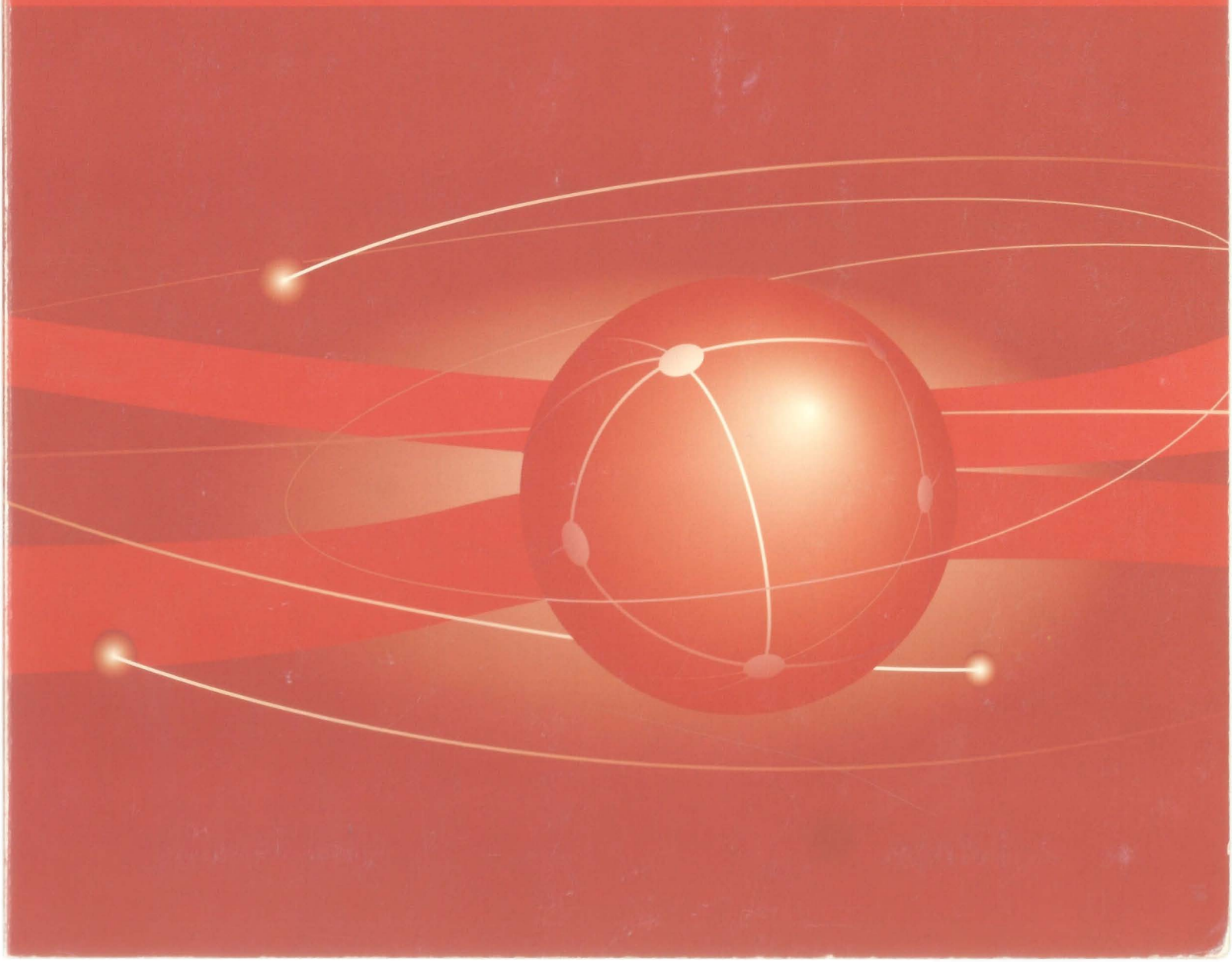
A TELEGEOGRAPHY GUIDE

TeleGeography 2004

GLOBAL TRAFFIC STATISTICS & COMMENTARY



TeleGeography 2004

Global Telecommunications Traffic Statistics and Commentary

First Printing—November 2003

This is book number

TG04-115243

Do not reproduce.

ISBN 1-886142-45-9

Printed in the United States of America

PriMetrica, Inc.
One Carlsbad Research Center • 2382 Faraday Avenue • Suite 140 • Carlsbad, CA 92008 USA
Tel. +1 760 579 0218 • Fax +1 760 579 0273 • E-mail: info@primetrica.com
www.primetrica.com

PriMetrica, Inc.

This report was prepared by TeleGeography, the Washington, D.C.-based research division of PriMetrica, Inc.

The *TeleGeography 2004* research and production team included:

Stephan Beckert . . . . . .Director of Research
J. Patrick Christian . . . . . .Senior Research Analyst
Alan Mauldin . . . . . .Senior Research Analyst
Paul Melton . . . . . .Senior Research Analyst
Abiola Ogunyemi . . . . . .Research Analyst
Markus Krisetya . . . . . .Director of Systems & Design
Michael Gorski . . . . . .Systems Administrator
Tim Stronge . . . . . .EVP of Research

The following publications also are available from PriMetrica, Inc.:

TeleGeography Research
Global Internet Geography Database and Report
Colocation Database and Report
International Bandwidth 2003 Volume 1: Submarine Networks
International Bandwidth 2003 Volume 2: Terrestrial Networks
U.S. Internet Geography 2003
MANs 2003
The TeleGeography International Traffic Database (subscription service)
The TeleGeography Bandwidth Pricing Database Service (subscription service)
Global Communications Submarine Cable Map
European Terrestrial Networks Map
Global Internet Map
Global Communications Traffic Map

Other PriMetrica Research
Global Comms Database
Yearbook of African Telecommunications 2003
Yearbook of Asia-Pacific Telecommunications 2003
Yearbook of European Telecommunications 2003
Yearbook of Eastern European Telecommunications 2003
Yearbook of Latin American Telecommunications 2003
Yearbook of Middle Eastern Telecommunications 2004
Wireless Substitution Study

For all inquiries, please contact:

PriMetrica, Inc.
2382 Faraday Avenue
Suite 140
Carlsbad, CA 92008 USA
Tel. +1 760 579 0218
Fax +1 760 579 0273
E-mail: info@primetrica.com

For more information, please visit www.primetrica.com.

Contents

List of Figures

List of Figures (continued)

List of Country Traffic Tables

Acknowledgements

We wish to thank the numerous carriers, government departments, regulators, and international organizations from around the world who responded to our requests for information. This report would not exist without the help of the dedicated people at these organizations who took the time to ensure that the data reported here are as current and accurate as possible.

We would also like to thank the many people who generously contributed their time and expertise to our research efforts, and those who helped to review early and final drafts of this book. They include: Linda Blake, Cathy Hsu, Jason Kowal, Mike Lemburg, Esperanza Magpantay, Bill Marmon, Michael Minges, Tim Riordan, Nathalie Rollet, and Heather Tinsley.

The Editors

Executive Summary

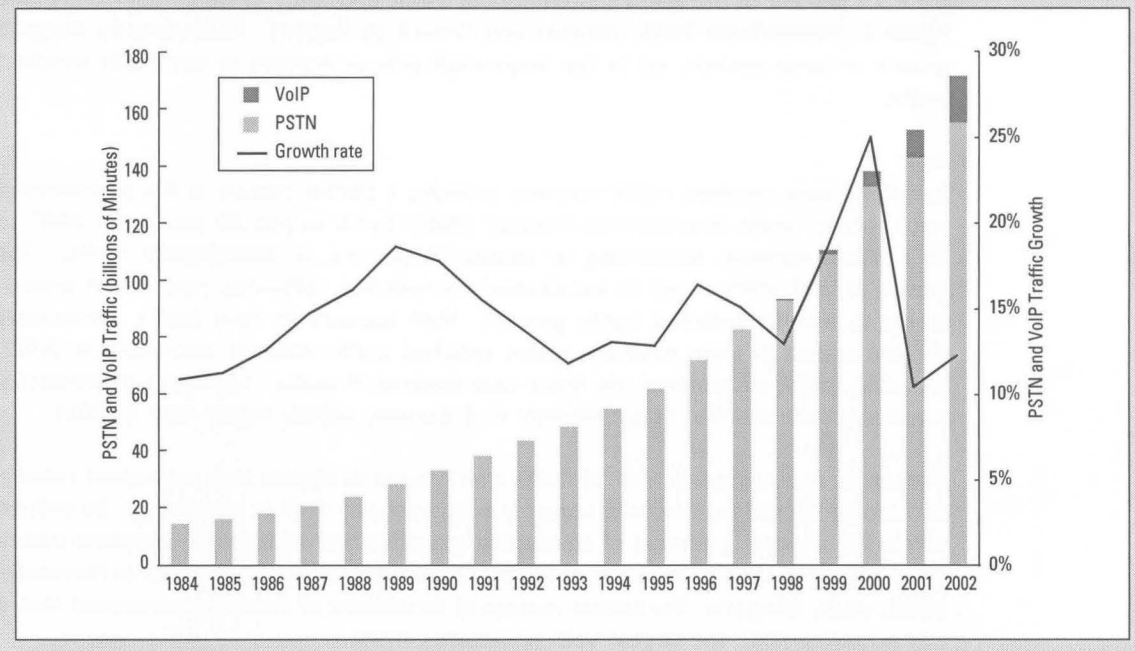
Executive Summary

If something cannot go on forever, it will stop.
—Stein's Law

Plummeting prices and surging traffic volumes were the hallmarks of the late 1990s international long-distance market. Market liberalization and competition caused prices to tumble, encouraging individuals to place far more calls than ever. For several consecutive years, carriers enjoyed double-digit annual volume growth, and revenues soared. As the economist Herbert Stein noted, however, markets must return to equilibrium eventually. The decade-long market expansion finally came to an end in 2000. Annual call volume growth crested at 25 percent, as did carrier revenues, which peaked at $72 billion.

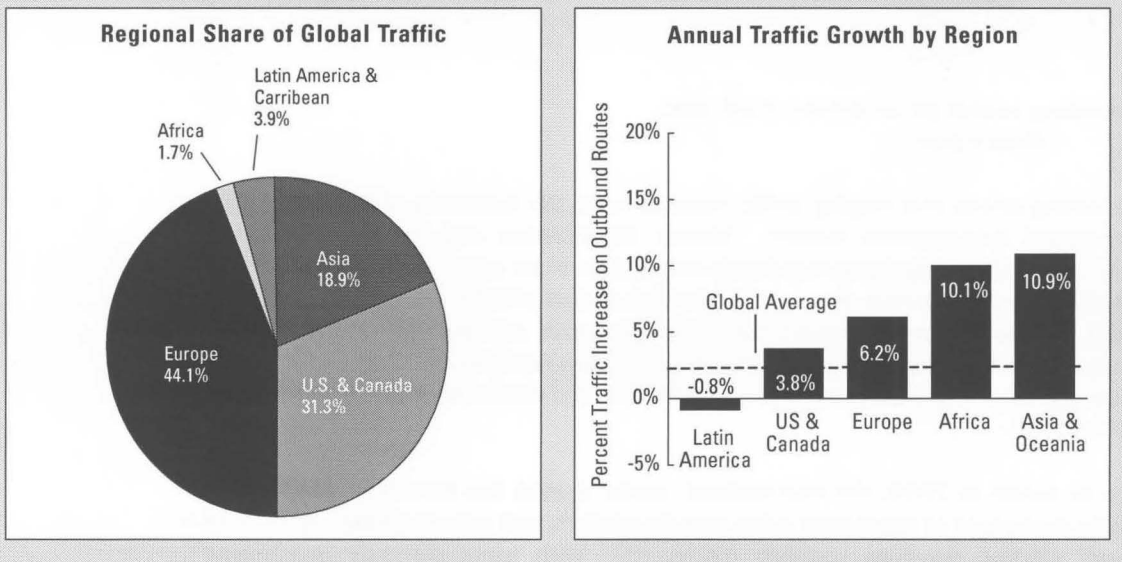
Since its zenith in 2000, the international carrier market has turned decidedly sour. Despite four years of aggressive price cuts by carriers, call minute growth rates have slowed, sending revenues spiraling downward. With some currently questioning whether the international voice sector is altogether doomed, now may be the time to recall Stein's Law. Call volume growth stabilized in 2002, and the relentless price decreases showed signs of possibly slowing.

Figure 1. Call Volumes and Growth Rates, 1984-2002



Source: TeleGeography research

Figure 2. International Traffic Volumes and Growth by Region



Notes: Global traffic was 155.2 billion minutes in 2002. Data do not include VoIP traffic.
Source: TeleGeography research

Traffic

International switched traffic increased just over six percent in 2002 to 155.2 billion minutes (see Figure 1. Call Volumes and Growth Rates, 1984-2002). Growth was particularly slow in Europe and North America, the two regions where international carrier markets liberalized earliest and matured most quickly. Europe and North America generate 75 percent of the world's international traffic and, thus, drive global trends (see Figure 2. International Traffic Volumes and Growth by Region). Consequently, sluggish growth in these markets led to the single-digit annual increase in worldwide switched traffic.

VoIP

Examining only switched traffic volumes provides a partial picture of the international voice sector. Voice-over-Internet-Protocol (VoIP) traffic surged 80 percent in 2002 to 18.7 billion minutes, accounting for almost 11 percent of international traffic. The growth in VoIP traffic—and its substitution for switched calls—has contributed considerably to anemic switched traffic growth. VoIP appears to have had a particularly notable impact in Latin America, where switched traffic volumes decreased in 2002. Including traffic transmitted via Voice-over-Internet Protocol, aggregate international minutes growth reached approximately 11.3 percent, slightly higher than in 2001.

Despite its recent growth, VoIP is still primarily used to bypass high settlement rates in developing countries. However, industry acceptance of VoIP is increasing. Incumbent carriers in a growing number of developing countries now accept and terminate incoming VoIP traffic. The VoIP sector received a significant vote of confidence in November 2003, when Teleglobe, the former monopoly incumbent of Canada, announced that it was acquiring ITXC, the largest VoIP wholesale carrier.

Mobiles

Mobile-originated international traffic surged upward by approximately 19 percent in 2002 to 27.9 billion minutes. As a result, calls from mobile phones accounted for 17.4 percent of the world's international traffic. Few mobile carriers operate their own international links, making them a crucial contributor to wholesale carriers' revenues from outgoing international calls. However, persistently high mobile termination costs make mobile growth a mixed blessing. In Europe, for example, mobile-terminated calls accounted for 32 percent of incoming international traffic but over 70 percent of international carriers' estimated termination costs. These cost differentials have prompted regulatory investigations from both European and U.S. authorities.

RBOC Entry into Long-Distance

Regulatory shackles have historically prevented the four U.S. Regional Bell Operating Companies (RBOC) from competing effectively in the long-distance market. While the four former Bell companies accounted for 87 percent of local access lines in the U.S., TeleGeography estimates that they carried only one percent of U.S. outgoing international traffic in 2002.

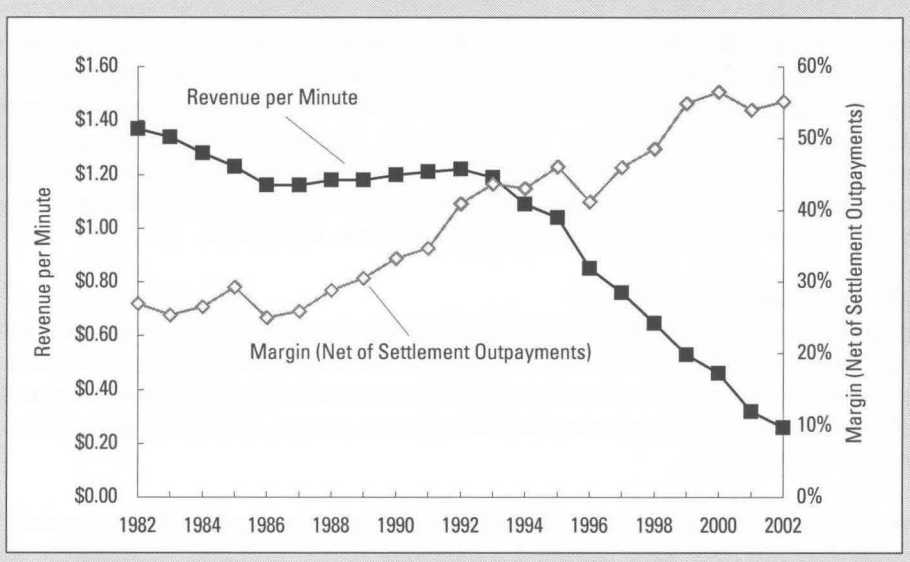
Over the course of 2002 and 2003, authorities eliminated most of these regulatory constraints. The Bells have launched a ferocious assault on both the domestic and international long-distance market. The RBOCs' initial success has been resounding. Qwest's long-distance subscriber base more than doubled in the second quarter of 2003, and BellSouth's long-distance revenues surged 70 percent between the third quarters of 2002 and 2003. As of late 2003, however, the Bells' impact in the international long-distance market has been mixed. While their retail traffic volume is growing dramatically, some RBOCs are relying almost completely on wholesale carriers to deliver their international traffic. Consequently, the RBOCs may prove to be fierce rivals of established retail long-distance carriers, but major customers of wholesale international carriers.

Revenues

During the boom years of the late 1990s, optimists predicted that traffic growth would more than offset falling prices. Unfortunately, the opposite turned out to be true. Price declines have outpaced traffic growth in the past two years, causing retail revenues from international traffic to decline from $72 billion in 2000 to $53 billion in 2002. Between 1999 and year-end 2003, TeleGeography estimates that average price decreases of 17.2 percent per year will have undermined annual call volume increases of 11.9 percent, with net revenue growth spiraling downward by an annual global average of 7.3 percent.

Carriers suffering in this multi-year market adjustment may be consoled by a few hopeful signs. First, the pace of retail rate decreases appears to have slackened. Prices for many of the world's highest-volume routes (e.g., U.S.-to-Canada) have already reached their floor and will likely stabilize or, at worst, drift slowly downward. Second, despite the surge of international VoIP traffic, cheap VoIP calls have not undermined international call revenues as much as feared. Evidence suggests that the substitution of inexpensive VoIP calls for higher-priced switched calls dragged down international service revenue by just two cents per minute in 2002, to 32 cents. Finally, plunging settlement outpayments have cushioned the decline in gross revenues. In fact, U.S. international

Figure 3. U.S. Carrier International Call Prices and Margins, 1982-2002



Notes: Revenue per Minute indicates average revenue per minute on outgoing international calls from the U.S. Calls to Canada and Mexico are excluded.

Source: FCC carrier filings and TeleGeography research

carriers enjoyed the highest average margins (revenues net of settlement outpayments) in 20 years (see Figure 3. U.S. Carrier International Call Prices and Margins, 1982-2002).

Measuring Change

For beleaguered international carriers, 2002 offered some encouraging signals. Though call volume growth remained anemic, the rate of price decreases gave some indication of abating. However, further turbulence is projected. Technologically, VoIP is emerging as a legitimate substitute for the switched network. Consumer migration from fixed-line phones to mobile handsets have created a new set of problems and possibilities for international carriers. Regulatory developments—VoIP, mobile termination, and the emergence of RBOCs as a force in the ILD market—continue to shape the international carrier market.

This year's edition of *TeleGeography*—the twelfth of our annual series—offers a comprehensive picture of an industry in flux. The report's call volume data set of over 3,000 international routes in 116 countries remains the principal tool for gauging change. In addition, *TeleGeography 2004* presents detailed analysis on traffic, prices, revenues, and technology trends for the international long-distance sector. To place this analysis in context of the industry at large, the report also incorporates over 30 pages of charts and tables from TeleGeography's original research on long-haul terrestrial networks, undersea cables, and international Internet backbones.

Traffic Analysis

Overview of International Traffic Trends

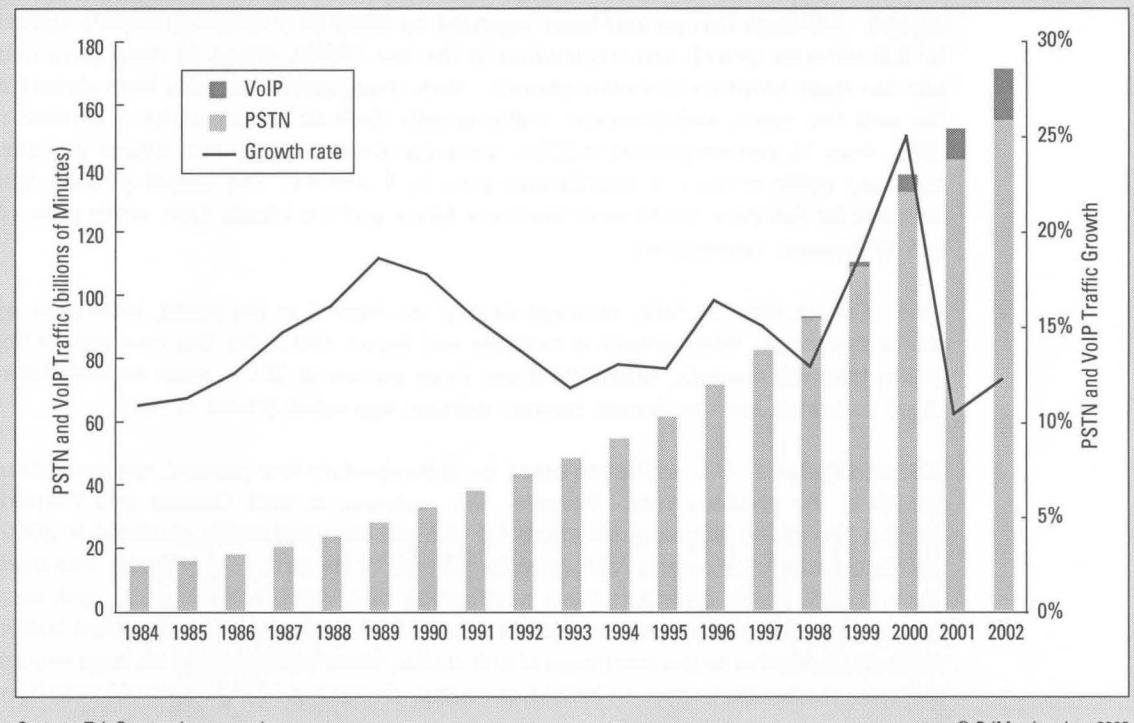
International carriers experienced a second consecutive year of sub-par international traffic growth, as volumes of switched traffic grew 6.2 percent from 146.1 billion to 155.2 billion minutes. While respectable by the standards of most industries, this growth pales in comparison to annual growth rates of 15 percent or more that were regularly achieved through the late 1990s and 2000. If voice-over-IP traffic (VoIP) were included, aggregate growth would come to approximately 11.3 percent, slightly below growth in 2001 (see Figure 1. Call Volumes and Growth Rates, 1984-2002). This article will review the past year's worldwide telecom traffic growth patterns and examine the reasons for the recent slowdown in growth rates.

Regional Trends

Aggregate traffic growth has slowed in all regions of the world (see Figure 2. Regional Traffic Growth, 2001-2002) over the past two years, but the reasons for the deceleration varied.

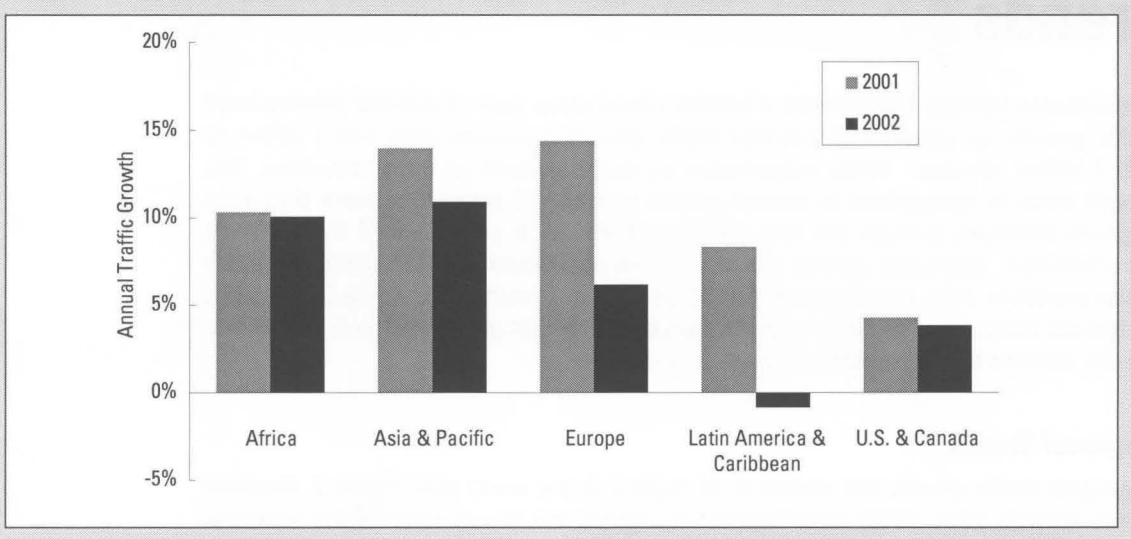
Latin America. The most pronounced drop occurred in Latin America, where outbound volumes of switched traffic actually declined by 1 percent after growing 8 percent in 2001. Although economic turmoil in many Latin American countries certainly played a

Figure 1. Call Volumes and Growth Rates, 1984-2002



Source: TeleGeography research

Figure 2. Regional Traffic Growth, 2001-2002



Source: TeleGeography research

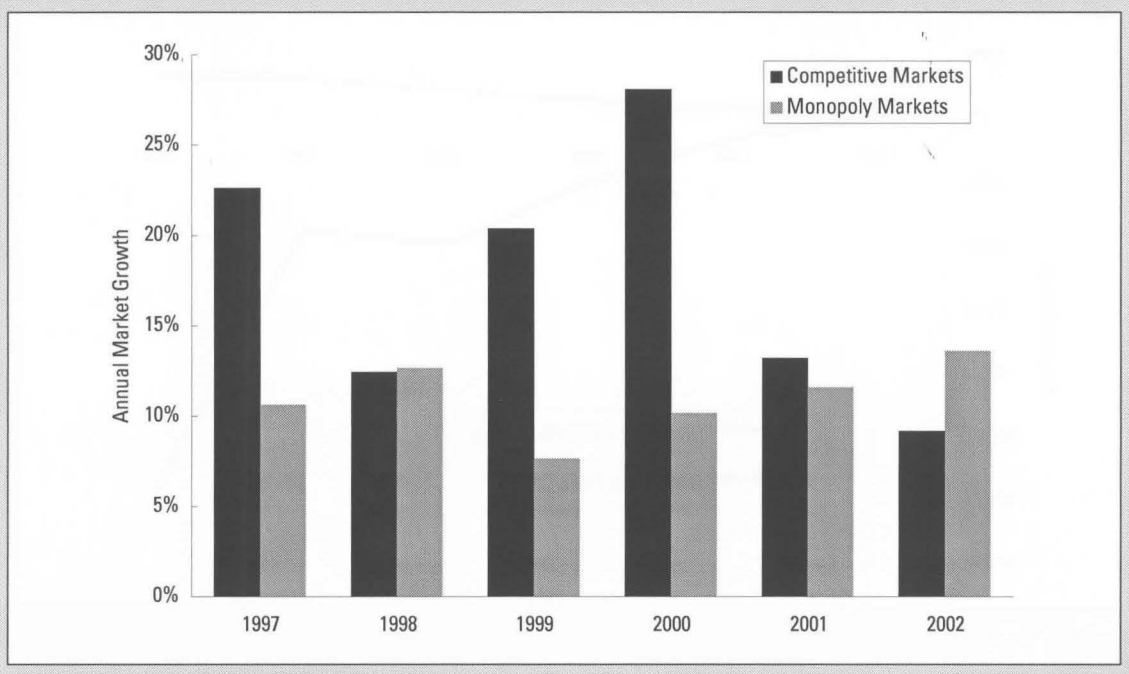
role in the slowdown, VoIP traffic also appears to have noticeably impacted switched call volumes from Latin America. While tracking the origin of wholesale VoIP is difficult, several Latin American countries are among the largest originating countries for many VoIP retailers contributing traffic data to TeleGeography.

Europe. Although Europe had been regarded by many as a relatively mature market for ILD services, growth was tremendous in the late 1990s, driven by deep price cuts and the mass adoption of mobile phones. Both these growth engines have slowed in the past two years, and European traffic growth declined to just under 7 percent in 2002, from 14 percent percent in 2001. Intra-European traffic growth slowed to 3 percent, and traffic to the U.S. and Canada grew by 8 percent. The fastest-growing destinations for European traffic were Northern Africa and the Middle East, which grew 10 and 12 percent, respectively.

Asia. Growth rates in Asia, although among the highest in the world, were poor by recent standards. While growth in Australia and Japan, two of the first countries to liberalize their ILD markets, slowed to under three percent in 2002, more recently liberalized countries, such as Taiwan, helped maintain aggregate growth in Asia.

U.S. and Canada. U.S. traffic increased by approximately four percent, comparable to growth in the previous year. However, U.S. volumes to both Canada and Western Europe, two of the largest destinations for U.S. international traffic, declined in 2002. Traffic to Latin America and Asia, grew by 13 and 17 percent, respectively. The slowdown in U.S. traffic growth is likely a reflection of several factors. First, and most importantly, U.S. traffic volumes include several billion minutes of reoriginated traffic. While small relative to the total base of U.S. traffic, these volumes may be large enough to have a noticeable impact on individual routes. Second, growing traffic volumes have

Figure 3. Traffic Growth in Competitive and Monopoly Markets, 1987-2002



Note: Data reflect aggregate PSTN and VoIP traffic volumes.
Source: TeleGeography research

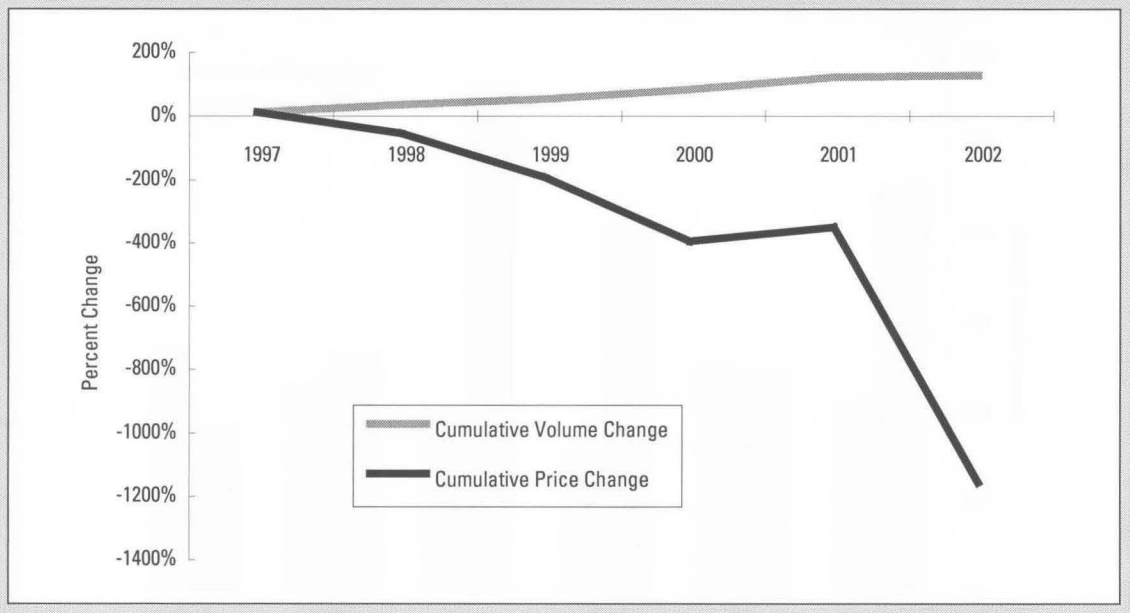
migrated from the PSTN to VoIP carriers. Finally, since international traffic flows reflect macroeconomic trends, the economic slowdown of 2001 and 2002 almost certainly had an impact on traffic volumes

Africa. Growth from Africa, which generated two percent of the world's outbound international traffic, remained relatively steady. Overall trends in African traffic were driven by South Africa, Northern African countries (Morocco, Algeria, Tunisia and Egypt), and Nigeria, which collectively account for over 60 percent of Africa's traffic. While growth in most countries was relatively constant, Nigerian traffic surged over 40 percent, buoyed by the recent liberalization of Nigeria's mobile phone market.

Price Elasticity

The price wars of the past five years have driven down retail prices for international calls by more than 70 percent in many competitive markets, unleashing pent-up demand for international long-distance services (see Figure 3. Traffic Growth in Competitive and Monopoly Markets, 1987-2002). In microeconomic terms, these price cuts "shifted the supply curve," allowing callers to purchase more long-distance services for a given amount of money. While this resulted in torrid short-term traffic growth, the long-distance market would eventually have to return to equilibrium. Five years after the main wave of market liberalization, an uneasy market equilibrium

Figure 4. Traffic Growth versus Price Declines, 1997-2002



Note: Price trends reflect Deutsche Telekom's retail price for calls from Germany to the U.S. in constant U.S. dollars. Volume reflects total voice traffic from Germany to the U.S. In 1997, Deutsche Telekom charged $2.03 for a 3-minute call from Germany to the U.S; in 2002, such a call cost $0.16. In 1997, Germany generated 319 million minutes of traffic to the U.S.; by 2002, traffic was 695 million minutes.

Source: TeleGeography research

appears to have set in. Retail prices and carrier market shares have become more stable, albeit at at painfully low levels, and traffic growth has returned closer to historical trends.

Interestingly, traffic growth in monopoly markets exceeded growth in competitive markets in 2002. However, traffic growth in competitive markets has far exceeded growth in monopoly markets over the past 6 years—17 percent, compared with 12 percent in monopoly markets.

The experience of recent years has shown that, while demand for long-distance services is price-elastic, demand is less than unitary. Price reductions outpaced traffic growth, causing carriers' revenues to plummet. While price erosion has slowed in the past two years, so too has volume growth—thus carriers' revenues have remained under intense pressure (see Figure 4. Traffic Growth versus Price Declines, 1997-2002).

The furious retail price competition has affected carriers worldwide—not just in the countries where the most traffic is originated. Although retail price declines are more immediately apparent, retail prices could not have fallen so far if termination and settlement rates in the destination countries had not declined as well (see "Overview of International Call Price and Revenue Trends" on pages 79 to 90).

Figure 5. International Wholesale Traffic and Destinations

	Total International Terminating Traffic			Total International Wholesale Traffic Terminating			Total Wholesale Revenues		
Regional Totals	**Fixed**	**Mobile**	**Total**	**Fixed**	**Mobile**	**Total**	**Fixed**	**Mobile**	**Total**
Northern Africa	1.9	0.6	2.5	0.8	0.3	1.2	$0.1	$0.1	$0.2
Sub-Saharan Africa	2.1	0.9	2.9	1.1	0.4	1.5	$0.2	$0.1	$0.3
Central Asia & Caucasus	0.5	0.1	0.6	0.3	0.1	0.4	$0.0	$0.0	$0.1
East Asia	15.5	6.7	22.2	6.4	2.5	8.9	$0.4	$0.3	$0.6
Middle East	4.5	2.2	6.6	1.9	0.9	2.8	$0.3	$0.2	$0.5
Oceania	3.6	1.0	4.6	1.6	0.4	2.0	$0.0	$0.1	$0.1
South Asia	4.3	0.6	4.9	1.6	0.2	1.9	$0.3	$0.0	$0.4
Eastern Europe	5.9	2.1	8.0	3.2	1.1	4.3	$0.2	$0.2	$0.4
Western Europe	41.6	19.9	61.5	8.0	9.0	17.0	$0.1	$1.6	$1.7
Caribbean & Atlantic	2.4	0.9	3.3	1.0	0.4	1.4	$0.3	$0.1	$0.3
Central America	5.8	2.1	8.0	1.2	0.4	1.6	$0.1	$0.0	$0.1
South America	4.9	1.1	6.0	2.9	0.7	3.6	$0.2	$0.1	$0.2
U.S. & Canada	22.5	1.3	23.8	6.5	0.4	6.9	$0.4	$0.0	$0.4
World	**115.5**	**39.4**	**154.9**	**36.5**	**16.8**	**53.4**	**$2.6**	**$2.8**	**$5.4**

Source: TeleGeography research

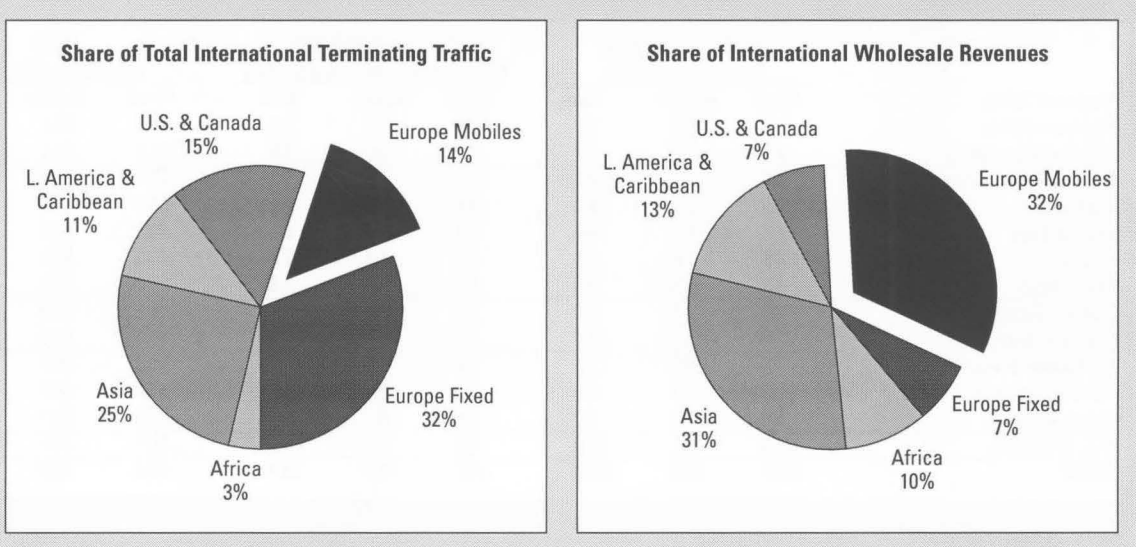
Prior to market deregulation, traffic growth was determined primarily by macroeconomic factors, including economic growth and growth in trade, tourism, and immigration. Now that the one-off surge from market liberalization has passed, these factors will, once again, drive growth patterns.

International Wholesale Trends

Wholesale traffic—calls carried to their final destinations via third-party carriers—accounted for approximately 34 percent of total international PSTN volumes in 2002 (see Figure 5. International Wholesale Traffic and Destinations). TeleGeography sampled several wholesale carriers to determine both the aggregate amount of international wholesale traffic and the largest wholesale destinations. This research revealed that some destinations received a disproportionately large amount of wholesale traffic. In general, international carriers purchase the services of wholesale carriers when sending traffic to countries where traditional mechanisms for terminating traffic (such as the settlement rate regime) are expensive. Wholesale traffic is highest to destinations where wholesale carriers have secured arrangements for terminating traffic at costs below the official interconnection rate. For example, the official U.S. carrier settlement rate with Cuba was $0.60 per minute in September 2003 while the average wholesale rate to Cuba at the Arbinet minutes exchange was only $0.55 per minute. TeleGeography's research indicates that wholesale carriers handle 80 percent of all traffic to Cuba.

TeleGeography found that the 53 billion minutes of calls handled by international wholesale carriers accounted for roughly $5.4 billion in revenues. Wholesale carrier revenues estimates reflect the estimated wholesale traffic to each country multiplied by the average observed wholesale price to that country. The wholesale prices used in the analysis were taken from several U.S. wholesale carriers and from average wholesale prices on Arbinet's minutes exchange. These prices are at the low end of the market; as a result, TeleGeography's revenue estimates should be regarded as

Figure 6. Traffic and Wholesale Revenues by Destination Region



Source: TeleGeography research

conservative. Furthermore, this methodology only counts wholesale revenue once per call. In reality, an international call often traverses through several wholesale carriers' networks, with each carrier booking revenue on the call. Thus, although net revenues totaled approximately $5.4 billion, gross revenues for the international wholesale carrier industry likely exceeded $10 billion in 2002 (see "Overview of International Call Price and Revenue Trends" on pages 79 to 90).

TeleGeography's research indicates that calls to mobile phones represent a disproportionately large share of wholesale carrier revenue. Only 14 percent of global PSTN traffic terminated on European mobiles in 2002, yet these calls accounted for 19 percent of international wholesale carrier traffic and, due to the high call costs, 32 percent of wholesale carrier revenues (see Figure 6. Traffic and Wholesale Revenues by Destination Region).

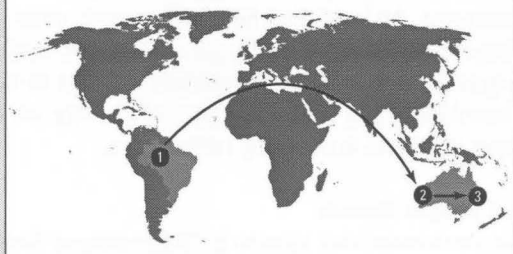
Routing and Settlement Arrangements

Until a few years ago, sending and terminating calls abroad was simple but expensive. International carriers (typically, incumbent monopolies) shared the cost and revenue for cross-border calls in accordance with the decades-old accounting rate regime. To send a call abroad, a carrier would route the signal onto its own international "half circuit," then transfer the call onto the matching network of its foreign counterpart for termination. For this service, the originating carrier would pay the foreign telco a hefty settlement fee, usually equal to one-half the accounting rate negotiated by the two carriers.

The accounting rate regime worked well enough to withstand decades of change. As long as carriers were predominately national monopolies and traffic on routes remained roughly in balance, there was little reason to question the economics of the accounting rate regime. But times have changed: in 2002, over 90 percent of the world's traffic

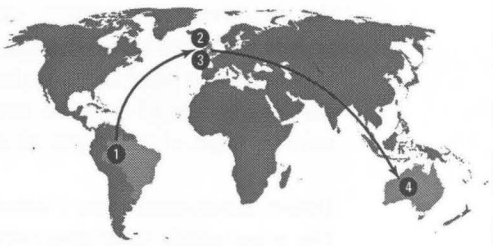
Figure 7. Call Delivery Methods

Standard Public Switched Call



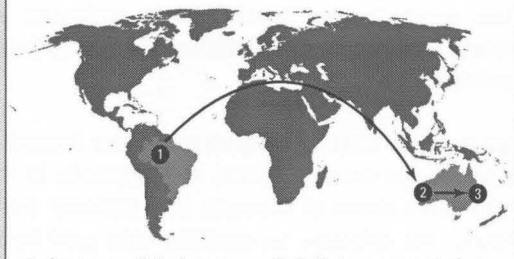
1. Customer dials international number.
2. Call is sent over the Public Switched Telephone Network (PSTN) by originating carrier, which pays settlement charge to terminating carrier in destination country.
3. Call is delivered to its final destination by terminating carrier.

Refile



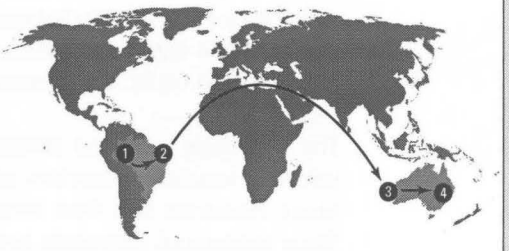
1. Customer dials international number.
2. Originating carrier sends call to hub country via PSTN or over international private line.
3. Refile carrier re-originates call over PSTN.
4. Call is delivered to final destination via refile carrier, which pays settlement charge to terminating carrier.

International Simple Resale (ISR)



1. Customer dials international number.
2. Call is routed over international private line to switch in destination country but outside network incumbent telco (e.g., to closed user group or mobile operator).
3. Call is re-rerouted to incumbent telco's network and completed as a local call on PSTN. No international settlements are paid by the originating carrier.

VoIP



1. Customer dials international number. Call is routed over PSTN to gateway computer.
2. Call is converted from analog voice to Internet Protocol (IP) format and sent over the Internet to a gateway in terminating country.
3. Call is converted back to analog format.
4. Call is completed as a local call on PSTN. No international settlements are paid by the originating carrier.

Source: TeleGeography research

was originated in countries with international services competition, and traffic imbalances on some large routes, such as the U.S. to Mexico, can amount to hundreds of millions of minutes annually.

As competition began to intensify, many carriers—particularly those sending more traffic than received—sought ways of reducing or avoiding high settlement costs by "bypassing" the international accounting rate system. Technological advances, such as voice-over-IP, have combined with the gradual deregulation of telecom markets to offer carriers a host of ways to send and terminate their international traffic. Not all are entirely legal—but almost all are cheaper than the accounting rate regime.

Direct Interconnection / International Simple Resale

The most widely used alternative to the settlement rate system is "International Simple Resale" (ISR). This bureaucratic name is something of a misnomer, in that ISR is not really voice resale. ISR involves the provision of switched voice services over leased or owned private lines interconnected directly to the public switched network (PSTN) in the origin and destination countries. Sometimes called "direct interconnection," this alternative allows international carriers to bypass the international gateway operator and to negotiate a termination rate directly with the local exchange carrier in the destination country. Most competitive telecom markets, including the European Union, the U.S., Canada, and Japan, now allow direct interconnection.

The advantage of direct interconnection is that local exchange carriers' termination rates are typically far lower than the official international settlement rate. Despite the apparent cost advantage of ISR, many carriers—particularly incumbents—still send a substantial proportion of their international traffic via the settlement rate regime. An informal survey of international carriers conducted by TeleGeography indicated that even in some highly competitive markets in Europe, many incumbent carriers still send most of their traffic via international settlements.

The seemingly outdated settlement system may hold some advantages for incumbent carriers. Incumbent carriers control most of the domestic-fixed line networks in their home countries and thus terminate the lion's share of inbound international traffic. Since settlement payments are symmetric, the effective termination rate paid by the sending carrier can be zero if traffic on a bilateral route is in balance. As markets have liberalized, most incumbent carriers have continued negotiating volume-based bilateral agreements but at lower, market-based rates. Many of these agreements are still denominated in SDR (Special Drawing Rights), a currency basket used for international settlements that helps reduce the impact of exchange-rate fluctuations.

By contrast, new market entrants, which tend to send far more traffic than they terminate on their own networks, generally find it advantageous to send as much traffic as possible via direct interconnection. For carriers sending traffic between countries where direct network interconnection is permitted, the term "bypass" has become a misnomer. The term suggests that there is an obstacle that must be overcome when, in fact, this is no longer the case. Instead, the settlement rate system has simply evolved into one of a number of options a carrier may choose for terminating international traffic.

Figure 8. AT&T versus MCI

Given the brutally competitive nature of the long-distance market, "bypass" is also common in domestic telecom markets. Attempts to avoid high domestic termination rates may affect international traffic flows, as well. In the late 1990s, for example. carriers seeking to avoid high mobile termination fees would "trombone" domestic calls bound for mobiles phones via another country to take advantage of international call termination rates below the cost of mobile termination costs.

An analogous practice came to light in the U.S. in 2003. AT&T has filed a lawsuit against MCI, alleging that MCI illegally routed domestic U.S. long-distance calls bound for high-cost rural destinations in the U.S. via Canada.

The FCC regulates termination rates charged by RBOCs, which are consequently among the lowest in the world. However, such restrictions do not apply to independent rural telecom companies, which account for roughly 6 percent of U.S. access lines. The average termination rate ("access charge") in these rural districts in 2002 was roughly 3.5 times higher than the prevailing rate in RBOC service areas—about 2.28 cents per minute, on average, compared with 0.64 cents per minute.

MCI routed a large volume of traffic bound for U.S. rural markets via Onvoy, a small regional carrier based in Minnesota. Onvoy routed the calls to Manitoba Telecom Services in Canada. Manitoba Telecom then sent the call to BCE, which terminates its U.S.-bound traffic via AT&T. While the details of BCE's agreement with AT&T are not public, AT&T's contract with BCE was apparently based on a fixed settlement rate that did not differentiate between rural and urban markets. Most crucially, the settlement rate negotiated by AT&T and BCE seems to be significantly less than the access charges levied by NECA carriers. While the routing arrangements are unusually complex, the underlying tactic was not: MCI and Onvoy were taking advantage of imbalances in termination rates.

