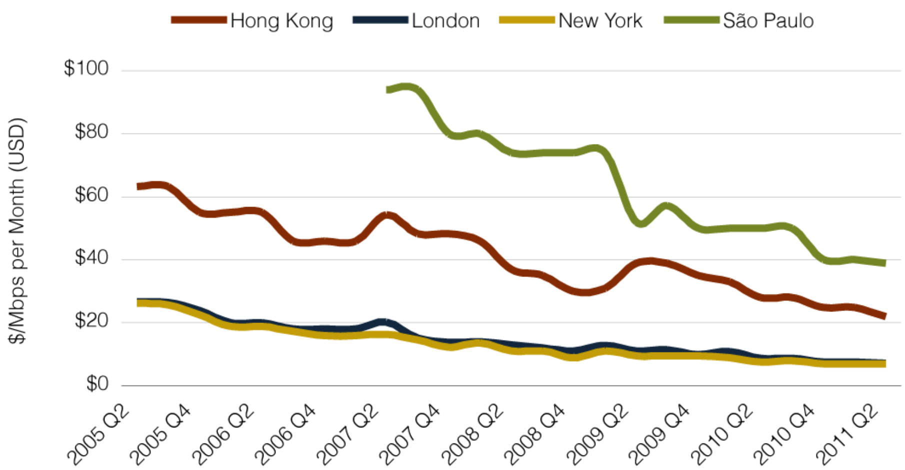
# Prices

Only a small handful of the world's largest Internet service providers are able to exchange all of their traffic via unpaid peering relationships. All other service providers must rely on wholesale Internet connectivity, called IP transit, from other backbone providers to deliver at least a portion of their traffic. Since 2003, TeleGeography has conducted a quarterly survey of wholesale Internet service providers in key telecom hub cities around the world to track IP transit pricing.

IP transit prices continued to decline around the globe (see Figure: Median GigE IP Transit Prices in Major Global Cities, Q2 2005-Q2 2011). Between Q2 2005 and Q2 2011, median GigE port prices in New York and London declined at a compounded rate of approximately 20 percent, while prices in Hong Kong declined 16 percent. For the highest capacities in the most competitive markets, the lowest prices fell to $1 per Mbps per month. However, average prices received by carriers, which include a diverse mix of locations, port capacities, and market conditions, were significantly higher.

**FIGURE 3**

## Median GigE IP Transit Prices in Major Global Cities, Q2 2005-Q2 2011




Notes: Each line is the median monthly price per Mbps in that city. Data exclude installation and local access fees. Gigabit Ethernet (GigE) = 1,000 Mbps.

Source: TeleGeography

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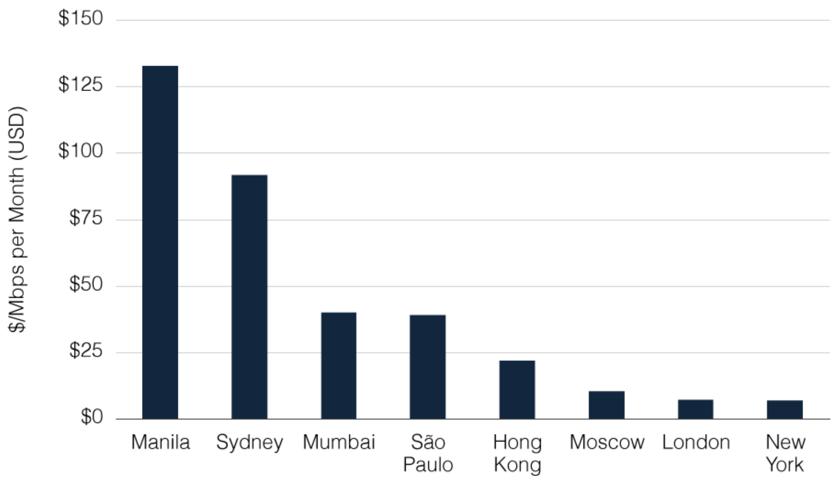
While prices have declined around the world, vast geographic price disparities remain (see Figure: Median GigE IP Transit Price by City, Q2 2011). The lowest prices, by far, are available in major cities in North America and Europe. GigE port prices in Hong Kong, one of the most competitive IP transit markets in Asia, are approximately 2.5 to 3.5 times higher than prices in London. In cities far from major Internet exchanges, the price of IP transit reflects the cost of transport back to a primary exchange, as well as the competitiveness of the local market. Median GigE prices in Bangkok, Manila, and Caribbean islands exceed $100 per Mbps, and prices in Africa can be several times higher.

**FIGURE 4**

## Median GigE IP Transit Price by City, Q2 2011




Notes: Prices represent median monthly price per Mbps for a fully committed GigE port in Q2 2011.

Source: TeleGeography

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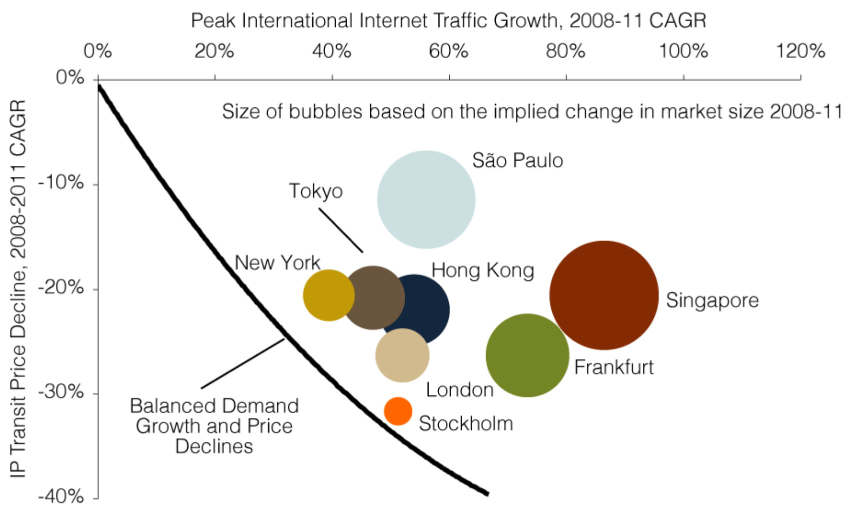
Although the rate of wholesale Internet access price decline implies a difficult business, comparing price erosion with volume growth suggests a more favorable scenario. In major markets, peak international Internet traffic growth, a rough proxy for IP transit demand, has outpaced IP transit price declines. This suggests that IP transit revenues have expanded (see Figure: International Internet Traffic Growth versus IP Transit Price Erosion, 2008-2011).

**FIGURE 5**

International Internet Traffic Growth versus IP Transit Price Erosion, 2008-2011




Notes: IP transit CAGR based on change of median monthly price per Mbps for a fully committed GigE port between Q2 2008 and Q2 2011. Data exclude installation and local access fees. Internet traffic CAGRs reflect change in peak traffic over Internet bandwidth connected across international borders between 2008 and 2011.

Source: TeleGeography

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# Outlook

The international Internet market will undergo a variety of changes in the coming years.

## *Sustainable Demand*

The rapid growth in Internet traffic prompts questions about the sustainability of this growth. In developing markets, broadband penetration rates are far from saturation levels, leaving substantial room for new subscriber growth. In more mature markets where the pace of broadband subscriber growth has slowed, faster broadband speeds and wider use of bandwidth-intensive applications—such as video services—have spurred higher traffic generation per user. As the quality of video accessed online progresses from standard definition to high-definition and eventually 3-D, the demand placed upon the global Internet should continue to surge.

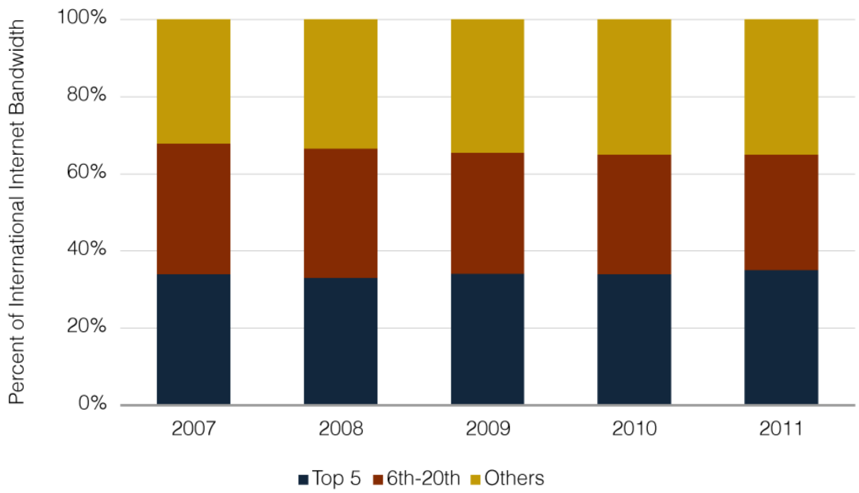
The compounding effect of rapid traffic growth requires carriers to make considerable investments to expand network capacity. Plummeting IP transit prices compound the risk of receiving a favorable return on investment, which makes low-cost network operation critical. To succeed, carriers must continuously deploy new technology that achieves the lowest unit cost, as well as optimize network topology and peering relationships. The continued use of content delivery networks and local caching services will also help to reduce requirements for new international capacity.