What is surprising about the dispute is the volume of traffic AT&T claims was routed via Canada. AT&T charges that between July 22, 2002, and July 23, 2003, 166 million minutes, 25 percent of AT&T's terminated traffic from Canada, were originated in the U.S. Of this traffic, approximately 88 percent was destined for high-cost rural carriers. While AT&T has not yet established how much incoming traffic was originated by MCI customers, the volume was clearly significant—and MCI does not dispute this point. MCI, for its part, argues that the company was simply using least-cost-routing procedures to identify the lowest-cost provider.

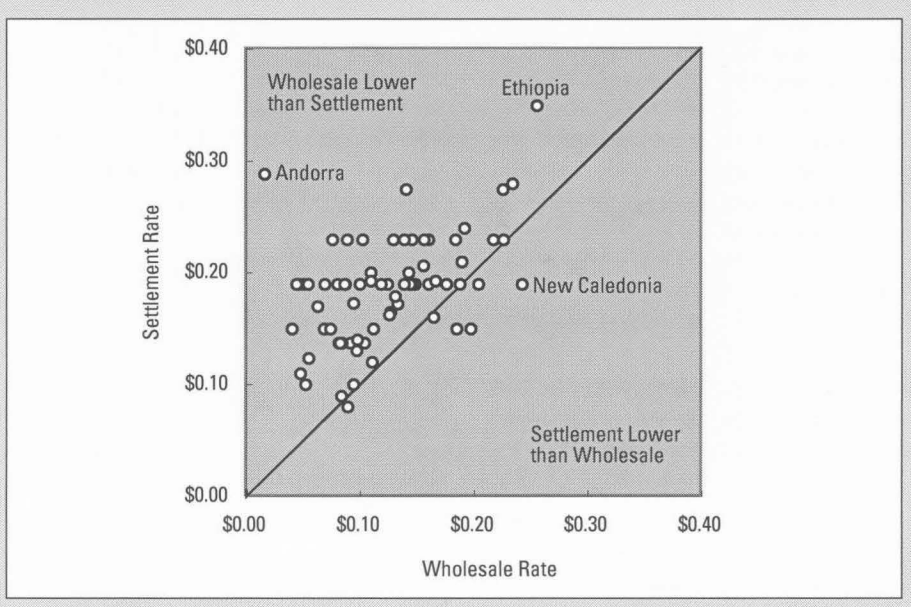
Source: TeleGeography research

Illicit Bypass

The issue of bypass traffic is far more significant in countries where direct interconnection with the domestic network is not permitted. While illicit bypass is difficult to measure, the volume is clearly large. In its annual report, Telmex estimates lost revenues of approximately $105 million due to settlement rate bypass in 2002, equivalent to over 12 percent of Telmex's international long-distance revenues.

Given its illicit nature, bypass traffic is difficult to measure, but it can be easily identified. A comparison of wholesale prices charged by carriers on minutes exchanges with official settlement rates suggests that many carriers have found ways to beat the system. Figure 9 compares wholesale country rates available from the Arbinet minutes exchange in November 2002 with the prevailing U.S. settlement rates. Each dot in the chart compares the settlement rate with the wholesale price charged for carrying a minute of traffic to that country. To cite one extreme example, one wholesaler opera-

Figure 9. Comparison of Wholesale and Settlement Rates, 2003



Note: Wholesale rates reflect average prices of traffic routed via Arbinet's minutes exchange on September 7, 2003. Settlement rates reflect U.S. carrier settlement rates in force during September 2003.

Source: AXCESSRATE℠ by Arbinet-thexchange, FCC, and TeleGeography research © PriMetrica, Inc. 2003

tor delivered traffic from New York to Andorra for $0.02 per minute in November 2003, 95 percent less than the prevailing settlement rate of $0.29 per minute. Since ISR is not permitted in Andorra, this traffic is certainly bypassing the settlement rate illicitly.

Voice over IP

The volume of traffic carried over IP links in 2002 was impressive: 18.7 billion minutes, equivalent to more than 10.8 percent of the world's international traffic. While the traffic volumes suggest that VoIP has become a mainstream technology, the primary destinations of VoIP traffic indicate that it is, as yet, primarily used for settlement rate arbitrage. VoIP has clearly emerged as the most successful means of bypassing the settlement rate regime to date. However, its very success as an arbitrage tool may be helping VoIP move into the mainstream. Faced with the rapid erosion of incoming termination traffic, a growing number of incumbent carriers in developing countries have reached agreements with leading VoIP carriers to terminate their traffic.

Refile

Refile represents a third form of alternatively routed traffic. Instead of avoiding accounting rates altogether, carriers employing refile bend the rules of the international settlement regime to their advantage. Refile occurs when a carrier re-routes an outgoing international call through a third country, frequently in order to take advantage of the intermediate country's lower settlement rate with the final destination.

Although the legal status of refile is more debatable than that of many other forms of bypass, the practice is certainly illicit. With the intent of disguising the true origin of traffic, the refile carrier in the intermediate country strips the numbering code, which

identifies the originating country and replaces it with its own country code. This ruse makes economic sense in cases where settlement rate disparity exists between originating countries.

Based on information gathered in its annual survey of international carriers, TeleGeography estimates that refile traffic accounts for about 15 to 20 percent of world traffic volumes. Much of this refile traffic is sent between countries where ISR is legal, and simply represents an alternate means of delivering traffic. "Multinational" carriers, telecom companies that operate switches in multiple markets, are more likely to send refile traffic than national carriers. Approximately 30 percent of the traffic carried by multinational operators surveyed by TeleGeography is refile traffic, compared with approximately 10 to 15 percent for carriers with a more strictly "national" orientation.

Who is sending all of this bypass traffic? Based on survey responses provided to TeleGeography, carriers in monopoly markets and developing countries are every bit as likely to trick the system as carriers battling for their existence in hotly contested markets. The destinations, volumes, and technologies employed may vary, but the ultimate goal is always the same: to maximize net revenues by minimizing net outpayments to other carriers. Given the pervasiveness of bypass traffic, the practice will survive as long as there are cost structures to be circumvented.

Looking Forward

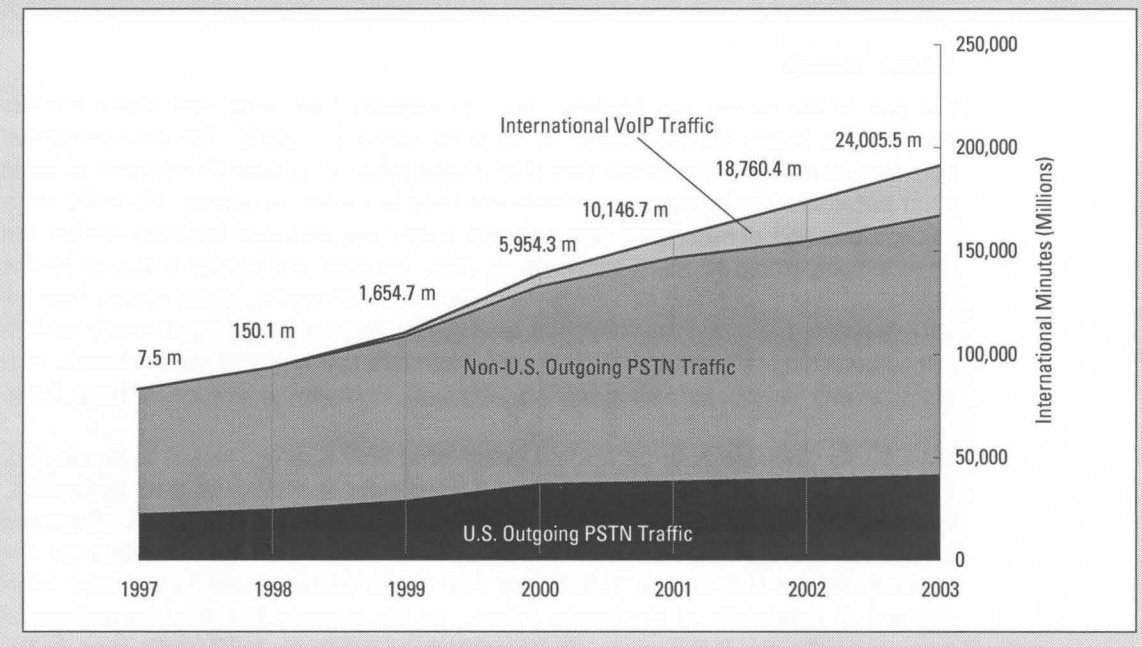
Although the pace of revenue declines is slowing, the outlook for the international voice market remains cloudy. The following sections examine three key issues that are reshaping the industry: the continued rapid growth and evolution of voice-over-IP traffic and carriers, the migration of voice traffic from fixed to mobile networks, and the U.S. Regional Bell Operating Companies' (RBOCs) entry into the long-distance market.

VoIP Routes & Traffic

While PSTN traffic growth has been sliding the past two years, VoIP has continued to surge, growing over 80 percent to 18.7 billion minutes of international voice traffic in 2002. Latin America, Asia and Eastern Europe—with deregulating markets, emerging competition, and relatively high settlement rates—remain the principal destinations for international VoIP traffic, underscoring the continued role of settlement rate arbitrage as the primary growth driver. While the destinations for VoIP traffic may not have registered much change over the past year, the field of players certainly has. Perhaps the most surprising dynamic to emerge during the past year has been increased incumbent participation in the VoIP market. Established traditional switched carriers are now beginning to compete directly with—and, in one case, acquire—their VoIP wholesale counterparts.

This article surveys the findings of TeleGeography's fourth annual international VoIP traffic survey, concluded in October 2003. The analysis begins at the global level, presenting evidence of a possible slowdown in 2003. More detailed discussion of regional growth trends and traffic patterns follows. The article concludes by reviewing the market structure of the VoIP industry and examining incumbent carriers' recent moves into the arena, both by by outsourcing traffic and transporting significant volumes on their own networks.

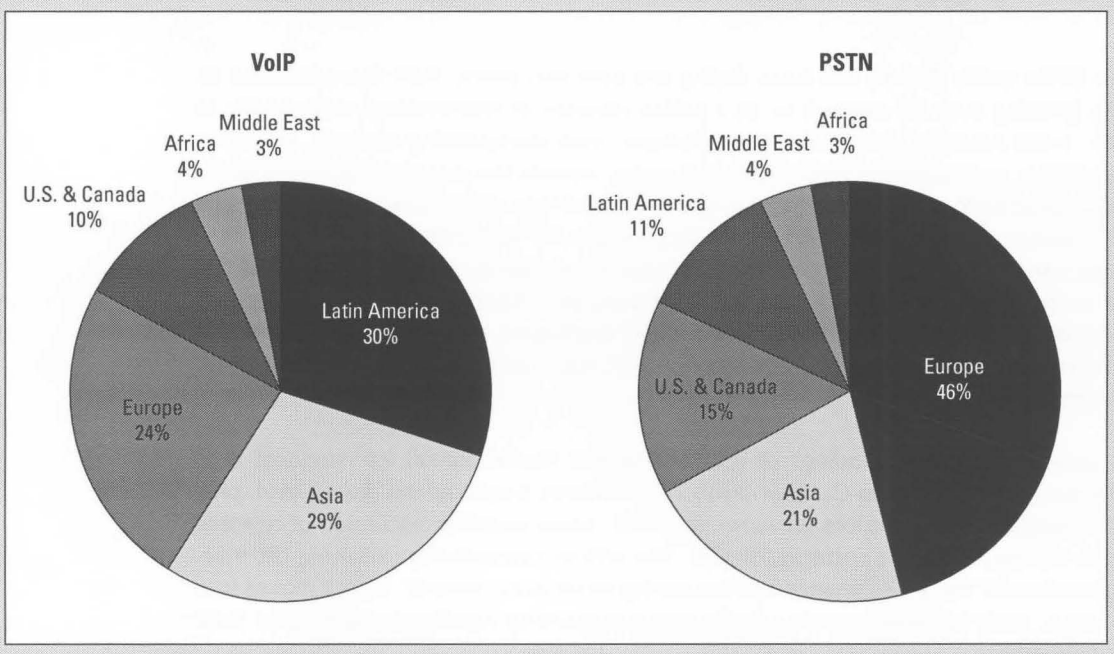
Figure 1. International VoIP and PSTN Traffic Summary, 1997-2003



Notes: Voice-over-IP (VoIP) traffic includes all cross-border voice calls carried on IP networks but terminated on public switched telephone networks; PC-to-PC communications and private network traffic are excluded. PSTN traffic includes circuit-switched voice and fax traffic carried on traditional international facilities as well as international simple resale (ISR) facilities. Figures for 2003 are estimated.

Source: TeleGeography research

Figure 2. International VoIP and PSTN Traffic Termination Summary, 2002



Notes: Charts represent the percentage of total inbound VoIP and inbound PSTN traffic by region. Voice-over-IP (VoIP) traffic includes all cross-border voice calls carried on IP networks but terminated on public switched telephone networks; PC-to-PC communications and private network traffic are excluded. PSTN traffic includes circuit-switched voice and fax traffic carried on traditional international facilities as well as international simple resale (ISR) facilities.

Source: TeleGeography research

Traffic Trends

The goal of our survey was twofold: first, to measure how much VoIP traffic transits international networks; and second, to establish where it is going. The data presented here include international phone calls that transit public or private IP networks at some point but ultimately terminate on traditional fixed or mobile networks. PC-to-PC communications and private corporate network traffic are excluded because neither are directly comparable to PSTN traffic flows. Also, because our survey is based on the reports of most—but not all—companies carrying VoIP traffic, some routes may be under-reported. Finally, the true point of origin for most wholesale VoIP traffic is difficult to ascertain. Many carriers track only where the traffic enters their network, usually at a centrally-located hub in the U.S., the U.K., Germany, Singapore, or Hong Kong.

Overall, our findings prove an obvious point—that VoIP is a new means to an old end. Because U.S.-based companies have had a head start in setting up their businesses, most global VoIP traffic currently originates in the U.S., although the U.K., Germany, and China are growing as alternative origination hubs. Furthermore, because the Internet remains U.S.-centric, U.S.-based VoIP carriers have access to the most international IP bandwidth at the lowest prices. As the primary hub for intercontinental Internet traffic, the U.S. may retain its position as a hub for VoIP traffic even as the ranks of VoIP carriers proliferate into Western Europe and Asia.

Global VoIP Traffic

Between 1997 and 2002, the combined traffic of companies routing international calls over IP networks increased from less than 10 million to more than 18.7 billion minutes. VoIP traffic grew by almost 85 percent in 2002, compared with just under 74 percent in 2001. By comparison, switched traffic increased by just over 6.2 percent in 2002. In total, VoIP and PSTN traffic grew 11.3 percent in 2002, to 173.9 billion minutes—slow, by historical standards, but not unprecedented.

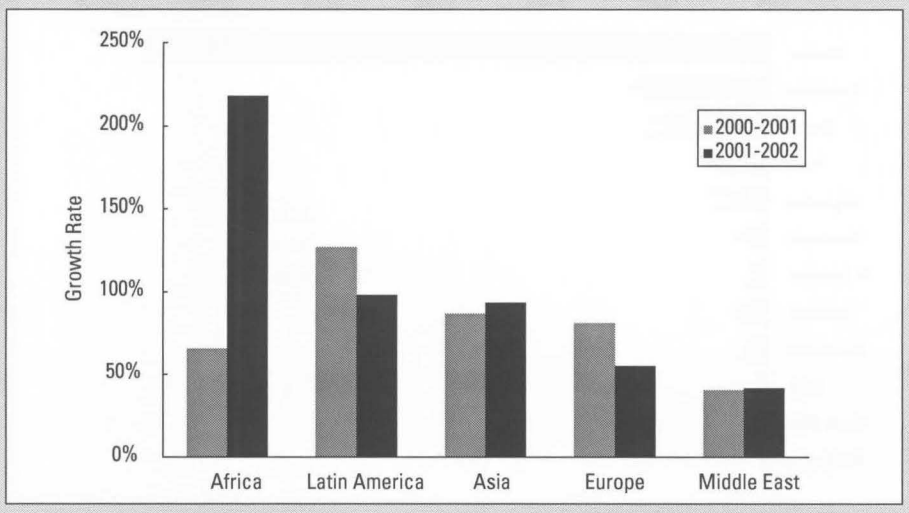
Based on TeleGeography's half-year survey results, international VoIP traffic may reach 24 billion minutes in 2003, constituting a little more than 12 percent of the world's forecasted international traffic (see Figure 1. International VoIP and PSTN Traffic Summary, 1997-2003). However, the survey results also suggest that VoIP growth has slowed to an annualized rate of approximately 30 percent in 2003.

Regions

In terms of total traffic, Latin America, Asia, and Eastern Europe continued to be the primary VoIP destinations in 2002, due to arbitrage opportunities, rapidly developing IP infrastructure, and opening markets (see Figure 2. International VoIP and PSTN Traffic Termination Summary, 2002).

Latin America. Latin America was the primary destination accounting for about one-third of all inbound international VoIP traffic—over five billion minutes. Traffic to both Peru and Venezuela grew by over 160 percent, making them the fastest-growing destinations in Latin America (see Figure 4. Global VoIP Traffic Termination in Latin America, 2001-2003).

Figure 3. International Inbound VoIP Traffic Growth by Region, 2001-2002



Notes: Voice-over-IP (VoIP) traffic includes all cross-border voice calls carried on IP networks but terminated on public switched telephone networks; PC-to-PC communications and private network traffic are excluded.

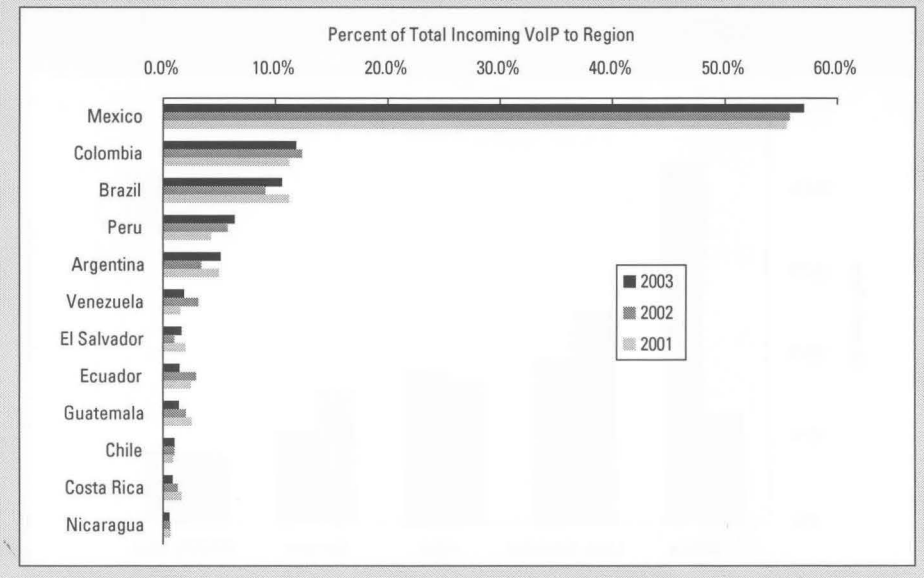
Source: TeleGeography research

Brazil opened its market to VoIP competition in 2002; however, industry participants report that regulatory obstacles remain significant. Consequently, traffic growth to Brazil was 60 percent in 2002—respectable by most standards, but sluggish by comparison to other newly liberalized markets, such as India. Mexico remained the largest recipient of VoIP traffic, accounting for over 50 percent of all incoming voice traffic to Latin America.

Asia. Traffic to Asia grew 95 percent in 2002, compared with 85 percent growth in 2001. Traffic growth to Asia was spurred by the opening of the international voice market in India where traffic increased by 190 percent, and the tripling of traffic to Philippines (see Figure 8. Inbound Growth to Top VoIP Destinations, 2002). China remained the top destination in Asia, but growth has slowed as the market has matured—China opened its international voice market to VoIP in 1999 (see Figure 5. Global VoIP Traffic Termination in Asia, 2001-2003).

Europe. VoIP traffic to Europe grew by just over 50 percent in 2002. Eastern European countries received 85 percent of this VoIP traffic, but only 15 percent of Europe's international PSTN traffic. Conversely, Western European countries received 85 percent of cross-border PSTN traffic but only 15 percent of international VoIP traffic. Poland, Russia, and Bulgaria accounted for more than half of Europe's inbound VoIP traffic in 2002 (see Figure 6. Global VoIP Traffic Termination in Europe, 2001-2003).

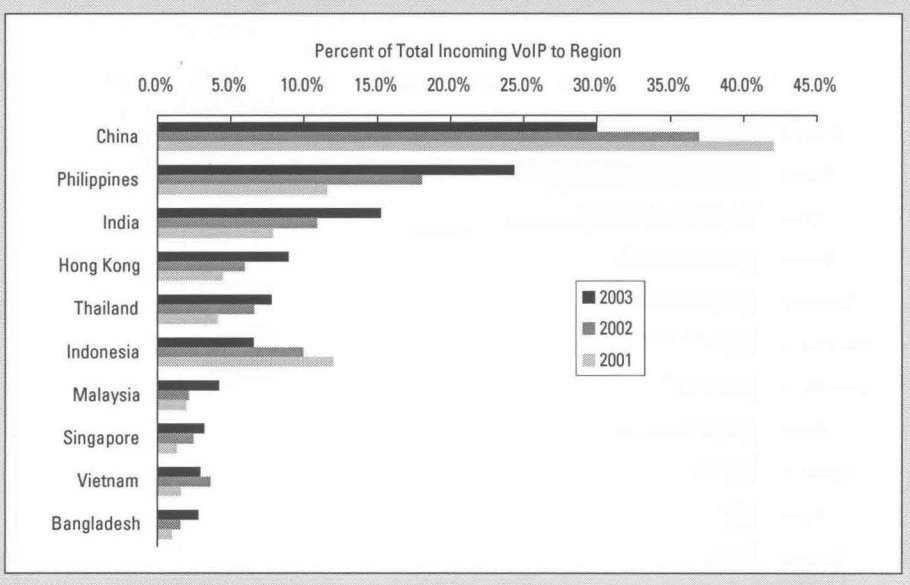
Figure 4. Global VoIP Traffic Termination in Latin America, 2001-2003



Notes: Total inbound VoIP traffic to Latin America was 5.6 billion minutes in 2002. Voice-over-IP (VoIP) traffic includes all cross-border voice calls carried on IP networks but terminated on the PSTN, PC-to-PC communications and private network traffic are excluded. Year 2003 rankings are based on statistics supplied for the first six months of 2003.

Source: TeleGeography research

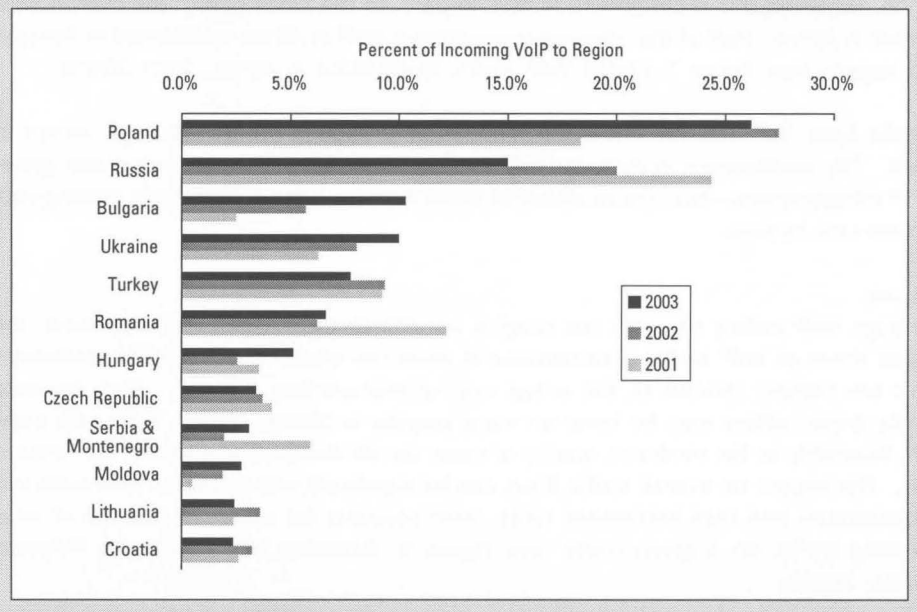
Figure 5. Global VoIP Traffic Termination in Asia, 2001-2003



Notes: Total inbound VoIP traffic to Asia was 5.4 billion minutes in 2002. Voice-over-IP (VoIP) traffic includes all cross-border voice calls carried on IP networks but terminated on the PSTN, PC-to-PC communications and private network traffic are excluded. Year 2003 rankings are based on statistics supplied for the first six months of 2003.

Source: TeleGeography research

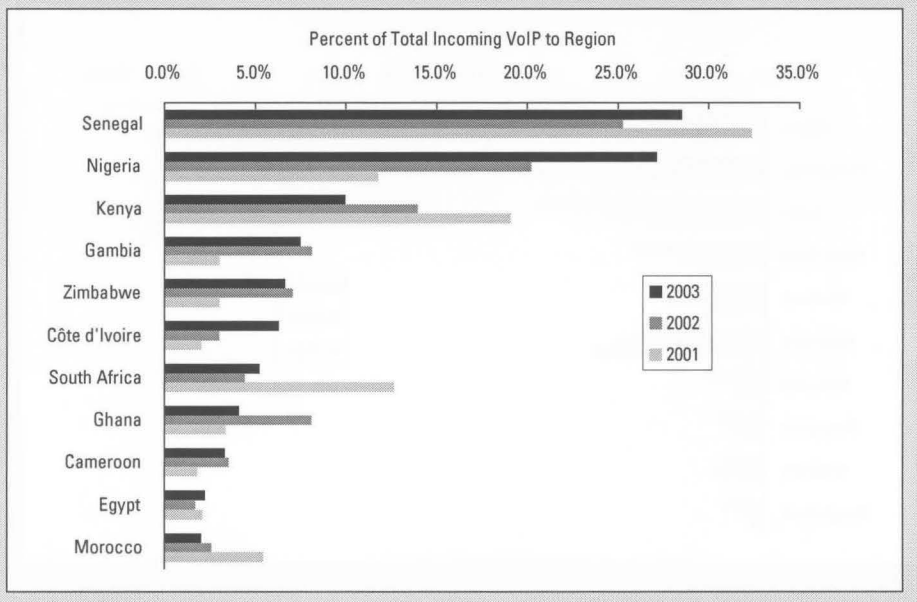
Figure 6. Global VoIP Traffic Termination in East Europe, 2001-2003



Notes: Total inbound VoIP traffic to Europe was 3.8 billion minutes in 2002 Voice-over-IP (VoIP) traffic includes all cross-border voice calls carried on IP networks but terminated on the PSTN, PC-to-PC communications and private network traffic are excluded. Year 2003 rankings are based on statistics supplied for the first six months of 2003.

Source: TeleGeography research

Figure 7. Global VoIP Traffic Termination in Africa, 2001-2003



Notes: Total inbound VoIP traffic to Africa was 750 million minutes in 2002. Voice-over-IP (VoIP) traffic includes all cross-border voice calls carried on IP networks but terminated on the PSTN, PC-to-PC communications and private network traffic are excluded. Year 2003 rankings are based on statistics supplied for the first six months of 2003.

Source: TeleGeography research

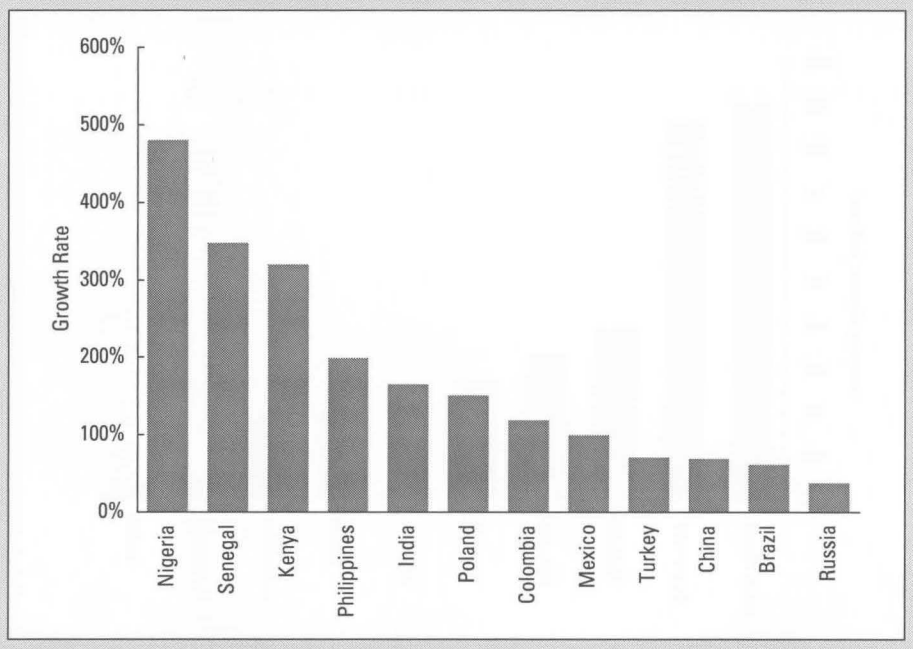
Africa. Traffic to Africa grew over 200 percent in 2002, far faster than any other world region. However, this rapid growth is due, in part, to the small size of the overall VoIP market in Africa. Half of the inbound international VoIP in Africa terminated in Senegal and Nigeria (see Figure 7. Global VoIP Traffic Termination in Africa, 2001-2003).

Middle East. VoIP has still not made substantial inroads in the Middle East, except in Israel. The environment is right for VoIP to flourish—high settlement rates and growing IP infrastructure—but, the incumbents have, thus far, been successful in limiting settlement-rate bypass.

Routes

Although VoIP calling patterns run roughly parallel to established PSTN demand, the largest share of VoIP traffic is terminated in countries where existing PSTN settlement rates are highest relative to the actual cost of transporting the call. Also, because quality expectations may be lower on many popular arbitrage routes, VoIP calls compare favorably to the mediocre quality of many circuit-switched and mobile terminated calls. The impact on overall traffic flows can be significant—in countries with sufficient infrastructure and high settlement rates, VoIP accounts for up to 15 percent of total incoming traffic on a given route (see Figure 9. Incoming VoIP Traffic on Selected Routes, 2002).

Figure 8. Inbound Growth to Top VoIP Destinations, 2002



Notes: Chart includes data from top three destinations of international VoIP traffic in Africa, Asia, Eastern Europe, and Latin America. Traffic data based on carrier reported traffic for 2002.

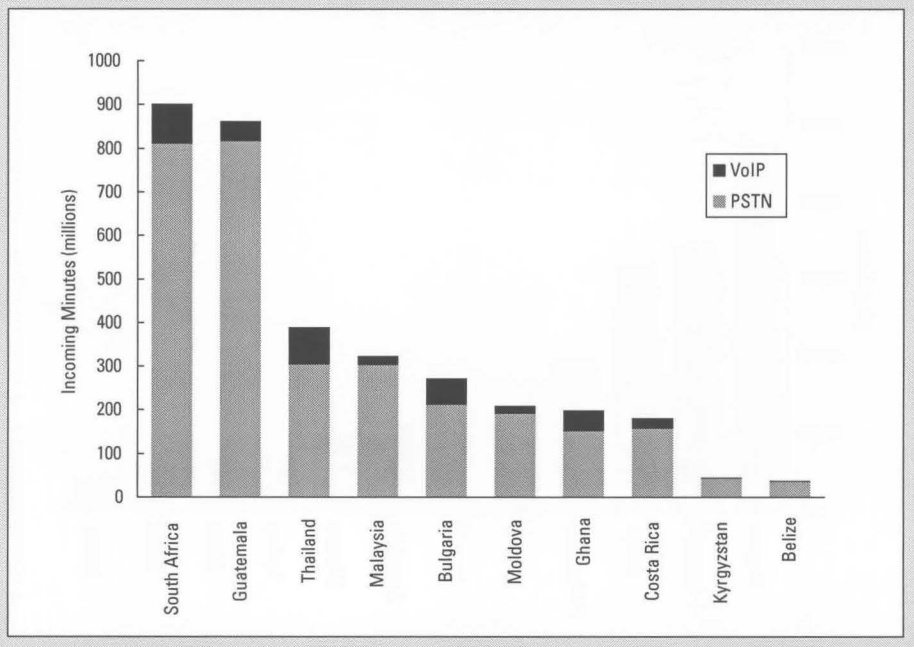
Source: TeleGeography research

The clearest example of this trend is traffic on the U.S.-Mexico route, which accounted for over 18 percent of U.S.-originated VoIP traffic between 2001 and 2003 (see Figure 10. Top 25 U.S.-Originated VoIP Routes, 2001-2003). Routes into the Philippines, Poland, and China are still growing strongly and accounted for another 15 percent of U.S.-originated VoIP traffic during the same time period. Routes to Poland and the Philippines have seen the most growth between 2001 and 2002, each growing by over 200 percent (see Figure 11. Growth on Top 10 U.S.-Originated VoIP Routes, 2001-2002). Traffic to India grew 190 percent, driven by the introduction of international competition. VoIP is still a logical alternative on routes like these, where the combination of market liberalization and relatively high termination rates create perfect conditions for arbitrage.

Wholesale VoIP

While many new and incumbent carriers have begun to build IP networks that will carry their voice traffic in coming years, most wholesale VoIP traffic is still carried by a handful of specialist providers acting as carriers' carriers. Most of these specialist wholesalers use regular Internet transit to carry their voice traffic; others use private lines running IP. Some use a combination of the two, along with PSTN "failover" circuits where IP connections are too thin, too few, or too congested.

Figure 9. Incoming VoIP Traffic to Selected Countries, 2002



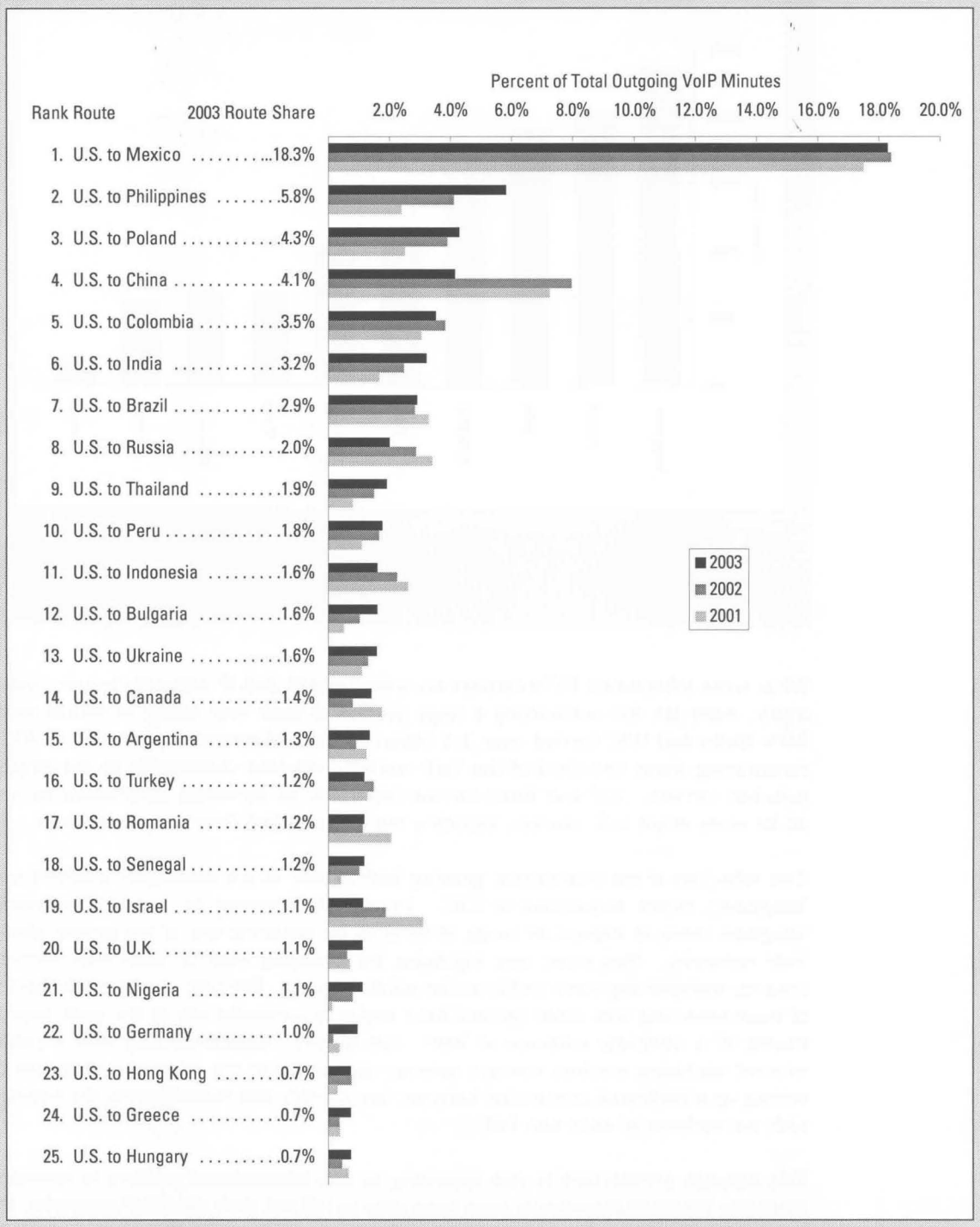
Notes: Traffic data based on carrier reported traffic for 2002.
Source: TeleGeography research

Regardless of the the companies' network architecture, VoIP carriers share the same goal: arbitrage. VoIP carriers take advantage of differences between official PSTN settlement fees and de facto termination rates by using IP to transport their voice traffic. Arbitrage continues to act as the primary driver for the prodigious growth of international VoIP traffic.

Many well-established telephone companies may still consider VoIP an experiment and sometimes see it as a threat to existing revenue streams; however, this view seems to be changing. Established PSTN carriers are increasingly using VoIP technology and adding VoIP services to their list of offerings. While a large portion of VoIP traffic carried by established carriers is bundled into enterprise services on private networks, some carriers are beginning to carry significant volumes of wholesale VoIP over their long-haul networks. Telecom Italia, Deutsche Telecom, and Reach are some of the most prominent incumbent carriers offering wholesale VoIP services.

A notable exception to the incumbents' cautious transition to VoIP is China Telecom. Since the first VoIP licenses were issued in 1999, China Telecom reports that VoIP traffic has grown to comprise almost half of its international traffic in 2002. This astonishing growth, however, was probably more the result of fierce competition to maintain market share against low-priced VoIP competitors than an intentional shift away from its PSTN network.

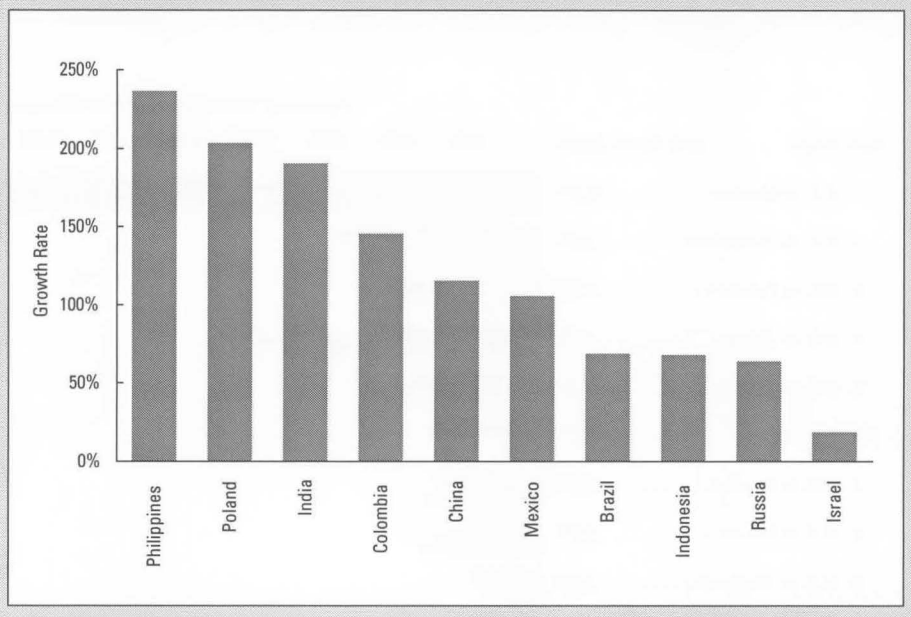
Figure 10. Top 25 U.S.-Originated VoIP Routes, 2001-2003



Notes: Route rankings are based on actual traffic reports by major wholesale and retail VoIP carriers. Figures do not include all VoIP carriers and routes, however, some omissions may have occurred. Year 2003 rankings are based on statistics supplied for the first six months of 2003. In 2003, routes omitted from this table may have accounted for almost 30 percent of U.S.-originated VoIP traffic. Data may include some traffic that was hubbed in the U.S., but not originated there.

Source: TeleGeography research

Figure 11. Growth on Top 10 U.S.-Originated VoIP Routes, 2001-2002



Notes: Voice-over-IP (VoIP) traffic includes all cross-border voice calls carried on IP networks but terminated on public switched telephone networks; PC-to-PC communications and private network traffic are excluded.

Source: TeleGeography research

While some established PSTN carriers are utilizing their own IP networks to carry voice traffic, most are still outsourcing a large portion of their VoIP traffic to middle men. Both iBasis and ITXC carried over 2.5 billion minutes of international traffic in 2002 constituting about one-third of the VoIP market—volumes comparable to the largest switched carriers. ITXC and iBasis carried this traffic for numerous incumbents, as well as for many major U.S. carriers, including the Regional Bell Operating Companies.

One reflection of the incumbents' growing faith in VoIP as a transmission platform was Teleglobe's recent acquisition of ITXC. Instead of deploying its own VoIP network, Teleglobe chose to expand its range of services by acquiring one of the largest global VoIP networks. This move also highlights the changing view of traditional carriers towards transporting voice traffic on the public Internet. The cost and time efficiencies of interconnecting with other carriers have begun to overcome one of the main impediments to a complete embrace of VoIP: call quality. Interconnecting with a public Internet backbone involves having a gateway and access to the Internet as opposed to setting up a dedicated connection between two carriers and reconfiguring the network with the addition of each new PoP.

This network architecture is also appealing to new international carriers in emerging markets. Whereas incumbents have been slow to roll out their own VoIP networks, the short deployment times and lower initial infrastructure investment seem to make VoIP the preferred transmission platform of new carriers. Data Access—backed by PCCW—began offering voice services in mid-2002 soon after the opening of the Indian market

Figure 12. If You Can't Beat Them...

Cloaked in the "gray area" of international telecom regulation, VoIP has posed new threats to established revenue streams, especially in protected single carrier markets. However, some of the world's aging international carrier monopolies have taken the decision to embrace, rather than fight, VoIP. These incumbents are partnering with VoIP carriers to terminate—and increasingly, originate—traffic to augment revenue rather than lose it. Incumbents in Venezuela, Philippines, Vietnam, and many other economies have formed partnerships with wholesale VoIP carriers. The incumbents must balance cannibalization of traditional revenue streams while capturing a portion of the traffic they are losing to illicit bypass. More information about how carriers and regulatory organizations are dealing with the introduction of VoIP in their markets can be found in a series of case studies published by the ITU (http://www.itu.int/ osg/spu/casestudies/index.html#iptel).

Source: TeleGeography research

to international competition. The company's rapid deployment of VoIP services has enabled it to achieve tremendous growth rates. Data Access claims to have already captured 30 percent of India's international long-distance market in a mere six months.

In Latin America, outbound PSTN traffic has actually declined for the first time. This, at a time when markets have recently opened or are in the process of opening and competition is rife, may indicate a shift by new carriers to VoIP as the transmission technology of choice. In Bolivia, the competitive carrier COTAS-Teledata took a different approach than competitors to rapidly gain market share upon the deregulation of the Bolivian market. The company outsourced its domestic and international long-distance network to ITXC. And from the first day of the deregulation, at the end of 2001, ITXC has been carrying COTAS-Teledata's long-distance traffic while other competing carriers' network buildouts were initially mired by funding issues.

Incumbents' adoption of VoIP has been more deliberate for a variety of reasons. Although call quality has frequently been cited as an obstacle, incumbents' willingness to route traffic via wholesale VoIP carriers suggests that this concern is not insurmountable. More crucially, incumbents (and other established PSTN operators) have invested billions of dollars in PSTN equipment. As this equipment reaches the end of its depreciation cycle, voice traffic from incumbents can be expected to steadily migrate to IP networks.

Retail VoIP

Many VoIP specialists have been taking a direct path to the consumer by way of PC-to-PC, PC-to-phone, and phone card calling plans. Companies such as Net2Phone, deltathree, Callserve, and Go2Call reported significant volumes of PC-to-phone traffic. Net2Phone continues to dominate the retail market with over 650 million minutes of international traffic in 2002. While retail carriers' volumes are small in comparison to ITXC and iBasis, their per-minute rates are significantly higher. Many retail VoIP carriers also offer wholesale services; however, like their switched counterparts, many are focusing more on the end user as wholesale margins evaporate.

Figure 13. Protocols

The capabilities of a VoIP network—that is, what can be delivered to the consumer—are largely determined by the standards implemented. To date, the most widely deployed standard for handling VoIP traffic has been H.323, a protocol developed under ITU auspices in the late 1990s for video communications over local area networks. Now in its fourth iteration, H.323 has been re-engineered specifically to handle VoIP calls.

Although H.323 is nearly ubiquitous in VoIP networks, a second standard, Session Initiation Protocol (SIP), has become widely accepted as the next generation protocol for VoIP call delivery. Its acceptance, however, has less to do with voice than it does with video and other premium services. SIP is designed to work with IP devices (like computers) much the same way a Web browser or email client does. This provides a particularly attractive scenario to VoIP carriers (and their vendors), which have had difficulty deriving much profit from the razor-thin margins associated with carrying voice traffic, especially on competitive routes. Although there was much hype surrounding the potential of SIP to revolutionize the VoIP industry—peaking with the release of the much publicized integration of SIP with Windows XP—few new applications have been developed so far. The advantages SIP may bring to the VoIP industry are still compelling but have yet to be realized on a large scale.

Source: TeleGeography research

In 2002, VoIP operators such as Vonage and 8x8, which offer voice services in the U.S. over residential broadband connections, elbowed their way into the media spotlight. Initial growth has been dramatic: Vonage's subscribership grew to over 100,000 within its first year of offering services. Although this growth has been dramatic, broadband VoIP customers still represent only a tiny fraction of the approximately 187 million local loops in service in the U.S..

U.S. cable TV companies have also announced that they will deploy VoIP via their broadband networks. However, the reality of cable-TV operators' deployments has not kept pace with the surrounding rhetoric. Most deployments have been limited regional trials, and large-scale rollouts of VoIP over broadband cable are not expected until the end of 2004 or 2005.

In Japan, broadband penetration is slightly lower than the U.S.; however, broadband VoIP subscribers are much more numerous. Broadband services provider Softbank BB began offering VoIP services mid-2002. By year-end 2002, the company had over 1.2 million subscribers and has grown in 2003 to about 2 percent of total phone lines. This striking growth has stimulated NTT and other major Japanese broadband providers to begin offering voice services over their IP networks.

While most of these VoIP-via-broadband operators have emphasized the VoIP component of their service offering, few (if any) of these service providers operate their own international VoIP networks. Instead, the long-haul portion of the call is typically routed via wholesale carriers—most of which operate switched networks. So, in essence, unless both the caller and the person being called are customers of the same VoIP telephone company, only the first leg of the call involves an IP network.

Figure 14. VoIP's Regulatory Status in the U.S.

VoIP has enjoyed a relatively unregulated status in the U.S. While end-users may regard VoIP as being comparable to plain old telephone service, the FCC treats VoIP as an "information service," because VoIP traffic traverses the Internet, rather than the PSTN. The U.S. Congress has mandated that the Internet and other interactive computer services, or, "information services," remain unfettered by state and federal regulation to promote healthy free market competition. Thus, VoIP has not been not subject to the same charges, taxes and fees as a basic telecommunications services under the Telecommunication Act of 1996.

Much of the current regulatory status of VoIP was defined in the 1998 Stevens Report, a report by the FCC apprising Congress of certain provisions of the Telecommunication Act of 1996 regarding the universal service system. The report confirmed that Internet services were "information services" and would remain unregulated and thus not obliged to contribute to the Universal Service Fund (USF). While phone-to-phone VoIP may resemble "telecommunication services" more closely than "information services," the FCC determined not to make any definitive pronouncements until it had a more detailed record of individual service offerings. The report concluded that, although VoIP providers do not directly contribute to the USF, they pay indirectly through leasing of private lines. Since then, phone-to-phone VoIP has remained in regulatory limbo.

As the VoIP industry has grown, however, the regulatory debate has heated up at the state level. RBOCs and state public utility commissions have begun to eye what they see as the loss of significant revenues under VoIP's current unregulated status. Perhaps more worryingly, the lighter regulatory burden imposed on VoIP service provider affords them a significant competitive advantage over PSTN service providers. Although the regulatory status of VoIP has not changed at the federal level since Stevens Report, a number of state governments have begun investigating whether VoIP should be regulated within their jurisdiction.

In August and September 2003, Minnesota, Wisconsin, and California moved to regulate VoIP carriers. Minnesota was the first state to decide that a VoIP carrier, Vonage, should be regulated and taxed as a traditional phone company, required to obtain business licenses and begin to pay fees to support state services such as 911. Wisconsin's Public Service Commission followed suit and contacted at least one VoIP carrier, 8x8, regarding a change in their regulatory status. California is latest and largest state to begin regulating VoIP carriers as traditional phone companies. Due to the state's size and importance, some feel that the decisions made by California's Public Utility commission (PUC) may have some influence on future FCC rulings.

All the recent regulatory activity has not been against VoIP carriers, however. A federal judge found that the Minnesota findings were in conflict with federal law and issued a permanent injunction against the PUC's August ruling. In Pennsylvania, a state senator introduced a bill in September for a statewide moratorium on regulating or taxing VoIP carriers for five years.

As an increasing number of state PUCs begin to evaluate the regulatory status of VoIP, Chairman Michael Powell announced that the FCC will hold a forum on these issues in December 2003 to review the FCC's regulation of VoIP. A formal ruling by the FCC is anticipated within 12 months of this forum. The international telecommunications industry will be watching with interest as the regulatory drama unfolds in the U.S.

Source: TeleGeography research

What's Next?

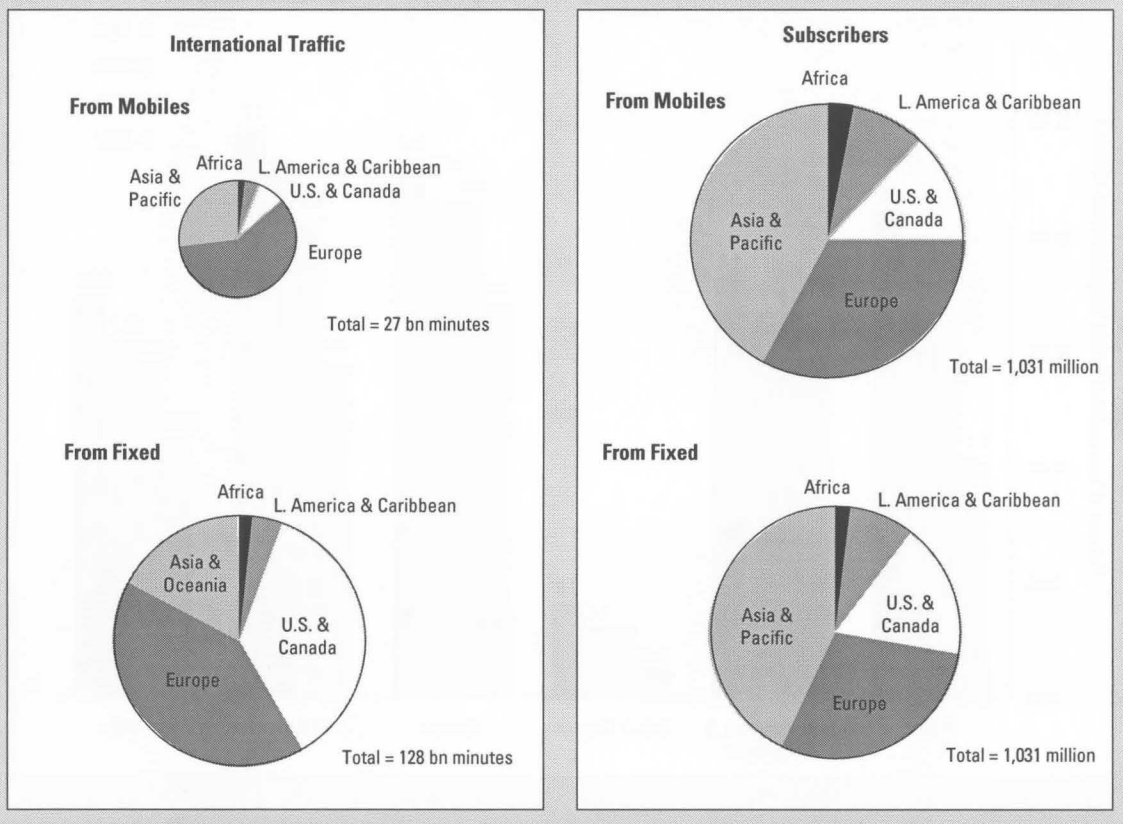
Since TeleGeography began tracking international phone calls more than a decade ago, market forces and technological innovation have driven down prices and increased traffic flows across the globe. The Internet and VoIP have no doubt played a significant role in accelerating this process in the last few years, and forecasting the effect on actual traffic flows remains an extremely difficult endeavor. Moreover, as new IP communications services and devices become available, they may stimulate new demand and increase VoIP traffic flows beyond the growth rates characteristic of the traditional voice telephony market. We will be watching—and reporting—these developments as they occur.

International Traffic to and from Mobile Phones

Over the past decade, rapid growth has transformed mobile telephony from a niche market segment to a formidable market force in international telecommunications. In 2002, mobile lines overtook fixed lines globally, passing from 47 to 52 percent of total lines. Ten years ago, the portion of calling opportunities (total possible calls between telephone numbers) involving mobiles was less than ten percent. In 2003, the ITU expects mobile calls (both to and from mobiles) to account for over 70 percent of worldwide calling opportunities. As a result of its growth and ubiquity, mobile telephony has become an important issue for investors, consumers, regulators, and, not least of all, international carriers.

That mobiles represent such a significant portion of calling opportunities underscores their relevance to international operators. The more calls (and, thus, international calls) that involve mobiles, the more wholesale revenue mobile operators may generate for international carriers—and the more termination costs international carriers pay out to mobile operators. Given the significant differential between fixed- and mobile-

Figure 1. Mobile versus Fixed International Traffic and Subscribers by Region, 2002



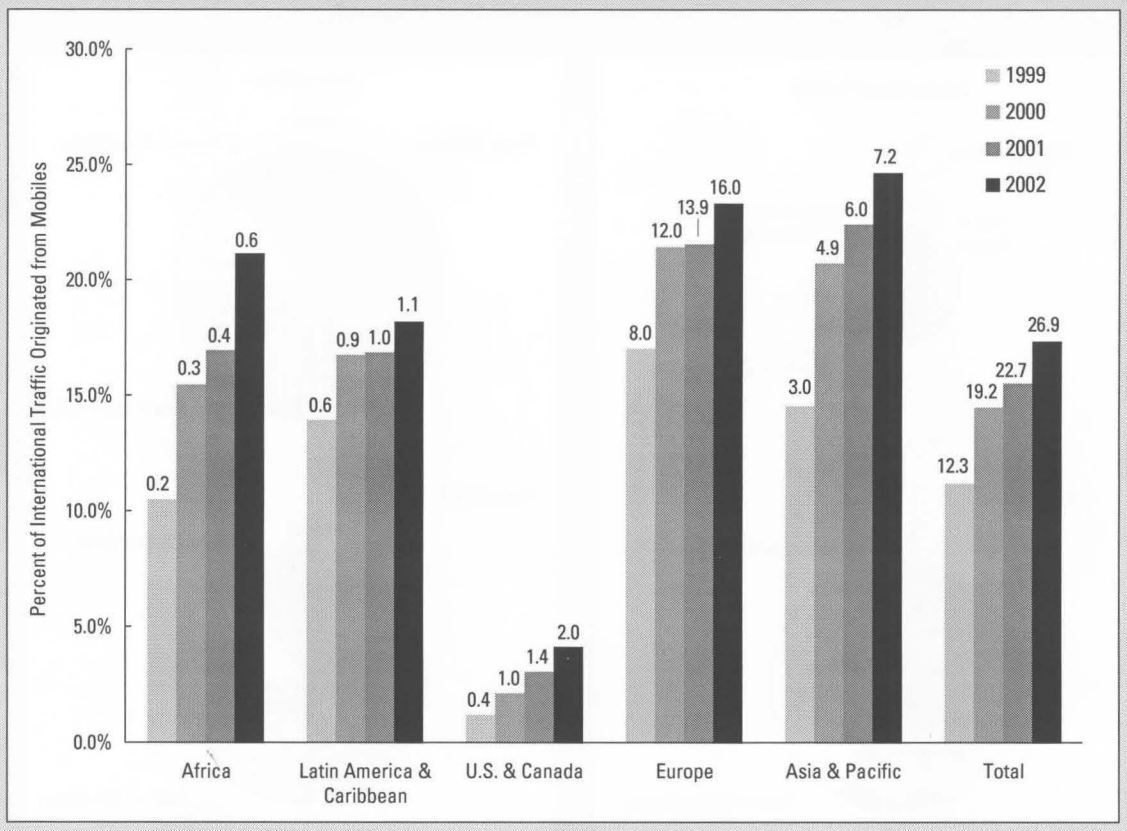
Source: ITU and TeleGeography research

termination prices, even a small increase in mobile-terminated traffic can result in a significant increase in total termination costs. Over the past year, mobile-originated traffic grew from 15 percent of total international traffic to 17 percent while mobile-terminated traffic rose from just over 23 percent to 25 percent. As that proportion grows, mobile traffic will become an even greater consideration for long-distance carriers.

Mobile Traffic

Growth in international mobile traffic has generally exceeded that of international fixed traffic of the past few years, reflecting the boom in mobile subscribership. The maturation of many mobile markets (particularly Europe) has dampened global subscriber growth from 54 percent in 1998 to 23 percent in 2002, down slightly from 29 percent in 2001. Even so, many other markets have shown robust growth in subscribership over the past year. Registering a 55 percent jump, Africa continues to lead the world in subscribership increases, largely due to countries with blistering growth rates such as Nigeria (1000 percent growth in 2001 and 395 percent in 2002). The United States and Canada remains the only region of the world in which fixed lines still outnumber mobile subscribers, though by only four percent.

Figure 2. Percent of Mobile-Originated International Traffic, 1999-2002

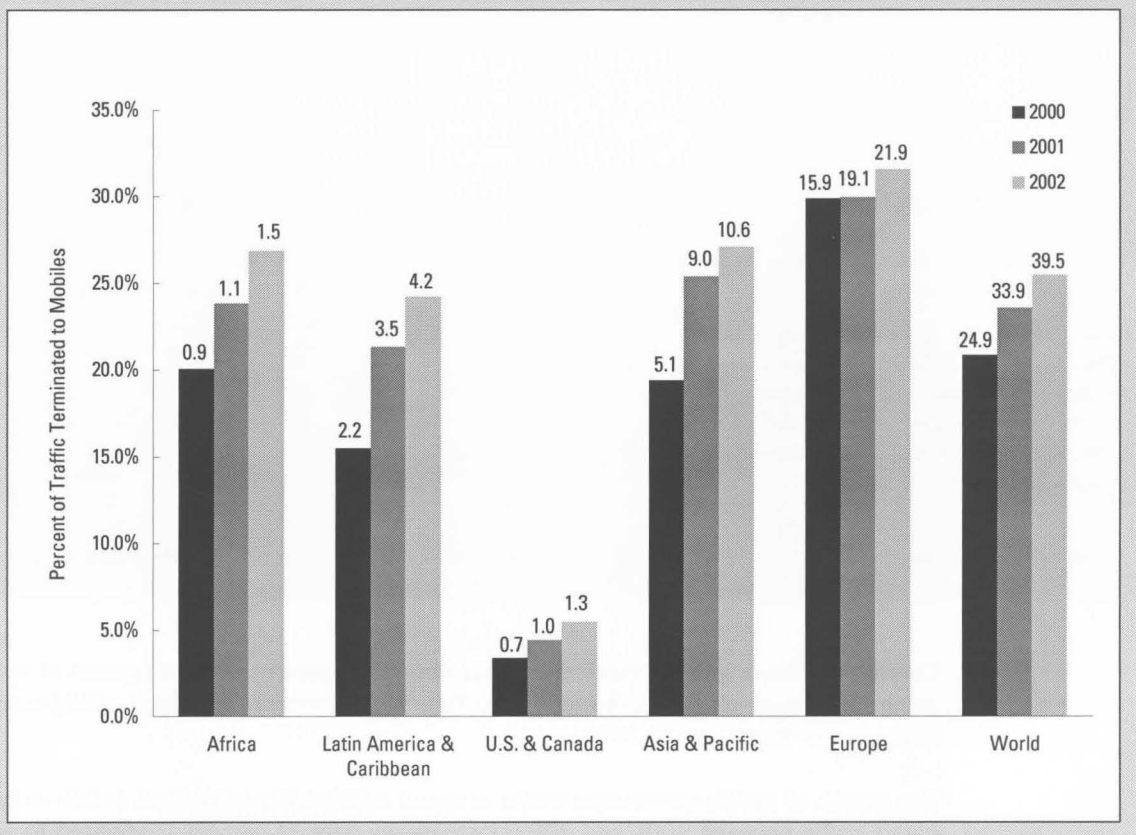


Notes: Numbers show total mobile-originated traffic minutes in billions.
Source: ITU and TeleGeography research

International mobile traffic has likewise experienced declining growth in recent years, though growth rates appear to be stabilizing. The volume of mobile-originated international traffic grew approximately 19 percent, from 22.7 billion minutes to 27.9 billion minutes, between 2001 and 2002. While almost triple the global switched growth rate, mobile traffic growth is roughly the same as the previous year. The distribution of traffic across regions has remained relatively constant over the past four years, with Europe representing 59 percent of the world's mobile-originated international traffic. Between 2001 and 2002, Europe's share declined slightly due to growth in other regions, such as Asia & Pacific and Africa (see Figure 1. Mobile versus Fixed International Traffic and Subscribers by Region, 2002).

Regional traffic growth rates tend to reflect differences in subscribership growth, varying considerably across the world. Africa, again, scored high with a 37 percent increase in mobile-originated international traffic. Latin America & Caribbean decreased from 13 to seven percent growth, on par with its decline in subscribership growth. Interestingly, while Asia & Pacific subscribership growth shrunk slightly between 2001 and 2002, its mobile-originated traffic growth was higher than the previous year.

Figure 3. Percent of Mobile-Terminated International Traffic, 2000-2002



Notes: Numbers show total mobile-terminated traffic minutes in billions.
Source: TeleGeography research

Figure 4. Roaming and International Mobile Traffic

An increase in mobile subscribers has a greater impact on international voice traffic than a comparable increase in fixed-line subscribers: fixed lines don't cross political borders with their users, but mobile handsets do. International roaming not only provides a valuable service to mobile users through "seamless" connectivity; it also generates demand for international telecommunications transport. To illustrate the contribution mobile roaming makes to international voice traffic flows, let's consider the case of a German mobile user traveling in Austria.

Upon activating her handset, the German traveler will select an Austrian host network on which to operate. Network selection may be performed manually, in which case the user chooses a host network from a list of available networks. Manual selection locks the mobile user into a specific network, to which the handset will return if the signal is lost or the handset deactivated. More likely, though, host network selection will be performed automatically by the handset, either on the basis of signal strength or preferences pre-programmed by the user's home provider. This selection process establishes a connection between the home and host networks, allowing the host network to locate the user and providing the host network with authentication and billing information.

When the German traveler makes a call from her handset, the call will be processed by the Austrian host network. Thus, when calling another German number, the call will be picked up by the host network and then transmitted along the PSTN to Germany for termination. The resulting traffic, while connecting two German numbers, actually constitutes an international call from Austria to Germany.

Conversely, if one of the traveler's friends in Germany calls her mobile, the call will be forwarded by her home network, via the PSTN, to Austria, where it will be picked up and delivered by the Austrian host network. Again, the call between two German numbers is, in fact, an international call between Germany and Austria.

In either case, the German traveler will incur a roaming charge for using the Austrian network. That charge, plus a markup from her home provider, will then be billed directly to her. For originating calls, the charges she receives are those dictated by the pricing scheme (peak/off-peak, etc.) of the Austrian operator, not her home provider. Billing between operators is generally handled by clearinghouses which compile roaming call records from host networks and distribute them to the users' home networks. The clearinghouse also calculates and collects the charges due the host network operators. Some operators opt to handle roaming relationship and billing management themselves, but clearinghouses are by and large the industry standard.

In the above example, we've made a number of assumptions in order to illustrate how roaming contributes to international voice traffic. One of the principal assumptions is the existence of a roaming agreement between the traveler's home mobile provider and at least one Austrian provider. Such agreements are quite common, especially among GSM operators. The GSM Association has established a standard roaming agreement in order to facilitate roaming between providers, as negotiating separate agreements for multiple providers would be prohibitively complicated or, at least, utterly tedious.

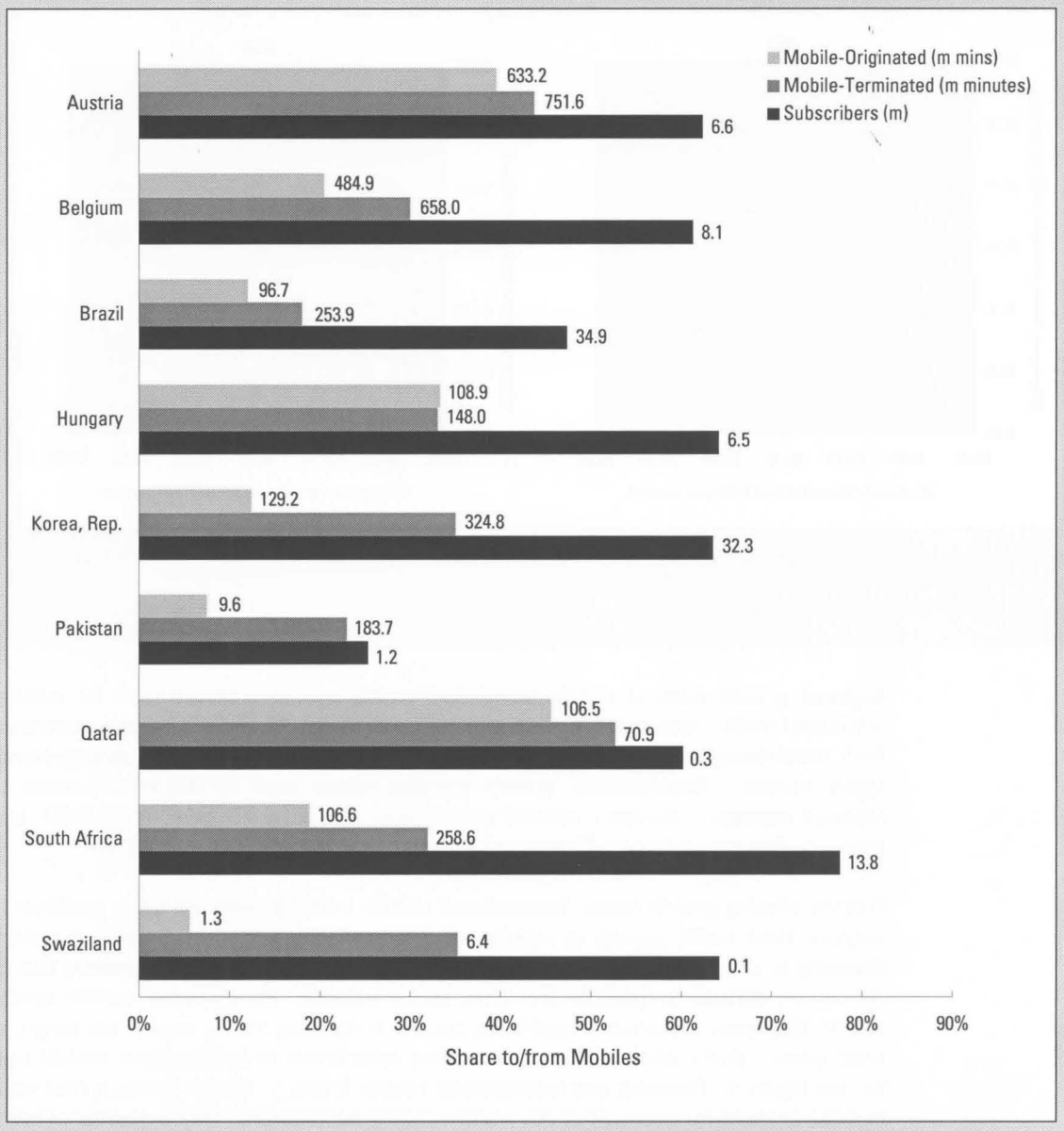
By illustrating intra-European roaming, we've also avoided discussing the technical interoperability necessary for international roaming. The European Union shares a common digital standard, GSM, which has been pivotal in facilitating roaming across its member states. GSM has also been deployed in other nations across the globe, but there are other digital standards (CDMA, TDMA, etc.) in use. Interstandard roaming is thus a central issue for truly global roaming. World phones, capable of functioning on GSM and CDMA networks across the globe, are expected to be launched commercially, at least in the U.S., by the end of 2003.

Source: TeleGeography research

Overall, mobile-originated traffic increased from 15.6 percent to 17.4 percent of outgoing international call volumes (see Figure 2. Percent of Mobile-Originated International Traffic, 1999-2002).

The growth of mobile-terminated traffic dropped significantly more than mobile-originated traffic between 2001 and 2002, increasingly only 17 percent (compared to 36 percent the previous year). Worldwide, approximately 25 percent of international call volumes, or 36 billion minutes, are terminated on mobile phones. European users

Figure 5. Mobile Subscribers and International Traffic for Selected Countries, 2002

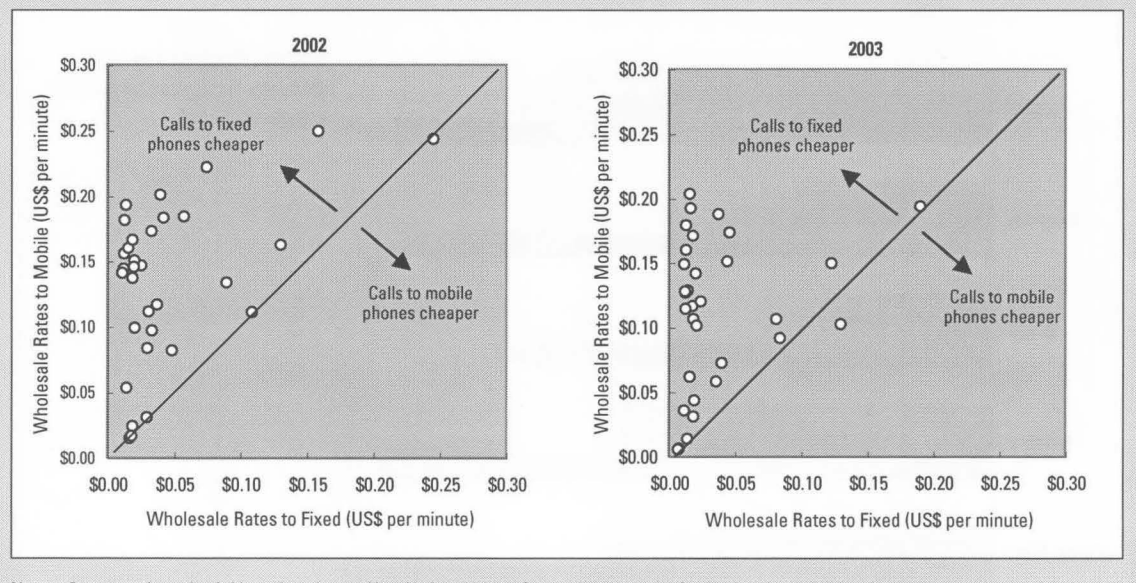


Notes: Numbers show absolute levels of mobile subscriber and traffic. Lengths of bars show relative levels to/from mobiles. Mobile subscriber percentage is based on total number of lines in service.

Source: ITU and TeleGeography research

again received the bulk of mobile-terminated traffic, with a 56 percent share of the world's total. Europe's share declined roughly one percent over the past year, reflecting stronger mobile-terminated growth rates in almost all other regions of the world.

Figure 6. International Call Prices: Mobile versus Fixed, 2002-2003



Notes: Rates are from the Arbinet-thexchange New York switch on September 2002 and September 2003. Each point represents the wholesale price per minute from New York to fixed and mobile dialing codes within a single country.

Source: AXCESSRATE℠ by Arbinet-thexchange and TeleGeography research

Regional growth rates of mobile-terminated traffic were less varied than for mobile-originated traffic, with most regions registering between 15 and 30 percent increases. Such consistency across world regions may indicate a maturing of the mobile-terminated market. Nevertheless, growth remains robust even in the most mature of regional markets. Europe's volume growth was a healthy 15 percent in 2002 (see Figure 3. Percent of Mobile-Terminated International Traffic, 2000-2002).

Despite slowing growth rates, international mobile traffic growth will likely continue to outpace fixed traffic growth as mobile penetration increases and substitution occurs. Roaming is often cited as a contributor to international mobile traffic growth, but its effects are difficult to quantify and often rather volatile. For example, mobile operators in Singapore reported a significant decline in roaming traffic during the height of SARS panic. (For a discussion of how roaming contributes to international mobile traffic, see Figure 4. Roaming and International Mobile Traffic.). Worth noting is that while mobiles account for over half of the world's calling destinations, only a quarter of international call volumes are terminated on mobile—and even less are originated on mobiles. That disparity may indicate some room for growth, but such growth may rely heavily on mobile substitution of fixed phones.

Termination and Regulation

With growing amounts of international traffic flowing to mobile handsets, mobile termination costs have become an increasingly important issue for international carriers, consumers, and regulatory agencies. Terminating traffic on mobile networks is almost universally more expensive than terminating traffic on fixed networks, resulting in a significant differential between call prices to mobile and fixed phones. Figure 6 charts the

Figure 7. Interconnection, Wholesale, and Retail Prices for Select Countries, 2003

	Interconnection (US$/min)			Wholesale (US$/min)			Retail (US$/min)		
Country	Fixed	Mobile	Mobile % of Fixed	Fixed	Mobile	Mobile % of Fixed	Fixed	Mobile	Mobile % of Fixed
France	0.03	0.13	452.4%	0.01	0.13	1066.7%	0.12	0.31	258.3%
Germany	0.02	0.26	1198.2%	0.01	0.16	1341.7%	0.12	0.28	233.3%
Hungary	0.03	0.16	558.6%	0.03	0.14	511.1%	0.27	0.41	151.9%
Italy	0.02	0.17	854.9%	0.01	0.13	1066.7%	0.12	0.27	225.0%
Portugal	0.02	0.22	1118.6%	0.02	0.16	815.0%	0.12	0.31	258.3%
Spain	0.03	0.23	896.8%	0.01	0.15	1363.6%	0.12	0.30	250.0%
Sweden	0.01	0.11	1118.8	0.01	0.12	958.3%	0.12	0.28	233.3%
Switzerland	0.02	0.28	1439.8%	0.02	0.19	1206.3%	0.12	0.33	275.0%

Notes: Percent reflects the mobile rate as a percentage of the fixed rate. Wholesale rates are from New York as of September 2003. Retail rates are from AT&T. Interconnection rates are for national interconnection.

Source: AXCESSRATE℠ by Arbinet-thexchange and TeleGeography research

differences between wholesale rates to fixed and mobile phones in various countries. In some countries, such as the United States and Canada, there are no additional charges associated with mobile termination, and wholesale prices are equal. In countries, such as Spain, wholesale costs to mobiles may be up to 14 times those of calls to fixed lines.

In order to illustrate the economic effects of terminating international traffic on mobile networks, TeleGeography estimated the costs of mobile termination based on wholesale pricing information gathered from the Band-X Switched Minutes Exchange. Though the wholesale rates may not be an exact reflection of actual carrier costs, they serve as an excellent proxy, as differences in wholesale rates between fixed and mobile termination mirror the differences in interconnection rates. If anything, the wholesale rates may provide too conservative an estimate, as the differences between fixed and mobile wholesale rates are sometimes less dramatic than the corresponding interconnection rates (see Figure 7. Interconnection, Wholesale, and Retail Prices for Select Countries, 2002). Note that in some cases, the wholesale rate is actually at or below the interconnection rate as a result of gray market arrangements.

Where the rates for fixed and mobile termination are in line, e.g., Paraguay, mobile traffic does not contribute significantly more to the cost of terminating traffic in a particular country. Where the difference is more substantial, mobile traffic contributes disproportionately to the total cost of termination (see Figure 8. Estimated Costs of Wholesale Traffic to Fixed and Mobile Destinations, 2002). Wholesale rates to Portuguese mobiles, for example, are nine times those to Portuguese fixed lines. Thus, while 37 percent of incoming international traffic is terminated on mobiles, they account for over 80 percent of termination costs. Given the dramatic differences in rates, a slight increase in mobile-terminated traffic may thus produce an appreciable increase in termination costs. In Europe, for example, mobile-terminated calls accounted for 32 percent of incoming international traffic, up only two points over the

Figure 8. Estimated Costs of Wholesale Traffic to Fixed and Mobile Destinations, 2002

Destination	Global Traffic to Destination (m min) Total Traffic	% to Mobile	Wholesale Rate to Destination (US$/min) Fixed	Mobile	Total Cost of Traffic (US$ m) Fixed	Mobile	% to Mobile
Africa							
Cameroon	50.0	44.4%	0.18	0.18	5.01	3.99	44.4%
Congo, Dem. Rep.	8.8	62.0%	0.15	0.19	0.50	1.04	67.4%
Ethiopia	34.3	8.4%	0.37	0.46	11.62	1.33	10.3%
Ghana	153.0	32.0%	0.08	0.09	8.32	4.41	34.6%
Kenya	69.2	40.0%	0.15	0.15	6.23	4.15	40.0%
Madagascar	26.0	34.1%	0.20	0.22	3.43	1.95	36.3%
Morocco	736.7	44.3%	0.18	0.23	73.90	75.02	50.4%
Senegal	183.4	32.5%	0.17	0.18	21.05	10.72	33.8%
Uganda	13.3	47.6%	0.11	0.11	0.77	0.70	47.6%
Africa Total	**5,405.8**	**26.9%**	**0.15**	**0.18**	**585.84**	**266.85**	**31.3%**
Asia & Pacific							
Australia	2,785.5	22.1%	0.02	0.14	43.42	86.05	66.5%
Azerbaijan	69.1	28.0%	0.14	0.15	6.97	2.90	29.4%
Bahrain	200.8	30.9%	0.16	0.18	22.21	11.16	33.4%
Bangladesh	268.8	25.8%	0.16	0.16	31.89	11.12	25.8%
Cambodia	33.4	69.0%	0.33	0.33	3.42	7.61	69.0%
China	4,688.6	19.6%	0.02	0.02	75.42	18.35	19.6%
Georgia	57.6	50.0%	0.06	0.07	1.73	2.02	53.8%
India	2,851.6	10.9%	0.25	0.25	635.29	77.61	10.9%
Indonesia	429.4	25.2%	0.06	0.12	19.26	13.01	40.3%
Jordan	236.0	35.0%	0.13	0.14	19.94	11.56	36.7%
Korea, Rep.	928.0	35.0%	0.03	0.06	18.10	19.49	51.9%
Malaysia	1,050.0	32.0%	0.03	0.03	21.42	10.08	32.0%
New Zealand	1,567.3	20.0%	0.02	0.15	25.08	41.02	65.2%
Pakistan	1,530.4	12.0%	0.24	0.24	323.21	44.09	12.0%
Qatar	134.6	52.7%	0.23	0.30	14.66	21.26	59.2%
Saudi Arabia	815.2	35.1%	0.17	0.19	90.01	54.29	37.6%
Singapore	3,587.0	32.8%	0.01	0.02	24.10	23.53	49.4%
Taiwan	2,001.3	25.1%	0.03	0.08	44.97	40.18	47.2%
Thailand	305.0	35.2%	0.10	0.10	19.78	10.72	35.2%
Asia & Pacific Total	**38,999.4**	**27.1%**	**0.09**	**0.11**	**2,546.19**	**1,208.34**	**32.2%**
Latin America & Caribbean							
Bolivia	115.1	31.0%	0.19	0.20	15.09	7.14	32.1%
Brazil	1,410.7	18.0%	0.07	0.10	80.97	25.39	23.9%
Chile	760.0	15.0%	0.02	0.11	12.92	12.54	49.3%
Colombia	815.8	14.9%	0.08	0.08	55.54	9.72	14.9%
Guatemala	817.7	28.3%	0.15	0.18	87.98	41.61	32.1%
Haiti	54.7	20.9%	0.23	0.29	9.96	3.31	24.9%
Mexico	5,836.9	27.2%	0.10	0.12	424.76	190.69	31.0%
Panama	125.9	25.6%	0.16	0.20	14.98	6.46	30.1%
Paraguay	71.4	45.6%	0.20	0.22	7.76	7.17	48.0%
L. America & Carib. Total	**17,471.5**	**24.3%**	**0.11**	**0.13**	**1,444.68**	**555.35**	**27.8%**

Notes: Global traffic to destination equals total incoming traffic to each country in 2002 and includes both traffic reported to TeleGeography and estimates. As incoming traffic is much more difficult to track than outgoing traffic, the sum of regional averages for incoming traffic does not directly compare to that of outgoing traffic. Bypass, refile, and a number of other factors contribute to the apparent "deficit."

Rates are from the Band-X London switch as of August 2002. Total cost to fixed and mobile destinations are estimated by multiplying the volume of total international minutes to fixed and mobile phones in each country by the wholesale rates to fixed and mobile destinations in the respective country. Figures may show rounding errors and weighting in calculations for regional averages.

Source: Band-X Ltd. and TeleGeography research

Figure 8. Estimated Costs of Wholesale Traffic to Fixed and Mobile Destinations, 2002 (Continued)

Destination	Global Traffic to Destination (m min) Total Traffic	% to Mobile	Wholesale Rate to Destination (US$/min) Fixed	Mobile	Total Cost of Traffic (US$ m) Fixed	Mobile	% to Mobile
Europe							
Austria	1,721.0	43.7%	0.02	0.16	19.39	120.26	86.1%
Bulgaria	213.0	25.0%	0.06	0.14	9.59	7.46	43.8%
Czech Republic	580.0	42.2%	0.03	0.13	10.06	31.80	76.0%
Denmark	1,203.2	28.0%	0.02	0.14	17.33	47.17	73.1%
Finland	398.6	42.0%	0.02	0.15	4.62	25.11	84.5%
France	8,899.4	27.1%	0.02	0.16	129.75	385.88	74.8%
Germany	15,092.5	28.0%	0.02	0.15	217.33	633.89	74.5%
Greece	935.0	31.0%	0.04	0.11	25.81	31.88	53.3%
Hungary	448.5	33.0%	0.04	0.15	12.02	22.20	64.9%
Italy	5,889.3	50.3%	0.02	0.16	58.54	473.96	89.0%
Luxembourg	394.1	35.0%	0.02	0.09	5.12	12.41	70.6%
Malta	65.5	32.5%	0.05	0.12	2.21	2.56	53.6%
Moldova	191.4	20.8%	0.07	0.07	10.61	2.79	20.8%
Netherlands	2,802.2	38.0%	0.02	0.19	34.75	202.32	85.3%
Norway	1,192.8	23.2%	0.01	0.13	9.16	36.05	79.7%
Portugal	1,310.3	37.4%	0.02	0.18	16.40	88.24	84.3%
Slovak Republic	278.0	33.4%	0.05	0.14	9.26	13.00	58.4%
Spain	3,415.3	33.0%	0.01	0.18	22.88	202.87	89.9%
Sweden	1,427.6	28.0%	0.01	0.14	10.28	55.96	84.5%
Switzerland	3,338.1	35.0%	0.02	0.17	43.40	198.62	82.1%
Europe Total	**69,520.9**	**31.6%**	**0.03**	**0.15**	**1,237.60**	**3,380.57**	**73.2%**
U.S. & Canada							
Canada	9,595.3	6.2%	0.02	0.02	180.01	11.90	3.2%
United States	14,249.8	5.0%	0.02	0.02	270.75	14.25	5.0%
U.S. & Canada Total	**23,845.1**	**5.5%**	**0.02**	**0.02**	**450.75**	**26.15**	**5.5%**

Notes: See facing page.

Source: Band-X Ltd. and TeleGeography research

previous year. The mobile percentage of termination costs, however, increased from 69 to 73 percent. These cost estimates are meant to be solely illustrative, but the economic effects they imply are definitely real.

The grave economic reality of these effects, exacerbated by burgeoning call volumes, has fomented a complete reversal in regulatory trends over the past few years. Where national regulatory agencies (NRAs) were once more concerned with stimulating the industry growth and competition, often through implementing calling party pays (CPP) payment structures and pricing constraints on fixed interconnection, they are now scrutinizing the charges levied for connection to mobile networks and, in some cases, intervening on behalf of fixed-line operators.

The European Union, long a leader in both international traffic and mobile penetration, has been most notorious for its pronounced interconnection price differentials (occasionally as severe as 2,000 percent), attracting vociferous complaints not only from

Figure 9. Payment Structures for Mobile Calls

Two payment structures exist for mobile services: calling party pays (CPP) and receiving party pays (RPP). In the former, the party originating the call to a mobile phone pays a premium for access to the mobile network. That is, the mobile user receiving the call incurs no charge for incoming traffic to her handset. Under the RPP scheme, the premium for mobile services is incurred by the mobile user receiving the call; the calling party pays the same price as for a comparable call to a fixed-line phone.

Of the two, CPP is by far the most commonly implemented payment structure, with RPP limited to only a handful of countries such as the U.S., Canada, China, Singapore, and Sri Lanka. The factors determining the choice of payment structure are largely contextual. CPP has been easy to introduce where consumers are accustomed to metered local calling and additional dialing codes were available for exclusive use by mobile providers. In countries where consumers are more accustomed to unmetered local calling or where technical obstacles (e.g., the availability of dialing codes) were encountered, RPP has been implemented. Mexico and Argentina are notable in that they have both switched from RPP to CPP during the past three years.

Proponents of CPP argue that it increases mobile penetration, especially by facilitating pre-paid mobile services. RPP, they contend, discourages mobile usage, prompting subscribers to turn off their phones or refuse calls rather than incur the charge for receiving them. Advocates of RPP, however, point out that RPP tends to keep fixed-mobile interconnection charges in line with prices for other forms of interconnection. In CPP markets, they contend, the mobile consumer has no incentive to consider the price for call termination on their phones when choosing a mobile provider. For customers in RPP markets, the cost of fixed-mobile interconnection is, in fact, a consideration in provider selection, and providers have nothing to gain by inflating prices. Recent studies have supported both claims: the number of subscribers has grown more rapidly in CPP countries, while fixed-mobile interconnection prices are substantially lower in RPP countries. Mexico provides an acute example of both trends. After the introduction of CPP in 1999, mobile subscribers in Mexico increased dramatically, more than doubling the previous year's growth, and the effective fixed-mobile interconnection tariff increased by approximately 250 percent. Despite the increased tariff, there was a considerable increase in incoming mobile traffic.

Source: TeleGeography research

European fixed-line operators but also from bodies such as the Office of the United States Trade Representative (USTR) and the Federal Communications Commission (FCC). In response to these criticisms and as part of the implementation of the European Telecommunications Regulatory Package, almost every European NRA has undertaken studies of the mobile market, with particular attention paid to interconnection issues. The results have been mixed, ranging from the establishment of best-practice guidelines for setting interconnection prices (in France) to direct mandates for cost-oriented pricing (in Sweden) to no intervention whatsoever (in Germany).

Much of the variation in regulatory action hinges on the market definitions applied to mobile operators. Where operators are deemed to have significant market power (SMP), they are generally subject to greater regulatory control. Thus, in Sweden, Telia, identified as bearing SMP due to its market share, is obliged to provide cost-oriented interconnection to its mobile network while the other two mobile operators are not. Furthermore, the Swedish regulator issued a mandate stating that the competitors' interconnection rates should be within 10 percent of Telia's rates in order not to warrant further regulatory investigation and potential action.

In the United Kingdom, Oftel has deemed each of the four mobile operators to wield SMP over mobile termination, due to their monopoly control over interconnection to their networks rather than their share of the overall market. As a result, all four operators are subject to regulatory intervention regarding interconnection. The broad assignment of SMP and corollary subjection to regulatory control underscores Oftel's generally aggressive stance towards reducing mobile interconnection prices. In September 2001, Oftel released its recommendations for cutting prices and implementing a price cap for termination charges. Mobile operators opposed Oftel's recommendation and referred the dispute to the Competition Commission. The Commission concurred with Oftel, suggesting a 15 percent reduction by April 2003 and subsequent reductions over the next three years.

Similar regulatory efforts have yielded disparate results. A court in the Netherlands overturned an OPTA (the Dutch NRA) ruling on fixed-mobile termination pricing earlier this year. Spanish regulator CMT mandated a 17 percent rate cut in 2002, followed by an additional seven percent reduction in October 2003. Italy's regulator approved a 13 percent reduction in fixed-to-mobile call costs in June 2003 and announced the possibility of a further 20 percent reduction over 2004 and 2005. Given the relative independence of European NRAs and the litigation pursuant to any regulatory intervention, the evolution of mobile termination rates will likely continue to be marked by such regional variations.

Despite regulatory differences within the EU, mobile termination costs are clearly, if slowly, moving downward. The differential between wholesale rates to European countries has generally narrowed, though generally by less than 20 percent. Elsewhere, the gap between prices has also narrowed, by as much as 50 percent in some cases. Wholesale rates, however, are highly variable over time and may reflect illicit, grey market arrangements rather than stable price declines.

Where from Here?

While such price reductions are welcome news for consumers and international carriers, their effect on mobile operators may be particularly severe. According to some estimates, mobile operators depend on termination for 25 percent of their revenues. Faced with mandated price cuts, mobile operators are struggling to shore up their average revenue per user (ARPU), which is no small feat given the slow up-take of 3G services and the inherent volatility of roaming traffic. International carriers can thus expect declines in termination costs to be much slower than pricing declines elsewhere in the international market and much more hotly contested. With mobile phones now outnumbering fixed lines, international mobile traffic and its associated costs will undoubtedly be an acute concern of international operators for some time to come.

International Services of U.S. RBOCs

In most of the world, the incumbent fixed-line local-exchange carrier (LEC) also dominates the national and international long-distance market. The U.S. stands as an exception to this rule: AT&T's local and long-distance services were separated in 1984 as a condition for settlement of a landmark antitrust case against AT&T. The terms of the "Modified Final Judgement" split AT&T into distinct operating companies: a long-distance carrier (AT&T), and a group of "Regional Bell Operating Companies." The settlement bequeathed the local network services market to the RBOCs but forbade them from offering long-distance services within their local-service areas.

In the twenty years since, the U.S. fixed-line market has been divided into two broad classes of operators: Local Exchange Carriers (LECs) and long-distance, or "Inter-Exchange Carriers" (IXCs). While the market for long-distance services became fiercely competitive in the 1990s, the market for local services continued to be dominated by the four RBOCs. Collectively, the four RBOCs account for approximately 87 percent of U.S. access lines—but virtually no long-distance customers (see Figure 1. RBOC Statistical Summary). However, this situation is changing rapidly.

Regulatory Changes

The Telecommunications Act of 1996 (1996 Act) dramatically changed the competitive landscape. The 1996 Act was motivated largely by two interrelated concerns. First, the U.S. Congress sought to foster greater competition for local services by, among other things, allowing the country's major long-distance carriers to compete directly for local services with incumbent carriers. The second goal, and the political quid pro quo for the first, was to free the RBOCs from the antitrust constraints imposed in 1984.

According to Section 271 of the 1996 Act, in order to receive FCC authorization to provide long-distance services in a state where an RBOC is the largest local exchange carrier, an RBOC must first prove that its local service market is actually competitive by satisfying a "14-point competitive checklist." "Section 271 Approval," as the process became known, proved to be a long, hard slog for the RBOCs.

Figure 1. RBOC Statistical Summary

Company	Access lines (million)	Long-Distance lines (mil)	Long-Distance Revenue 2002 (billion)	Total Revenue 2002 (billion)
BellSouth	23.9	3.4	$0.88	$22.4
Qwest	16.5	1.1	n.a.	$15.4
SBC	54.8	11.5	$2.32	$43.1
Verizon	56.2	15.9	n.a.	$67.6

Notes: Access line and long-distance line data for BellSouth, SBC, and Verizon for Q3 2003; Qwest access and long-distance data are for Q2 2003. SBC reported 11.5 million long-distance customers rather than subscriber lines.

Source: TeleGeography research

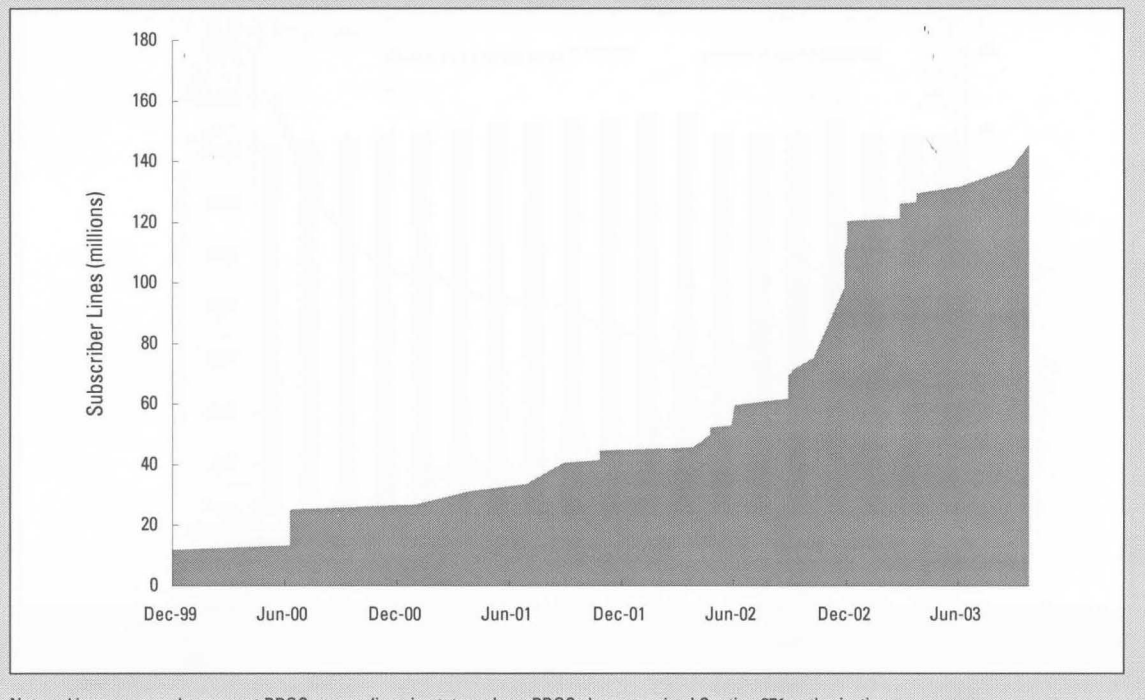
Figure 2. Section 271 Approvals

RBOC	State	Status	Date Approved	RBOC Access Lines
Verizon	New York	Approved	12/22/99	11,857,572
SBC	Kansas	Approved	6/30/00	1,390,959
SBC	Texas	Approved	6/30/00	11,844,985
SBC	Oklahoma	Approved	1/22/01	1,663,280
Verizon	Massachusetts	Approved	4/16/01	4,406,165
Verizon	Connecticut	Approved	7/20/01	2,381,200
Verizon	Pennsylvania	Approved	9/19/01	6,970,719
SBC	Arkansas	Approved	11/16/01	1,037,211
SBC	Missouri	Approved	11/16/01	3,033,011
Verizon	Rhode Island	Approved	2/24/02	641,977
Verizon	Vermont	Approved	4/17/02	360,161
BellSouth	Georgia	Approved	5/15/02	4,225,392
BellSouth	Louisiana	Approved	5/15/02	2,377,949
Verizon	Maine	Approved	6/19/02	731,657
Verizon	New Jersey	Approved	6/24/02	6,681,455
BellSouth	Alabama	Approved	9/18/02	2,260,366
BellSouth	Kentucky	Approved	9/18/02	1,805,685
BellSouth	Mississippi	Approved	9/18/02	1,345,229
BellSouth	North Carolina	Approved	9/18/02	2,892,176
BellSouth	South Carolina	Approved	9/18/02	1,720,475
Verizon	Delaware	Approved	9/25/02	589,979
Verizon	New Hampshire	Approved	9/25/02	795,753
Verizon	Virginia	Approved	10/30/02	4,226,700
SBC	California	Approved	12/19/02	23,013,488
BellSouth	Florida	Approved	12/19/02	9,027,643
BellSouth	Tennessee	Approved	12/19/02	2,673,375
Qwest	Colorado	Approved	12/23/02	2,812,527
Qwest	Idaho	Approved	12/23/02	692,507
Qwest	Iowa	Approved	12/23/02	1,107,337
Qwest	Montana	Approved	12/23/02	374,971
Qwest	Nebraska	Approved	12/23/02	473,127
Qwest	North Dakota	Approved	12/23/02	211,961
Qwest	Utah	Approved	12/23/02	1,076,872
Qwest	Washington	Approved	12/23/02	3,378,958
Qwest	Wyoming	Approved	12/23/02	261,260
Verizon	District of Columbia	Approved	3/19/03	919,587
Verizon	Maryland	Approved	3/19/03	3,932,175
Verizon	West Virginia	Approved	3/19/03	862,638
SBC	Nevada	Approved	4/14/03	426,320
Qwest	New Mexico	Approved	4/15/03	854,785
Qwest	Oregon	Approved	4/15/03	1,918,643
Qwest	South Dakota	Approved	4/15/03	257,651
Qwest	Minnesota	Approved	6/26/03	2,279,543
SBC	Michigan	Approved	9/17/03	5,910,478
SBC	Illinois	Approved	10/15/03	7,609,540
SBC	Indiana	Approved	10/15/03	3,358,983
SBC	Ohio	Approved	10/15/03	5,133,605
SBC	Wisconsin	Approved	10/15/03	2,614,546
Qwest	Arizona	Pending	Pending	2,881,752

Notes: Access line data are as of December 31, 2001. Hawaii and Alaska are not served by RBOCs.