## *Achieving Scale*

The quest to increase scale in order to drive down unit costs led to the concentration of the majority of the world's international Internet bandwidth among a handful of operators. The top 20 carriers, in terms of capacity, operated roughly two-thirds of all international Internet bandwidth between 2007 and 2011 (see Figure: Concentration of International Internet Bandwidth by Carrier, 2007-2011). Large scale and low cost not only bolster the return on investment for the wholesale Internet access business, but also provide a favorable cost basis for other layer 3 services, such as IP VPNs.

**FIGURE 6**

### Concentration of International Internet Bandwidth by Carrier, 2007–2011




Notes: Data represent percentage of total international Internet capacity held by the Top 5 carriers the 6th-20th ranked carriers, and all other carriers with international capacity in the given year. Data as of mid-year. Domestic links excluded.

Source: TeleGeography

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## *The Expanding Core Network Frontier*

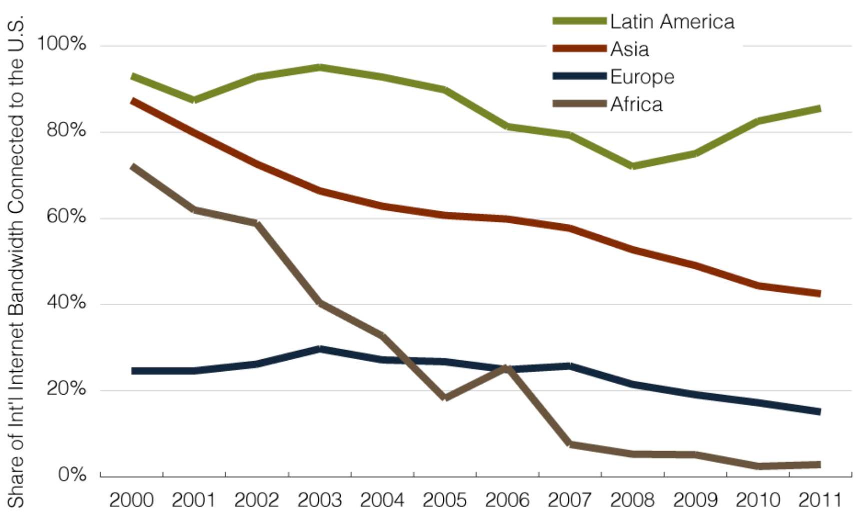
IP transit prices worldwide have reached very low levels in developed markets, but remain high in many developing markets and in countries that are remote from major IP transit hubs. As the major IP backbone operators expand into emerging areas in search of new customers and favorable market conditions, prices in these regions will fall. In Europe, companies such as Cogent and Level 3 have entered new countries such as Croatia, Serbia, and Slovenia. In Africa, Telecom Italia is offering IP transit in Djibouti, a key landing point for multiple submarine cables, while Tata Communications has established points of presence in Kenya, Tanzania, and South Africa. As frontier outposts on the global network become more directly linked with the core backbones of multiple operators, access prices will come down, even though fundamental differences in geography and market environment may prolong price disparities among locations.

## *The Decentralization of the Global Internet*

Consistent with the expanding frontier of the Internet, the global network has become less centered on the U.S. over time. The development of rich regional networks, coupled with a need for diversification, has reduced the share of international capacity connected to the U.S. for all regions except for Latin America (see Figure: Changes in Regional Connectivity to the U.S., 2000–2011). Operators have also diversified the array of city-to-city connections used in global backbones to create additional routing options. For instance, the London-New York route's share of total trans-Atlantic capacity has declined from 46 percent in 2005 to 30 percent in 2011 as operators have deployed more capacity on other routes such as Paris-Washington and Frankfurt-New York. While operators will continue to introduce alternate routes into the major hub cities, the development of new hubs is also vital. Countries such as Turkey, the U.A.E., Kenya, and Brazil are angling to leverage their favorable geography, physical infrastructure, and proximity to fast-growing markets to become regional Internet hubs.

**FIGURE 7**

### Changes in Regional Connectivity to the U.S., 2000–2011




Notes: Data as of mid-year.

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