Source: FCC and TeleGeography research

Figure 3. RBOC Access Lines Approved for Long-Distance Service



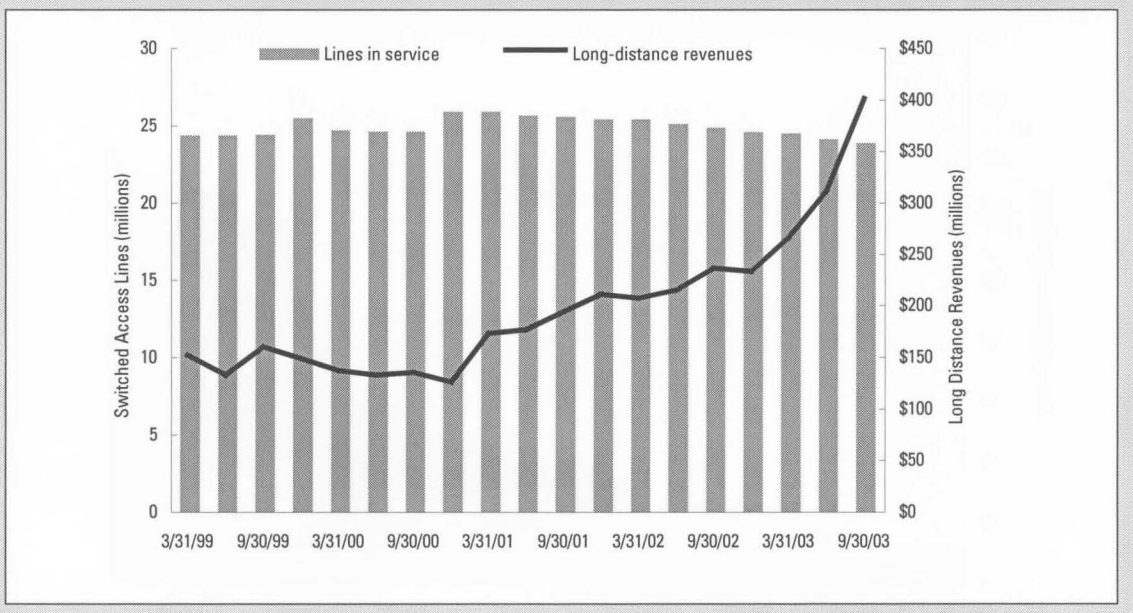
Notes: Lines approved represent RBOC access lines in states where RBOCs have received Section 271 authorization.
Source: FCC and TeleGeography research

Ameritech (which later merged with SBC) filed the first Section 271 application in January 1997, only to have it rejected a few weeks later. The first RBOC to win Section 271 approval in a state was Verizon (then known as BellAtlantic), in New York in December 1999. The pace of approvals continued slowly in 2000 and 2001 and accelerated in mid-year 2002 (see Figure 3, RBOC Access Lines Approved for Long-Distance Service 1999-2003). By November 2003, the Bells had received authorization to provide long-distance services in all states but Arizona (see Figure 2. Section 271 Approvals).

A number of factors account for the recent wave of approvals. While critics of the RBOCs point to a friendlier management team at the FCC, some fundamental issues have changed as well. The Bell Companies are clearly no longer as invulnerable as they seemed during the telecom boom. The number of phone lines in service—the RBOC's core business—peaked in 2000 and has declined by approximately one percent per quarter during the past 12 months. Moreover, a growing number of the lines in service are lower-margin "unbundled" wholesale lines that rival carriers, such as AT&T and MCI, are reselling to their own customers.

Due to the growing pressure on their traditional business lines, the RBOCs have scrambled to find other source of revenues. All four Bells have identified long-distance service as a priority growth area, and international long-distance as a lucrative niche within the sector. Now free from regulatory restraints, the Bells have made rapid inroads in

Figure 4. BellSouth Switched Line and Long-Distance Revenues



Source: BellSouth and TeleGeography research

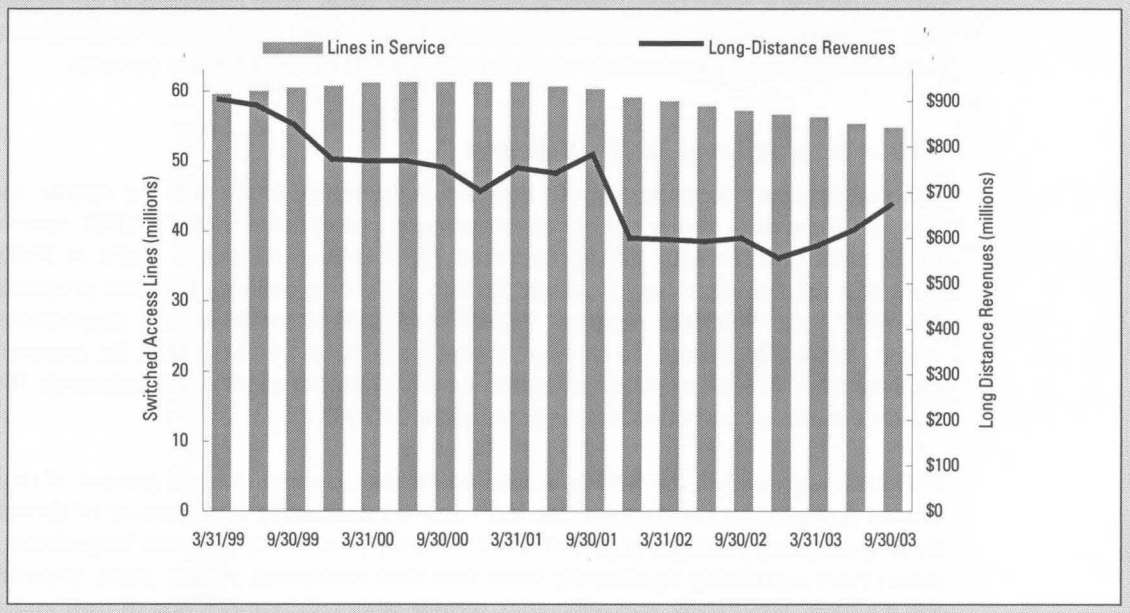
the long-distance market. For example, BellSouth's long-distance revenues have grown more then 70 percent in the past 12 months (see Figure 4), and Qwest's long-distance subscribers more than doubled in the second quarter of 2003.

RBOC International Long-Distance Strategies

While the RBOCs have been quite public about their international long-distance ambitions, most are reluctant to divulge consistent metrics regarding this business. Consequently, assessing their current market position and their potential impact is difficult. However, the four local service providers clearly have the potential to capture substantial international service market share. According to FCC data, the four RBOCs accounted for approximately 15 percent of residential long-distance customers at year-end 2002—compared with almost none in 1999. While they've been gaining market share rapidly, each company is taking a distinct approach to the long-distance market, and the international market, in particular.

Verizon, the largest RBOC, was formed through the 2000 merger of Bell Atlantic with GTE, the largest "independent" (non-RBOC) local-service provider. While Bell Atlantic had been prohibited from competing in the long-distance market, GTE had re-entered this segment in 1996. Verizon was also the first RBOC to receive Section 271 approval in any of its markets, and had aggressively marketed long-distance services to its customers. By the third quarter of 2003, Verizon reported nearly 16 million long-distance access lines in service. Verizon uses a combination of direct bilateral routes and wholesale carriers for its international traffic. Verizon carried over 135.7 million minutes of international traffic in 2002.

Figure 5. SBC Switched Lines and Long-Distance Revenues



Source: SBC and TeleGeography research

SBC is the second largest RBOC, with just under 55 million local access lines in service. SBC received Section 271 authorization in its final four states in October 2003. At the end of the third quarter of 2003, SBC had 11.5 million long-distance customers, and approximately 1.7 million international long-distance customers. SBC currently sends most of its international traffic via WilTel and other wholesale carriers. SBC has developed discount plans for calls to Latin America and Canada to serve its customer base in Texas, California, and the Midwest. SBC has also developed calling plans targeted towards the substantial Arab immigrant communities in Detroit and Chicago. After declining steadily over the past three years, SBC's long-distance revenues began to increase sharply in Q2 and Q3 of 2003 (see Figure 5. SBC Switched Lines and Long-Distance Revenues).

BellSouth was the first RBOC to receive Section 271 authorization in all of its states. With Florida as its largest single market, the company has targeted its international long-distance service offerings towards the Latino community. While BellSouth sends some Latin American traffic via direct routes, the great majority is sent via wholesale carriers. BellSouth reported approximately 16 million minutes of international long-distance traffic in 2002, all of it resale. The company's long-distance revenues have grown more than 70 percent in the past four quarters (see again Figure 4. BellSouth Switched Lines and Long-Distance Revenues), suggesting that international traffic volumes will also increase sharply in 2003.

Qwest, the ambitious fiber-optic network builder, merged with RBOC US West in 2000. Qwest provides an extensive set of wholesale long-distance network services in addition to its local telecom services. Qwest has also provided retail long-distance service on a resale basis outside its local service area. While Qwest is still awaiting 271

approval in Arizona, the company's long-distance subscribers have grown rapidly in its other markets. In the second quarter of 2003, Qwest added 590,000 retail long-distance customers, more than doubling its subscriber base. With its origins in the wholesale networks business, Qwest is developing not just a retail international long-distance business but is also aggressively offering international wholesale voice services.

RBOCs International Traffic Volumes

Although precise international traffic data are not available for most of the RBOCs, the four Bell companies clearly did not generate much international traffic in 2002 relative to the total U.S. market. Verizon reported 135.7 million minutes of traffic in 2002, most of it originating in Hawaii (where Verizon has a long-distance business predating the 1996 Act). BellSouth reported 16 million minutes of traffic, all of it international resale. While SBC did not file an international traffic report with the FCC, the company routes almost all of its international traffic via WilTel, which reported approximately 100 million minutes of outbound international traffic in 2002.

FCC data suggest that the RBOCs accounted for slightly more than 15 percent of residential domestic long-distance subscribers and approximately 10.6 percent of domestic long-distance traffic by year-end 2002. The Bells' share of business long-distance subscribers is probably significantly lower than their residential market share, since the RBOCs have, historically, had difficulties serving large corporations due to their inability to provide a full array of long-distance services. The RBOCs' share of international long-distance service is also likely lower than their share of domestic long-distance services. Price-sensitive high-volume consumers are likely to favor discount carriers, while international businesses, as noted above, have traditionally been a difficult market for RBOCs.

TeleGeography estimates that the RBOCs originated approximately 1.6 billion minutes of international traffic in 2002, roughly 3 percent of total U.S. international traffic. However, most of this traffic was not carried by the Bells, but delivered by wholesale carriers. Consequently, TeleGeography estimates that international traffic actually carried by the RBOCs was between 300 and 400 million minutes, about one percent of U.S. traffic. Though tiny, this volume is important in its historical context. As recently as mid-year 2002, the states for which RBOCs had received Section 271 authorization accounted for only one-third of the Bell's total access lines. With the exception of some of Verizon's former GTE operations, they served no long-distance customers at all prior to 1999.

How much of the international long-distance market will the RBOCs ultimately capture? Though exact parallels are hard to find, the experience of fixed-line operators in other countries provides a useful frame of reference. Incumbent fixed-line operators seldom account for less than thirty percent of a country's international voice traffic. Obviously, the situation of incumbents in other countries is not directly comparable, in that other incumbents' local and long-distance operations were never legally separated. Also, none of the Bells possess the complete national coverage that their foreign counterparts can provide. Nevertheless, the RBOC's rapid market-share gains in the past year suggest they are well on their way to reshaping the U.S. long-distance market.

Carriers

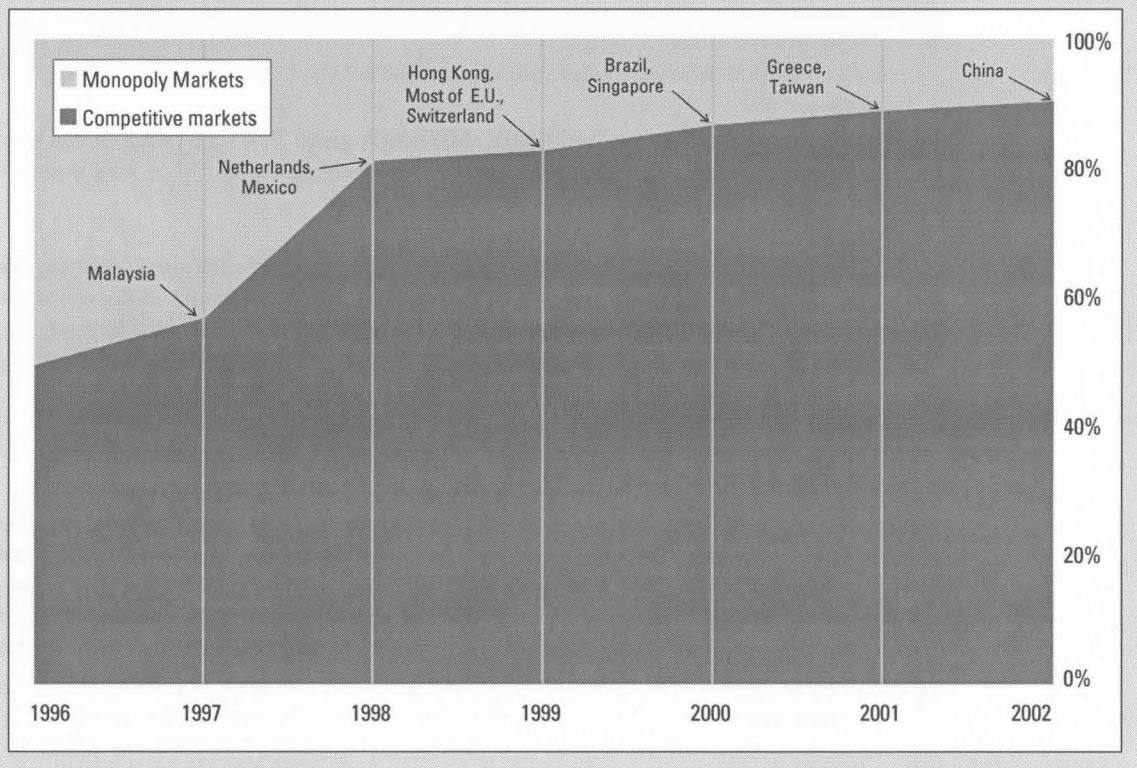
Competition and Market Shares

In 1995, less than half of the world's international traffic was originated in the 15 countries that had opened their international long-distance markets to competition. By 2002, more than 50 countries, accounting for 90 percent of the world's international traffic, had liberalized their international long-distance markets (see Figure 1. Traffic From Competitive Telecom Markets, 1995-2002).

The most dramatic change in the competitive landscape was the European Union's "Big Bang" telecom market liberalization initiative, which opened most of Western Europe to international competition in January 1998 (though a few countries jumped the gun, opening their markets in 1997). Since the dramatic market opening of January 1998, many additional countries have joined the ranks of competitive markets, including Greece, Taiwan, China, and, most recently, India.

New market entrants used low prices to pry customers away from the former monopoly incumbent carriers. Given their lower cost structures and their lack of an established customer base, new carriers were able to price their services far more

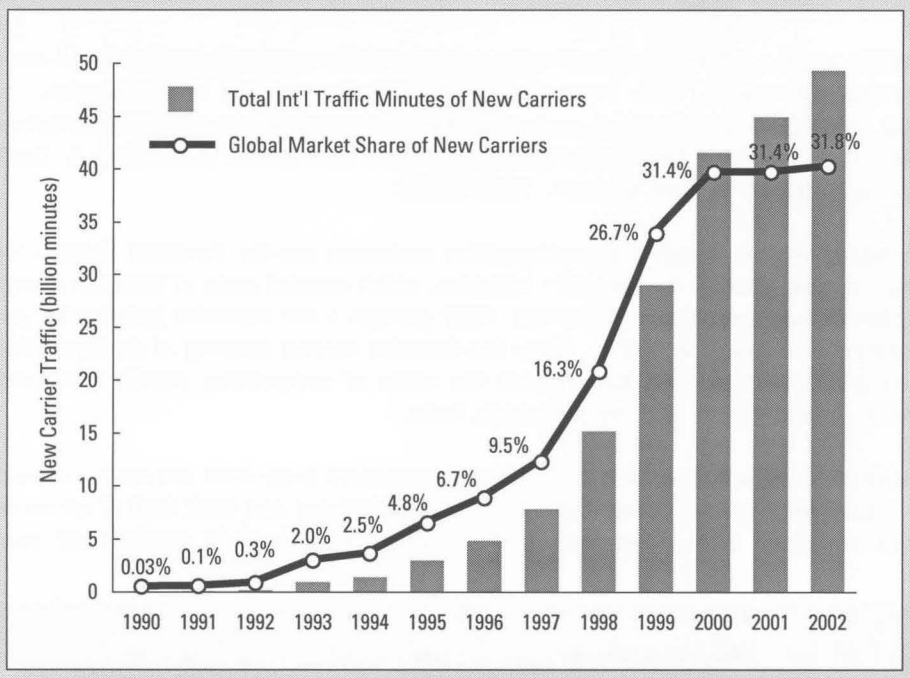
Figure 1. Traffic From Competitive Telecom Markets, 1995-2002



Notes: Country labels reflect the timeline of market liberalization for select countries. Between 1996 and 2002 a total of 35 countries opened their international telecommunications markets to competition.

Source: TeleGeography research

Figure 2. New Carrier Market Shares, 1990-2002



Notes: New carrier figure includes only carriers that began facilities-based operation after 1989.
Source: TeleGeography research

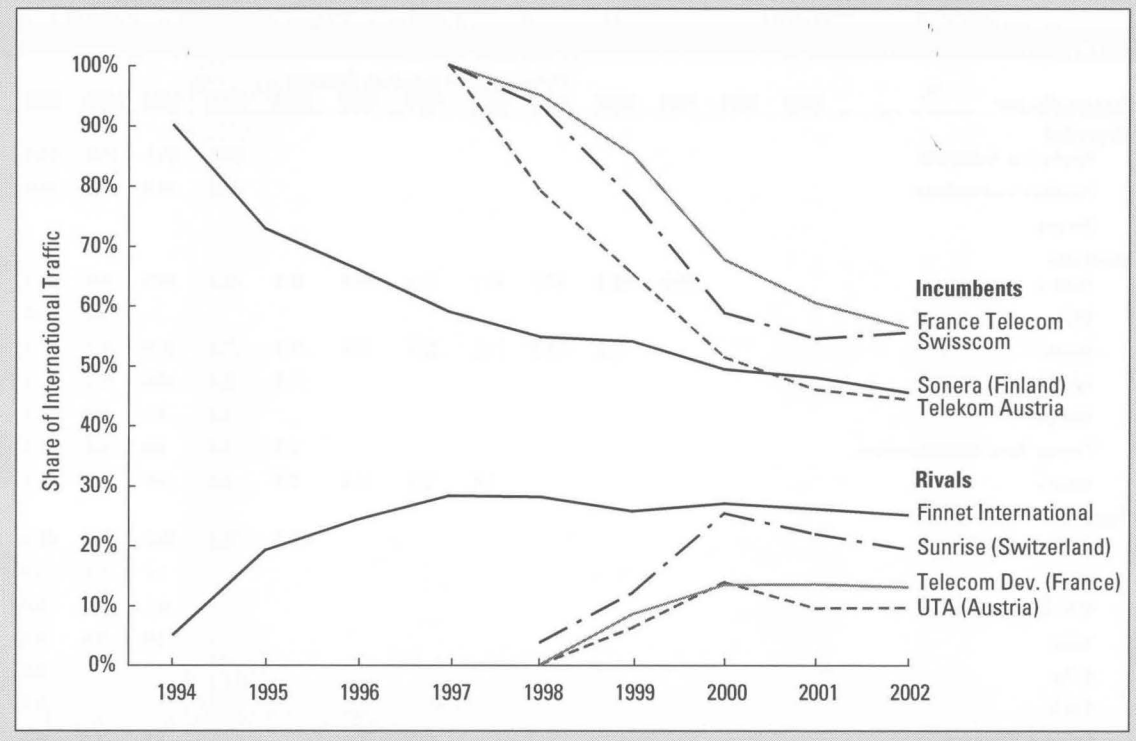
aggressively than their entrenched rivals. Moreover, given that international call costs had traditionally been set well above carriers' underlying costs, there was plenty of room for price reductions.

Low prices proved an effective market-entry strategy. In most countries, new carriers were able to capture 10 to 20 percent of the market within two years of liberalization. Between 1990 and 2002, new international carriers (that is, carriers formed after 1989) grew from a fraction of a percent to 32 percent of the total international long-distance market (see Figure 2. New Carrier Market Shares, 1990-2002).

The Empire Strikes Back

Incumbent carriers were initially slow to respond to the low prices offered by their rivals. Their large customer base, as well has their relatively higher cost structures (most were privatized former state-owned companies, with large legacy staff), made it difficult to cut prices. However, as their market shares declined precipitously, incumbents found themselves with no choice but to cut both prices and costs sharply. Five years into the market era, incumbents' prices generally compare favorably with those of their main domestic rivals, though they have ceded the most price-sensitive customers to deep discount providers. (For example, "Teledump" in Germany offers calls to the U.S. for only 2.1 Euro cents per minute, even during peak business hours—approximately one-sixth the rate charged by either Deutsche Telekom or Arcor.)

Figure 3. Market Shares of Incumbents and Key Rivals, 1998-2002



Source: TeleGeography research

Most incumbents' market shares have stabilized in the past two years at 45 to 55 percent of their home countries' international long distance market (see Figure 3. Market Shares of Incumbents and Key Rivals, 1998-2002). While new carriers gained market share rapidly in the 1990s, their growth has slowed, and now barely exceeds the pace of the international long-distance market as a whole.

Some incumbent carriers, such as AT&T, have even been able to recapture market share lost to rivals in previous years. AT&T's traffic grew from approximately 12 billion minutes in 2001 to 12.7 billion minutes in 2002—approximately 1 billion minutes more than MCI, its closes rival. On a worldwide basis, data suggest that MCI was able to retain its position as the largest carrier of international traffic, with 18.7 billion minutes of traffic, 6 billion of which were originated outside the United States.

Market Shares of International Carriers

Country/Carrier	Percentage of Outgoing Minutes													
	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Argentina														
Telefónica Argentina										54.6	51.1	54.5	54.1	46.9
Telecom International										45.3	48.9	45.5	45.9	46.3
Others														6.8
Australia														
Telstra			100.0	98.0	87.0	76.3	73.4	62.0	55.0	49.5	49.5	38.9	39.2	39.0
MCI												6.0	10.0	19.4
Optus				2.0	13.0	21.9	23.4	27.0	26.0	21.9	21.9	21.7	18.2	17.9
AAPT									11.0	13.4	13.6	12.7	13.1	10.6
Teleglobe										4.4	4.4	5.4	5.9	6.0
Primus Telecommunications									3.0	4.0	5.0	6.0	6.4	3.7
Others						1.8	3.2	11.0	5.0	6.8	5.6	9.3	7.2	3.4
Austria														
Telekom Austria									100.0	79.0	65.3	51.3	45.9	44.3
MCI											1.4	2.6	7.2	12.4
UTA Telekom											6.1	13.8	9.4	9.5
Tele2											5.0	7.1	6.8	7.8
E-Tel													3.9	4.0
COLT													3.7	3.7
Cable & Wireless											3.8	3.5	4.3	2.8
Others										21.0	18.4	21.6	18.9	15.6
Belgium														
Belgacom									100.0	87.1	81.0	69.6	63.7	64.7
MCI												9.8	14.4	19.3
COLT													6.4	4.5
Cable & Wireless												2.1	5.9	1.9
Others										13.0	19.0	18.4	9.6	9.6
Brazil														
EMBRATEL										100.0	100.0	90.7	86.8	66.7
Intelig												9.3	13.2	16.5
Telefónica Brazil														3.6
Telemar Participações														0.8
Others														12.4

Notes: Data based on outgoing international traffic for the public switched network and International Simple Resale (ISR) covering the full calendar or fiscal year. Some data aggregated in "others" rows include market shares for carriers shown individually in later years. Market shares may not total to 100 percent due to rounding.

Source: TeleGeography research

Country/Carrier	Percentage of Outgoing Minutes													
	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Canada*														
Bell Canada											27.4	26.3	25.3	24.4
Allstream					1.0	5.0	8.0	9.0	10.0	14.0	19.1	21.1	21.6	24.0
Teleglobe Canada	29.0	30.0	30.0	31.0	29.0	33.0	30.0	23.0	26.0	23.8	16.9	16.3	17.4	15.8
Sprint Canada							15.0	21.0	17.0	18.0	19.5	14.1	13.9	13.4
Telus											5.8	8.0	7.6	8.9
Primus Telecommunications											8.7	9.0	8.2	7.4
Stentor	71.0	70.0	70.0	69.0	66.0	54.0	44.0	44.0	41.0	40.0				
Others					4.0	8.0	3.0	3.0	6.0	4.0	2.6	5.1	6.0	6.1
Chile														
CTC Mundo				<1.0	17.5	31.2	31.0	22.2	22.8	25.5	26.4	30.6	32.1	31.0
ENTEL Chile			100.0	80.0	57.5	40.0	40.6	37.3	34.1	33.2	34.8	34.2	32.5	30.5
Chile Sat				20.0	25.0	19.7	19.4	15.2	17.9	13.9	12.8	13.0	13.0	14.3
BellSouth Chile						6.6	6.8	10.0	11.1	10.7	10.0	10.1	9.8	10.6
Globus								9.3	6.8	7.0	7.2	3.4	3.2	3.7
TransAm						<1.0	<1.0	2.8	3.1	3.2	3.0	3.1	2.8	3.0
AT&T Latin America-Chile						1.2	<1.0	2.8	3.1	3.0	2.7	2.0	2.0	2.2
Telefónica del Sur Carrier												0.2	1.8	1.8
Others						<1.0	<1.0	0.4	1.0	3.2	3.0	3.4	2.8	3.0
Colombia														
Telecom Colombia									100.0	88.0	70.5	55.7	47.6	37.2
Orbitel										7.0	15.7	24.3	28.2	34.1
ETB										5.0	13.8	20.1	24.2	28.7
Czech Republic														
Cesky Telecom												82.2	77.7	52.6
E-Tel													3.3	2.2
Cable & Wireless													4.6	1.2
Others												18.0	14.1	44.0
Denmark														
Tele Danmark							100.0	92.5	84.4	67.5	55.0	47.2	42.7	39.6
Tele2 Denmark								4.0	6.6	12.4	13.2	13.3	12.1	11.4
Primus Telecommunications													7.8	9.9
SONOFON														7.5
Telia Danmark								3.5	6.3	9.9	10.7	9.1	7.1	6.7
Cable & Wireless												4.7	7.2	2.8
Others									2.7	10.3	21.0	25.7	23.0	21.9

Notes: See page 66.

*Canada: The Stentor alliance, which was dissolved in 1999, included Bell Canada, Telus, MTS, SaskTell, and Aliant. BCE, the parent company of Bell Canada, announced the purchase of Teleglobe in February 2000. Until October 1998, Teleglobe held a monopoly on all non-U.S. routes. Sprint Canada market shares include Fonorola, which merged with Sprint Canada in 1998. AT&T market shares include ACC traffic prior to 1999 merger. Primus acquired the consumer division of AT&T Canada in May 1999.

Source: TeleGeography research

Market Shares of International Carriers

Country/Carrier	Percentage of Outgoing Minutes													
	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Dominican Republic														
CODETEL				100.0	90.0	85.8	83.0	77.0	73.8	72.2	78.1	77.4	77.8	73.8
Tricom						6.7	7.5	12.8	12.9	15.5	14.2	15.5	14.6	14.9
Centennial						7.5	9.5	10.2	13.3	12.3	7.7	7.1	7.6	11.2
Estonia														
Elion													80.0	70.0
Tele2													12.9	18.0
Elisa/Radiolinja													6.4	10.0
Others													0.7	1.9
Finland*														
Sonera					100.0	90.0	72.8	66.0	58.9	54.7	54.0	49.3	47.9	45.5
Finnet International						5.0	19.1	24.2	28.2	28.0	25.7	26.9	26.0	25.0
FinnetCom										0.0	0.0	6.4	7.2	8.0
Song Networks						3.0	7.7	8.8	9.3	12.0	8.6	8.5	6.7	7.1
Others						2.0	0.4	0.9	3.5	5.2	11.6	8.8	12.2	14.5
France														
France Telecom									100.0	95.0	85.0	67.6	60.4	56.3
Telecom Developpement											8.4	13.3	13.4	13.0
LDCOM											0.1	5.8	7.7	11.5
MCI												4.0	4.8	6.5
Cable & Wireless												3.0	5.6	3.2
Telia												1.0	2.0	3.1
COLT													2.2	2.0
Primus Telecommunications													2.0	1.9
Others										5.0	6.6	5.3	1.9	2.4
Germany														
Deutsche Telekom									100.0	80.3	58.0	47.3	48.7	49.7
MCI												10.1	11.7	14.4
COLT												5.2	5.2	5.9
Arcor										3.4	3.3	2.9	4.9	4.4
Telia												1.6	1.5	3.4
Cable & Wireless												4.1	4.8	3.0
Viag Interkom												1.6	1.5	1.4
Others										16.3	38.7	27.2	21.7	17.8
Greece														
OTE												100	93.0	90.0
Others													7.0	10.0

Notes: See page 66.

*Finland: Song Networks acquired Telia's fixed-line business in Finland in June 2001.

Source: TeleGeography research

Country/Carrier	Percentage of Outgoing Minutes													
	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Hong Kong														
PCCW Hong Kong Telecom									100.0	90.0	61.3	39.0	36.4	29.4
City Telecom												16.9	26.3	22.7
New World Telephone										2.1	14.3	14.6	14.9	18.6
MCI												5.8	8.4	8.2
New T&T Hong Kong										2.0	9.6	9.1	8.6	7.5
Others										6.0	14.8	14.6	5.4	13.6
Indonesia														
PT Indosat					100.0	99.5	95.4	88.5	84.8	88.2	86.5	89.2	89.7	89.7
PT Satelindo						0.5	4.6	11.5	15.2	11.8	13.5	10.8	10.3	10.3
Ireland														
Eircom								100.0	91.0	78.0	73.8	75.0	70.3	62.8
MCI									3.0	3.0	6.5	10.6	13.5	16.7
Esat Telecommunications									5.0	8.0	9.9	8.3	10.8	9.9
Others									1.0	11.0	9.8	6.1	5.4	10.6
Israel														
Bezeq								100.0	72.5	51.4	45.9	44.2	41.1	40.2
Barak ITC									15.0	24.8	29.9	31.3	33.0	33.5
Golden Lines									12.5	23.7	24.3	24.5	25.9	26.3
Italy*														
Telecom Italia									100.0	88.6	73.5	65.0	59.2	55.5
Wind Telecomunicazioni										4.5	9.2	10.8	17.1	18.0
MCI												1.8	2.4	7.6
Albacom										1.1	6.5	8.0	6.7	6.3
Cable & Wireless												6.1	7.4	4.5
COLT													1.9	2.7
Others										5.8	10.8	8.3	5.3	5.4
Japan*														
KDDI	93.3	88.0	73.3	69.7	66.9	66.3	66.2	63.9	62.7	58.0	51.3	43.6	36.9	36.0
C&W IDC	3.7	6.5	13.3	15.3	16.9	17.3	17.3	18.7	18.4	18.2	17.6	22.8	25.4	24.8
Japan Telecom	3.0	5.5	13.4	15.0	16.2	16.4	16.5	17.5	19.0	18.3	17.5	16.7	14.1	13.8
NTT Communications Corp.											1.2	2.5	5.9	7.6
MCI											5.1	9.2	6.7	4.8
Others										5.5	7.3	5.2	11.1	13.0
Korea, Rep.														
Korea Telecom			100.0	79.9	74.5	68.7	72.6	73.5	69.0	66.6	59.5	51.9	49.4	52.5
DACOM Corporation				20.1	25.5	31.3	27.4	26.5	27.0	21.9	24.7	23.6	26.7	23.1
Onse Telecom									4.0	11.5	15.8	15.3	15.2	15.8
Others												9.1	8.8	8.5

Notes: See page 66.

*Italy: Wind and Infostrada were merged in 2001.

*Japan: Japan Telecom market shares include ITJ prior to 1997 merger.

Source: TeleGeography research

Market Shares of International Carriers

Country/Carrier	Percentage of Outgoing Minutes													
	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Malaysia														
Telekom Malaysia							100.0	90.0	80.0	77.0	58.5	61.1	54.7	45.8
Maxis Communications										7.6	11.2	15.9	18.1	17.1
TIME Telekom										4.9	8.7	8.9	8.3	17.0
Celcom								8.0	11.0	10.0	14.5	9.0	11.5	10.7
Digi Telecommunications											7.2	5.5	7.4	9.4
Others								2.0	9.0	1.0	1.0	1.0		
Mexico														
Telmex								100.0	83.0	78.1	68.0	64.7	68.0	68.7
Avantel									7.5	8.5	10.0	15.1	14.7	15.0
Alestra									8.5	10.5	13.1	13.1	12.5	12.8
Others									1.0	3.0	8.9	7.1	4.8	3.5
Netherlands														
PTT Telecom Netherlands (KPN)								100.0	95.0	84.9	68.3	57.8	51.4	47.2
MCI												10.8	9.5	18.7
Primus Telecommunications												3.5	3.0	9.0
Telfort											16.8	19.3	15.4	8.7
COLT													7.2	6.0
Cable & Wireless												2.2	6.7	4.2
Others									5.0	15.1	14.9	6.3	6.7	6.2
New Zealand														
Telecom New Zealand	100.0	92.0	82.0	80.0	78.4	74.8	78.0	78.2	74.6	77.6	72.5	71.8	71.4	64.9
TelstraClear		8.0	18.0	20.0	21.6	25.2	22.0	19.8	20.2	12.5	17.9	15.3	15.0	14.7
Others								2.0	5.2	9.9	9.6	12.9	13.6	20.3
Nigeria														
Nigerian Telecommunications													100.0	97.0
Others														3.0
Norway														
Telenor									100.0	92.6	73.2	75.0	72.6	66.2
Tele2 Norge											7.0	7.3	6.9	6.9
Others										7.4	19.8	17.6	20.5	27.0

Notes: See page 66.

Source: TeleGeography research

Country/Carrier	Percentage of Outgoing Minutes													
	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Philippines*														
PLDT			100.0	91.6	84.2	69.0	68.0	79.0	73.0	69.0	65.4	51.8	49.9	46.0
Globe Telecom								2.0	7.0	8.6	16.0	30.6	36.7	41.2
Digitel								2.0	3.0	4.3	4.9	5.0	4.5	4.5
Bayan Tel							<1.0	4.0	5.0	5.7	4.6	3.5	2.6	3.1
Eastern Telecommunications						7.0	6.0	5.0	7.0	6.4	3.4	4.6	3.8	2.9
Capitol Wireless						<1.0	<1.0	1.0	1.0	3.5	4.1	3.1	1.5	1.4
Philippine Global Communications				8.4	15.8	23.0	23.0	6.0	3.0	1.1	1.3	1.2	0.9	0.9
Others						1.0	3.0	1.0	1.0	1.4	1.0	1.0	1.0	1.0
Portugal														
Marconi												83.3	76.3	76.7
Cable & Wireless												8.6	12.5	10.0
Jazztel												2.0	1.7	2.0
Others												6.1	9.6	11.3
Singapore														
Singapore Telecom											100.0	95.0	83.7	74.1
StarHub												4.0	10.4	11.2
MCI												0.2	2.4	4.5
Others												0.7	3.6	10.2
Spain														
Telefónica									100.0	90.5	82.7	82.6	72.2	56.4
Lince											2.1	2.4	3.2	8.2
MCI												0.3	2.4	6.3
Teleglobe											2.2	2.6	2.9	5.9
Retevisión										4.5	4.3	3.7	3.5	5.8
Cable & Wireless												3.3	8.6	4.5
BT												1.4	2.3	3.9
Communitel Global														3.8
COLT													2.1	1.8
Others										5.0	8.7	3.7	2.9	3.4
Sweden														
Telia				100.0	92.0	87.0	76.0	69.0	66.0	61.0	53.1	47.1	43.4	39.3
MCI												13.8	17.0	19.9
Tele2					8.0	13.0	21.0	22.0	22.0	24.0	18.0	14.5	13.2	10.9
Telenordia											7.0	4.8	4.4	5.7
COLT													2.0	4.0
Cable & Wireless												0.4	6.2	2.3
Others							3.0	9.0	12.0	14.0	28.9	19.4	13.8	17.9

Notes: See page 66.

*Philippines: PLDT market shares include Smart Communications traffic prior to 1999 acquisition. Globe Telecom market shares include Islacom traffic prior to 2001 merger.

Source: TeleGeography research

Market Shares of International Carriers

Country/Carrier	Percentage of Outgoing Minutes													
	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Switzerland*														
Swisscom									100.0	93.1	77.6	58.7	54.4	55.4
Sunrise										3.7	6.6	25.3	21.8	19.3
MCI												7.4	5.7	9.4
COLT													4.3	5.6
Cable & Wireless												5.3	6.4	2.8
Others										3.0	22.4	3.3	7.4	7.4
Taiwan														
Chunghwa Telecom										100.0	100.0	91.2	80.6	64.6
Others												8.8	19.4	35.4
United Kingdom*														
BT	91.0	86.0	81.0	76.8	74.2	68.6	67.7	60.0	54.9	51.7	39.7	37.2	30.4	27.9
Cable & Wireless	9.0	14.0	19.0	23.2	24.0	28.1	25.8	26.8	30.3	32.2	31.3	28.5	22.3	23.8
MCI								6.6	5.1	5.2	10.0	11.8	12.5	14.5
Primus												3.5	5.0	5.8
Teleglobe										4.2	4.8	5.6	4.1	5.2
COLT													3.7	4.7
Energis Carrier Services												4.2	3.6	3.4
Telia												2.0	2.5	2.7
Others					1.8	3.3	6.5	6.6	9.7	7.0	14.2	7.2	15.9	12.0
United States*														
AT&T Corp.	83.3	78.4	74.8	70.3	62.2	60.1	54.3	50.2	44.7	42.9	36.8	25.7	30.9	31.7
MCI	10.2	14.6	17.8	21.2	25.4	28.6	32.0	32.9	31.2	28.6	28.3	33.0	29.5	29.1
Sprint	5.8	6.4	6.3	7.3	10.3	11.1	11.3	13.2	12.0	11.6	12.7	10.4	13.9	11.8
IDT Corporation											0.5	4.4	5.5	9.0
Teleglobe USA									1.3	3.3	4.9	4.0	3.8	4.2
Cable & Wireless												0.9	2.3	2.7
Primus									0.3	0.5	3.0	2.9	2.1	2.5
TRICOM USA												1.0	1.6	2.2
Telecom New Zealand														1.9
Telia USA												0.9	1.4	1.1
Others	0.7	0.7	1.1	1.2	2.1	0.2	2.4	3.7	10.5	13.1	14.7	16.8	9.0	3.8

Notes: See page 66.

* Switzerland: Sunrise shares include diAx traffic prior to November 2000 merger.

* United Kingdom: Figures for Cable & Wireless reflect data for Mercury prior to its April 1997 merger with Bell Cablemedia, Videotron, and NYNEX CableComms.

* United States: Market shares for U.S. carriers prior to 1993 exclude traffic to Canada and Mexico. MCI market shares prior to 1998 merger aggregate MCI and WorldCom traffic. World Access filed for bankruptcy and ceased operations in the first half of 2001.

Source: TeleGeography research

Top 40 International Carriers

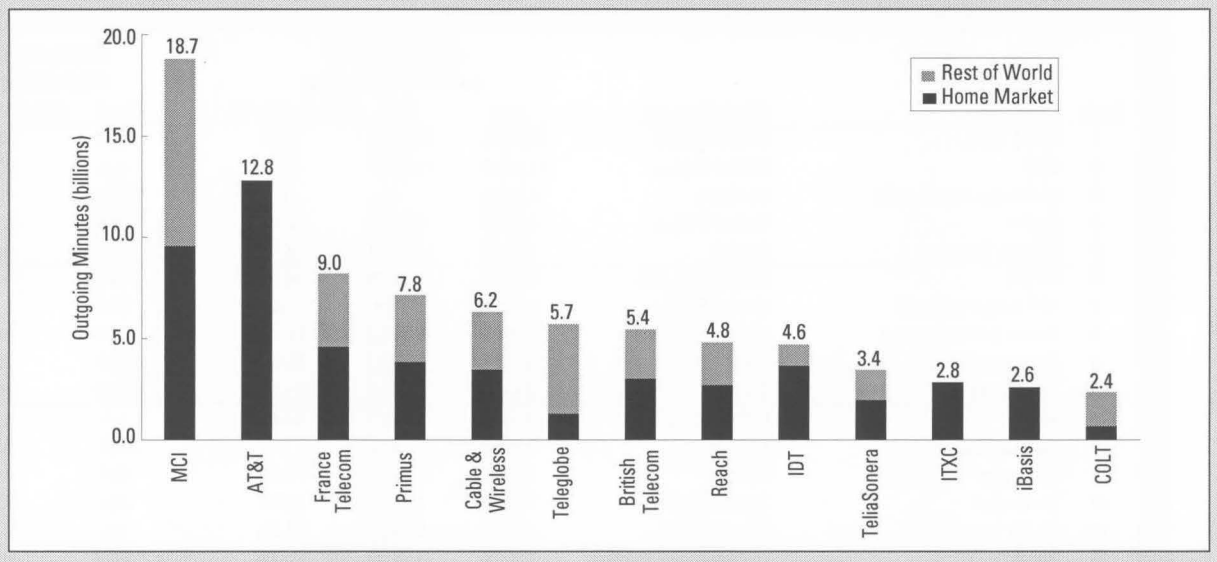
Rank	Company	Origin Country	Outgoing Traffic (millions of minutes) 2002	2001	Change '01-'02	2002 Revenue (US$ billions) Total	Int'l Service
1	AT&T Corp.	United States	12,796.5	12,006.8	6.6%	$37.8	$4.5
2	MCI	United States	11,750.2	11,454.7	2.6%	n.a.	$1.1
3	Deutsche Telekom (b)	Germany	5,275.0	n.a.	n.a.	$50.8	n.a.
4	Sprint	United States	4,774.3	5,384.4	-11.3%	$26.6	$0.5
5	France Telecom	France	4,603.0	4,592.0	0.2%	$44.1	n.a.
6	BT (a)	United Kingdom	4,058.5	4,233.5	-4.1%	$29.0	n.a.
7	IDT Corporation (b)	United States	3,644.5	n.a.	n.a.	$1.5	n.a.
8	Cable & Wireless (a)	United Kingdom	3,459.2	3,113.8	11.1%	$6.6	n.a.
9	Telecom Italia	Italy	3,405.1	3,042.0	11.9%	$28.8	n.a.
10	Telefónica	Spain	2,518.2	3,084.8	-18.4%	$27.6	$1.2
11	MCI	United Kingdom	2,103.0	1,747.4	20.4%	n.a.	n.a.
12	Bell Canada (b)	Canada	2,000.0	n.a.	n.a.	$12.6	n.a.
13	Allstream	Canada	1,960.7	1,711.4	14.6%	$0.9	n.a.
14	Swisscom	Switzerland	1,937.0	1,757.0	10.2%	$9.4	$0.1
15	Saudi Telecom	Saudi Arabia	1,916.3	1,516.6	26.4%	n.a.	n.a.
16	Etisalat	United Arab Emirates	1,893.6	1,395.9	35.7%	$2.2	n.a.
17	Teleglobe USA	United States	1,677.9	1,458.1	15.1%	n.a.	n.a.
18	PTT Telecom (KPN)	Netherlands	1,662.9	1,695.0	-1.9%	$12.1	$0.4
19	MCI	Germany	1,533.0	1,209.1	26.8%	n.a.	n.a.
20	Belgacom	Belgium	1,530.7	1,372.2	11.6%	$4.9	$0.5
21	Singapore Telecom (a)	Singapore	1,456.0	1,565.0	-7.0%	$5.8	$0.5
22	Telmex	Mexico	1,371.9	1,386.4	-1.0%	$11.7	$1.0
23	Chunghwa Telecom	Taiwan	1,368.0	1,227.2	11.5%	$5.1	<$0.1
24	China Telecom	China	1,325.0	n.a.	n.a.	$9.2	$0.1
25	Teleglobe Canada	Canada	1,289.3	1,376.7	-6.4%	n.a.	n.a.
26	Rostelecom	Russia	1,219.2	1,081.6	12.7%	$0.8	$0.3
27	Telstra (a)	Australia	1,200.0	1,188.0	1.0%	$12.0	$0.2
28	PCCW Hong Kong Telecom	Hong Kong	1,169.0	1,270.0	-8.0%	$2.6	$0.5
29	Sprint Canada (b)	Canada	1,100.0	n.a.	n.a.	$0.5	n.a.
30	Cable & Wireless	United States	1,092.1	910.1	20.0%	$6.6	n.a.
31	Telecom Developpement	France	1,058.4	1,021.5	3.6%	n.a.	n.a.
32	Primus Telecommunications	United States	1,008.6	832.0	21.2%	$1.0	<$0.1
33	Wind Telecomunicazioni	Italy	987.0	880.0	12.2%	$3.7	n.a.
34	KDDI (a)(b)	Japan	950.0	n.a.	n.a.	$22.9	n.a.
35	LDCOM	France	940.0	585.8	60.5%	$0.5	n.a.
36	City Telecom	Hong Kong	905.0	916.0	-1.2%	$0.1	n.a.
37	OTE	Greece	897.9	825.1	8.8%	$4.1	$0.3
38	TRICOM USA	United States	876.9	603.4	45.3%	$0.3	$0.0
39	Eircom (a)	Ireland	876.6	973.3	-9.9%	$3.0	$0.1
40	Primus Telecommunications UK	United Kingdom	837.1	700.0	19.6%	$1.0	n.a.

Notes: Traffic figures are for public switched telephone network (PSTN) circuits and International Simple Resale only (service resale is excluded). Carrier rankings based on originating country minutes only; when based on the aggregated traffic of all subsidiaries, the top multinational carriers include: AT&T, BT, MCI, Cable & Wireless, Teleglobe, and Primus. International service revenues generally reflect net of PSTN service revenues after adding or subtracting for settlement payments but may also include some private line revenue. All revenue figures converted from original currency at conversion rate current to year end reported.

a. Data are for the fiscal year ending March 31, 2003. Telstra's fiscal year ends June 30, 2003.
b. Traffic data for 2002 are estimates.

Source: TeleGeography research, FCC, and company reports.

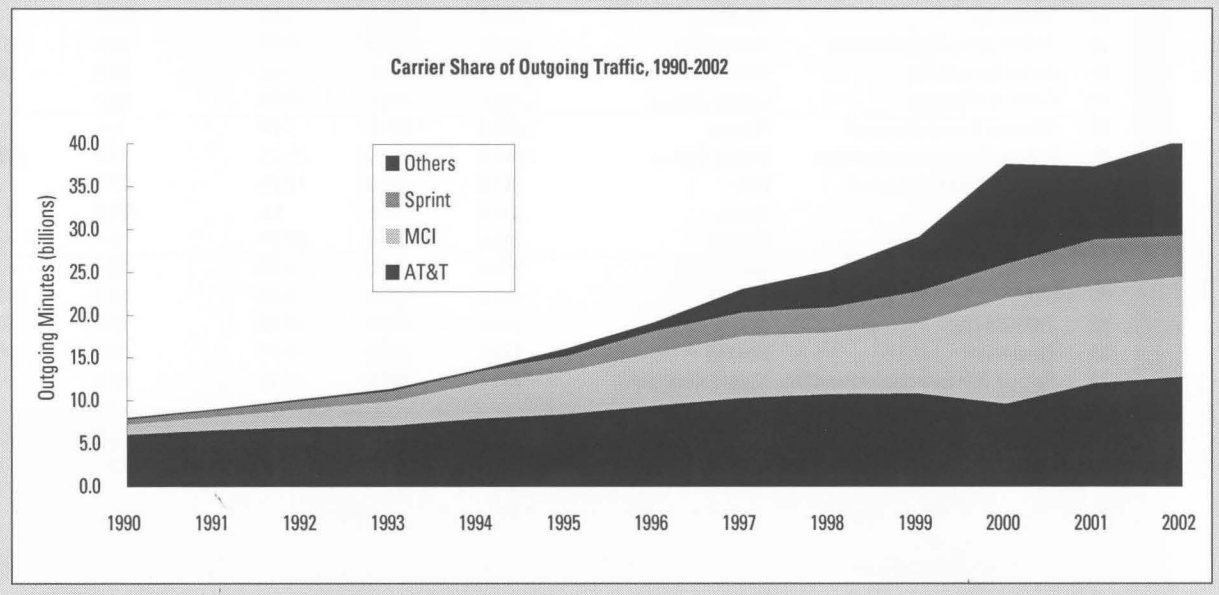
Traffic Base of Selected Multinational Carriers



Notes: AT&T data include U.S.-originated traffic only. Reach home market includes Australia and Hong Kong; TeliaSonera home market includes Sweden and Finland. Some Cable & Wireless data are estimated. ITXC and iBasis traffic are VoIP.

Source: TeleGeography research

Market Shares of U.S. International Carriers



Notes: Traffic figures are for public switched network circuits based on billing point of call, not originating point. International Simple Resale (ISR) is included in facilities-based totals.

Source: TeleGeography research and FCC carrier filings

Price & Revenue

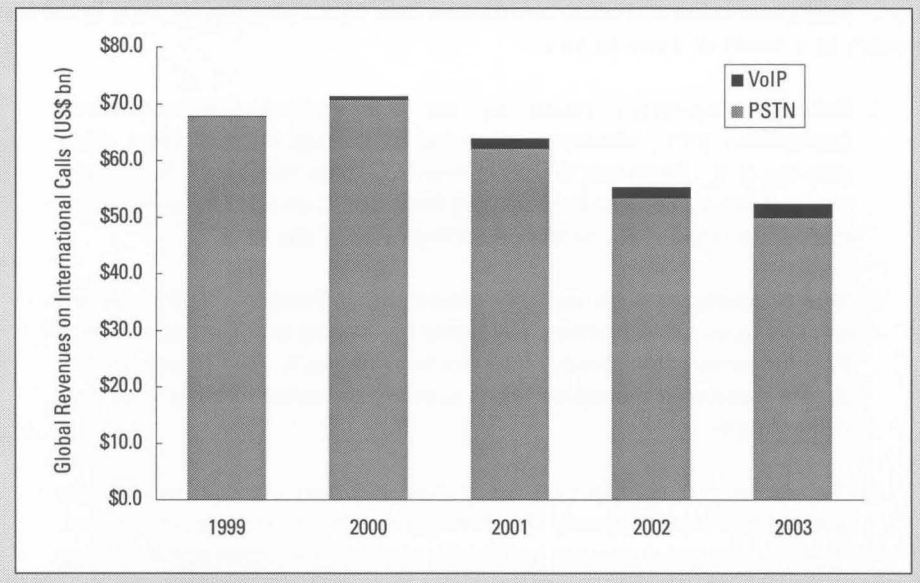
Overview of International Call Price and Revenue Trends

Since reaching a record high of $72 billion in 2000, global revenues from international calls will have slipped to barely $50 billion by year-end 2003. This article examines the turbulent—and often countervailing—trends underlying this revenue slump. While revenue erosion on outgoing international calls has been a near-universal experience for carriers across the globe, carriers' net revenues—outgoing revenues minus settlement payments made to other carriers—have shown mixed results. For some carriers, net revenues have actually increased due to falling settlement payments. The analysis also examines how carriers must contend with increasing market complexity—the number of separately-priced international routes has proliferated, and prices for many of these routes remain volatile. Finally, the analysis concludes with a review of several emerging trends suggesting that the international call revenue erosion may soon slow.

The Revenue Retreat

The biggest story in the international services market remains the revenue decline. The market for international voice communications saw its peak in 2000, when global revenues exceeded $70 billion. Since then, global call traffic has continued to expand; however, plunging call prices have neutralized volume gains. Between 1999 and year-end 2003, TeleGeography estimates that average annual price decreases of 17.2 percent will have undermined annual call volume increases of 11.9 percent, with net revenue growth spiraling downward by an annual average of 7.3 percent globally (see Figure 1. Global Retail Revenues from International Calls, 1999-2003).

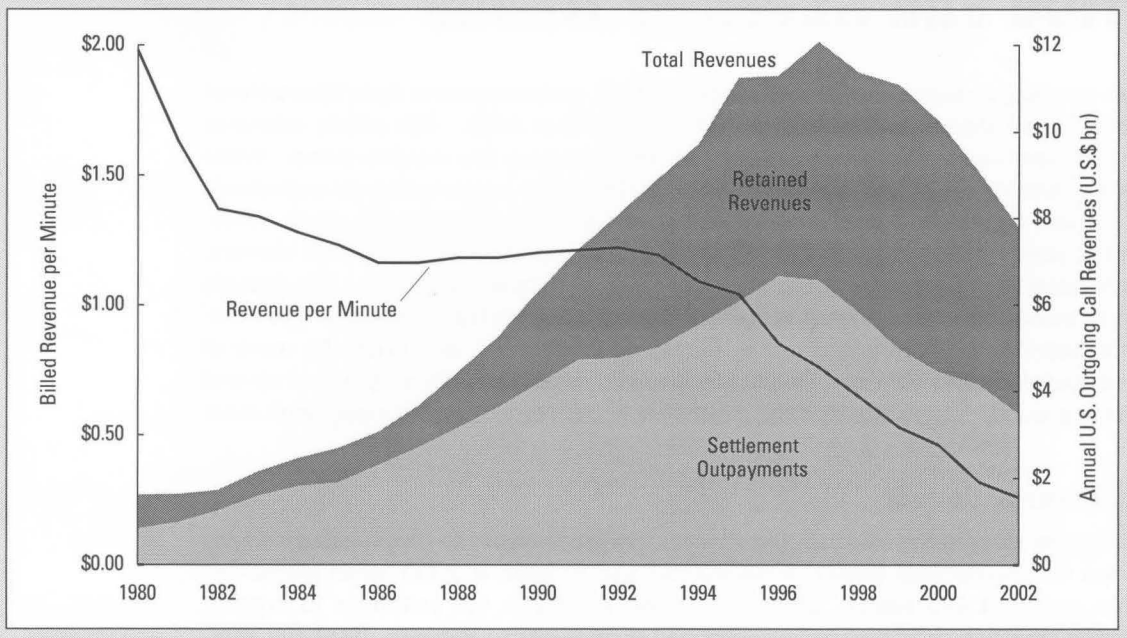
Figure 1. Global Retail Revenues from International Calls, 1999-2003



Notes: Data measure retail revenues on outgoing international calls; totals do not include revenue from wholesale carriers or incoming international traffic termination. Data for 2003 are projections.

Source: TeleGeography research

Figure 2. U.S. Carrier Revenues and Settlement Outpayments, 1980-2002



Notes: Data are for PSTN traffic only. Data exclude calls to Canada and Mexico. Net revenues reflect revenues retained by U.S. carriers on outgoing calls after settlement payments to foreign carriers.

Source: FCC carrier filings and Telegeography research

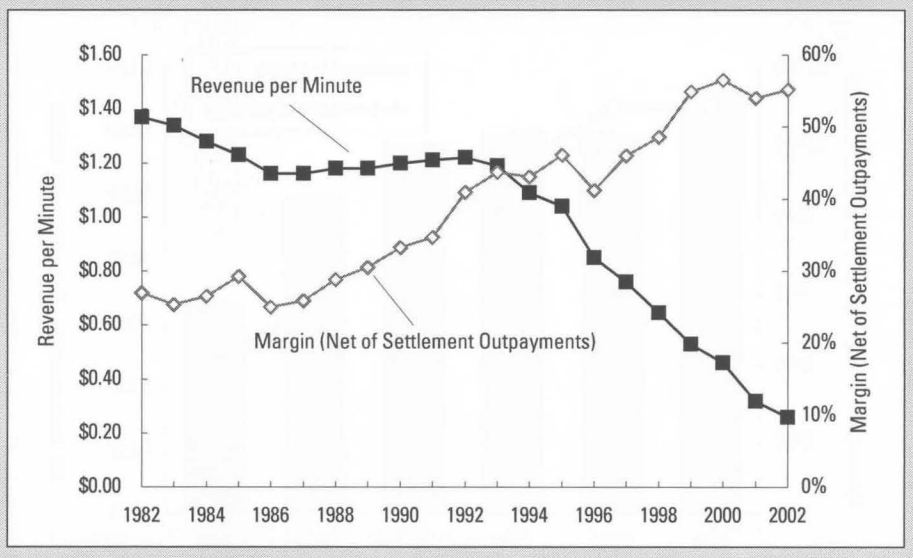
Beginning in the 1990s, fierce competition in many countries forced international carriers to slash prices to near-cost levels. As carriers' costs have subsequently fallen, so too have their prices. Costs have declined largely as a result of lower termination payments—the per-minute fees a carrier must pay to connect each call to its final destination. Settlement rates and other termination fees have fallen significantly in the last ten years as a result of three factors:

1. Unilateral regulatory action by the U.S. Federal Communications Commission (FCC) effectively placed price ceilings on settlement rates with the U.S. Beginning in 1997, new FCC rules required U.S. carriers to negotiate settlement fees ranging from $0.15 to $0.23 per minute—much lower than many of the prevailing rates of the time.

2. New technologies such as Voice-over-Internet-Protocol (VoIP) enabled carriers to evade settlement payments by routing traffic around foreign PTTs for termination directly into the local network. The threat of illicit bypass motivated monopoly telcos in many countries to lower their settlement price.

3. The spread of competition for public switched service increasingly enabled carriers to directly interconnect with their foreign counterparts. Direct interconnect charges are usually the same fees that domestic long

Figure 3. U.S. Carrier International Call Prices and Margins, 1982-2002



Notes: Revenue per minute indicates average revenue per minute on outgoing international calls from the U.S. Calls to Canada and Mexico are excluded.

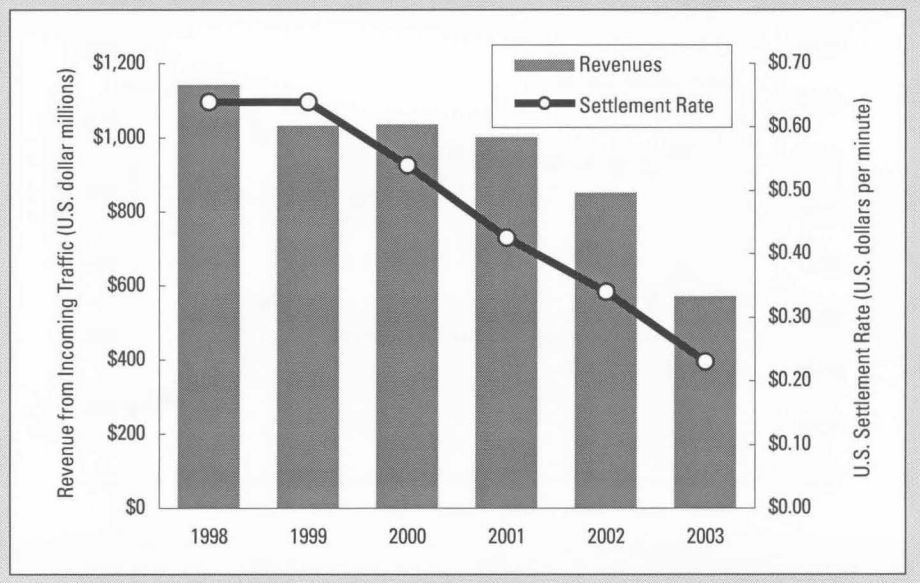
Source: FCC carrier filings and TeleGeography research

distance operators pay to send traffic onto local networks, generally falling in the range of $0.01 to $0.04 per minute—far lower than traditional settlement rates.

Fortunately for many international carriers, profits have fared much better than revenues. While the prices carriers charge customers have dropped precipitously, so have the termination fees paid to overseas carriers. As a result, relative margins (per-minute revenues net of settlement payments) have crept upward for many carriers. For example, multinational carrier Primus has registered an increase in net margin in every quarter since year-end 1998. In 2002, U.S. carriers enjoyed their fattest margins, on average, in twenty years (see Figure 3. U.S. Carrier International Call Prices and Margins, 1982-2002).

Though many carriers have benefitted from falling termination payments, others have suffered. The dramatic settlement rate decreases have damaged carriers receiving more international traffic than they send. VSNL, India's incumbent international carrier, terminates approximately five times as many minutes than it originates. This net traffic surplus has yielded large settlement payment incomes. In fact, VSNL's net settlement surplus with the United States is so large that the carrier lists AT&T and MCI among its five largest "customers." In recent years, VSNL's revenues have plunged in lock-step with its U.S. carrier settlement rate (see Figure 4. VSNL Settlement Rates and Revenues from Incoming Traffic). As with VSNL, carriers in developing countries, historical beneficiaries of large traffic surpluses, face double revenue difficulties as domestic prices on outgoing traffic plunge and overseas settlement payments from incoming traffic dissolve.

Figure 4. VSNL Settlement Rates and Revenues from Incoming Traffic



Source: VSNL financial reports and TeleGeography research

Sizing the Market: Gross versus Net Revenue

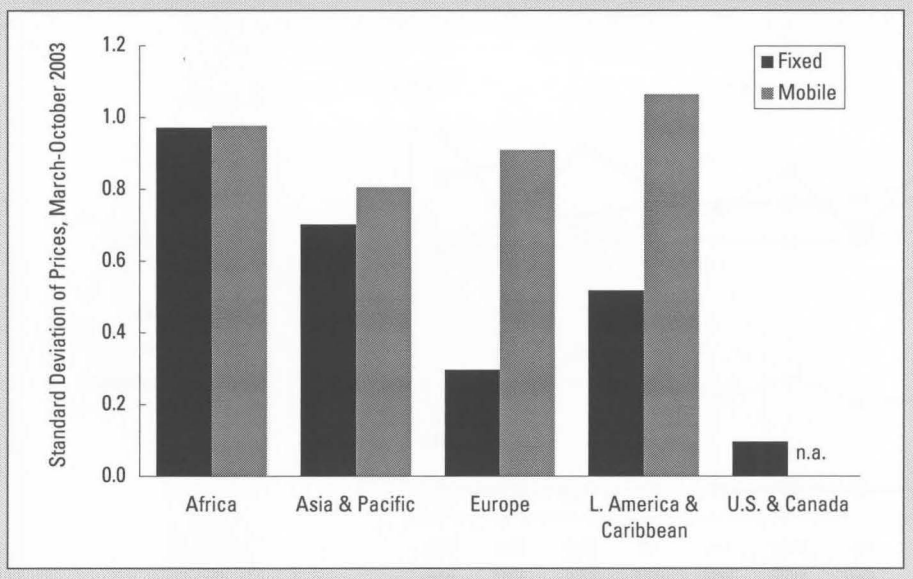
International call revenue collected from end users totaled $53.3 billion in 2002. In recent years, wholesale carriers—intermediaries that bridge carriers generating international calls and the foreign telcos terminating them—have complicated the revenue picture. TeleGeography has launched research to determine how much of total international PSTN traffic travels via wholesale carriers and at what prices. TeleGeography has found that international wholesale carriers handled approximately 53 billion minutes of calls, accounting for roughly $5.4 billion in revenues (see "Overview of International Traffic Trends" on pages 17 to 28).

The $5.4 billion wholesale revenue total is net of payments to other wholesale carriers. However, it is not uncommon for a single call to traverse three, four, or even five different carriers' networks before arriving at its destination, with each carrier booking revenue from the call. Although we estimate total wholesale carrier revenue net of payments to other wholesale carriers to equal $5.4 billion, the actual wholesale carrier industry total may be closer to $10 to 15 billion each year. Settlement payments and other interconnect charges collected by domestic carriers to complete international calls account for an additional estimated $30 to 35 billion per year. Termination payments, when combined with wholesale carrier revenues, accounted for over $40 billion in inter-carrier payments in 2002. Thus, while we estimate net revenues at $53.3 billion, gross international carrier revenues easily exceeded $90 billion.

Market Complexity

As carriers wage their struggle to stem revenue erosion, they must also contend with increasingly complex market choices.

Figure 5. Variance of International Wholesale Prices over Time



Notes Data show the regional averages for month-to-month standard deviation on average wholesale rates from the Arbinet minutes exchange. Standard deviation is a metric of historical variance. In this data set, higher standard deviation equates to higher variance over time (i.e., price volatility).

Source: AXCESSRATE℠ by Arbinet-thexchange and TeleGeography research

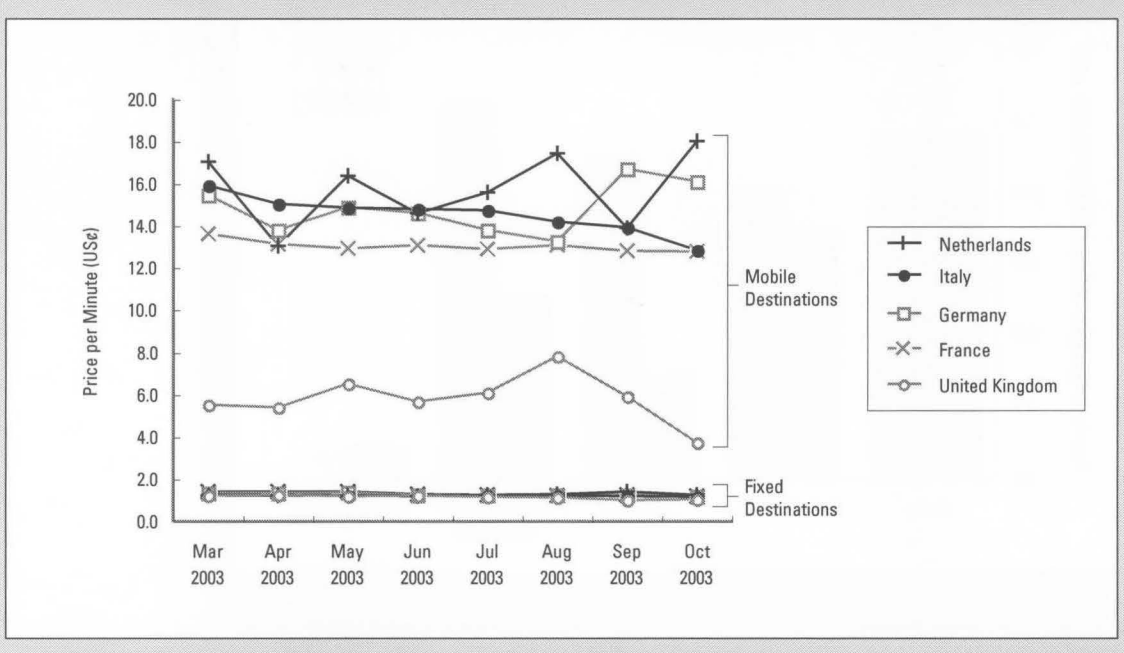
Disintegration of the "One Country, One Rate" System

In previous years, when the international settlement regime held sway, determining interconnection costs was relatively straightforward. A carrier would negotiate a single, per-minute settlement rate with carriers in each country to which it sent traffic. Whether the call traveled to the most densely wired megalopolis or to the most remote hamlet was irrelevant; with few exceptions, the settlement rate was the same to all destinations within a country. Monopoly ownership of most network elements within a country allowed for the simple rate structure.

The twenty-first century telecom market is far more fragmented. Rarely does a single company control all aspects (international calling, domestic long distance, cellular, and local connectivity) of the network. Indeed, many governments now allow foreign carriers to own network elements within their home markets. Thus, a British carrier can build an international network from London to Frankfurt and add on a domestic link from Frankfurt to Munich. However, unless foreign carriers also own the local cell towers or last-mile copper needed to complete a call, they must eventually hand off to some other carrier. For that service, the terminating carrier charges an interconnect fee.

Interconnect fees tend to vary by distance: fees covering calls terminating within a major city are at the low end of most rate structures; termination fees that include long-distance transport within the destination country are more expensive. In many countries, the type of operator completing a call also plays an important role in determining interconnect fees. In Europe, termination rates to mobile phones are sometimes eleven times higher than fees to fixed networks. International wholesale carriers typically pass

Figure 6. International Wholesale Prices to Europe: Mobile versus Fixed



Notes: Data measure average international wholesale prices from the Arbinet minutes exchange.
Source: AXCESSRATE℠ by Arbinet-thexchange

these fees onto their customers. Consequently, international wholesale prices typically fall into three groupings: calls to cities are among the cheapest, calls to fixed-line telephones in other parts of a country are in the middle, and (in those countries with high mobile interconnect fees) calls to wireless phones are the most expensive.

Operators that do not tailor their prices to their termination costs run the danger of losing substantial sums. As a hypothetical example, an operator may offer a single, blended rate of $0.25 per minute to a country where the incumbent Local Exchange Carriers (LEC) charges a $0.05 termination fee and the mobile operator charges a $0.35 fee. When dealing with most customers (such as residential end-users), this blended rate makes perfect sense for the international carrier: only a small proportion of traffic will flow to the mobile operator. When dealing with other carriers, however, this blended rate is an invitation to disaster. By examining calling codes, savvy telecom service providers can identify their calls destined for the mobile operator, and route this traffic and *only* this traffic via the carrier offering blended rates. The blended rate, which made sense when dealing with retail customers, now costs the wholesale carrier $0.10 ($0.35 minus $0.25) per minute.

Further complicating rate plans, country destinations rarely comprise as simple a structure as a single interconnect fee for fixed carriers and a second interconnect fee for mobile carriers. Many countries have licensed multiple LECs and multiple mobile operators—each with its own termination fee. As a result, some international wholesale operators now charge a separate price for each major domestic operator to which they terminate traffic. For example, the October 2003 average wholesale price (as pro-

Figure 7. U.S. Carrier Revenues for International Voice Service, 2001-2002

	Total Receipts (US$ millions)					Average Revenue per Minute (US$/minute)			
	Billed Revenue	Settlement Outpayment	Retained Revenue	Settlement Inpayment	Net Revenue	Billed Revenue	Settlement Outpayment	Retained Revenue	Sett. In
2001									
AT&T	5,749.2	1,466.1	4,283.1	273.9	4,556.9	0.48	0.12	0.36	0.06
MCI	2,875.8	1,778.9	1,096.9	557.9	1,654.9	0.25	0.16	0.10	0.10
Sprint	1,370.7	778.1	592.6	172.3	764.9	0.25	0.14	0.11	0.07
Top 3 Total	**9,995.7**	**4,023.1**	**5,972.6**	**1,004.1**	**6,976.7**	**0.35**	**0.14**	**0.21**	**0.08**
2002									
AT&T	5,473.3	1,241.6	4,231.8	297.5	4,529.2	0.43	0.10	0.33	0.06
MCI	2,135.2	1,300.0	835.2	275.6	1,110.8	0.18	0.11	0.07	0.05
Sprint	1,187.8	803.7	384.1	118.3	502.4	0.25	0.17	0.08	0.05
Top 3 Total	**8,796.4**	**3,345.3**	**5,451.1**	**691.4**	**6,142.4**	**0.30**	**0.11**	**0.19**	**0.05**
Change 2001-2002									
AT&T	-5%	-15%	-1%	9%	-1%	-11%	-21%	-7%	-9%
MCI	-26%	-27%	-24%	-51%	-33%	-28%	-29%	-26%	-47%
Sprint	-13%	3%	-35%	-31%	-34%	-2%	17%	-27%	-31%
Top 3 Total	**-12%**	**-17%**	**-9%**	**-31%**	**-12%**	**-13%**	**-18%**	**-10%**	**-33%**

Notes: This table breaks down international voice service revenue for the three largest U.S. international carriers. In 2002, for example, AT&T collected $5.5 billion from customers for U.S. international outgoing calls and paid foreign carriers $1.2 billion to terminate those calls. Thus, the company gained $4.2 billion by carrying U.S. outgoing calls. Because FCC regulations generally entitled each U.S. carrier to terminate incoming calls based on the percentage of U.S. outgoing traffic it originates, AT&T also collected a significant sum ($298 million) on foreign settlement inpayments, netting $4.5 billion on international voice service.

Source: FCC carrier filings and TeleGeography research

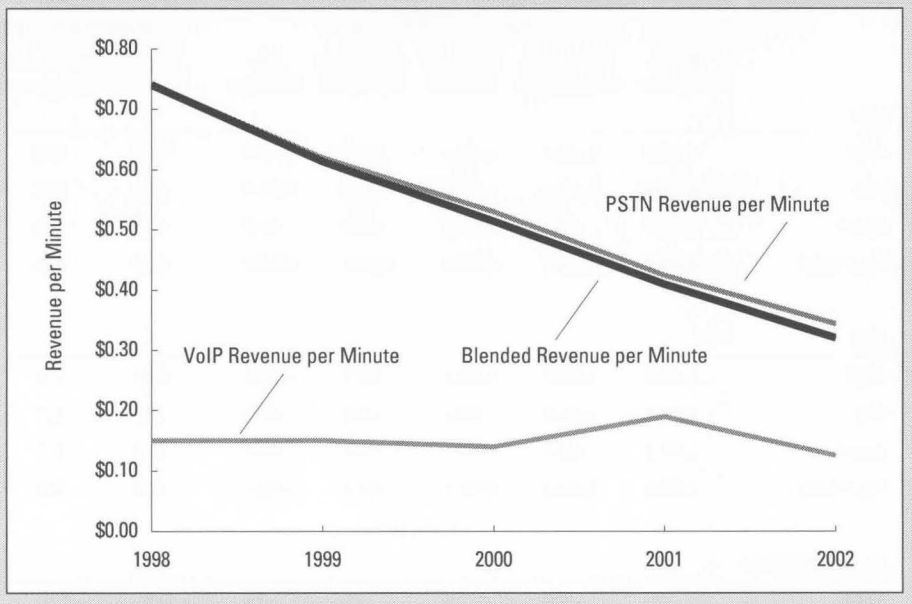
cured via Arbinet's minutes exchange) for a one-minute call to an individual in the U.K. on Vodaphone's network was 2.8¢ per minute via Arbinet, while a call to an Orange mobile subscriber cost 6.2¢.

As the number of mobile operator and LEC licensees proliferates within a country, so too does the number of separately priced international routes to that country. For example, international minutes to Germany sold on wholesale markets have striated into *sixteen* distinct routes: four routes to T-Mobile and its three largest mobile competitors, eleven separate routes to Frankfurt, Berlin, and nine other German cities, and one route covering other fixed-line destinations in the country. Where once a carrier could cover the entire world via settlement arrangements with, at most, 150 carriers, there are now nearly 700 separately priced international routes.

Route Prices and Volatility

Although average rates have tracked generally downward in recent years, large price gaps still separate many types of routes. For routes to countries where mobile operators have maintained high termination rates, calls to wireless phones are expensive. The differences are particularly dramatic in Europe, where international wholesale rates

Figure 8. PSTN versus VoIP Revenue per Minute, 1999-2002



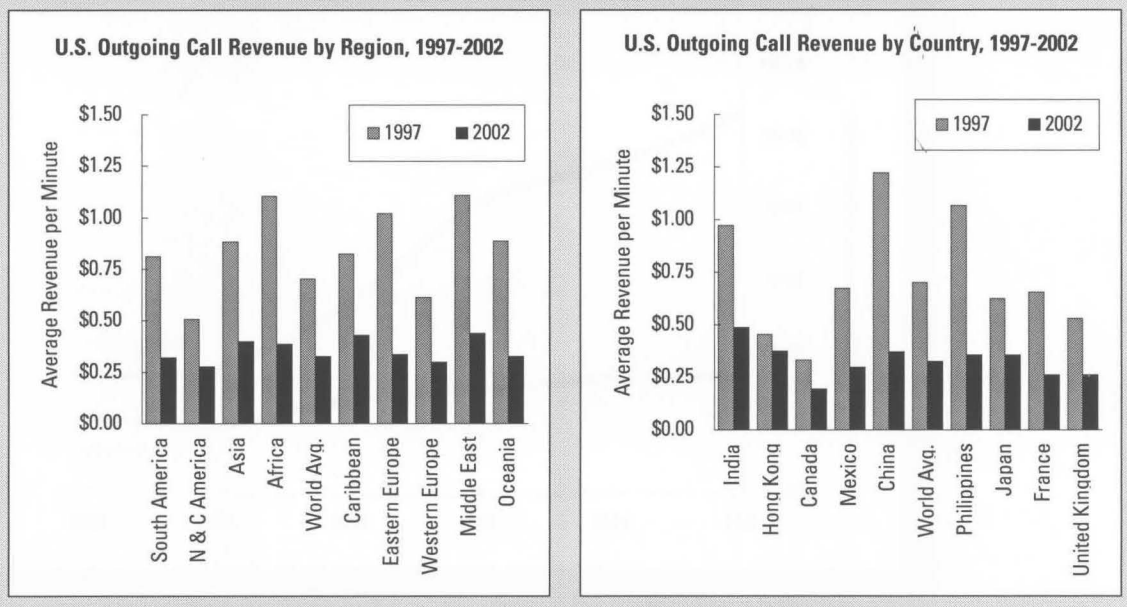
Notes: Data reflect average retail revenue per minute from outgoing international calls. The data do not factor in wholesale revenues. While average VoIP revenue per minute temporarily peaked in 2001 due to increased traffic to higher-priced destinations, VoIP prices to most destinations have consistently declined since 1999.

Source: TeleGeography research

to mobiles are four times more expensive than calls to fixed. In some countries, the differences are even starker. Calls to German mobiles averaged 16.1¢ in October 2003, compared to just 1.2¢ for calls to fixed-line phones. Rates to developing countries whose incumbent operators maintain high settlement rates are also relatively costly. For example, wholesale rates to major African cities averaged 15.2¢ per minute in October 2003, compared to 3.3¢ per minute for European cities (see "Wholesale Rates by Country, 2000-2003" on page 95).

The most expensive international routes typically attract the most innovative market activity on the part of suppliers. As a result, these routes tend to feature the most price volatility. Dramatic price swings stem from gray market activities in countries where cheap and direct interconnection to local networks is not permitted. In such markets, traditional settlement rates remain the only legal option to terminate calls—and often remain expensive. In an effort to evade settlement charges, some carriers have bypassed the international gateway operator by disguising incoming international calls as local traffic. Over time, local authorities spot these gray market links and shut them down. With the average lifespan of an illicit bypass link measured in months if not weeks, wholesale rates to such countries are unstable. When authorities step in, an international route available at bargain basement prices one day may not work the next, forcing international carriers to shift their traffic back to "official"—and relatively costly—links.

Figure 9. U.S. Call Revenues by Destination



Note: Charts show average revenue on U.S. international outgoing calls for the three largest U.S. carriers (AT&T, MCI, and Sprint).

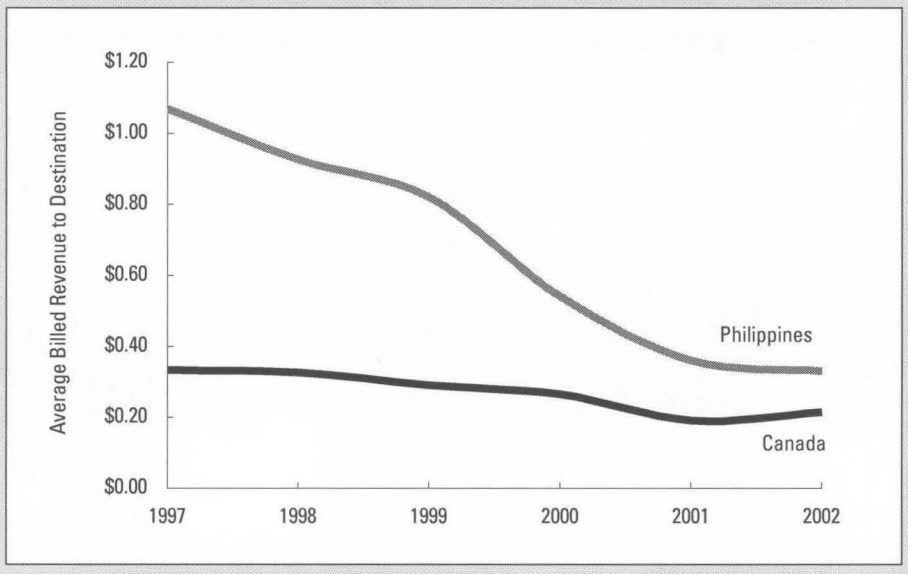
Source: FCC carrier filings and TeleGeography research

Trends in wholesale prices to many mobile destinations appear strikingly similar to the price volatility for calls to gray market countries. As with calls bypassing an international telco's settlement rates, carriers seek to minimize high mobile termination fees. Traffic to mobile destinations tends to shift from one wholesale carrier to the next, depending on which carrier has crafted the cheapest interconnect path to the cellular operator. Thus, while average prices to mobiles often remain far higher than to fixed line destinations, they also fluctuate actively (see Figure 5. Variance of International Wholesale Prices over Time and Figure 6. International Wholesale Prices to Europe: Mobile versus Fixed).

Outlook for Revenues

For the many carriers that have watched revenues erode for several consecutive years, the central question is when steep price declines will end. Results from the year 2002 failed to offer a clear answer. MCI, in the throes of bankruptcy, slashed prices by an average of 26 percent between 2001 and 2002 (see Figure 7. U.S. Carrier Revenues for International Voice Service, 2001-2002). In contrast, many carriers appear to have reached the bottom of the deflationary cycle—at least for now. Average international revenue per minute for the U.S. carrier Sprint barely declined (2 percent)—Sprint's smallest price decrease since 1998. Telecom New Zealand managed to raise prices by an average of one percent between its 2002 and 2003 fiscal years. The "Retail Pricing Trends, 2000-2003" figure on page 99 illustrates how retail price declines have slowed. The unweighted average list price of the 43 routes presented in the figure fell by 17 percent between 2000 and 2001, by 20 percent in 2001-2002, and by only 5 percent in 2002-2003.

Figure 10. U.S. Call Prices to Canada and Philippines, 1997-2002



Notes: Data reflect average billed revenues on outgoing calls from the U.S. carried by AT&T, MCI, and Sprint.
Source: TeleGeography research

Negligible VoIP Substitution Effect

By pressuring incumbent PTTs to lower their settlement rates, VoIP has had an indirect yet notable impact on international call costs and prices. Between 1999 and 2003, U.S. carriers' settlement rates with India fell from $0.64 to $0.23 per minute; rates to Saudi Arabia plunged from $0.68 to $0.14. These settlement rate reductions have filtered through the system, resulting in call price decreases.

However, one encouraging sign for international carriers is that the dreaded VoIP substitution effect has not yet materialized. Worries about VoIP's impact on revenues have centered on the substitution of relatively low-priced VoIP services for higher priced PSTN calls. Indeed, the global average retail price for an international call carried on the PSTN was $0.34 per minute in 2001, compared to an estimated $0.12 per minute for international VoIP traffic. For now, however, fears of a substitution effect appear misplaced; international VoIP traffic remains too small relative to total international traffic. VoIP call volumes accounted for only eleven percent of international traffic in 2002. TeleGeography's estimates suggest that the "substitution effect" dragged down blended (PSTN plus VoIP) international service revenue per minute by just two cents in 2002 (see Figure 8. PSTN versus VoIP Revenue per Minute, 1999-2002).

Regional Price Differences Flattening

Another recent trend suggests that differences among prices to different world regions are beginning to disappear. A few years ago, calls among North American and European countries were dramatically cheaper than calls to developing countries. For example, a call to the Philippines from the U.S. cost, on average, three times more than

a call to Canada in 1997 (see Figure 9. U.S. Call Revenues by Destination and Figure 10. U.S. Call Prices to Canada and Philippines, 1997-2002). By 2002, that margin had shriveled to 50 percent.

Why are regional price differences beginning to flatten? In part, the downward trend in prices to developing markets reflects the spread of competition to countries outside Western Europe and North America—telecom market liberalization typically has resulted in a transition from high settlement rates demanded by a single monopoly to lower interconnect fees offered by multiple operators. The price declines have also taken effect due to new technologies (especially VoIP) allowing gray market rerouting around incumbents in countries with high settlement rates. Rather than risk potentially forfeiting all incoming traffic, several incumbent telcos have slashed their settlement rates when faced with gray market bypass threats.

The cross-regional price equalization also reflects the fact that some "mature" routes to long-liberalized countries have much less scope for further price declines. In the future, routes currently featuring rapidly falling prices will likely also mature as carrier costs to those countries reach a new floor. Consequently, downward price pressure should ease. After a few years of continued downward pricing trends, global call price declines appear likely to decelerate from double-digit to single-digit annual decreases. When combined with continued traffic growth, an end to the call-price freefall could stabilize international call revenue or even send them inching upward.

Elements of an International Call

An international service provider has a number of options to send its customers' calls abroad. Excluding call-back, refile, and other forms of non-traditional traffic switching, a U.S. carrier could choose from the three following methods for transporting a customer's call to its destination in Germany.

1. Settlement Rate Regime. To switch the call from the customer's telephone to its own long distance network, the international carrier pays the local exchange carrier (LEC) in Washington an origination fee, and then uses its own capacity to bring the call to New York, where the international cable to Germany begins. Costs for the domestic portion of the call equal approximately 0.7¢ per minute. The carrier shifts the call onto the international its own "half circuit," then pays the German carrier a settlement fee to transfer the call onto its matching half circuit and to the final destination. The U.S. carrier's marginal cost of using its own backhaul and international circuit is relatively insignificant: 0.1¢ per minute. The settlement rate, at 10.5¢ per minute, is far more expensive. Total cost: 11.2¢ per minute. With a U.S.-to-Germany retail call price of 16¢ per minute, this method would generate a profit of 4.8¢ per minute.

2. Direct Interconnection. Competition rules in Germany permit foreign carriers to interconnect directly with the domestic telephone network. Rather than leasing a half circuit and paying a settlement fee, a U.S. carrier can lease a whole circuit all the way to an international gateway in Germany, and then pay the German carrier a 2.2¢ per minute fee to switch the call to Berlin. Total cost, including origination, backhaul, private line lease, and interconnection in Germany: 2.9¢ per minute.

3. Service Resale. A telephone service provider may wish to avoid carrying its own traffic to Germany altogether by purchasing the minutes transported over another carrier's network in bulk and marketing those minutes as its own. The charge required for end-to-end service resale is a "wholesale rate" covering origination, U.S. domestic long distance, and the underlying carrier's international transport and termination charges. Thanks to special interconnect arrangements with terminating carriers, some wholesalers can offer a wholesale price that is lower than the official termination rate. Total cost: 1.6¢ per minute.

The following pages examine the component costs of transmitting an international call on selected routes, both to and from the United States. The calculations exclude Selling, General, & Administrative (SG&A) costs, which can form a significant portion of actual carrier expenses.

International Carrier Call Costs from the U.S.

	Per Minute Cost (U.S. cents), October 2003						
	Origination Cost	Int'l Circuit	Settlement Rate	Interconnect Rate	Wholesale Rate	**Total Cost**	**Retail Price/** Profit (Loss)
Americas							
U.S.-Canada (Toronto)							**7.0**
Settlement	0.7	0.1	10.0	_	_	**10.7**	(3.7)
Interconnect	0.7	0.1	_	0.2	_	**0.9**	6.1
Wholesale for resellers	_	_	_	_	0.7	**0.7**	6.3
U.S.-Mexico (Mexico City)							**16.0**
Settlement	0.7	0.6	9.5	_	_	**10.8**	5.2
Interconnect	_	_	_	_	_	**n.a.**	n.a.
Wholesale for resellers	_	_	_	_	1.5	**1.5**	14.5
Europe							
U.S.-Germany							**16.0**
Settlement	0.7	0.1	10.5	_	_	**11.2**	4.8
Interconnect	0.7	0.1	_	2.2	_	**2.9**	13.1
Wholesale for resellers	_	_	_	_	1.2	**1.6**	14.4
U.S.-U.K.							**10.0**
Settlement	0.7	0.1	11.0	_	_	**11.7**	(1.7)
Interconnect	0.7	0.1	_	1.9	_	**2.6**	7.4
Wholesale for resellers	_	_	_	_	1.0	**1.0**	9.0
Asia							
U.S.-Australia							**16.0**
Settlement	0.7	1.3	11.0	_	_	**13.0**	3.0
Interconnect	0.7	1.3	_	2.9	_	**4.8**	11.2
Wholesale for resellers	_	_	_	_	1.4	**1.4**	14.6
U.S.-Hong Kong							**17.0**
Settlement	0.7	1.0	7.0	_	_	**8.7**	8.3
Interconnect	0.7	1.0	_	1.6	_	**3.3**	13.7
Wholesale for resellers	_	_	_	_	1.0	**1.0**	16.1
U.S.-India							**43.0**
Settlement	0.7	4.4	23.0	_	_	**28.1**	14.9
Interconnect	0.7	4.4	_	14.6	_	**19.7**	23.3
Wholesale for resellers	_	_	_	_	9.3	**9.3**	33.7
U.S.-Japan							**14.0**
Settlement	0.7	0.5	14.5	_	_	**15.7**	(1.7)
Interconnect	0.7	0.5	_	1.7	_	**2.8**	11.2
Wholesale for resellers	_	_	_	_	1.8	**1.8**	12.2

Notes: See following page.

Source: TeleGeography research; AXCESSRATE℠ by Arbinet-thexchange; FCC carrier filings

International Carrier Call Costs to the U.S.

	Per Minute Cost (U.S. cents), October 2003						
	Origination Cost	Int'l Circuit	Settlement Rate	Interconnect Rate	Wholesale Rate	**Total Cost**	**Retail Price/** Profit (Loss)
Americas							
Canada-U.S.							**7.7**
Settlement	0.2	0.1	10.0	_	_	**10.3**	(2.6)
Interconnect	0.2	0.1	_	0.7	_	**0.9**	6.8
Mexico-U.S.							**40.7**
Settlement	1.0	0.6	9.5	_	_	**11.1**	29.6
Interconnect	_	_	_	_	_	**n.a.**	n.a.
Europe							
Germany-U.S.							**5.3**
Settlement	2.2	0.1	10.5	_	_	**12.8**	(7.4)
Interconnect	2.2	0.1	_	0.7	_	**2.9**	2.4
U.K.-U.S.							**22.3**
Settlement	1.9	0.1	11.0	_	_	**13.0**	9.4
Interconnect	1.9	0.1	_	0.7	_	**2.6**	19.7
Asia							
Australia-U.S.							**22.0**
Settlement	2.9	1.3	11.0	_	_	**15.2**	6.8
Interconnect	2.9	1.3	_	0.7	_	**4.8**	17.2
Hong Kong-U.S.							**38.7**
Settlement	1.6	1.0	7.0	_	_	**9.7**	29.0
Interconnect	1.6	1.0	_	0.7	_	**3.3**	35.4
India-U.S.							**56.0**
Settlement	14.6	4.4	23.0	_	_	**42.0**	14.0
Interconnect	14.6	4.4		0.7	_	**19.6**	36.4
Japan-U.S.							**55.0**
Settlement	1.7	0.5	14.5	_	_	**16.7**	38.3
Interconnect	1.7	0.5	_	0.7	_	**2.9**	52.2

Notes:

1. Costs shown are indicative of carriers' cost per call but may not reflect actual costs. Selling, General & Administrative (SG&A) expenses are excluded.
2. All costs are expressed in U.S. cents and exclusive of taxes. Component costs may not appear to sum to total cost due to rounding.
3. Rates are based on international calls originating or terminating from Washington, D.C. at peak hours. All rates are current as of October 2003.
4. U.S. origination cost includes access charges paid to Local Exchange Carrier (Verizon) and U.S. domestic network costs for transmitting calls to an international gateway.
5. Non-U.S. carriers may own significant portions of home country local networks, in which case origination costs are counted as intra-corporate transfers.
6. Circuit costs are based on one-year leases.
7. Calculations converting circuit ownership prices to per minute costs assume that each 64 Kbps is used for ten years and that each voice path is used four hours (240 minutes) per day.
8. Interconnection rates show price for national termination, except Canada and Japan, where the regional rate is used.
9. Direct interconnection by foreign carriers to the domestic public switched telephone network is not permitted in Mexico.
10. Settlement rates are for peak rate traffic terminated by the largest foreign carrier.
11. Wholesale rates reflect average prices of traffic from the Arbinet minutes exchange on October 5, 2003.

Source: TeleGeography research; **AXCESSRATE**SM by Arbinet-thexchange; FCC carrier filings

U.S. International Settlement Rates

Destination	1999	2000	2001	2002	2003
Andorra	0.29	0.28	0.29	0.27	0.29
Argentina	0.33	0.19	0.19	0.19	0.19
Australia	0.15	0.15	0.14	0.14	0.11
Austria	0.14	0.14	0.13	0.13	0.14
Bahamas	0.30/0.15	0.15	0.15	0.13	0.11
Bahrain	0.55	0.55	0.19	0.19	0.19
Bangladesh	0.80	0.67	0.31	0.13	0.14
Belarus	0.43	0.35	0.22	0.19	0.19
Belgium	0.14	0.14	0.13	0.13	0.14
Bolivia	0.43	0.29	0.19	0.19	0.19
Brazil	0.30	0.19	0.19	0.19	0.14
Canada	0.10/0.06	0.10/0.06	0.10/0.06	0.10/0.06	0.10/0.06
Chile	0.19	0.19	0.19	0.19	0.19
China	0.58	0.50	0.35	0.20	0.18
Colombia	0.38	0.33	0.19	0.19	0.19
Costa Rica	0.29	0.28	0.19	0.19	0.19
Croatia	0.25	0.22	0.18	0.18	0.19
Cyprus	0.37	0.37	0.15	0.15	0.15
Czech Republic	0.18	0.18	0.17	0.17	0.19
Denmark	0.11	0.12	0.10	0.10	0.11
Dominican Republic	0.26	0.19	0.19	0.19	0.19
El Salvador	0.31	0.27	0.19	0.19	0.19
Finland	0.14	0.14	0.13	0.13	0.11
France	0.10	0.10	0.10	0.10	0.11
French Polynesia	0.70	0.70	0.15	0.15	0.15
Germany	0.10	0.10	0.10	0.10	0.11
Ghana	0.50	0.38	0.30	0.23	0.23
Greece	0.17	0.13	0.13	0.13	0.14
Guyana	0.85	0.85	0.85	0.23	0.23
Hong Kong	0.07	0.07	0.06	0.06	0.07
Hungary	0.19	0.16	0.14	0.14	0.15
Iceland	0.14	0.14	0.13	0.13	0.14
India	0.64	0.54	0.43	0.34	0.23
Indonesia	0.48	0.25	0.25	0.19	0.19
Iran	0.90	0.78	0.19	0.19	0.19
Ireland	0.10	0.10	0.10	0.09	0.10
Israel	0.15	0.15	0.15	0.15	0.15
Italy	0.11	0.11	0.10	0.10	0.11
Japan	0.14	0.14	0.13	0.14	0.15
Jordan	0.50	0.50	0.44	0.19	0.19

Notes:

1. All rates expressed in US$. Equivalent dollar values are presented for accounting rates that are established in Special Drawing Rights (SDRs) or gold francs. The exchange rates used to convert SDRs to U.S. dollars are: 1999: 1SDR=$1.3713; 2000: 1SDR=$1.2842; 2001: 1SDR=$1.2457; 2002: 1SDR=$1.2701, 2003: 1 SDR=1.37379. Gold francs were converted using a linking coefficient value of $1=2.5374 GF.
2. Average U.S. settlement rates in 2000 and 2001 are for the month of July. Rates in other years are for August.
3. Where two rates are shown, there are peak/off-peak rates or growth-based rates (traffic above a benchmark level is eligible for a lower rate).
4. Rates are for the largest carrier serving the route. Different settlement rates may apply to competing carriers.

Source: FCC

Destination	1999	2000	2001	2002	2003
Kazakhstan	0.51	0.34	0.16	0.16	0.14
Korea, Rep.	0.36	0.26	0.19	0.19	0.19
Kuwait	0.78	0.15	0.15	0.15	0.15
Luxembourg	0.14	0.14	0.07	0.07	0.08
Macau	0.50	0.15	0.15	0.15	0.15
Malaysia	0.40	0.19	0.19	0.19	0.19
Mexico	0.19	0.19	0.19	0.10	0.10
Moldova	1.04	1.04	1.04	1.04	0.19
Netherlands	0.07	0.07	0.06	0.06	0.07
New Zealand	0.14	0.14	0.13	0.13	0.13
Norway	0.08	0.08	0.13	0.08	0.08
Oman	0.68	0.60	0.60	0.60	0.19
Pakistan	0.60	0.51	0.36	0.23	0.21
Panama	0.45	0.28	0.19	0.19	0.19
Paraguay	0.40	0.40	0.19	0.19	0.19
Peru	0.33	0.25	0.25	0.19	0.19
Philippines	0.29	0.19	0.19	0.19	0.19
Poland	0.21	0.19	0.19	0.19	0.19
Portugal	0.15	0.15	0.10	0.10	0.11
Russia	0.35	0.30	0.20	0.14	0.14
Saudi Arabia	0.68	0.67	0.14	0.14	0.14
Serbia & Montenegro	0.34	0.30	0.25	0.26	0.17
Singapore	0.15	0.15	0.15	0.15	0.15
Slovak Republic	0.29	0.20	0.13	0.13	0.14
Slovenia	0.34	0.34	0.17	0.17	0.19
South Africa	0.35	0.30	0.19	0.19	0.19
Spain	0.14	0.14	0.13	0.13	0.14
Sri Lanka	0.60	0.60	0.45	0.30	0.23
Sweden	0.06	0.06	0.06	0.06	0.06
Switzerland	0.14	0.14	0.13	0.13	0.14
Taiwan	0.23	0.15	0.15	0.15	0.15
Thailand	0.35	0.30	0.19	0.19	0.19
Turkey	0.33	0.27	0.21	0.19	0.19
Ukraine	0.50	0.22	0.17	0.17	0.11
United Arab Emirates	1.00/0.65	0.14	0.15	0.15	0.15
U.K.	0.11/0.07	0.10/0.06	0.10/0.06	0.10/0.06	0.11/0.07
Uruguay	0.33	0.19	0.19	0.19	0.19
Uzbekistan	0.60	0.45	0.19	0.11	0.09
Venezuela	0.32	0.23	0.19	0.19	0.19
Vietnam	0.78	0.67	0.56	0.65	0.62

Notes:

1. All rates expressed in US$. Equivalent dollar values are presented for accounting rates that are established in Special Drawing Rights (SDRs) or gold francs. The exchange rates used to convert SDRs to U.S. dollars are: 1999: 1SDR=$1.3713; 2000: 1SDR=$1.2842; 2001: 1SDR=$1.2457; 2002: 1SDR=$1.2701, 2003: 1 SDR=1.37379. Gold francs were converted using a linking coefficient value of $1=2.5374 GF.
2. Average U.S. settlement rates in 2000 and 2001 are for the month of July. Rates in other years are for August.
3. Where two rates are shown, there are peak/off-peak rates or growth-based rates (traffic above a benchmark level is eligible for a lower rate).
4. Rates are for the largest carrier serving the route. Different settlement rates may apply to competing carriers.

Source: FCC

Termination Rates By Country, 2001-2003

	Local Termination (U.S. cents)			Regional Termination (U.S. cents)			National Termination (U.S. cents)		
	2001	2002	2003	2001	2002	2003	2001	2002	2003
Argentina	1.04	0.97	0.97	1.04	0.97	0.97	1.04	0.97	0.97
Australia	n.a.	0.52	0.52	n.a.	0.76	0.73	n.a.	3.24	2.86
Austria	1.05	1.06	0.99	1.61	1.55	1.52	2.61	2.53	2.63
Belgium	0.74	0.83	0.77	1.20	1.17	1.08	1.60	1.39	1.26
Canada	n.a.	n.a.	n.a.	0.25	0.25	n.a.	n.a.	n.a.	n.a.
Denmark	0.60	0.60	0.60	0.95	0.96	0.96	1.42	1.44	1.43
Finland	0.59	0.59	0.58	n.a.	n.a.	n.a.	0.78	0.79	0.78
France	0.62	0.59	0.58	1.25	1.11	1.05	1.86	1.47	1.45
Germany	0.74	0.77	0.76	1.13	1.26	1.25	1.78	2.20	2.17
Greece	0.82	0.77	0.77	1.35	1.37	1.37	2.26	3.05	3.03
Hong Kong	1.64	1.64	1.63	1.64	1.64	1.63	1.64	1.64	1.63
Hungary	10.39	2.36	1.80	10.39	2.84	2.46	10.39	3.70	2.90
India	n.a.	9.74	12.59	n.a.	n.a.	n.a.	n.a.	28.77	14.58
Ireland	0.74	0.47	0.36	1.13	0.78	0.64	1.54	1.12	0.96
Italy	0.88	0.77	0.76	1.56	1.25	1.23	2.11	1.96	1.93
Japan	1.38	1.37	1.34	1.76	1.45	1.65	n.a.	n.a.	n.a.
Luxembourg	1.72	n.a.	n.a.	1.72	1.32	1.31	1.72	1.62	1.61
Mexico	1.25	0.98	0.98	1.25	0.98	0.98	1.25	0.98	0.98
Netherlands	0.69	0.69	0.62	0.90	0.91	0.82	1.11	1.15	1.05
New Zealand	1.61	1.57	0.67	1.61	1.57	0.67	1.61	1.57	0.67
Norway	0.58	0.52	0.57	0.71	0.64	0.70	0.89	0.82	0.89
Portugal	0.77	0.96	0.59	1.51	1.42	1.27	2.60	2.08	1.94
Spain	0.89	0.90	0.89	1.35	1.24	1.36	2.58	2.62	2.52
Sweden	0.69	0.66	0.65	0.93	0.89	0.88	1.13	1.01	1.01
Switzerland	n.a.	n.a.	n.a.	1.45	1.32	1.20	2.26	2.08	1.91
U.K.	0.64	0.63	0.60	0.92	0.88	0.82	1.97	1.95	1.90
U.S.	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65

Notes:

1. All interconnection charges are for peak period.
2. All rates are established in national currencies and presented here in U.S. cents. All rates were converted using October 2003 exchange rates.
3. Local termination is the lowest level of interconnection, typically giving a carrier access to a single town or part of a city.
4. Regional and national termination are also known as single tandem and double tandem termination.
5. Regional termination generally gives a carrier access to all subscribers within a metropolitan area or a North American area code.
6. U.S. termination fees vary according to Local Exchange Carrier (LEC). U.S. average for regional termination was 0.78¢ as of October 2003.

Source: National regulatory agencies and ITU

Wholesale Rates by Country, 2000-2003

	Rate to Largest City (US¢)				Rate to Mobiles (US¢)				Rate to Rest of Country (US¢)			
Africa	**2000**	**2001**	**2002**	**2003**	**2000**	**2001**	**2002**	**2003**	**2000**	**2001**	**2002**	**2003**
Algeria	n.a.	n.a.	n.a.	8.0	n.a.	n.a.	11.2	10.7	14.2	12.8	10.8	8.2
Egypt	31.6	19.1	12.9	12.9	36.0	24.6	16.3	10.3	31.5	21.1	16.4	12.8
Nigeria	17.7	12.7	7.4	4.5	39.0	28.6	22.3	17.4	29.8	23.5	22.9	9.8
South Africa	10.7	7.6	4.1	4.3	17.2	11.1	18.4	15.2	14.2	8.5	4.3	4.4
Africa Average	**20.0**	**16.6**	**13.5**	**15.2**	**27.4**	**21.9**	**18.4**	**15.7**	**24.3**	**20.4**	**19.2**	**14.9**
Asia												
Australia	n.a.	n.a.	n.a.	1.4	9.7	15.7	13.8	12.9	2.4	2.2	1.8	1.4
China	6.2	3.4	1.8	1.3	13.2	7.4	2.5	1.5	10.0	5.3	2.2	1.3
Hong Kong	n.a.	n.a.	n.a.	n.a.	2.5	2.4	1.9	1.0	2.2	2.7	1.9	1.0
India	24.0	18.5	15.8	8.3	44.8	41.0	25.0	9.2	41.5	37.9	24.6	12.2
Israel	4.6	4.1	2.9	1.9	12.0	13.0	8.4	4.4	5.2	4.5	2.9	1.9
Japan	3.1	2.9	2.5	1.8	13.5	16.8	14.7	10.7	3.6	3.2	2.4	1.8
Malaysia	5.1	3.4	2.9	1.8	5.9	4.5	3.2	3.2	5.5	3.5	2.8	1.8
New Zealand	2.3	1.9	2.0	1.5	6.9	15.9	15.1	20.4	2.3	1.9	2.0	1.5
Pakistan	n.a.	34.8	24.4	18.9	n.a.	36.0	24.4	19.5	42.6	35.5	23.8	18.9
Philippines	10.9	9.6	8.9	12.2	11.6	10.1	13.4	15.0	11.2	10.2	9.2	12.2
Saudi Arabia	n.a.	14.3	5.7	3.7	37.3	23.5	18.5	18.8	34.2	20.2	16.6	15.7
Singapore	n.a.	n.a.	n.a.	n.a.	4.2	1.6	1.6	1.1	3.7	1.5	1.4	1.1
Taiwan	4.3	3.1	2.5	n.a.	7.4	9.6	8.1	6.9	5.2	3.9	2.5	1.4
Thailand	7.5	5.7	3.3	3.9	18.9	14.2	9.8	7.3	17.2	14.2	9.9	n.a.
Vietnam	52.1	51.2	44.5	25.3	57.0	53.3	39.6	26.4	54.9	49.6	37.2	26.2
Asia Average	**16.8**	**15.7**	**11.0**	**8.9**	**22.8**	**19.4**	**15.2**	**14.8**	**25.8**	**21.0**	**16.1**	**12.7**
Europe												
Austria	1.6	1.2	1.2	1.3	13.6	14.8	15.6	n.a.	2.1	1.9	1.7	1.4
Finland	3.4	2.1	1.9	1.7	6.6	12.9	14.6	11.7	3.4	2.1	1.9	1.7
France	1.9	1.5	1.2	1.2	22.5	16.4	15.7	12.8	2.1	1.6	1.6	1.2
Germany	0.9	1.0	1.2	1.2	21.1	14.7	14.5	16.1	1.8	1.4	1.6	1.2
Greece	4.6	2.6	3.0	2.3	11.1	7.7	11.2	12.1	8.8	3.9	3.6	2.4
Ireland	2.1	1.3	1.2	1.4	14.3	13.8	14.6	n.a.	2.1	1.3	1.2	1.4
Italy	1.8	1.4	1.5	1.2	24.2	16.7	16.1	12.8	2.2	1.8	1.6	1.2
Netherlands	1.6	1.5	1.3	1.2	20.1	15.8	19.4	18.0	1.8	1.4	1.5	1.2
Poland	6.1	3.4	3.2	1.8	11.9	9.6	17.4	17.2	9.9	5.1	3.8	1.7
Russia	3.3	2.5	1.4	1.1	10.0	9.8	5.4	3.7	10.5	9.1	5.6	3.8
Spain	2.4	1.4	1.2	1.1	23.4	16.3	18.2	15.0	2.7	1.4	1.4	1.0
Sweden	1.1	0.8	1.0	1.2	7.0	15.2	14.2	11.5	1.3	0.9	1.1	1.0
Switzerland	1.6	1.2	1.8	1.6	16.9	17.0	16.7	19.3	2.2	1.5	1.8	1.5
Europe Average	**3.9**	**3.9**	**3.4**	**3.3**	**13.3**	**12.8**	**13.7**	**13.5**	**10.2**	**8.6**	**8.1**	**4.5**
Latin America & Caribbean												
Argentina	6.9	3.7	1.9	0.9	13.6	8.0	6.8	n.a.	11.2	7.6	6.6	2.8
Brazil	4.5	2.9	2.0	2.0	14.2	13.4	10.0	10.2	11.7	10.5	6.9	4.1
Chile	n.a.	n.a.	n.a.	n.a.	8.9	8.2	11.2	n.a.	5.0	3.1	2.5	1.2
Colombia	5.7	5.5	4.8	3.5	13.6	9.3	8.3	5.9	11.2	8.3	7.9	5.3
Mexico	n.a.	4.1	3.7	1.5	12.1	12.3	11.8	6.3	9.4	12.0	9.7	8.0
Peru	6.5	4.9	3.9	2.0	21.0	16.8	20.2	14.2	15.2	11.2	8.9	n.a.
Latin America & Carib. Avg.	**8.0**	**6.7**	**5.5**	**4.4**	**19.1**	**18.7**	**16.6**	**14.7**	**18.8**	**17.3**	**16.0**	**11.2**
U.S. & Canada												
Canada	n.a.	n.a.	n.a.	0.7	n.a.	n.a.	n.a.	n.a.	2.2	1.7	1.6	n.a.
United States	n.a.	n.a.	n.a.	0.6	n.a.	n.a.	n.a.	n.a.	1.9	1.8	1.8	1.2
U.S. & Canada Average	**n.a.**	**n.a.**	**n.a.**	**0.7**	**n.a.**	**n.a.**	**n.a.**	**n.a.**	**2.0**	**1.7**	**1.7**	**1.2**

Notes: Rates for 2003 reflect average price of wholesale traffic from the Arbinet minutes exchange on October 5, 2003. Rates for 2000-2003 reflect prices from the Band-X London Switch in August of each year. Rates for 2000-2003, originally established in U.K. pounds sterling, are expressed here as U.S. cents based on exchange rate conversions of 1.500 $/£ in August 2000, 1.426 $/£ in August 2001, and 1.536 $/£ in August 2002. Regional averages are simple, unweighted averages for all countries within a region. Global Average is an unweighted average for all countries in the world.

Source: AXCESSRATE℠ by Arbinet-thexchange; Band-X, Ltd.; TeleGeography research

Retail Prices for a Three-Minute Call

Retail Rate (US$) for Fixed-Line Termination, October 2003

From/To	Australia	Austria	Belgium	Canada	Czech Rep.	Denmark	Finland	France
Australia	n.a.	1.37	1.37	0.66	1.99	1.37	1.58	1.06
Austria peak	1.06	n.a.	0.86	1.06	0.69	0.86	0.86	0.86
Austria off-peak	0.89	n.a.	0.69	0.89	0.53	0.69	0.69	0.69
Belgium peak	1.45	0.80	n.a.	0.59	1.79	0.80	0.80	0.59
Belgium off-peak	1.11	0.66	n.a	0.35	1.48	0.66	0.66	0.35
Canada	0.75	0.34	1.32	n.a.	0.73	0.43	0.50	0.34
Czech Rep. Peak	0.84	0.84	0.84	0.84	n.a.	0.84	0.84	0.84
Czech Rep. off-peak	0.80	0.80	0.80	0.79	n.a.	0.79	0.79	0.79
Denmark	1.60	0.66	0.66	0.66	1.13	n.a.	0.38	0.66
Finland peak	1.28	1.26	1.26	1.28	1.26	0.46	n.a.	1.26
Finland off-peak	0.96	0.77	0.77	0.79	0.77	0.33	n.a.	0.77
France peak	1.35	0.70	0.60	0.60	1.24	1.16	0.70	n.a.
France off-peak	0.69	0.43	0.34	0.34	0.88	0.89	0.43	n.a.
Germany	0.60	0.16	0.16	0.16	0.52	0.16	0.16	0.16
Ireland peak	2.37	1.05	1.05	0.53	1.34	1.05	1.05	1.05
Ireland off-peak	1.21	0.81	0.81	0.42	1.16	0.81	0.81	0.81
Italy	2.67	0.80	0.80	0.80	1.30	0.80	0.80	0.80
Japan peak	5.21	6.86	6.86	3.93	7.87	6.86	6.86	5.30
Japan off-peak	3.29	5.03	5.03	3.11	5.58	5.03	5.03	1.65
Korea, Rep. peak	2.95	3.49	3.49	3.83	3.45	3.49	3.49	3.43
Korea, Rep. off-peak	2.06	2.43	2.43	2.67	2.40	2.43	2.43	2.41
Mexico	2.67	2.14	2.14	1.53	2.14	2.14	2.14	2.14
Netherlands	0.56	0.39	0.21	0.28	1.05	0.32	0.42	0.21
Norway	0.38	0.51	0.33	0.38	0.51	0.31	0.46	0.35
Poland	2.63	1.18	1.18	2.63	1.18	1.18	1.29	1.29
Portugal peak	2.16	0.72	0.72	0.66	1.39	0.71	0.71	0.57
Portugal off-peak	1.29	0.40	0.40	0.35	0.82	0.40	0.40	0.29
Singapore	1.04	2.42	1.73	0.67	3.28	1.73	1.73	1.73
Singapore off-peak	0.86	2.42	1.73	0.67	3.28	1.73	1.73	1.73
Spain	2.57	0.56	0.56	1.44	1.26	0.56	0.56	0.56
Sweden	1.03	0.65	0.42	0.42	0.65	0.20	0.20	0.42
Switzerland peak	0.56	0.28	0.56	0.28	1.39	0.56	0.56	0.28
Switzerland off-peak	0.42	0.21	0.42	0.21	1.04	0.42	0.42	0.21
Turkey peak	3.10	2.07	2.07	2.07	2.07	2.07	2.07	2.07
Turkey off-peak	2.48	1.33	1.33	1.33	1.33	1.33	1.33	1.33
U.K. peak	1.00	1.12	0.79	0.71	1.12	0.83	1.12	0.79
U.K. off-peak	0.46	0.96	0.46	0.46	0.96	0.46	0.96	0.46
U.S. (MCI) peak	0.48	0.48	0.48	0.21	1.23	0.48	0.48	0.48
U.S. (MCI) off-peak	0.24	0.24	0.24	0.15	0.87	0.24	0.24	0.24
U.S. (AT&T)	0.36	0.36	0.36	0.18	0.81	0.36	0.36	0.36

Notes:

1. All rates are in U.S. dollars exclusive of taxes and were current on October 31, 2003.
2. Rates for calls from the U.S. to Canada and Mexico are from Washington, D.C. to Montreal and Mexico City.
3. Where available, retail prices reflect rates under discount calling plans of the major carrier in each country. Most of these calling plans require a monthly subscription fee. For example, the AT&T AnyHour International Savings Plan charges $2.95 per month.
4. Rates do not include special supplements for calls to mobile phones.
5. Peak and off-peak rates are listed only for carriers that offered different rates based on time and day.

Source: TeleGeography research

Retail Rate (US$) for Fixed-Line Termination, October 2003

Germany	Hong Kong	Ireland	Italy	Japan	Korea, Rep.	Mexico	Neth'lands	Norway	To/From
1.06	0.96	0.66	1.06	1.06	1.89	2.51	1.16	1.48	Australia
0.69	1.06	1.06	0.69	1.06	1.06	2.12	0.86	0.86	Austria peak
0.53	0.89	0.89	0.53	0.89	0.89	1.79	0.69	0.69	Austria off-peak
0.59	1.45	0.80	0.59	1.45	1.99	2.46	0.59	0.80	Belgium peak
0.35	1.11	0.66	0.35	1.11	1.48	1.96	0.35	0.66	Belgium off-peak
0.57	0.23	0.50	0.34	0.43	0.34	1.03	0.23	0.23	Canada
0.84	1.23	0.84	0.84	1.23	1.23	2.93	0.84	0.84	Czech Rep. Peak
0.79	1.18	0.79	0.79	1.18	1.18	2.79	0.79	0.79	Czech Rep. off-peak
0.66	1.89	0.94	0.66	2.55	4.15	4.15	0.66	0.21	Denmark
1.26	2.71	1.26	1.26	1.50	2.71	4.57	1.26	0.46	Finland peak
0.77	2.71	0.77	0.77	1.50	2.71	4.57	0.77	0.33	Finland off-peak
0.60	1.35	0.70	0.60	1.35	1.35	2.29	0.60	0.70	France peak
0.34	0.75	0.43	0.34	0.69	0.69	1.34	0.34	0.43	France off-peak
n.a.	0.60	0.16	0.16	0.60	0.60	1.53	0.16	0.16	Germany
1.05	2.37	n.a.	1.34	2.37	2.37	2.12	1.05	1.34	Ireland peak
0.81	1.21	n.a.	1.16	1.21	1.21	2.12	0.81	1.16	Ireland off-peak
0.80	2.67	0.80	n.a.	2.67	2.67	3.07	0.80	0.80	Italy
5.30	4.57	6.86	6.86	n.a.	3.38	6.49	6.86	6.86	Japan peak
1.65	2.84	5.03	5.03	n.a.	2.47	4.12	5.03	5.03	Japan off-peak
3.43	2.60	3.49	3.49	2.13	n.a.	4.07	3.43	3.49	Korea, Rep. peak
2.41	1.81	2.43	2.43	1.50	n.a.	2.85	2.41	2.43	Korea, Rep. off-peak
2.14	2.67	2.14	2.14	2.67	2.67	n.a.	2.14	2.14	Mexico peak
0.39	1.16	0.42	0.42	1.02	1.51	1.89	n.a.	0.39	Netherlands
0.31	1.30	0.47	0.35	0.51	2.22	2.50	0.35	n.a.	Norway
1.18	4.76	1.29	1.29	4.76	4.76	4.76	1.18	1.29	Poland
0.66	2.16	0.71	0.71	2.16	3.36	3.36	0.71	0.71	Portugal peak
0.35	1.31	0.40	0.40	1.31	2.17	2.17	0.40	0.40	Portugal off-peak
1.73	1.21	2.42	1.73	1.55	1.81	3.45	1.73	1.73	Singapore peak
1.73	1.21	2.42	1.73	1.55	1.55	3.45	1.73	1.73	Singapore off-peak
0.56	2.57	0.56	0.56	2.57	2.57	1.72	0.56	1.08	Spain peak
0.42	1.58	0.65	0.65	1.03	2.98	2.05	0.42	0.20	Sweden
0.28	1.39	0.56	0.28	0.56	0.56	1.39	0.56	0.56	Switzerland peak
0.21	1.04	0.42	0.21	0.42	0.42	1.04	0.42	0.42	Switzerland off-peak
2.07	5.31	2.07	2.07	3.10	5.31	3.10	2.07	2.07	Turkey peak
1.33	4.13	1.33	1.33	2.48	4.13	2.48	1.33	1.33	Turkey off-peak
0.79	1.37	0.67	0.92	1.53	2.70	2.70	0.79	1.00	U.K. peak
0.46	1.12	0.46	0.46	1.41	2.58	2.58	0.46	0.46	U.K. off-peak
0.48	0.51	0.48	0.48	0.42	0.42	1.17	0.48	0.48	U.S. (MCI) peak
0.24	0.30	0.24	0.24	0.24	0.21	0.75	0.24	0.24	U.S. (MCI) off-peak
0.36	0.30	0.36	0.36	0.30	0.24	0.51	0.36	0.36	U.S. (AT&T)

Notes:

1. All rates are in U.S. dollars and exclusive of taxes and were current on October 31, 2003.
2. Rates for calls from the U.S. to Canada and Mexico are from Washington, D.C. to Montreal and Mexico City.
3. Where available, retail prices reflect rates under discount calling plans. Most of these calling plans require a monthly subscription fee. For example, the AT&T AnyHour International Savings Plan charges $2.95 per month.
4. Rates do not include special supplements for calls to mobile phones.
5. Peak and off-peak rates are listed only for carriers that offered different rates based on time and day.

Source: TeleGeography research

Retail Prices for a Three-Minute Call

Retail Rate (US$) for Fixed-Line Termination, October 2003

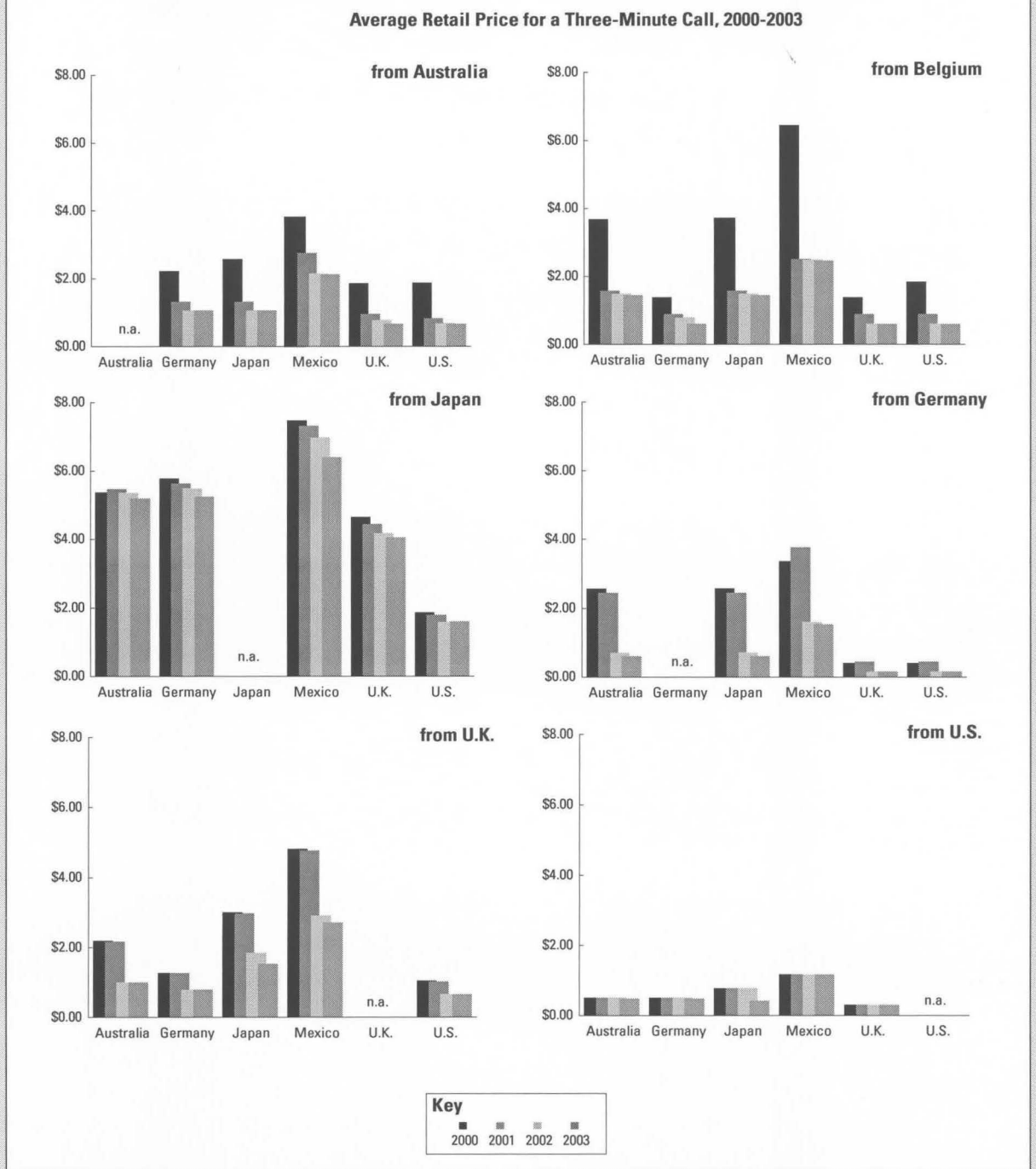
From/To	Poland	Portugal	Singapore	Spain	Sweden	Switzerland	Turkey	U.K.	U.S.
Australia	1.99	2.41	1.16	1.48	1.27	1.27	1.79	0.66	0.66
Austria peak	1.06	1.06	1.06	0.86	0.86	0.69	1.06	0.86	1.06
Austria off-peak	0.89	0.89	0.89	0.69	0.69	0.33	0.89	0.69	0.89
Belgium peak	1.93	0.80	1.45	0.59	0.80	0.80	1.45	0.59	0.59
Belgium off-peak	1.59	0.66	1.11	0.35	0.66	0.66	1.11	0.35	0.35
Canada	0.66	0.55	0.23	0.66	0.39	0.59	0.84	0.32	0.23
Czech Rep. Peak	0.72	0.84	1.23	0.84	0.84	0.84	1.67	0.84	0.84
Czech Rep. off-peak	0.69	0.79	1.18	0.79	0.79	0.79	1.59	0.79	0.79
Denmark	0.85	1.13	2.64	0.94	0.15	0.66	1.32	0.53	0.66
Finland peak	1.26	1.28	2.71	1.26	0.46	1.26	1.50	1.26	1.28
Finland off-peak	0.77	0.96	2.71	0.77	0.33	0.77	1.50	0.77	0.79
France peak	1.24	0.70	2.29	0.60	0.70	0.60	1.24	0.60	0.60
France off-peak	0.88	0.43	1.35	0.34	0.43	0.34	0.88	0.34	0.34
Germany	0.60	0.16	1.59	0.16	0.16	0.16	0.60	0.16	0.16
Ireland peak	1.34	1.34	2.37	1.34	1.34	1.34	2.55	0.43	0.53
Ireland off-peak	1.16	1.16	1.21	1.16	1.16	1.16	2.21	0.34	0.42
Italy	1.30	0.80	2.67	0.80	0.80	0.80	1.30	0.80	0.80
Japan peak	7.87	6.86	5.03	6.86	6.86	6.86	6.86	3.93	1.65
Japan off-peak	5.58	5.03	3.66	5.03	5.03	5.03	5.03	1.65	1.10
Korea, Rep. peak	3.45	3.49	2.60	3.49	3.49	3.43	3.45	2.89	1.84
Korea, Rep. off-peak	2.40	2.43	1.81	2.43	2.43	2.41	2.44	2.03	1.28
Mexico peak	2.14	2.14	2.67	2.14	2.14	2.14	2.14	2.14	1.22
Netherlands	0.91	0.81	1.26	0.42	0.28	0.35	1.09	0.18	0.18
Norway	1.00	1.09	0.85	0.35	0.31	0.35	1.77	0.35	0.35
Poland	n.a.	1.29	4.76	1.29	1.18	1.18	2.63	1.29	2.63
Portugal peak	1.39	n.a.	3.36	0.46	3.36	0.66	1.39	0.66	0.65
Portugal off-peak	0.82	n.a.	2.17	0.21	2.17	0.35	0.82	0.35	0.34
Singapore peak	3.28	3.28	n.a.	2.42	1.73	1.73	3.28	1.02	0.67
Singapore off-peak	3.28	3.28	n.a.	2.42	1.73	1.73	3.28	1.02	0.67
Spain peak	1.26	0.56	2.56	n.a.	0.56	0.56	1.26	0.56	0.56
Sweden	0.65	1.03	1.03	0.65	0.00	0.42	1.13	1.03	0.34
Switzerland peak	1.39	0.56	1.39	0.56	0.56	n.a.	1.39	0.28	0.28
Switzerland off-peak	1.04	0.42	1.04	0.42	0.42	n.a.	1.04	0.21	0.21
Turkey peak	2.07	2.07	3.10	2.07	2.07	2.07	n.a.	2.07	2.07
Turkey off-peak	1.33	1.33	2.48	1.33	1.33	1.33	n.a.	1.33	1.33
U.K. peak	1.12	0.96	1.62	0.92	0.79	0.79	1.41	n.a.	0.67
U.K. off-peak	0.96	0.75	1.46	0.46	0.67	0.46	1.33	n.a.	0.46
U.S. (MCI) peak	1.02	0.48	0.72	0.48	0.48	0.48	1.53	0.3	n.a.
U.S. (MCI) off-peak	0.84	0.24	0.42	0.24	0.24	0.24	1.35	0.21	n.a.
U.S. (AT&T)	0.45	0.36	0.42	0.36	0.36	0.36	1.29	0.24	n.a.

Notes:

1. All rates are in U.S. dollars exclusive of taxes and were current on October 31, 2003.
2. Rates for calls from the U.S. to Canada and Mexico are from Washington, D.C. to Montreal and Mexico City.
3. Where available, retail prices reflect rates under discount calling plans of the major carrier in each country. Most of these calling plans require a monthly subscription fee. For example, the AT&T AnyHour International Savings Plan charges $2.95 per month.
4. Rates do not include special supplements for calls to mobile phones.
5. Peak and off-peak rates are listed only for carriers that offered different rates based on time and day.

Source: TeleGeography research

Retail Pricing Trends, 2000-2003



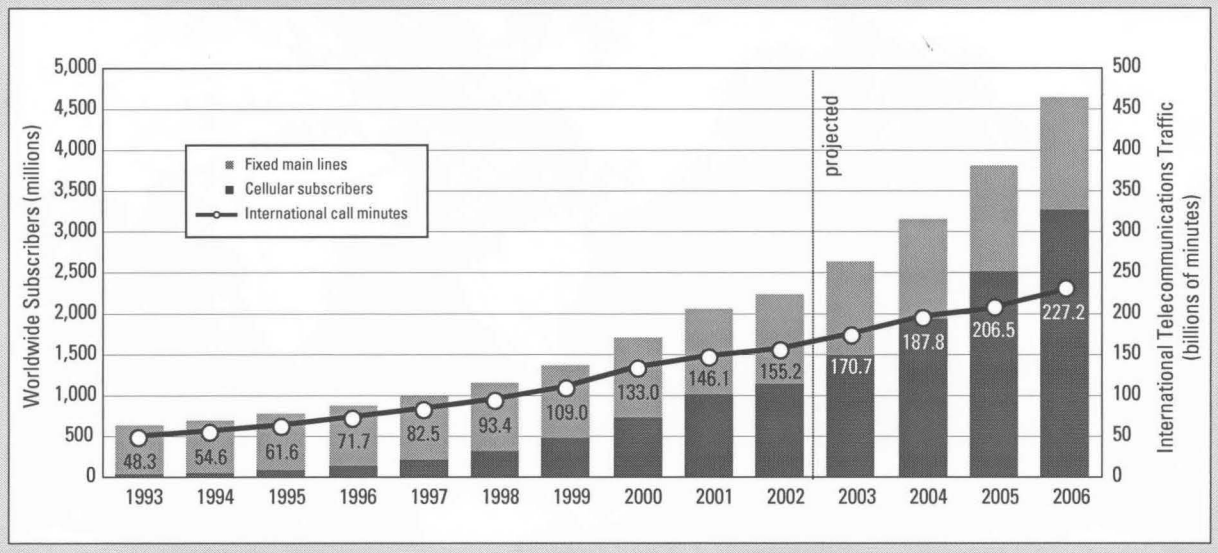
Notes: All rates are for peak calling and are expressed in U.S. dollars. To correct for exchange rate fluctuation in the time series, all retail prices (2000-2003) were converted to U.S. dollars using October 2003 exchange rates.

Source: PBI Media (2000) and TeleGeography (2001-2003) research

Traffic Summary

Global Traffic Review

Figure 1. International Traffic and Main Line Growth



Notes: Data include outbound international traffic on public networks only, VoIP call volumes are excluded. Projections assume 10 percent traffic growth, 5 percent main line growth, and 20 percent mobile subscriber growth annually.

Source: TeleGeography research and ITU

Figure 2. International Traffic, Revenue, and Subscriber Growth

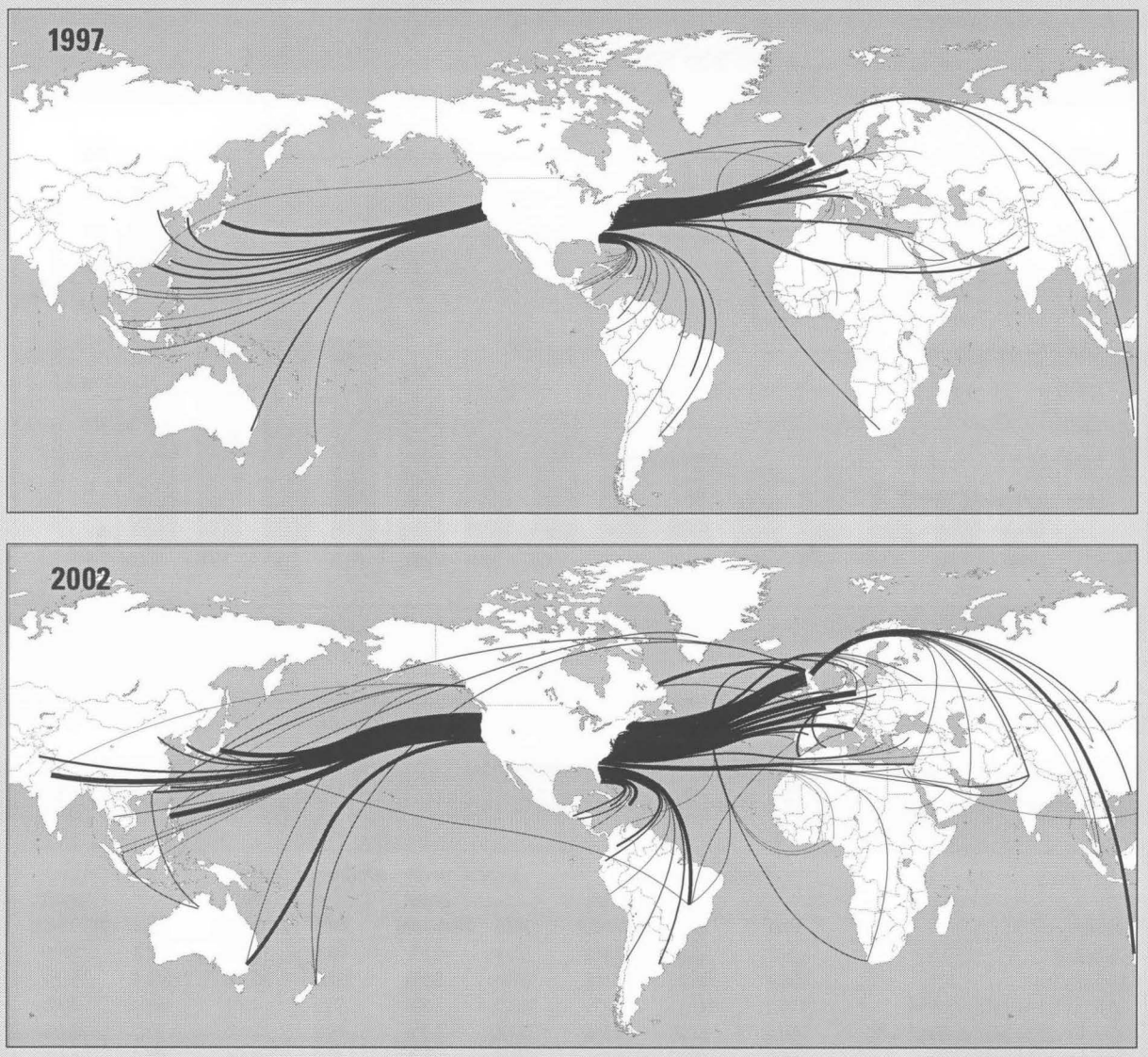
	Historical Trend			*Slow Growth*		*Moderate Growth*		*Fast Growth*	
			CAGR		CAGR		CAGR		CAGR
Indicator	**1998**	**2002**	**1998-2002**	**2006**	**2002-2006**	**2006**	**2002-2006**	**2006**	**2002-2006**
Calls (bn)	29.0	55.4	17.6%	75.4	8.0%	90.9	13.2%	108.6	18.3%
Minutes (bn)	93.4	155.2	13.5%	188.6	5.0%	227.2	10.0%	271.4	15.0%
per main line subscriber	110.5	141.7	6.4%	153.0	1.9%	170.6	4.8%	189.0	7.5%
per main line plus mobile	80.3	68.9	-3.8%	64.4	-1.7%	60.9	-3.0%	57.2	-4.5%
Revenue (US$ bn)	69.2	53.3	-6.3%	42.5	-5.5%	40.7	-6.5%	38.2	-8.0%
Assumptions									
Call length (mins)	3.2	2.8	-3.5%	2.5	-2.8%	2.5	-2.8%	2.5	-2.8%
Price per minute (US$)	0.74	0.34	-17.5%	0.23	-10.0%	0.18	-15.0%	0.14	-20.0%
Main lines (bn)	0.8	1.1	6.7%	1.2	3.0%	1.3	5.0%	1.4	7.0%
Mobile subscribers (bn)	0.3	1.2	38.1%	1.7	10.0%	2.4	20.0%	3.3	30.0%
Total subscribers (bn)	1.2	2.3	18.0%	2.9	6.8%	3.7	13.4%	4.7	20.5%

Notes: 1998-2002 based on reported data. 2003-2006 based on TeleGeography forecasts. Scenarios are as follows:

1. Slow Growth: PSTN traffic continue to grow at a similarly slow pace experienced in 2000-2001 as newly competitive markets mature and as traffic migrates to IP networks.
2. Moderate Growth: PSTN traffic growth returns to rates experienced prior to the widespread market liberalization of the late 1990s as price cutting keeps traffic on the PSTN.
3. Fast Growth: PSTN traffic growth accelerates from 2000-2001 rates as mobile subscriber growth remains strong and continued price cutting stimulates traffic increases.

Source: TeleGeography research and ITU World Telecommunication Indicators Database

Figure 3. Intercontinental Traffic Flows, 1997 and 2002

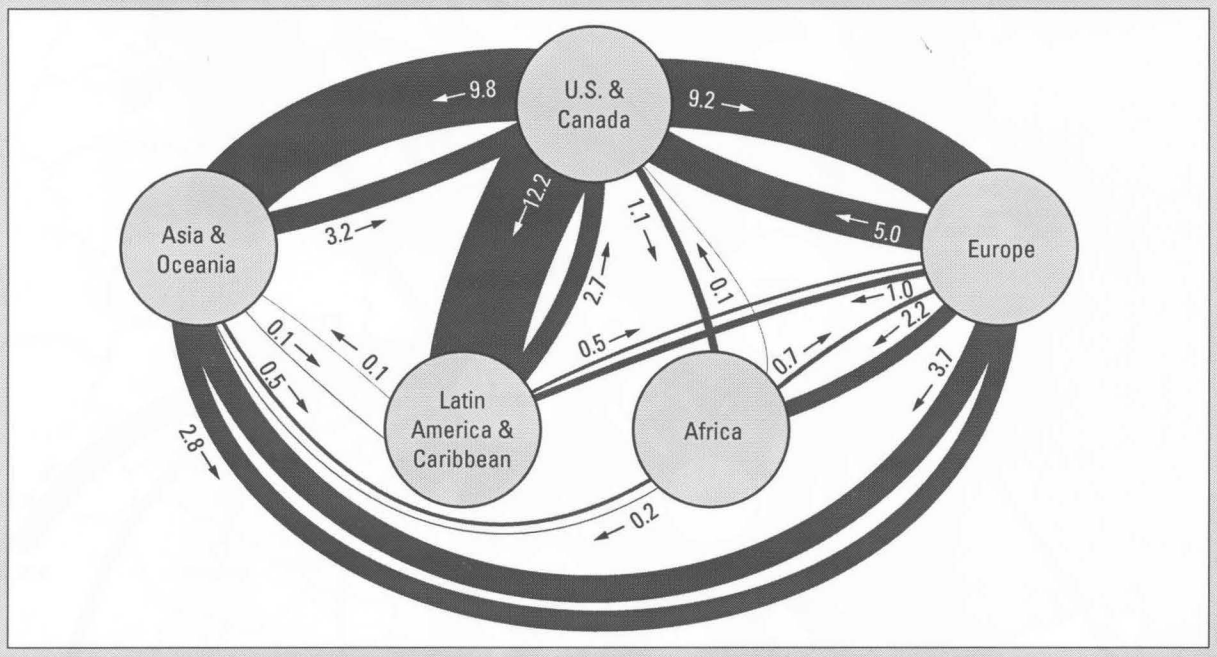


Notes: Each band is proportional to the total annual traffic on the public network in both directions between each pair of countries. These maps show all intercontinental routes with an annual volume of more than 100 million minutes. The total volume of these routes in 2002 was 43.5 billion minutes, approximately 28 percent of global international traffic.

Source: TeleGeography research

International Traffic by Region

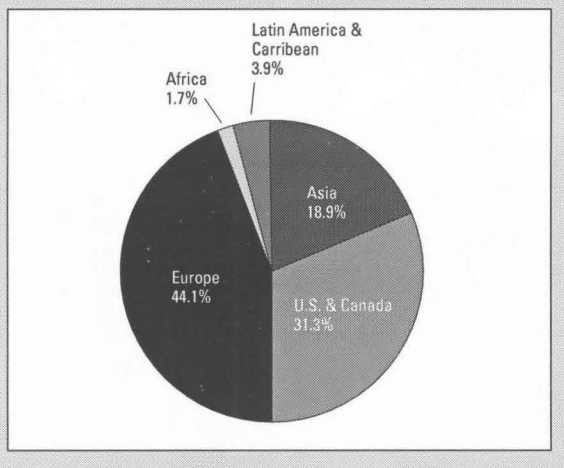
Figure 1. Interregional Traffic Flows, 2002



Notes: These interregional traffic flows total 55.2 billion minutes. That sum does not equal global PSTN total of 155.2 billion minutes because (1) data set is based on top 20 outgoing routes for 130 largest countries only; (2) traffic within regions account for a further 60.0 billion minutes based on data set; (3) interregional routes below 100 million minutes are not shown.

Source: TeleGeography research

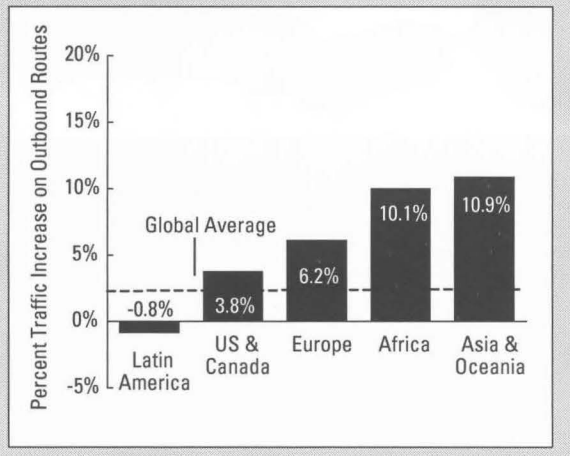
Figure 2. International Traffic by Origin, 2002



Note: Global traffic was 155.2 billion minutes in 2002. Data do not included VoIP calls.

Source: TeleGeography research

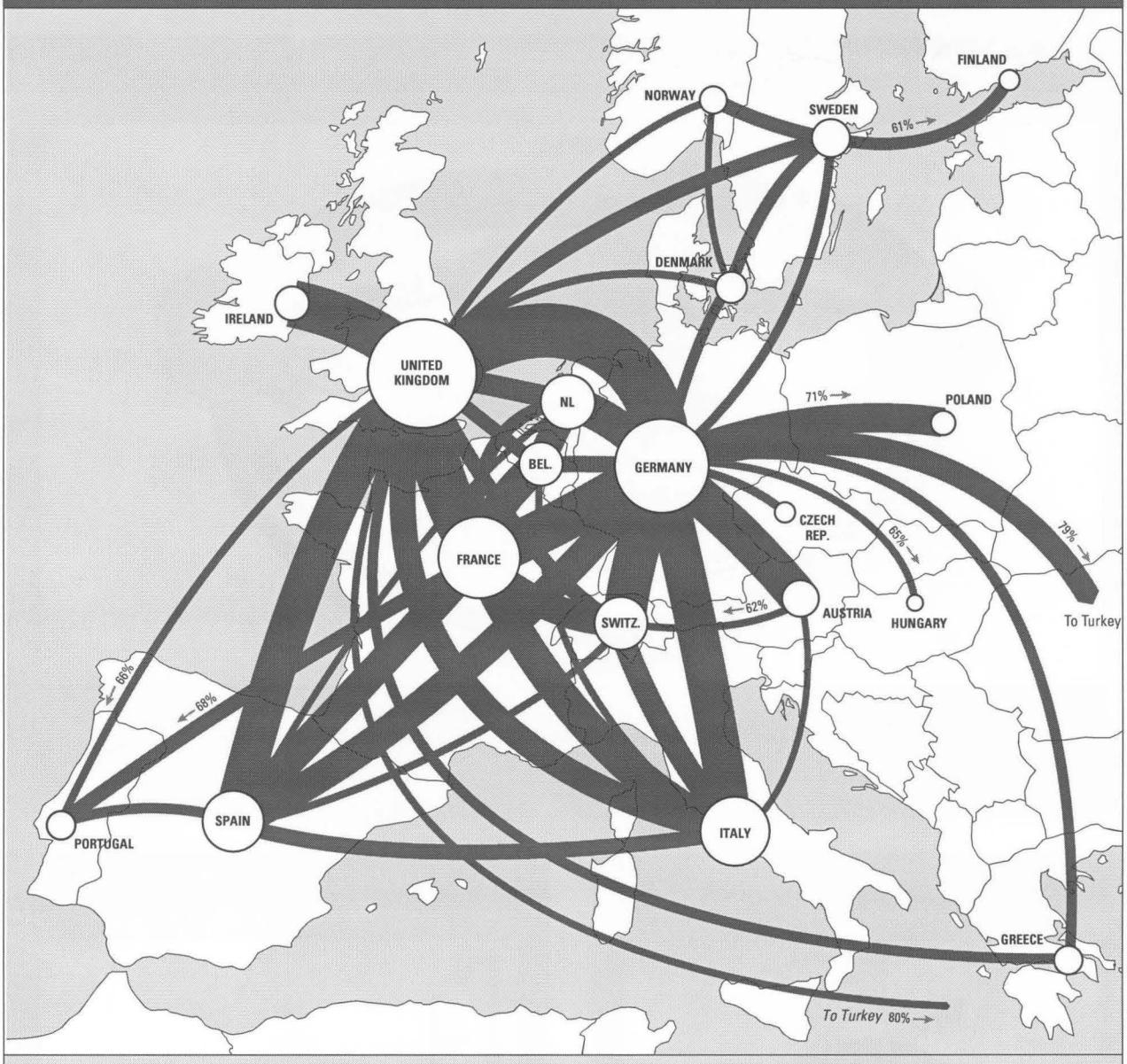
Figure 3. Traffic Growth by Region, 2001-2002



Notes: Global traffic was 155.2 billion minutes in 2002. Data do not include VoIP calls.

Source: TeleGeography research

Figure 4. European Telecommunications Traffic Flows, 2002



Key

All figures are given in millions of minutes of telecommunications traffic for the public telephone network.

The map shows all intra-European routes with a combined 2002 volume of more than 200 million minutes.

Traffic Flows

600 400 200
Million Minutes

Each band is proportional to the total annual traffic on the public telephone network in both directions between each pair of countries.

Total Outgoing Traffic

250
1,000
5,000
Million Minutes

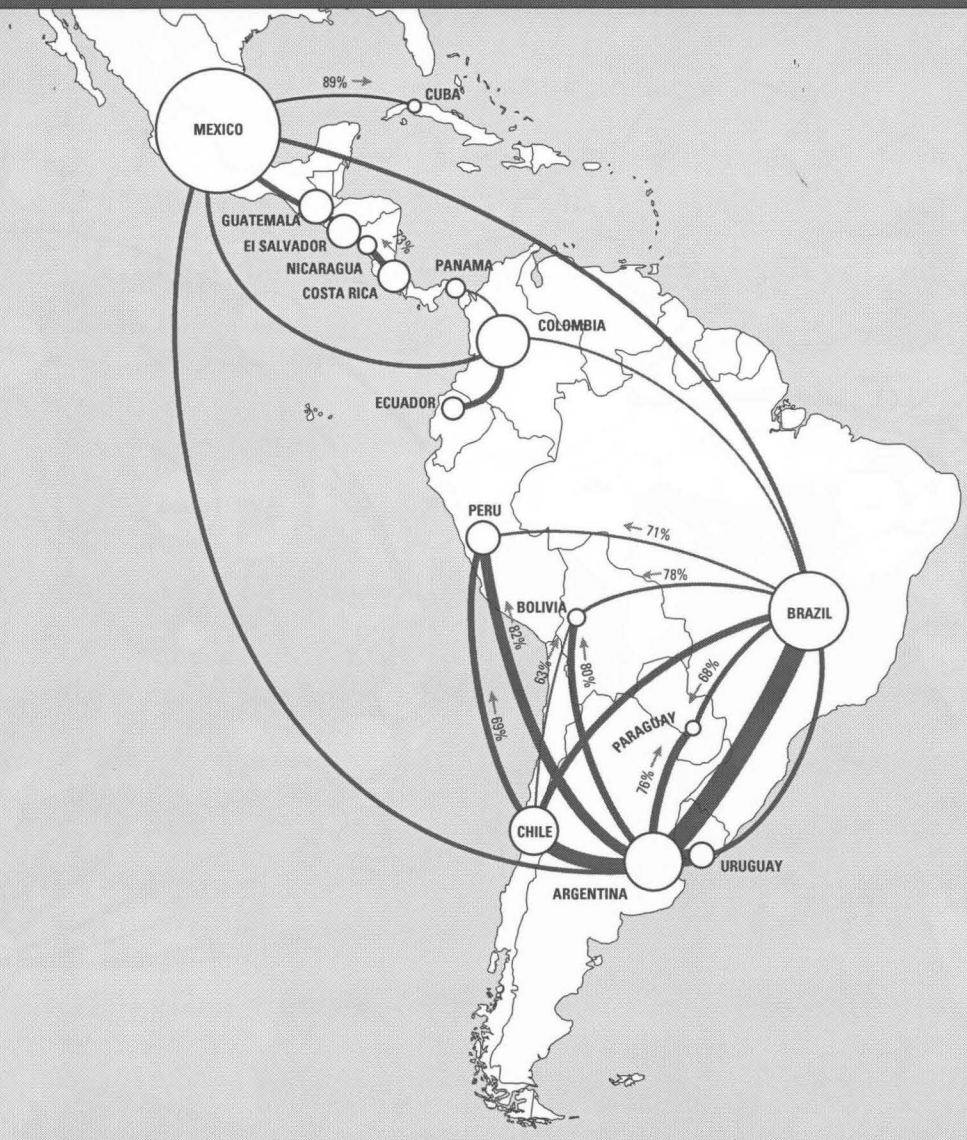
The area of each circle is proportional to the volume of the total annual outgoing traffic from each country.

Balance of Traffic

On routes where traffic in one direction accounts for more than 60 percent of the total, an arrow shows the direction most of the traffic flows.

Source: TeleGeography research

Figure 5. Latin American Telecommunications Traffic Flows, 2002



Key

All figures are given in millions of minutes of telecommunications traffic for the public telephone network.

The map shows all routes within Latin America with a combined 2002 volume of more than 10 million minutes.

Traffic Flows

100 50 10
Million Minutes

Each band is proportional to the total annual traffic on the public telephone network in both directions between each pair of countries.

Total Outgoing Traffic

100
500
1,000
Million Minutes

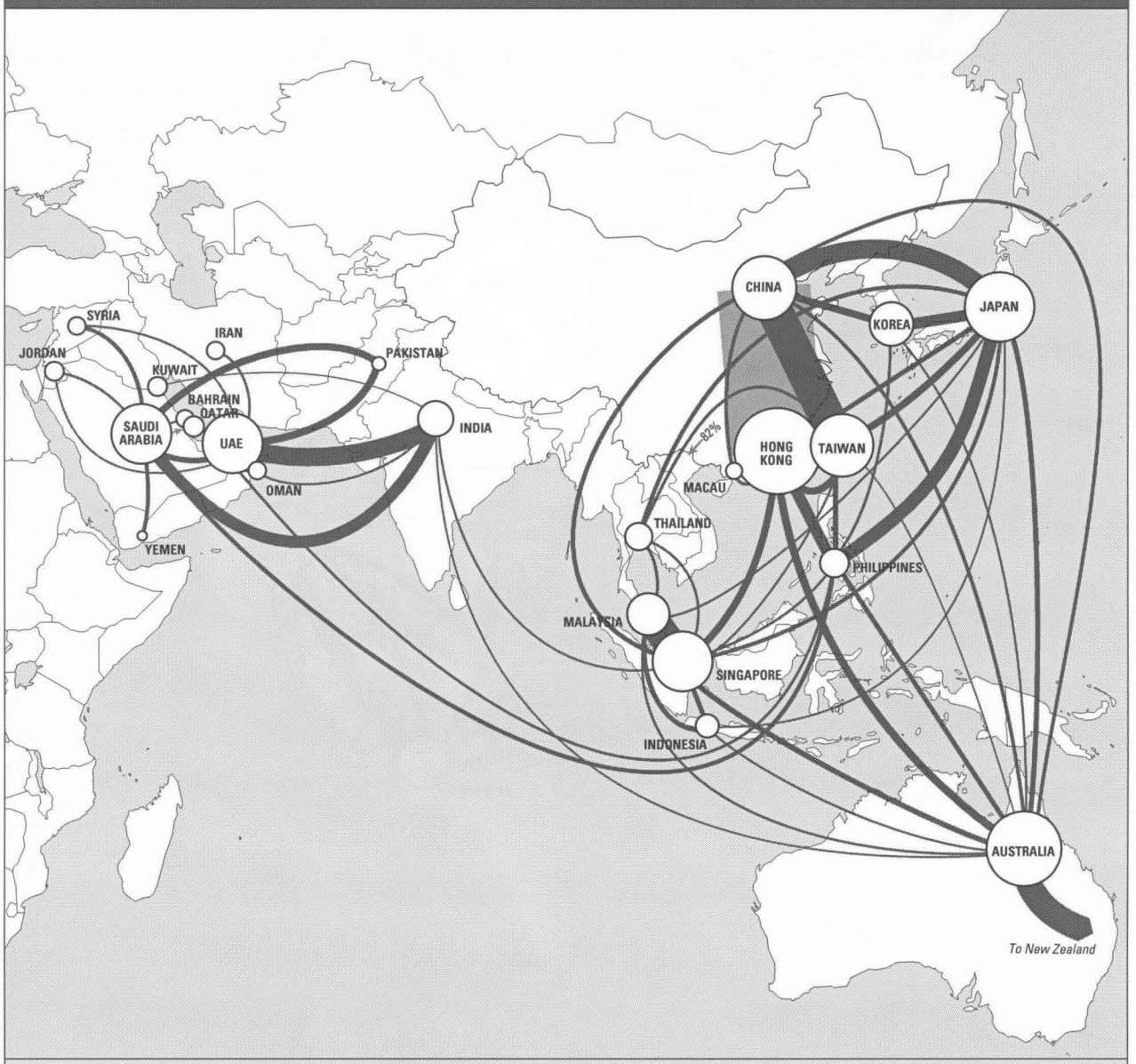
The area of each circle is proportional to the volume of the total annual outgoing traffic from each country.

Balance of Traffic

On routes where traffic in one direction accounts for more than 60 percent of the total, an arrow shows the direction most of the traffic flows.

Source: TeleGeography research

Figure 6. Asian Telecommunications Traffic Flows, 2002



Key

All figures are given in millions of minutes of telecommunications traffic for the public telephone network.

The map shows all intra-Asian routes with a combined 2002 volume of more than 50 million minutes.

Traffic Flows

500 200 50
Million Minutes

Each band is proportional to the total annual traffic on the public telephone network in both directions between each pair of countries.

Total Outgoing Traffic

100
500
1,500
Million Minutes

The area of each circle is proportional to the volume of the total annual outgoing traffic from each country.

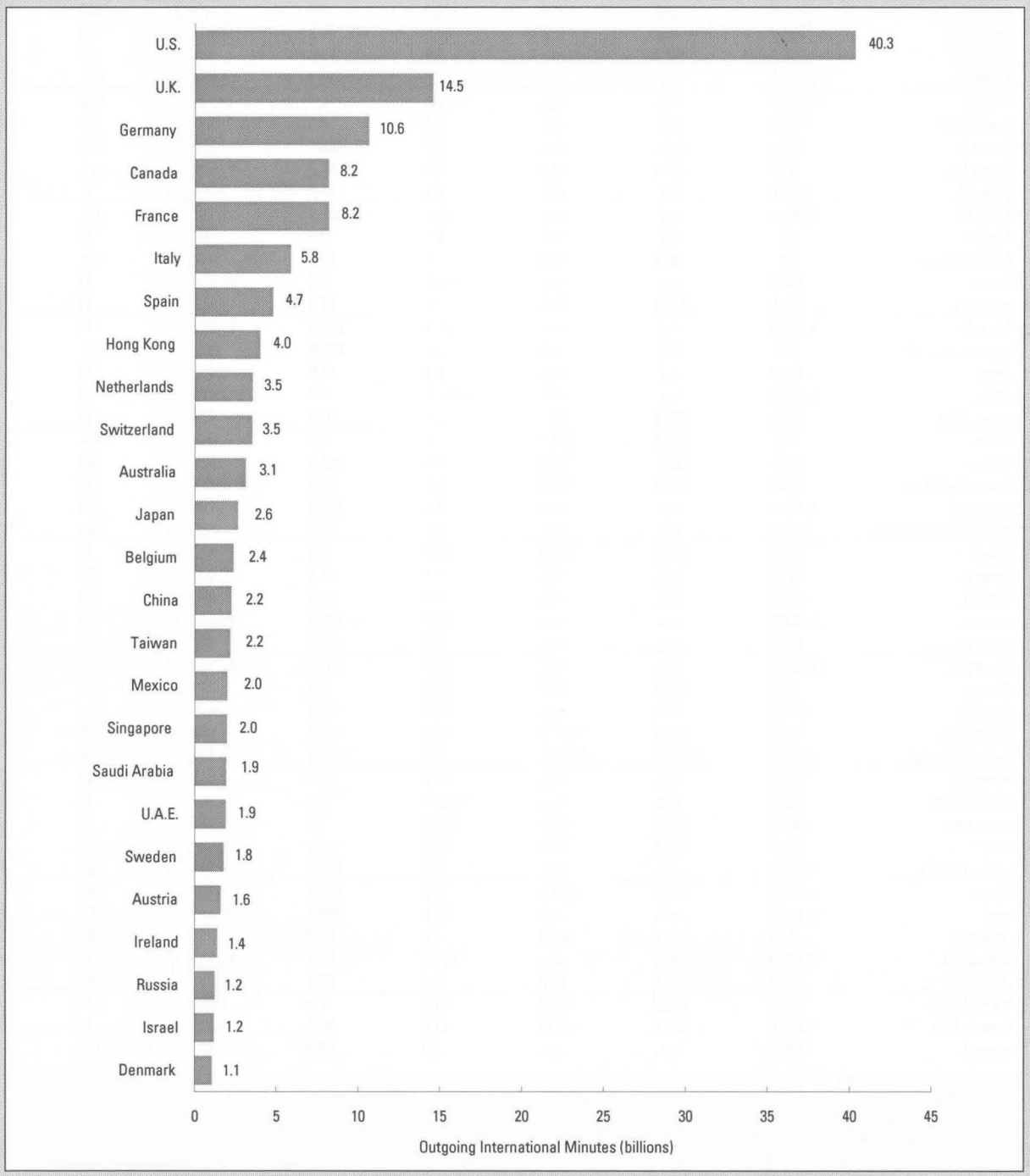
Balance of Traffic

On routes where traffic in one direction accounts for more than 60 percent of the total, an arrow shows the direction of most of the traffic flows.

Source: TeleGeography research

International Traffic by Country

Figure 1. Top 25 Countries for Outgoing International PSTN Traffic, 2002



Notes: Data are in billions of minutes of public switched traffic. VoIP call volumes are excluded.
Source: TeleGeography research

Figure 2. International Traffic Indicators, 2002

	Outgoing (m minutes)	Incoming (m minutes)	Balance (m minutes)	Population (m)	Minutes (Out) per Capita	Main Lines (thous.)	Minutes (Out) per Main Line
Albania	62.0	400.8	338.8	3.2	19.4	220	282
Angola	34.3	63.9	29.6	13.9	2.5	85	403
Argentina	426.7	n.a.	n.a.	37.9	11.3	8,009	53
Armenia	36.2	58.3	22.1	3.1	11.8	543	67
Australia	3,078.0	n.a.	n.a.	19.6	157.2	10,590	291
Austria	1,603.0	n.a.	n.a.	8.1	196.9	3,988	402
Azerbaijan	32.5	n.a.	n.a.	8.2	4.0	989	33
Bahrain	107.1	n.a.	n.a.	0.7	159.4	175	611
Barbados	44.2	78.8	34.6	0.3	164.3	n.a.	n.a.
Belarus	240.6	n.a.	n.a.	9.9	24.2	2,967	81
Belgium	2,365.4	n.a.	n.a.	10.3	229.2	5,132	461
Bolivia	39.1	n.a.	n.a.	8.7	4.5	564	69
Botswana (a)	63.7	45.7	-18.0	1.7	37.2	n.a.	n.a.
Brazil	806.0	n.a.	n.a.	174.5	4.6	38,810	21
Bulgaria	136.0	213.0	77.0	7.9	17.3	2,922	47
Canada	8,183.0	n.a.	n.a.	31.4	260.5	19,962	410
Cayman Islands	34.7	37.0	2.3	n.a.	992.0	n.a.	n.a.
Chile	294.3	n.a.	n.a.	15.6	18.9	3,467	85
China	2,240.0	n.a.	n.a.	1,281.0	1.7	214,420	10
Costa Rica	129.4	158.5	29.1	3.9	32.8	479	270
Cuba	19.2	282.9	263.7	11.3	1.7	n.a.	n.a.
Cyprus	253.6	163.7	-89.9	0.8	331.5	427	593
Czech Republic	475.0	580.0	105.0	10.2	46.5	2,444	194
Denmark	1,050.0	n.a.	n.a.	5.4	195.4	3,739	281
Dominican Republic	222.6	n.a.	n.a.	8.6	25.8	583	382
Egypt	198.4	938.3	739.9	66.4	3.0	7,430	27
Estonia	103.2	n.a.	n.a.	1.4	76.0	475	217
Finland	490.0	n.a.	n.a.	5.2	94.2	2,850	172
France	8,170.0	n.a.	n.a.	59.4	137.4	33,994	240
Georgia	114.4	n.a.	n.a.	5.2	22.1	649	176
Germany	10,620.0	n.a.	n.a.	82.5	128.7	53,720	198
Ghana	58.3	153.0	94.7	20.1	2.9	274	213
Greece	998.0	n.a.	n.a.	10.6	93.9	n.a.	n.a.
Guatemala	145.9	817.7	671.8	12.0	12.2	846	172
Hong Kong (a)	3,981.1	1,745.3	-2,235.7	6.8	587.8	3,278	1,215
Hungary	327.0	n.a.	n.a.	10.2	32.2	3,666	89
India (a) (b)	660.0	n.a.	n.a.	1,048.3	0.6	41,215	16
Indonesia	289.4	429.4	140.1	211.7	1.4	7,750	37
Iran	171.2	118.8	-52.4	65.5	2.6	5,090	34
Ireland (a) (b)	1,395.0	n.a.	n.a.	3.9	359.7	1,975	706
Israel	1,193.7	814.1	-379.6	6.5	183.8	3,100	385
Italy	5,840.0	n.a.	n.a.	57.9	100.8	27,452	213
Jamaica	56.3	349.6	293.3	2.6	21.5	450	125
Japan (a)	2,638.5	n.a.	n.a.	127.1	20.8	71,149	37
Jordan	198.4	236.0	37.6	5.2	38.4	675	294
Kazakhstan	131.6	260.2	128.7	14.8	8.9	2,082	63
Korea, Rep.	1,041.8	928.0	-113.8	47.6	21.9	18,600	56
Kuwait	189.8	n.a.	n.a.	2.1	90.2	482	394

Notes: Data are in millions of minutes of public switched traffic. VoIP call volumes are excluded.
a. International traffic for year ending March 31, 2003. New Zealand and Pakistan fiscal years end June 30, 2003.
b. Traffic data exclude some carriers or routes (See country table for details).

Source: TeleGeography research

Figure 2. International Traffic Indicators, 2002 (continued)

	Outgoing (m minutes)	Incoming (m minutes)	Balance (m minutes)	Population (m)	Minutes (Out) per Capita	Main Lines (thous.)	Minutes (Out) per Main Line
Kyrgyzstan	18.3	44.5	26.3	5.0	3.6	395	46
Latvia	63.0	110.6	47.6	2.3	27.0	701	90
Luxembourg	414.0	n.a.	n.a.	0.4	932.4	n.a.	n.a.
Macau	152.7	114.0	-38.7	0.4	344.8	153	996
Macedonia	64.7	192.5	127.8	2.0	31.7	26	2,454
Malaysia (a)	982.0	1,050.0	68.0	24.3	40.4	4,670	210
Malta	43.8	65.6	21.8	0.4	110.2	207	211
Mauritius	37.1	64.0	26.9	1.2	30.6	327	113
Mexico	1,996.9	5,836.9	3,840.0	100.9	19.8	14,942	134
Moldova	65.8	191.4	125.6	4.3	15.5	n.a.	n.a.
Namibia	60.6	52.1	-8.5	1.8	33.2	121	499
Netherlands	3,525.0	n.a.	n.a.	16.1	218.3	10,000	353
New Zealand (a)	984.0	n.a.	n.a.	3.9	254.3	1,719	572
Nicaragua	44.0	n.a.	n.a.	5.3	8.2	172	256
Nigeria	86.9	n.a.	n.a.	132.8	0.7	702	124
Norway	871.4	n.a.	n.a.	4.5	192.0	3,325	262
Oman (b)	165.8	n.a.	n.a.	2.5	65.3	228	728
Pakistan (a) (b)	128.3	1,530.4	1,402.1	144.9	0.9	3,655	35
Palestinian Territory	40.9	n.a.	n.a.	3.2	12.7	299	137
Paraguay	28.4	71.4	43.0	5.5	5.2	273	104
Peru	141.9	1,090.7	948.8	26.7	5.3	1,766	80
Philippines (a)	461.0	3,939.2	3,478.2	79.9	5.8	3,311	139
Portugal	970.0	n.a.	n.a.	10.0	96.7	4,361	222
Qatar	233.5	134.6	-98.9	0.6	382.8	177	1,323
Russia (b)	1,219.2	1,005.4	-213.8	144.1	8.5	35,500	34
Saudi Arabia	1,916.3	815.2	-1,101.1	22.1	86.6	1,719	1,115
Serbia and Montenegro	284.2	587.1	302.9	10.7	26.7	2,017	141
Singapore (a)	1,965.0	n.a.	n.a.	4.2	471.9	1,927	1,020
Slovak Republic	194.0	n.a.	n.a.	5.4	35.9	1,119	173
South Africa (a)	567.2	811.8	244.6	43.6	13.0	4,002	142
Spain (c)	4,740.0	n.a.	n.a.	41.2	115.1	18,706	253
Swaziland (a)	23.3	18.3	-5.0	1.1	21.4	35	664
Sweden	1,755.0	n.a.	n.a.	8.9	196.7	6,579	267
Switzerland	3,495.0	n.a.	n.a.	7.2	483.5	5,335	655
Syria	179.8	n.a.	n.a.	17.0	10.6	2,099	86
Taiwan	2,154.0	n.a.	n.a.	22.5	95.9	9,175	235
Tajikistan (b)	10.0	n.a.	n.a.	6.3	1.6	238	42
Thailand	419.1	305.0	-114.1	61.6	6.8	6,500	64
Trinidad and Tobago (a)	80.2	276.6	196.4	1.3	60.8	209	383
Turkey	650.0	1,100.0	450.0	69.6	9.3	18,915	34
Turkmenistan (b)	24.1	n.a.	n.a.	5.5	4.3	n.a.	n.a.
Ukraine	405.0	n.a.	n.a.	48.7	8.3	n.a.	n.a.
United Arab Emirates	1,893.6	n.a.	n.a.	3.0	621.0	672	2,817
United Kingdom (a)	14,545.4	9,569.6	-4,975.8	58.9	247.1	29,411	495
United States	40,337.2	14,249.8	-26,087.4	288.4	139.9	159,735	253
Uzbekistan	60.8	n.a.	n.a.	25.4	2.4	1,670	36
Yemen	43.9	186.9	143.0	18.6	2.4	542	81

Notes: Data are in millions of minutes of public switched traffic. VoIP call volumes are excluded.
a. International traffic for year ending March 31, 2003. New Zealand and Pakistan fiscal years end June 30, 2003.
b. Traffic data exclude some carriers or routes (See country table for details).
c. Data include refile traffic.

Source: TeleGeography research

International Traffic by Route

Figure 1. Top 50 International Routes, 2002

Rank	Countries	Minutes each Way	Total Minutes
1.	Canada - U.S.	6,000.0 — 4,861.0	10,861.0
2.	U.S. - Mexico	5,201.4 — 1,688.8	6,890.2
3.	U.K. - U.S.	2,635.0 — 1,722.4	4,357.5
4.	Hong Kong - China	2,063.6 — 882.0	2,945.6
5.	U.S. - Philippines	2,251.5 — 125.0	2,376.5
6.	U.S. - India	1,722.6 — 95.0	1,817.6
7.	U.S. - Germany	1,064.1 — 695.0	1,759.1
8.	U.K. - Germany	947.8 — 770.0	1,717.8
9.	U.K. - France	845.6 — 680.0	1,525.6
10.	Ireland - U.K.	810.0 — 691.1	1,501.1
11.	U.S. - Japan	895.6 — 525.0	1,420.6
12.	Germany - France	740.0 — 650.0	1,390.0
13.	Switzerland - Germany	710.0 — 650.0	1,360.0
14.	U.S. - Dominican Republic	1,186.2 — 160.0	1,346.2
15.	Germany - Italy	680.0 — 620.0	1,300.0
16.	U.K. - Spain	644.6 — 630.0	1,274.6
17.	Germany - Austria	695.0 — 570.0	1,265.0
18.	U.S. - Brazil	952.2 — 266.0	1,218.2
19.	Australia - U.S.	615.0 — 579.4	1,194.4
20.	U.S. - France	632.6 — 490.0	1,122.6
21.	Taiwan - China	749.1 — 373.0	1,122.1
22.	Germany - Netherlands	555.0 — 545.0	1,100.0
23.	France - Italy	550.0 — 510.0	1,060.0
24.	U.S. - Italy	730.5 — 325.0	1,055.5
25.	France - Belgium	560.0 — 480.0	1,040.0
26.	Australia - U.K.	560.0 — 478.0	1,038.0
27.	Singapore - Malaysia	590.0 — 415.0	1,005.0
28.	U.S. - Guatemala	908.8 — 80.1	988.9
29.	Spain - France	530.0 — 440.0	970.0
30.	Spain - Germany	565.0 — 390.0	955.0
31.	Germany - Poland	670.0 — 275.0	945.0
32.	Switzerland - France	480.0 — 450.0	930.0
33.	Belgium - Netherlands	460.0 — 445.0	905.0
34.	U.K. - Canada	464.5 — 420.0	884.5
35.	U.K. - Italy	478.0 — 350.0	828.0
36.	New Zealand - Australia	450.0 — 360.0	810.0
37.	Germany - Turkey	600.0 — 155.0	755.0
38.	U.S. - Colombia	721.9 — 28.1	750.0
39.	U.S. - China	660.9 — 80.0	740.9
40.	U.S. - Korea, Rep.	471.5 — 257.9	729.4
41.	Switzerland - Italy	415.0 — 310.0	725.0
42.	U.K. - Netherlands	352.3 — 345.0	697.3
43.	U.S. - Jamaica	647.3 — 31.7	679.0
44.	France - Morocco	560.0 — 115.0	675.0
45.	U.S. - Netherlands	423.8 — 220.0	643.8
46.	U.S. - Pakistan	615.2 — 17.7	632.9
47.	Israel - U.S.	326.5 — 297.3	623.8
48.	Japan - China	415.0 — 190.0	605.0
49.	U.A.E. - India	514.9 — 61.0	575.8
50.	U.S. - Taiwan	315.2 — 222.1	537.3

Notes: All data in millions of minutes of telecommunications traffic. The country which generates more traffic on each route is listed first. The routes listed above total 73.7 billion minutes, equal to 48 percent of all international traffic. Data for Hong Kong, Ireland, Japan, Malaysia, New Zealand, Singapore, and the U.K. are for fiscal year 2002/2003. The sum of minutes each way may not equal the total minutes due to rounding.

Source: TeleGeography research

Country Traffic Statistics

Albania

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Italy	25.0	40.3%
2.	Greece	19.2	31.0%
3.	France	7.0	11.3%
4.	Germany	2.6	4.2%
5.	United Kingdom	2.0	3.2%
6.	United States	1.6	2.6%
7.	Turkey	1.4	2.3%
8.	Macedonia	0.9	1.5%
9.	Serbia and Montenegro	0.8	1.3%
10.	Monaco	0.7	1.1%
11.	Austria	0.5	0.8%
12.	Switzerland	0.5	0.8%
13.	Netherlands	0.4	0.6%
14.	Canada	0.3	0.5%
15.	Bulgaria	0.3	0.5%
16.	Croatia	0.3	0.5%
17.	Romania	0.3	0.4%
18.	Hungary	0.2	0.2%
19.	Slovenia	0.1	0.1%
	Others	3.9	6.3%
	TOTAL	**62.0**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	178.6	317.0	400.8
Outgoing	64.9	65.4	62.0
Surplus (Deficit)	113.7	251.6	338.8
Total Volume	243.5	382.4	462.8

Note: Data are in millions of minutes of public switched telecommunications traffic.

Angola

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Portugal	15.9	46.3%
2.	South Africa	5.2	15.3%
3.	France	1.9	5.5%
4.	Namibia	1.7	5.1%
5.	Brazil	1.6	4.7%
6.	United Kingdom	1.4	4.1%
7.	United States	1.2	3.6%
8.	Netherlands	0.9	2.7%
9.	Belgium	0.6	1.8%
10.	Spain	0.5	1.6%
11.	Germany	0.5	1.5%
12.	Italy	0.4	1.0%
13.	Switzerland	0.3	0.9%
14.	Mozambique	0.3	0.7%
15.	Canada	0.2	0.7%
16.	Gambia	0.2	0.7%
17.	Zimbabwe	0.2	0.6%
18.	Israel	0.2	0.6%
19.	Russia	0.2	0.6%
20.	Côte d'Ivoire	0.1	0.4%
	Others	0.5	1.4%
	TOTAL	**34.3**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	39.8	52.2	63.9
Outgoing	35.4	32.8	34.3
Surplus (Deficit)	4.5	19.3	29.6
Total Volume	75.2	85.0	98.1

Note: Data are in millions of minutes of public switched telecommunications traffic.

Anguilla

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United States	1.8	33.5%
2.	United Kingdom	0.8	14.9%
3.	Saint Kitts and Nevis	0.6	10.7%
4.	Jamaica	0.4	7.3%
5.	Antigua and Barbuda	0.2	3.8%
6.	Barbados	0.2	3.8%
7.	Dominica	0.2	3.3%
8.	Guyana	0.2	3.1%
9.	Saint Lucia	0.2	3.1%
10.	Trinidad and Tobago	0.1	2.6%
11.	Saint Vincent and the Grenadines	0.1	1.8%
12.	Dominican Republic	0.1	1.3%
13.	Guadeloupe	0.1	0.9%
14.	Bermuda	0.0	0.5%
15.	Grenada	0.0	0.4%
	Others	0.3	4.6%
	TOTAL	**5.5**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	n.a.	n.a.	6.7
Outgoing	4.8	5.7	5.5
Surplus (Deficit)	n.a.	n.a.	1.2
Total Volume	n.a.	n.a.	12.2

Note: Data are in millions of minutes of public switched telecommunications traffic.

Antigua and Barbuda

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United States	5.6	36.2%
2.	Guyana	1.2	7.6%
3.	Jamaica	1.2	7.4%
4.	Dominica	1.1	6.9%
5.	Trinidad and Tobago	1.0	6.7%
6.	Barbados	1.0	6.6%
7.	United Kingdom	0.9	5.7%
8.	Saint Kitts and Nevis	0.6	4.1%
9.	Canada	0.6	4.0%
10.	Saint Lucia	0.4	2.8%
11.	Saint Vincent and the Grenadines	0.3	1.8%
12.	Grenada	0.2	1.1%
13.	Anguilla	0.2	1.0%
14.	Guadeloupe	0.2	1.0%
15.	Cuba	0.1	0.7%
16.	Cayman Islands	0.1	0.5%
	Others	0.4	2.6%
	TOTAL	**15.5**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	n.a.	n.a.	35.5
Outgoing	20.0	25.6	15.5
Surplus (Deficit)	n.a.	n.a.	20.0
Total Volume	n.a.	n.a.	50.9

Note: Data are in millions of minutes of public switched telecommunications traffic.

Argentina

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United States	81.0	19.0%
2.	Brazil	40.0	9.4%
3.	Uruguay	38.0	8.9%
4.	Spain	37.0	8.7%
5.	Peru	33.0	7.7%
6.	Chile	31.0	7.3%
7.	Paraguay	31.0	7.3%
8.	Bolivia	25.0	5.9%
9.	Italy	17.0	4.0%
10.	Mexico	12.0	2.8%
11.	Canada	7.0	1.6%
12.	China	7.0	1.6%
13.	France	7.0	1.6%
14.	Honduras	6.5	1.5%
15.	Cuba	6.0	1.4%
16.	Germany	6.0	1.4%
17.	United Kingdom	6.0	1.4%
18.	Colombia	5.0	1.2%
19.	Venezuela	5.0	1.2%
20.	Israel	3.0	0.7%
	Others	23.2	5.4%
	TOTAL	**426.7**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	n.a.	n.a.	n.a.
Outgoing	432.1	455.9	426.7
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

Note: Data are in millions of minutes of public switched telecommunications traffic.

Armenia

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (thousands)	Percent of Outgoing Traffic
1.	Russia	19,756.0	54.6%
2.	Georgia	2,274.0	6.3%
3.	Ukraine	1,657.0	4.6%
4.	United States	862.0	2.4%
5.	Greece	422.0	1.2%
6.	Iran	355.0	1.0%
7.	France	301.0	0.8%
8.	Kazakhstan	284.0	0.8%
9.	Belarus	270.0	0.7%
10.	Turkey	258.0	0.7%
11.	United Arab Emirates	190.0	0.5%
12.	Uzbekistan	146.0	0.4%
13.	Turkmenistan	128.0	0.4%
14.	United Kingdom	125.0	0.3%
15.	Netherlands	86.0	0.2%
16.	Syria	81.0	0.2%
17.	Spain	80.0	0.2%
18.	Latvia	72.0	0.2%
19.	Belgium	70.0	0.2%
	Others	8,690.0	24.0%
	TOTAL	**36,180.0**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	n.a.	n.a.	58.3
Outgoing	31.4	34.6	36.2
Surplus (Deficit)	n.a.	n.a.	22.1
Total Volume	n.a.	n.a.	94.5

Note: National traffic data are in millions of minutes of public switched telecommunications traffic; route data are in thousands of minutes of public switched telecommunications traffic.

Australia

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United States	615.0	20.0%
2.	United Kingdom	560.0	18.2%
3.	New Zealand	360.0	11.7%
4.	Canada	140.0	4.5%
5.	Philippines	135.0	4.4%
6.	Hong Kong	100.0	3.2%
7.	Japan	100.0	3.2%
8.	China	95.0	3.1%
9.	Singapore	90.0	2.9%
10.	India	80.0	2.6%
11.	Germany	70.0	2.3%
12.	Italy	65.0	2.1%
13.	Malaysia	55.0	1.8%
14.	Indonesia	50.0	1.6%
15.	Vietnam	50.0	1.6%
	Others	538.0	17.5%
	TOTAL	**3,078.0**	

NATIONAL TRAFFIC BALANCE

Minutes	FY 2000/2001	FY 2001/2002	2002
Incoming	n.a.	n.a.	n.a.
Outgoing	2,650.0	3,030.0	3,078.0
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

Note: Data are in millions of minutes of public switched telecommunications traffic. Fiscal year ends 30 June.

Austria

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Germany	570.0	35.6%
2.	Italy	90.0	5.6%
3.	Switzerland	90.0	5.6%
4.	Hungary	60.0	3.7%
5.	Turkey	60.0	3.7%
6.	United States	60.0	3.7%
7.	Poland	50.0	3.1%
8.	Romania	50.0	3.1%
9.	United Kingdom	47.0	2.9%
10.	France	37.0	2.3%
11.	Serbia and Montenegro	35.0	2.2%
12.	Bosnia-Herzegovina	30.0	1.9%
13.	Spain	30.0	1.9%
14.	Slovak Republic	28.0	1.7%
15.	Croatia	26.0	1.6%
16.	Czech Republic	26.0	1.6%
17.	Netherlands	25.0	1.6%
18.	Slovenia	19.0	1.2%
19.	Belgium	15.0	0.9%
20.	Russia	15.0	0.9%
	Others	240.0	15.0%
	TOTAL	**1,603.0**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	n.a.	n.a.	n.a.
Outgoing	1,410.0	1,480.0	1,603.0
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

Note: Data are in millions of minutes of public switched telecommunications traffic.

Azerbaijan

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (thousands)	Percent of Outgoing Traffic
1.	Russia	14,657.3	45.1%
2.	Georgia	1,584.4	4.9%
3.	Ukraine	1,573.2	4.8%
4.	Kazakhstan	777.2	2.4%
5.	Uzbekistan	381.0	1.2%
6.	Belarus	309.5	1.0%
7.	Turkmenistan	257.6	0.8%
8.	Moldova	84.6	0.3%
9.	Kyrgyzstan	67.5	0.2%
10.	Tajikistan	22.0	0.1%
	Others	12,800.0	39.4%
	TOTAL	**32,500.0**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	59.7	n.a.	n.a.
Outgoing	28.1	29.6	32.5
Surplus (Deficit)	31.6	n.a.	n.a.
Total Volume	87.8	n.a.	n.a.

Note: National traffic data are in millions of minutes of public switched telecommunications traffic; route data are in thousands of minutes of public switched telecommunications traffic. The "Others" category may include routes to non-members of the Commonwealth of Independent States that rank among the top destinations for outgoing traffic.

Bahrain

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	India	19.8	18.5%
2.	Saudi Arabia	17.7	16.5%
3.	United Arab Emirates	13.5	12.6%
4.	United Kingdom	6.1	5.7%
5.	Kuwait	5.3	5.0%
6.	Qatar	4.5	4.2%
7.	United States	4.5	4.2%
8.	Pakistan	4.1	3.8%
9.	Egypt	4.1	3.8%
10.	Philippines	2.2	2.1%
11.	Jordan	2.1	2.0%
12.	Bangladesh	1.8	1.7%
13.	Morocco	1.8	1.6%
14.	Oman	1.8	1.6%
15.	Lebanon	1.4	1.3%
16.	Iran	1.2	1.1%
17.	France	1.2	1.1%
18.	Sri Lanka	0.9	0.9%
19.	Germany	0.9	0.8%
20.	Syria	0.9	0.8%
	Others	11.3	10.5%
	TOTAL	**107.1**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	125.6	182.6	n.a.
Outgoing	139.5	109.2	107.1
Surplus (Deficit)	(13.9)	73.4	n.a.
Total Volume	265.2	291.8	n.a.

Note: Data are in millions of minutes of public switched telecommunications traffic.

Barbados

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United States	11.1	25.2%
2.	United Kingdom	6.5	14.6%
3.	Guyana	5.6	12.7%
4.	Trinidad and Tobago	4.8	11.0%
5.	Canada	3.4	7.7%
6.	Saint Vincent and the Grenadines	2.6	5.8%
7.	Saint Lucia	2.1	4.8%
8.	Jamaica	2.0	4.6%
9.	Grenada	0.9	2.0%
10.	Antigua and Barbuda	0.8	1.8%
11.	Dominica	0.4	1.0%
12.	Saint Kitts and Nevis	0.4	1.0%
13.	Cayman Islands	0.3	0.7%
14.	Bermuda	0.2	0.5%
15.	Bahamas	0.2	0.3%
16.	Netherlands Antilles	0.2	0.3%
17.	India	0.1	0.3%
18.	Anguilla	0.1	0.3%
	Others	2.4	5.3%
	TOTAL	**44.2**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	n.a.	n.a.	78.8
Outgoing	32.1	37.6	44.2
Surplus (Deficit)	n.a.	n.a.	34.6
Total Volume	n.a.	n.a.	123.0

Note: Data are in millions of minutes of public switched telecommunications traffic.

Belarus

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Russia	133.6	55.5%
2.	Ukraine	25.5	10.6%
3.	Germany	17.7	7.3%
4.	Poland	12.3	5.1%
5.	Lithuania	6.9	2.9%
	Others	44.7	18.6%
	TOTAL	**240.6**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	n.a.	n.a.	n.a.
Outgoing	178.5	209.9	240.6
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

Note: Data are in millions of minutes of public switched telecommunications traffic. The "Others" category may include routes to non-members of the Commonwealth of Independent States that rank among the top destinations for outgoing traffic.

Belgium

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	France	480.0	20.3%
2.	Netherlands	460.0	19.4%
3.	Germany	275.0	11.6%
4.	United Kingdom	220.0	9.3%
5.	Italy	120.0	5.1%
6.	United States	110.0	4.7%
7.	Luxembourg	80.0	3.4%
8.	Spain	75.0	3.2%
9.	Morocco	55.0	2.3%
10.	Switzerland	43.0	1.8%
11.	Turkey	35.0	1.5%
12.	Denmark	32.0	1.4%
13.	Australia	30.0	1.3%
14.	Poland	30.0	1.3%
15.	Sweden	25.0	1.1%
16.	Greece	24.0	1.0%
17.	Canada	21.0	0.9%
18.	Austria	19.0	0.8%
19.	Portugal	18.0	0.8%
20.	Ireland	12.0	0.5%
	Others	213.4	9.0%
	TOTAL	**2,365.4**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	n.a.	n.a.	n.a.
Outgoing	1,835.0	2,155.0	2,365.4
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

Note: Data are in millions of minutes of public switched telecommunications traffic.

Belize

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (thousands)	Percent of Outgoing Traffic
1.	United States	6,173.9	53.5%
2.	Guatemala	1,019.7	8.8%
3.	Mexico	723.5	6.3%
4.	Honduras	619.7	5.4%
5.	El Salvador	383.9	3.3%
6.	United Kingdom	326.9	2.8%
7.	Canada	322.3	2.8%
8.	Jamaica	159.7	1.4%
9.	Costa Rica	149.2	1.3%
10.	Panama	149.1	1.3%
11.	India	118.2	1.0%
12.	Barbados	112.5	1.0%
13.	China	103.4	0.9%
14.	Cuba	99.5	0.9%
15.	Nicaragua	89.8	0.8%
16.	Trinidad and Tobago	87.8	0.8%
17.	Bahamas	48.0	0.4%
18.	Colombia	45.7	0.4%
19.	Taiwan	44.3	0.4%
20.	Germany	41.8	0.4%
	Others	710.0	6.2%
	TOTAL	**11,532.0**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	24.0	28.5	36.2
Outgoing	9.6	10.7	11.5
Surplus (Deficit)	14.4	17.8	24.7
Total Volume	33.6	39.1	47.8

Note: National traffic data are in millions of minutes of public switched telecommunications traffic; route data are in thousands of minutes of public switched telecommunications traffic.

Bolivia

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United States	8.2	21.0%
2.	Argentina	6.8	17.4%
3.	Peru	4.0	10.2%
4.	Brazil	3.7	9.5%
5.	Chile	3.7	9.5%
6.	Colombia	2.6	6.6%
7.	Spain	1.9	4.9%
8.	Ecuador	0.7	1.8%
9.	Italy	0.7	1.8%
10.	Mexico	0.7	1.8%
11.	Paraguay	0.6	1.5%
12.	Canada	0.5	1.3%
13.	China	0.5	1.3%
14.	Germany	0.5	1.3%
15.	United Kingdom	0.5	1.3%
16.	Uruguay	0.5	1.3%
17.	Switzerland	0.4	1.0%
18.	Venezuela	0.4	1.0%
19.	Cuba	0.3	0.8%
20.	France	0.3	0.8%
	Others	1.6	4.1%
	TOTAL	**39.1**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	80.8	n.a.	n.a.
Outgoing	27.2	31.9	39.1
Surplus (Deficit)	53.6	n.a.	n.a.
Total Volume	107.9	n.a.	n.a.

Note: Data are in millions of minutes of public switched telecommunications traffic.

Botswana

LARGEST TELECOMMUNICATIONS ROUTES, FY 2002/2003

	Destination	Minutes (thousands)	Percent of Outgoing Traffic
1.	South Africa	43,020.0	67.5%
2.	Zimbabwe	6,320.0	9.9%
3.	United Kingdom	2,390.0	3.7%
4.	Zambia	2,210.0	3.5%
5.	United States	1,230.0	1.9%
6.	Namibia	1,120.0	1.8%
7.	Kenya	650.0	1.0%
8.	Malawi	360.0	0.6%
9.	Swaziland	340.0	0.5%
10.	Australia	290.0	0.5%
11.	Lesotho	290.0	0.5%
12.	Nigeria	180.0	0.3%
13.	Ireland	160.0	0.3%
14.	Mauritius	150.0	0.2%
15.	Mozambique	150.0	0.2%
16.	Germany	140.0	0.2%
17.	France	130.0	0.2%
18.	Sri Lanka	120.0	0.2%
19.	Canada	110.0	0.2%
20.	Switzerland	100.0	0.2%
	Others	4,170.0	6.5%
	TOTAL	**63,735.0**	

NATIONAL TRAFFIC BALANCE

Minutes	FY 2000/2001	FY 2001/2002	FY 2002/2003
Incoming	n.a.	41.2	45.7
Outgoing	42.0	59.0	63.7
Surplus (Deficit)	n.a.	(17.8)	(18.0)
Total Volume	n.a.	100.2	109.5

Note: National traffic data are in millions of minutes of public switched telecommunications traffic; route data are in thousands of minutes of public switched telecommunications traffic. Fiscal year ends 31 March.

Brazil

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United States	266.0	33.0%
2.	Portugal	72.0	8.9%
3.	Argentina	56.0	6.9%
4.	Italy	42.0	5.2%
5.	United Kingdom	35.0	4.3%
6.	Spain	34.0	4.2%
7.	Germany	31.0	3.8%
8.	France	26.0	3.2%
9.	Japan	25.0	3.1%
10.	Chile	18.0	2.2%
11.	Paraguay	17.0	2.1%
12.	Uruguay	15.0	1.9%
13.	Canada	14.0	1.7%
14.	Bolivia	13.0	1.6%
15.	Switzerland	12.0	1.5%
16.	Mexico	11.0	1.4%
17.	Peru	10.0	1.2%
18.	Netherlands	7.5	0.9%
19.	Colombia	7.0	0.9%
20.	Venezuela	6.5	0.8%
	Others	88.0	10.9%
	TOTAL	**806.0**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	1,212.4	n.a.	n.a.
Outgoing	692.7	772.2	806.0
Surplus (Deficit)	519.8	n.a.	n.a.
Total Volume	1,905.1	n.a.	n.a.

Note: Data are in millions of minutes of public switched telecommunications traffic.

Bulgaria

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Greece	19.0	14.0%
2.	Germany	18.0	13.2%
3.	Turkey	13.0	9.6%
4.	Italy	9.0	6.6%
5.	Spain	7.0	5.1%
6.	United Kingdom	6.0	4.4%
7.	France	5.0	3.7%
8.	Russia	5.0	3.7%
9.	Austria	4.0	2.9%
10.	United States	4.0	2.9%
11.	Macedonia	3.0	2.2%
12.	Netherlands	3.0	2.2%
13.	Serbia and Montenegro	3.0	2.2%
14.	Belgium	2.0	1.5%
15.	Israel	2.0	1.5%
16.	Romania	2.0	1.5%
17.	Switzerland	2.0	1.5%
18.	Ukraine	2.0	1.5%
19.	Czech Republic	1.6	1.2%
20.	Cyprus	1.5	1.1%
	Others	23.9	17.6%
	TOTAL	**136.0**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	211.0	220.0	213.0
Outgoing	110.0	125.0	136.0
Surplus (Deficit)	101.0	95.0	77.0
Total Volume	321.0	345.0	349.0

Note: Data are in millions of minutes of public switched telecommunications traffic.

Burkina Faso

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (thousands)	Percent of Outgoing Traffic
1.	Côte d'Ivoire	3,720.6	22.2%
2.	France	3,081.6	18.4%
3.	Senegal	2,003.0	11.9%
4.	Togo	1,202.1	7.2%
5.	Mali	996.2	5.9%
6.	Benin	625.8	3.7%
7.	Niger	416.2	2.5%
8.	Belgium	364.2	2.2%
9.	Switzerland	335.7	2.0%
10.	Italy	287.8	1.7%
11.	United States	275.4	1.6%
12.	Germany	223.1	1.3%
13.	Netherlands	215.0	1.3%
14.	Nigeria	195.8	1.2%
15.	Canada	165.1	1.0%
16.	Lebanon	162.1	1.0%
17.	Cameroon	161.4	1.0%
18.	Gabon	152.7	0.9%
19.	Spain	140.1	0.8%
20.	Morocco	138.6	0.8%
	Others	1,920.0	11.4%
	TOTAL	**16,789.5**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	n.a.	n.a.	n.a.
Outgoing	10.6	8.7	16.8
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

Note: National traffic data are in millions of minutes of public switched telecommunications traffic; route data are in thousands of minutes of public switched telecommunications traffic.

Burundi

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Belgium	0.6	20.9%
2.	France	0.3	11.5%
3.	South Africa	0.2	8.5%
4.	Kenya	0.2	8.4%
5.	United States	0.2	5.4%
6.	United Kingdom	0.1	4.8%
7.	Tanzania	0.1	4.4%
8.	Canada	0.1	4.2%
9.	Switzerland	0.1	3.3%
10.	Italy	0.1	3.3%
11.	Netherlands	0.1	3.1%
12.	Germany	0.0	1.7%
13.	Senegal	0.0	1.5%
14.	Greece	0.0	1.4%
15.	India	0.0	1.1%
16.	Sweden	0.0	1.0%
17.	Denmark	0.0	1.0%
18.	Ethiopia	0.0	1.0%
19.	Côte d'Ivoire	0.0	0.9%
20.	Mali	0.0	0.8%
	Others	0.3	12.0%
	TOTAL	**2.8**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	4.4	n.a.	n.a.
Outgoing	2.9	3.0	2.8
Surplus (Deficit)	1.5	n.a.	n.a.
Total Volume	7.3	n.a.	n.a.

Note: Data are in millions of minutes of public switched telecommunications traffic.

Canada

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United States	6,000.0	73.3%
2.	United Kingdom	420.0	5.1%
3.	Hong Kong	148.0	1.8%
4.	India	136.0	1.7%
5.	France	120.0	1.5%
6.	Philippines	120.0	1.5%
7.	Italy	115.0	1.4%
8.	Germany	110.0	1.3%
9.	Australia	65.0	0.8%
10.	Mexico	65.0	0.8%
	Others	889.0	10.9%
	TOTAL	**8,183.0**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	n.a.	n.a.	n.a.
Outgoing	7,224.0	7,915.0	8,183.0
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

Note: Data are in millions of minutes of public switched telecommunications traffic.

Cayman Islands

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Jamaica	13.1	37.8%
2.	United States	11.2	32.3%
3.	Canada	2.7	7.8%
4.	United Kingdom	2.3	6.7%
5.	Barbados	1.1	3.3%
6.	Honduras	0.7	2.1%
7.	Trinidad and Tobago	0.7	1.9%
8.	Bermuda	0.3	1.0%
9.	Brazil	0.2	0.7%
10.	India	0.2	0.6%
11.	Bahamas	0.2	0.5%
12.	Philippines	0.2	0.5%
13.	Antigua and Barbuda	0.1	0.4%
14.	Saint Lucia	0.1	0.3%
15.	Guyana	0.1	0.3%
16.	Ireland	0.1	0.3%
17.	Switzerland	0.1	0.3%
18.	Costa Rica	0.1	0.2%
	Others	0.8	2.4%
	TOTAL	**34.7**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	27.3	n.a.	37.0
Outgoing	42.0	40.6	34.7
Surplus (Deficit)	(14.7)	n.a.	2.3
Total Volume	69.3	n.a.	71.8

Note: Data are in millions of minutes of public switched telecommunications traffic.

Chile

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United States	86.7	29.5%
2.	Argentina	36.8	12.5%
3.	Peru	21.8	7.4%
4.	Spain	16.8	5.7%
5.	Brazil	15.7	5.3%
6.	Mexico	8.0	2.7%
7.	Colombia	7.7	2.6%
8.	Ecuador	6.8	2.3%
9.	Bolivia	6.4	2.2%
10.	Germany	6.0	2.0%
11.	Canada	5.7	1.9%
12.	France	5.1	1.7%
13.	Venezuela	4.7	1.6%
14.	Italy	4.5	1.5%
15.	United Kingdom	4.4	1.5%
16.	Uruguay	3.0	1.0%
17.	Australia	2.7	0.9%
18.	Japan	2.7	0.9%
19.	Sweden	2.2	0.8%
20.	Paraguay	1.6	0.5%
	Others	45.1	15.3%
	TOTAL	**294.3**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	n.a.	n.a.	n.a.
Outgoing	261.4	281.2	294.3
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

Note: Data are in millions of minutes of public switched telecommunications traffic.

China

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Hong Kong	882.0	39.4%
2.	Taiwan	373.0	16.7%
3.	Japan	190.0	8.5%
4.	United States	80.0	3.6%
5.	Korea, Rep.	66.0	2.9%
6.	Macau	55.0	2.5%
7.	Singapore	51.0	2.3%
8.	United Kingdom	47.0	2.1%
9.	Australia	25.0	1.1%
10.	Canada	25.0	1.1%
11.	Germany	24.0	1.1%
12.	France	18.0	0.8%
13.	Italy	14.0	0.6%
14.	Malaysia	12.0	0.5%
15.	Russia	11.0	0.5%
	Others	367.0	16.4%
	TOTAL	**2,240.0**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	3,500.0	4,270.0	n.a.
Outgoing	1,850.0	2,040.0	2,240.0
Surplus (Deficit)	1,650.0	2,230.0	n.a.
Total Volume	5,350.0	6,310.0	n.a.

Note: Data are in millions of minutes of public switched telecommunications traffic. Data are for PSTN traffic only. VoIP traffic accounted for over one billion minutes of additional call volumes from China in 2001.

Costa Rica

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United States	45.9	35.5%
2.	Nicaragua	24.0	18.5%
3.	Panama	6.2	4.8%
4.	Mexico	5.1	3.9%
5.	El Salvador	4.9	3.8%
6.	Guatemala	4.0	3.1%
7.	Colombia	3.7	2.8%
8.	Honduras	3.4	2.6%
9.	Canada	3.2	2.5%
10.	Spain	1.7	1.3%
11.	Cuba	1.6	1.2%
12.	Argentina	1.4	1.1%
13.	Venezuela	1.4	1.1%
14.	Peru	1.2	0.9%
15.	Chile	1.1	0.8%
16.	Italy	0.9	0.7%
17.	Dominican Republic	0.8	0.6%
18.	United Kingdom	0.8	0.6%
19.	France	0.8	0.6%
20.	Germany	0.7	0.5%
	Others	10.5	8.1%
	TOTAL	**129.4**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	137.8	165.5	158.5
Outgoing	99.6	131.4	129.4
Surplus (Deficit)	38.2	34.1	29.1
Total Volume	237.4	296.9	287.9

Note: Data are in millions of minutes of public switched telecommunications traffic.

Cuba

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United States	2.9	15.1%
2.	Spain	2.6	13.8%
3.	Canada	2.0	10.6%
4.	Italy	1.8	9.4%
5.	Mexico	1.5	8.0%
6.	France	1.3	6.8%
7.	Germany	0.6	3.3%
8.	United Kingdom	0.5	2.7%
9.	Venezuela	0.4	2.3%
10.	Netherlands	0.4	1.9%
11.	Panama	0.3	1.7%
12.	Dominican Republic	0.3	1.6%
13.	Brazil	0.3	1.5%
14.	Portugal	0.3	1.5%
15.	Switzerland	0.2	1.2%
16.	Colombia	0.2	1.2%
17.	Chile	0.2	1.1%
18.	Jamaica	0.2	1.0%
19.	Russia	0.2	0.9%
20.	Argentina	0.2	0.9%
	Others	2.6	13.5%
	TOTAL	**19.2**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	284.4	258.0	282.9
Outgoing	20.6	22.4	19.2
Surplus (Deficit)	263.8	235.5	263.7
Total Volume	304.9	280.4	302.1

Note: Data are in millions of minutes of public switched telecommunications traffic.

Cyprus

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Greece	82.8	32.6%
2.	United Kingdom	70.2	27.7%
3.	United States	11.4	4.5%
4.	Russia	10.7	4.2%
5.	Bulgaria	5.8	2.3%
6.	Romania	5.2	2.1%
7.	Germany	4.9	1.9%
8.	Ukraine	4.6	1.8%
9.	Lebanon	3.6	1.4%
10.	Italy	2.7	1.1%
11.	Syria	2.6	1.0%
12.	Philippines	2.5	1.0%
13.	France	2.4	0.9%
14.	Egypt	2.3	0.9%
15.	Serbia and Montenegro	2.3	0.9%
16.	Sri Lanka	2.3	0.9%
17.	Switzerland	2.3	0.9%
18.	Israel	2.2	0.9%
19.	Netherlands	2.0	0.8%
20.	Sweden	1.9	0.7%
	Others	28.9	11.4%
	TOTAL	**253.6**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	159.7	166.7	163.7
Outgoing	192.6	220.2	253.6
Surplus (Deficit)	(32.9)	(53.5)	(89.9)
Total Volume	352.3	386.9	417.3

Note: Data are in millions of minutes of public switched telecommunications traffic.

Czech Republic

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Germany	115.0	24.2%
2.	Slovak Republic	95.0	20.0%
3.	Austria	34.0	7.2%
4.	United Kingdom	29.0	6.1%
5.	Poland	21.0	4.4%
6.	France	19.0	4.0%
7.	Italy	19.0	4.0%
8.	United States	15.0	3.2%
9.	Netherlands	14.0	2.9%
10.	Switzerland	13.0	2.7%
11.	Ukraine	13.0	2.7%
12.	Croatia	9.0	1.9%
13.	Russia	9.0	1.9%
14.	Hungary	8.5	1.8%
15.	Spain	8.0	1.7%
16.	Belgium	6.5	1.4%
17.	Sweden	5.5	1.2%
18.	Greece	4.5	0.9%
19.	Denmark	3.5	0.7%
20.	Belarus	3.0	0.6%
	Others	30.5	6.4%
	TOTAL	**475.0**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	n.a.	n.a.	580.0
Outgoing	359.9	424.4	475.0
Surplus (Deficit)	n.a.	n.a.	105.0
Total Volume	n.a.	n.a.	1,055.0

Note: Data are in millions of minutes of public switched telecommunications traffic.

Denmark

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Sweden	198.0	18.9%
2.	Germany	163.0	15.5%
3.	United Kingdom	114.0	10.9%
4.	Norway	107.0	10.2%
5.	United States	55.0	5.2%
6.	France	43.0	4.1%
7.	Netherlands	38.0	3.6%
8.	Spain	26.0	2.5%
9.	Italy	24.0	2.3%
10.	Belgium	17.0	1.6%
11.	Finland	17.0	1.6%
12.	Turkey	17.0	1.6%
13.	Switzerland	16.0	1.5%
14.	Iceland	9.0	0.9%
15.	Canada	7.0	0.7%
16.	Greece	7.0	0.7%
17.	Australia	6.0	0.6%
18.	Ireland	6.0	0.6%
19.	Portugal	4.0	0.4%
	Others	160.0	15.2%
	TOTAL	**1,050.0**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	n.a.	n.a.	n.a.
Outgoing	905.0	995.0	1,050.0
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

Note: Data are in millions of minutes of public switched telecommunications traffic.

Djibouti

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	France	1.8	31.0%
2.	Ethiopia	1.2	21.6%
3.	Yemen	0.4	7.2%
4.	Germany	0.3	5.6%
5.	United Arab Emirates	0.2	3.6%
6.	Somalia	0.2	3.2%
7.	Saudi Arabia	0.1	2.4%
8.	Canada	0.1	2.4%
9.	United Kingdom	0.1	2.3%
10.	United States	0.1	2.2%
11.	Belgium	0.1	1.4%
12.	Egypt	0.1	1.2%
13.	Kenya	0.1	1.0%
14.	Netherlands	0.1	0.9%
15.	Eritrea	0.0	0.8%
16.	Italy	0.0	0.8%
17.	Senegal	0.0	0.5%
18.	Norway	0.0	0.5%
19.	India	0.0	0.5%
20.	Switzerland	0.0	0.4%
	Others	0.6	10.5%
	TOTAL	**5.7**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	12.2	n.a.	n.a.
Outgoing	4.5	3.8	5.7
Surplus (Deficit)	7.6	n.a.	n.a.
Total Volume	16.7	n.a.	n.a.

Note: Data are in millions of minutes of public switched telecommunications traffic.

Dominican Republic

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United States	160.0	71.9%
2.	Spain	10.0	4.5%
3.	Italy	5.0	2.2%
4.	Canada	4.1	1.8%
5.	Venezuela	3.6	1.6%
6.	Haiti	3.2	1.4%
7.	Germany	3.1	1.4%
8.	Mexico	2.8	1.3%
9.	Colombia	2.6	1.2%
10.	Netherlands Antilles	2.5	1.1%
11.	United Kingdom	2.5	1.1%
12.	France	2.3	1.0%
13.	Cuba	2.1	0.9%
14.	Switzerland	2.0	0.9%
15.	Argentina	1.9	0.9%
16.	Panama	1.4	0.6%
17.	Chile	1.1	0.5%
18.	Netherlands	1.1	0.5%
19.	Costa Rica	1.0	0.4%
20.	Guatemala	0.8	0.4%
	Others	9.5	4.3%
	TOTAL	**222.6**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	1,340.0	1,714.6	n.a.
Outgoing	211.7	227.4	222.6
Surplus (Deficit)	1,128.3	1,487.2	n.a.
Total Volume	1,551.7	1,942.0	n.a.

Note: Data are in millions of minutes of public switched telecommunications traffic.

Egypt

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Saudi Arabia	52.0	26.2%
2.	United Arab Emirates	17.4	8.8%
3.	Kuwait	15.6	7.9%
4.	United States	15.0	7.6%
5.	United Kingdom	13.9	7.0%
6.	Italy	12.6	6.4%
7.	France	9.6	4.8%
8.	Germany	9.6	4.8%
9.	Lebanon	6.6	3.3%
10.	Jordan	5.2	2.6%
11.	Qatar	4.0	2.0%
12.	Syria	3.9	2.0%
13.	Libya	3.8	1.9%
14.	Sudan	3.6	1.8%
15.	Netherlands	2.8	1.4%
16.	Switzerland	2.8	1.4%
17.	Morocco	2.7	1.4%
18.	Canada	2.5	1.3%
19.	Greece	2.3	1.2%
20.	Bahrain	2.2	1.1%
	Others	10.3	5.2%
	TOTAL	**198.4**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	620.6	n.a.	938.3
Outgoing	183.1	192.3	198.4
Surplus (Deficit)	437.5	n.a.	739.9
Total Volume	803.7	n.a.	1,136.7

Note: Data are in millions of minutes of public switched telecommunications traffic.

Eritrea

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (thousands)	Percent of Outgoing Traffic
1.	Italy	687.7	15.4%
2.	Saudi Arabia	516.6	11.5%
3.	United States	494.3	11.0%
4.	United Kingdom	258.6	5.8%
5.	Sudan	236.1	5.3%
6.	Germany	226.4	5.1%
7.	Kenya	166.1	3.7%
8.	Egypt	118.4	2.6%
9.	India	114.5	2.6%
10.	Netherlands	109.3	2.4%
11.	Sweden	102.2	2.3%
12.	South Africa	70.8	1.6%
13.	Djibouti	67.0	1.5%
14.	Korea, Rep.	55.4	1.2%
15.	France	53.8	1.2%
16.	Switzerland	51.3	1.1%
17.	Canada	46.5	1.0%
18.	Denmark	37.6	0.8%
19.	Norway	33.0	0.7%
20.	Libya	28.0	0.6%
	Others	1,000.0	22.3%
	TOTAL	**4,480.0**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	17.9	22.7	25.1
Outgoing	2.9	3.6	4.5
Surplus (Deficit)	15.0	19.1	20.6
Total Volume	20.8	26.2	29.6

Note: National traffic data are in millions of minutes of public switched telecommunications traffic; route data are in thousands of minutes of public switched telecommunications traffic.

Estonia

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Finland	32.3	31.3%
2.	Russia	15.0	14.5%
3.	Sweden	10.0	9.7%
4.	Germany	5.7	5.5%
5.	United Kingdom	5.1	4.9%
6.	Latvia	4.9	4.7%
7.	Lithuania	4.9	4.7%
8.	Norway	3.9	3.8%
9.	Netherlands	2.9	2.8%
10.	United States	2.9	2.8%
11.	Ukraine	2.7	2.6%
12.	Denmark	2.3	2.2%
13.	Italy	1.3	1.3%
14.	Belarus	1.2	1.2%
15.	France	1.2	1.2%
16.	Poland	1.1	1.1%
17.	Spain	0.9	0.9%
18.	Belgium	0.7	0.7%
19.	Austria	0.5	0.5%
20.	Canada	0.5	0.5%
	Others	3.2	3.1%
	TOTAL	**103.2**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	n.a.	91.9	n.a.
Outgoing	75.5	93.2	103.2
Surplus (Deficit)	n.a.	(1.3)	n.a.
Total Volume	n.a.	185.1	n.a.

Note: Data are in millions of minutes of public switched telecommunications traffic.

Ethiopia

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (thousands)	Percent of Outgoing Traffic
1.	United States	1,569.0	12.2%
2.	Kenya	1,030.7	8.0%
3.	Djibouti	900.3	7.0%
4.	Italy	813.8	6.3%
5.	Saudi Arabia	789.9	6.1%
6.	United Kingdom	777.4	6.0%
7.	United Arab Emirates	713.2	5.5%
8.	Germany	470.7	3.7%
9.	South Africa	418.1	3.2%
10.	France	386.8	3.0%
11.	India	362.7	2.8%
12.	Switzerland	359.4	2.8%
13.	Netherlands	216.0	1.7%
14.	Egypt	203.0	1.6%
15.	Yemen	200.7	1.6%
16.	Sudan	163.2	1.3%
17.	Canada	158.7	1.2%
18.	Sweden	128.0	1.0%
19.	Belgium	126.1	1.0%
20.	Nigeria	110.7	0.9%
	Others	2,980.0	23.1%
	TOTAL	**12,880.0**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	51.2	43.3	34.3
Outgoing	13.4	13.4	12.9
Surplus (Deficit)	37.7	29.8	21.4
Total Volume	64.6	56.7	47.2

Note: National traffic data are in millions of minutes of public switched telecommunications traffic; route data are in thousands of minutes of public switched telecommunications traffic.

Finland

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Sweden	155.0	31.6%
2.	Germany	45.0	9.2%
3.	United Kingdom	41.0	8.4%
4.	Estonia	35.0	7.1%
5.	Russia	30.0	6.1%
6.	Norway	21.0	4.3%
7.	United States	20.0	4.1%
8.	Spain	16.0	3.3%
9.	Denmark	15.0	3.1%
10.	France	15.0	3.1%
11.	Netherlands	12.0	2.4%
12.	Italy	11.0	2.2%
13.	Belgium	8.0	1.6%
14.	Switzerland	8.0	1.6%
15.	Austria	5.0	1.0%
16.	Canada	4.0	0.8%
17.	China	4.0	0.8%
18.	Greece	4.0	0.8%
19.	Poland	4.0	0.8%
20.	Turkey	3.0	0.6%
	Others	34.0	6.9%
	TOTAL	**490.0**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	n.a.	n.a.	n.a.
Outgoing	468.0	485.0	490.0
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

Note: Data are in millions of minutes of public switched telecommunications traffic.

France

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United Kingdom	680.0	8.3%
2.	Germany	650.0	8.0%
3.	Belgium	560.0	6.9%
4.	Morocco	560.0	6.9%
5.	Italy	550.0	6.7%
6.	United States	490.0	6.0%
7.	Switzerland	450.0	5.5%
8.	Spain	440.0	5.4%
9.	Algeria	420.0	5.1%
10.	Portugal	320.0	3.9%
11.	Tunisia	300.0	3.7%
12.	Netherlands	225.0	2.8%
13.	Canada	170.0	2.1%
14.	Turkey	135.0	1.7%
15.	Poland	110.0	1.3%
16.	Monaco	105.0	1.3%
17.	Senegal	85.0	1.0%
18.	Luxembourg	80.0	1.0%
19.	Sweden	55.0	0.7%
20.	Romania	45.0	0.6%
	Others	1,740.0	21.3%
	TOTAL	**8,170.0**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	n.a.	n.a.	n.a.
Outgoing	6,500.0	7,605.0	8,170.0
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

Note: Data are in millions of minutes of public switched telecommunications traffic.

Gabon

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	France	8.1	29.4%
2.	Senegal	2.4	8.8%
3.	Mali	2.3	8.5%
4.	Cameroon	2.1	7.5%
5.	Benin	2.0	7.3%
6.	Côte d'Ivoire	1.4	5.2%
7.	Lebanon	0.5	2.0%
8.	United States	0.5	1.9%
9.	Equatorial Guinea	0.5	1.8%
10.	Morocco	0.5	1.8%
11.	Congo, Rep.	0.5	1.8%
12.	Mauritania	0.4	1.4%
13.	Burkina Faso	0.4	1.4%
14.	United Kingdom	0.3	1.3%
15.	Italy	0.3	1.1%
16.	Belgium	0.3	1.1%
17.	South Africa	0.3	1.1%
18.	Germany	0.3	1.0%
19.	Canada	0.2	0.8%
20.	Nigeria	0.2	0.8%
	Others	3.9	14.1%
	TOTAL	**27.4**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	n.a.	n.a.	n.a.
Outgoing	22.0	25.0	27.4
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

Note: Data are in millions of minutes of public switched telecommunications traffic.

Gambia

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (thousands)	Percent of Outgoing Traffic
1.	Senegal	4,688.8	34.8%
2.	United Kingdom	2,705.7	20.1%
3.	United States	2,163.0	16.0%
4.	Canada	1,287.8	9.6%
5.	France	353.8	2.6%
6.	Nigeria	185.6	1.4%
7.	Germany	183.5	1.4%
8.	Sierra Leone	151.3	1.1%
9.	Lebanon	143.5	1.1%
10.	Spain	142.7	1.1%
11.	Mauritania	138.7	1.0%
12.	Netherlands	82.1	0.6%
13.	Belgium	69.9	0.5%
14.	Switzerland	45.8	0.3%
15.	Hong Kong	44.3	0.3%
16.	Guinea-Bissau	43.9	0.3%
17.	Norway	42.4	0.3%
18.	Mali	35.5	0.3%
19.	Saudi Arabia	35.2	0.3%
20.	Denmark	34.7	0.3%
	Others	900.0	6.7%
	TOTAL	**13,484.2**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	n.a.	n.a.	n.a.
Outgoing	6.7	7.1	13.5
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

Note: National traffic data are in millions of minutes of public switched telecommunications traffic; route data are in thousands of minutes of public switched telecommunications traffic. Traffic totals for 2000 and 2001 excluded some cross-border traffic to Senegal.

Georgia

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (thousands)	Percent of Outgoing Traffic
1.	Russia	66,700.0	58.3%
2.	Azerbaijan	7,100.0	6.2%
3.	Armenia	5,500.0	4.8%
4.	Ukraine	5,100.0	4.5%
5.	Turkey	2,900.0	2.5%
6.	Greece	1,500.0	1.3%
7.	Germany	1,300.0	1.1%
8.	Kazakhstan	1,200.0	1.0%
9.	Belarus	900.0	0.8%
10.	United Kingdom	800.0	0.7%
11.	United States	800.0	0.7%
12.	Italy	500.0	0.4%
13.	Spain	500.0	0.4%
14.	Uzbekistan	400.0	0.3%
15.	France	300.0	0.3%
16.	Portugal	300.0	0.3%
17.	Turkmenistan	300.0	0.3%
18.	Austria	200.0	0.2%
19.	Belgium	200.0	0.2%
20.	Moldova	200.0	0.2%
	Others	17,700.0	15.5%
	TOTAL	**114,400.0**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	37.6	n.a.	n.a.
Outgoing	45.6	105.0	114.4
Surplus (Deficit)	(8.0)	n.a.	n.a.
Total Volume	83.2	n.a.	n.a.

Note: National traffic data are in millions of minutes of public switched telecommunications traffic; route data are in thousands of minutes of public switched telecommunications traffic. Total traffic for 2000 reflect traffic from Sakartvelos Telecomi only. The "Others" category may include routes to non-members of the Commonwealth of Independent States that rank among the top destinations for outgoing traffic.

Germany

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United Kingdom	770.0	7.3%
2.	France	740.0	7.0%
3.	Austria	695.0	6.5%
4.	United States	695.0	6.5%
5.	Italy	680.0	6.4%
6.	Poland	670.0	6.3%
7.	Switzerland	650.0	6.1%
8.	Turkey	600.0	5.6%
9.	Netherlands	555.0	5.2%
10.	Spain	390.0	3.7%
11.	Belgium	250.0	2.4%
12.	Greece	195.0	1.8%
13.	Denmark	185.0	1.7%
14.	Croatia	165.0	1.6%
15.	Czech Republic	165.0	1.6%
16.	Hungary	150.0	1.4%
17.	Russia	150.0	1.4%
18.	Serbia and Montenegro	150.0	1.4%
19.	Canada	130.0	1.2%
20.	Sweden	130.0	1.2%
	Others	2,505.0	23.6%
	TOTAL	**10,620.0**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	n.a.	n.a.	n.a.
Outgoing	9,570.0	10,320.0	10,620.0
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

Note: Data are in millions of minutes of public switched telecommunications traffic.

Ghana

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United Kingdom	23.7	40.6%
2.	United States	23.0	39.4%
3.	Germany	4.0	6.8%
4.	Canada	2.0	3.5%
5.	France	1.0	1.7%
6.	Italy	0.8	1.4%
7.	Netherlands	0.7	1.2%
8.	Togo	0.6	1.0%
9.	Burkina Faso	0.4	0.7%
10.	Nigeria	0.3	0.5%
11.	Belgium	0.2	0.3%
12.	Senegal	0.1	0.2%
13.	Japan	0.1	0.2%
14.	Guinea	0.0	0.1%
15.	Gabon	0.0	0.1%
16.	Cameroon	0.0	0.1%
17.	Korea, Rep.	0.0	0.1%
18.	Norway	0.0	<0.1%
19.	Malaysia	0.0	<0.1%
	Others	1.4	2.3%
	TOTAL	**58.3**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	166.4	139.3	153.0
Outgoing	42.1	46.7	58.3
Surplus (Deficit)	124.3	92.5	94.7
Total Volume	208.4	186.0	211.3

Note: Data are in millions of minutes of public switched telecommunications traffic.

Greece

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Germany	140.0	14.0%
2.	United Kingdom	140.0	14.0%
3.	Albania	105.0	10.5%
4.	Italy	80.0	8.0%
5.	United States	61.0	6.1%
6.	Bulgaria	45.0	4.5%
7.	Cyprus	42.0	4.2%
8.	France	40.0	4.0%
9.	Romania	37.0	3.7%
10.	Netherlands	24.0	2.4%
11.	Belgium	21.0	2.1%
12.	Serbia and Montenegro	19.0	1.9%
13.	Switzerland	19.0	1.9%
14.	Ukraine	19.0	1.9%
15.	Russia	18.0	1.8%
16.	Australia	15.0	1.5%
17.	Turkey	15.0	1.5%
18.	Poland	14.0	1.4%
19.	Sweden	14.0	1.4%
20.	Canada	13.0	1.3%
	Others	117.0	11.7%
	TOTAL	**998.0**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	889.8	891.0	n.a.
Outgoing	793.2	887.0	998.0
Surplus (Deficit)	96.6	4.0	n.a.
Total Volume	1,683.0	1,778.0	n.a.

Note: Data are in millions of minutes of public switched telecommunications traffic.

Grenada

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United States	22.1	76.6%
2.	Trinidad and Tobago	2.8	9.6%
3.	Barbados	0.9	3.0%
4.	United Kingdom	0.6	2.1%
5.	Saint Vincent and the Grenadines	0.5	1.6%
6.	Canada	0.4	1.4%
7.	Saint Lucia	0.4	1.2%
8.	Guyana	0.3	0.9%
9.	Jamaica	0.2	0.8%
10.	Antigua and Barbuda	0.2	0.6%
11.	Saint Kitts and Nevis	0.1	0.4%
12.	Cuba	0.1	0.3%
13.	Dominica	0.0	0.1%
14.	Germany	0.0	0.1%
15.	India	0.0	0.1%
16.	Bermuda	0.0	0.1%
17.	Cayman Islands	0.0	0.1%
	Others	0.1	0.5%
	TOTAL	**28.8**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	n.a.	n.a.	37.2
Outgoing	16.6	40.3	28.8
Surplus (Deficit)	n.a.	n.a.	8.4
Total Volume	n.a.	n.a.	66.1

Note: Data are in millions of minutes of public switched telecommunications traffic.

Guatemala

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United States	80.1	54.9%
2.	El Salvador	15.2	10.4%
3.	Mexico	12.0	8.2%
4.	Honduras	7.9	5.4%
5.	Costa Rica	5.8	3.9%
6.	Nicaragua	3.7	2.5%
7.	Colombia	2.7	1.8%
8.	Panama	2.2	1.5%
9.	Korea, Rep.	1.9	1.3%
10.	Canada	1.7	1.2%
11.	Spain	1.5	1.0%
12.	Cuba	0.7	0.5%
13.	Dominican Republic	0.7	0.5%
14.	Belize	0.6	0.4%
15.	Italy	0.6	0.4%
16.	Germany	0.6	0.4%
17.	Argentina	0.6	0.4%
18.	Venezuela	0.6	0.4%
19.	Peru	0.5	0.3%
20.	Brazil	0.5	0.3%
	Others	5.6	3.8%
	TOTAL	**145.9**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	295.9	536.8	817.7
Outgoing	125.9	156.2	145.9
Surplus (Deficit)	170.0	380.6	671.8
Total Volume	421.8	693.1	963.6

Note: Data are in millions of minutes of public switched telecommunications traffic.

Hong Kong

LARGEST TELECOMMUNICATIONS ROUTES, FY 2002/2003

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	China	2,063.6	51.8%
2.	Philippines	347.7	8.7%
3.	United States	306.2	7.7%
4.	Canada	184.4	4.6%
5.	United Kingdom	153.5	3.9%
6.	Australia	137.7	3.5%
7.	Taiwan	128.9	3.2%
8.	Japan	88.3	2.2%
9.	Singapore	85.9	2.2%
10.	Macau	48.7	1.2%
	Others	436.2	11.0%
	TOTAL	**3,981.1**	

NATIONAL TRAFFIC BALANCE

Minutes	FY 2000/2001	FY 2001/2002	FY 2002/2003
Incoming	1,858.0	1,942.3	1,745.3
Outgoing	3,074.9	3,487.3	3,981.1
Surplus (Deficit)	(1,216.8)	(1,545.0)	(2,235.7)
Total Volume	4,932.9	5,429.6	5,726.4

Note: Data are in millions of minutes of public switched telecommunications traffic. Fiscal year ends 31 March.

Hungary

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Germany	79.7	24.4%
2.	Romania	53.9	16.5%
3.	Austria	30.5	9.3%
4.	United States	27.9	8.5%
5.	United Kingdom	18.4	5.6%
6.	Italy	17.7	5.4%
7.	Serbia and Montenegro	16.6	5.1%
8.	France	12.4	3.8%
9.	Slovak Republic	10.5	3.2%
10.	Switzerland	8.6	2.6%
11.	Croatia	7.0	2.1%
12.	Netherlands	6.3	1.9%
13.	Poland	6.1	1.9%
14.	Ukraine	5.9	1.8%
15.	Czech Republic	5.1	1.6%
	Others	39.1	12.0%
	TOTAL	**327.0**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	n.a.	n.a.	n.a.
Outgoing	349.2	326.8	327.0
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

Note: Data are in millions of minutes of public switched telecommunications traffic.

India

LARGEST TELECOMMUNICATIONS ROUTES, FY 2002/2003

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United States	95.0	14.4%
2.	Saudi Arabia	90.0	13.6%
3.	United Kingdom	65.0	9.8%
4.	United Arab Emirates	61.0	9.2%
5.	Singapore	29.0	4.4%
6.	Kuwait	24.0	3.6%
7.	Oman	17.0	2.6%
8.	Germany	16.0	2.4%
9.	Malaysia	15.0	2.3%
10.	Canada	13.0	2.0%
11.	Australia	12.0	1.8%
12.	Hong Kong	12.0	1.8%
13.	Sri Lanka	11.0	1.7%
14.	France	10.0	1.5%
15.	Italy	9.0	1.4%
16.	Japan	9.0	1.4%
17.	Qatar	9.0	1.4%
18.	Pakistan	8.5	1.3%
19.	Philippines	8.0	1.2%
20.	Bangladesh	7.0	1.1%
	Others	139.5	21.1%
	TOTAL	**660.0**	

NATIONAL TRAFFIC BALANCE

Minutes	FY 2000/2001	FY 2001/2002	FY 2002/2003
Incoming	2,161.4	2,533.6	n.a.
Outgoing	527.1	586.4	660.0
Surplus (Deficit)	1,634.3	1,947.2	n.a.
Total Volume	2,688.5	3,120.0	n.a.

Note: Data are in millions of minutes of public switched telecommunications traffic. Fiscal year ends 31 March. Data exclude some cross-border traffic with Bangladesh, Nepal, and Pakistan.

Indonesia

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Singapore	61.0	21.1%
2.	Malaysia	46.4	16.0%
3.	Australia	21.1	7.3%
4.	Japan	17.9	6.2%
5.	United States	15.1	5.2%
6.	Taiwan	11.6	4.0%
7.	Hong Kong	9.7	3.3%
8.	Korea, Rep.	8.9	3.1%
9.	China	8.8	3.0%
10.	United Kingdom	7.5	2.6%
11.	Thailand	6.4	2.2%
12.	India	5.5	1.9%
13.	Philippines	5.2	1.8%
14.	Netherlands	5.0	1.7%
15.	Germany	4.6	1.6%
16.	France	3.6	1.2%
17.	Brunei	3.0	1.0%
18.	Italy	2.4	0.8%
19.	Saudi Arabia	2.4	0.8%
20.	Canada	1.8	0.6%
	Others	41.6	14.4%
	TOTAL	**289.4**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	345.8	365.9	429.4
Outgoing	315.5	316.2	289.4
Surplus (Deficit)	30.3	49.6	140.0
Total Volume	661.3	682.1	718.8

Note: Data are in millions of minutes of public switched telecommunications traffic.

Iran

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United Arab Emirates	33.7	19.7%
2.	Pakistan	15.8	9.2%
3.	United States	13.5	7.9%
4.	Saudi Arabia	12.8	7.5%
5.	United Kingdom	12.3	7.2%
6.	Germany	9.2	5.4%
7.	Kuwait	7.1	4.2%
8.	India	6.0	3.5%
9.	Turkey	5.0	2.9%
10.	Azerbaijan	3.5	2.1%
11.	Italy	3.5	2.0%
12.	Syria	2.7	1.6%
13.	Qatar	2.7	1.5%
14.	Sweden	2.6	1.5%
15.	France	2.6	1.5%
16.	Switzerland	2.4	1.4%
17.	Japan	2.3	1.4%
18.	Bahrain	2.2	1.3%
19.	China	1.8	1.1%
20.	Canada	1.7	1.0%
	Others	27.8	16.3%
	TOTAL	**171.2**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	216.8	173.1	118.8
Outgoing	176.8	179.1	171.2
Surplus (Deficit)	40.0	(6.0)	(52.4)
Total Volume	393.6	352.2	289.9

Note: Data are in millions of minutes of public switched telecommunications traffic.

Ireland

LARGEST TELECOMMUNICATIONS ROUTES, FY 2002/2003

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United Kingdom	810.0	58.1%
2.	United States	165.0	11.8%
3.	Germany	47.0	3.4%
4.	France	45.0	3.2%
5.	Spain	31.0	2.2%
6.	Netherlands	30.0	2.2%
7.	Australia	23.0	1.6%
8.	Italy	22.0	1.6%
9.	Canada	16.0	1.1%
10.	Belgium	12.0	0.9%
11.	Sweden	10.0	0.7%
12.	Switzerland	7.0	0.5%
13.	Denmark	6.0	0.4%
14.	Finland	6.0	0.4%
15.	Latvia	6.0	0.4%
16.	Romania	6.0	0.4%
17.	South Africa	6.0	0.4%
18.	Poland	5.0	0.4%
19.	Austria	4.0	0.3%
20.	Portugal	3.0	0.2%
	Others	135.0	9.7%
	TOTAL	**1,395.0**	

NATIONAL TRAFFIC BALANCE

Minutes	FY 2000/2001	FY 2001/2002	FY 2002/2003
Incoming	n.a.	n.a.	n.a.
Outgoing	1,250.0	1,385.0	1,395.0
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

Note: Data are in millions of minutes of public switched telecommunications traffic. Fiscal year ends 31 March. Data exclude at least 100 million minutes of cross-border traffic to Northern Ireland.

Israel

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United States	326.5	27.4%
2.	United Kingdom	80.3	6.7%
3.	Russia	70.5	5.9%
4.	Ukraine	63.9	5.3%
5.	France	60.5	5.1%
6.	Germany	45.9	3.8%
7.	Canada	33.3	2.8%
8.	Italy	26.0	2.2%
9.	Netherlands	20.3	1.7%
	Others	466.7	39.1%
	TOTAL	**1,193.7**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	661.0	728.0	814.1
Outgoing	1,022.4	1,120.0	1,193.7
Surplus (Deficit)	(361.4)	(392.0)	(379.6)
Total Volume	1,683.4	1,848.0	2,007.8

Note: Data are in millions of minutes of public switched telecommunications traffic.

Italy

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Germany	620.0	10.6%
2.	France	510.0	8.7%
3.	Romania	350.0	6.0%
4.	United Kingdom	350.0	6.0%
5.	United States	325.0	5.6%
6.	Switzerland	310.0	5.3%
7.	Spain	260.0	4.5%
8.	Morocco	185.0	3.2%
9.	Albania	175.0	3.0%
10.	Ukraine	145.0	2.5%
11.	Poland	125.0	2.1%
12.	Austria	115.0	2.0%
13.	Belgium	105.0	1.8%
14.	Greece	95.0	1.6%
15.	Netherlands	95.0	1.6%
16.	Philippines	90.0	1.5%
17.	Serbia and Montenegro	80.0	1.4%
18.	Tunisia	80.0	1.4%
19.	Croatia	75.0	1.3%
20.	Algeria	70.0	1.2%
	Others	1,680.0	28.8%
	TOTAL	**5,840.0**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	n.a.	n.a.	n.a.
Outgoing	4,160.0	5,140.0	5,840.0
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

Note: Data are in millions of minutes of public switched telecommunications traffic.

Jamaica

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United States	31.7	56.4%
2.	United Kingdom	9.9	17.5%
3.	Canada	4.2	7.5%
4.	Cayman Islands	2.1	3.8%
5.	Bahamas	1.0	1.7%
6.	Trinidad and Tobago	0.9	1.5%
7.	Barbados	0.5	0.9%
8.	Cuba	0.5	0.9%
9.	Saint Lucia	0.4	0.7%
10.	India	0.4	0.6%
11.	Netherlands Antilles	0.4	0.6%
12.	Guyana	0.3	0.5%
13.	Antigua and Barbuda	0.2	0.4%
14.	Bermuda	0.2	0.4%
15.	Colombia	0.2	0.3%
16.	China	0.2	0.3%
17.	Saint Vincent and the Grenadines	0.1	0.2%
	Others	2.6	4.5%
	TOTAL	**56.3**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	328.5	413.8	349.6
Outgoing	73.9	95.6	56.3
Surplus (Deficit)	254.6	318.2	293.3
Total Volume	402.3	509.4	405.9

Note: Data are in millions of minutes of public switched telecommunications traffic.

Japan

LARGEST TELECOMMUNICATIONS ROUTES, FY 2002/2003

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United States	525.0	19.9%
2.	China	415.0	15.7%
3.	Philippines	355.0	13.5%
4.	Korea, Rep.	185.0	7.0%
5.	Brazil	180.0	6.8%
6.	Taiwan	115.0	4.4%
7.	Thailand	100.0	3.8%
8.	United Kingdom	95.0	3.6%
9.	Hong Kong	70.2	2.7%
10.	Australia	62.3	2.4%
11.	Singapore	48.2	1.8%
12.	Indonesia	44.8	1.7%
13.	Germany	40.8	1.5%
14.	France	36.2	1.4%
15.	Malaysia	36.1	1.4%
16.	Canada	31.9	1.2%
17.	Peru	27.6	1.0%
18.	Vietnam	19.5	0.7%
19.	Russia	5.2	0.2%
20.	Sri Lanka	3.5	0.1%
	Others	242.2	9.2%
	TOTAL	**2,638.5**	

NATIONAL TRAFFIC BALANCE

Minutes	FY 2000/2001	FY 2001/2002	FY 2002/2003
Incoming	n.a.	n.a.	n.a.
Outgoing	2,178.4	2,575.4	2,638.5
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

Note: Data are in millions of minutes of public switched telecommunications traffic. Fiscal year ends 31 March.

Jordan

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Egypt	34.0	17.1%
2.	Saudi Arabia	30.1	15.2%
3.	United Arab Emirates	16.0	8.1%
4.	Palestinian Territory	15.9	8.0%
5.	Syria	14.8	7.4%
6.	Iraq	13.8	7.0%
7.	United States	10.4	5.2%
8.	Israel	9.0	4.5%
9.	Kuwait	8.0	4.0%
10.	Lebanon	6.8	3.4%
11.	Qatar	4.0	2.0%
12.	Germany	3.2	1.6%
13.	United Kingdom	3.1	1.6%
14.	Bahrain	2.6	1.3%
15.	Yemen	2.1	1.1%
16.	France	2.0	1.0%
17.	Oman	1.8	0.9%
18.	Italy	1.7	0.9%
19.	India	1.7	0.9%
20.	Canada	1.6	0.8%
	Others	14.5	7.3%
	TOTAL	**198.4**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	214.1	217.0	236.0
Outgoing	170.6	185.3	198.4
Surplus (Deficit)	43.5	31.7	37.6
Total Volume	384.7	402.3	434.4

Note: Data are in millions of minutes of public switched telecommunications traffic.

Kazakhstan

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Russia	47.5	36.1%
2.	Uzbekistan	16.3	12.4%
3.	Kyrgyzstan	9.3	7.1%
4.	Tajikistan	6.0	4.6%
5.	Ukraine	4.0	3.0%
6.	Germany	3.2	2.4%
7.	Turkmenistan	1.8	1.4%
8.	Belarus	1.5	1.1%
9.	Azerbaijan	1.3	1.0%
10.	Armenia	0.8	0.6%
11.	Georgia	0.7	0.5%
12.	China	0.4	0.3%
13.	France	0.4	0.3%
14.	Moldova	0.3	0.2%
15.	India	0.1	0.1%
	Others	38.0	28.9%
	TOTAL	**131.6**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	183.1	206.9	260.2
Outgoing	105.4	118.6	131.6
Surplus (Deficit)	77.8	88.4	128.7
Total Volume	288.5	325.5	391.8

Note: Data are in millions of minutes of public switched telecommunications traffic.

Korea, Rep.

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United States	257.9	24.8%
2.	Japan	161.6	15.5%
3.	China	159.4	15.3%
4.	Philippines	71.6	6.9%
5.	Australia	48.3	4.6%
6.	Canada	37.5	3.6%
7.	Indonesia	36.8	3.5%
8.	Hong Kong	24.6	2.4%
9.	Thailand	20.1	1.9%
10.	United Kingdom	18.3	1.8%
11.	Vietnam	18.0	1.7%
12.	Germany	17.0	1.6%
13.	New Zealand	15.5	1.5%
14.	Taiwan	14.1	1.4%
15.	Singapore	13.6	1.3%
16.	France	10.5	1.0%
17.	Russia	8.7	0.8%
18.	Italy	7.5	0.7%
19.	Pakistan	7.4	0.7%
20.	Bangladesh	6.9	0.7%
	Others	86.3	8.3%
	TOTAL	**1,041.8**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	n.a.	n.a.	928.0
Outgoing	1,063.0	1,120.0	1,041.8
Surplus (Deficit)	n.a.	n.a.	(113.8)
Total Volume	n.a.	n.a.	1,969.8

Note: Data are in millions of minutes of public switched telecommunications traffic.

Kuwait

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Egypt	88.9	46.8%
2.	India	26.0	13.7%
3.	United States	11.5	6.0%
4.	United Kingdom	11.4	6.0%
5.	Iran	10.1	5.3%
6.	Philippines	6.0	3.1%
7.	Bangladesh	4.9	2.6%
8.	Sri Lanka	3.2	1.7%
9.	Pakistan	3.1	1.6%
10.	Morocco	2.9	1.5%
11.	Germany	2.0	1.1%
12.	France	1.8	0.9%
13.	Canada	1.1	0.6%
14.	Italy	1.0	0.5%
15.	Indonesia	0.7	0.4%
16.	Turkey	0.7	0.3%
17.	Sudan	0.5	0.3%
18.	Tunisia	0.5	0.3%
19.	Mauritania	0.3	0.1%
20.	Somalia	0.1	0.1%
	Others	13.2	7.0%
	TOTAL	**189.8**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	n.a.	n.a.	n.a.
Outgoing	158.7	166.6	189.8
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

Note: Data are in millions of minutes of public switched telecommunications traffic.

Kyrgyzstan

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (thousands)	Percent of Outgoing Traffic
1.	Kazakhstan	7,013.8	38.4%
2.	Russia	5,994.8	32.8%
3.	Uzbekistan	2,434.7	13.3%
4.	Tajikistan	624.7	3.4%
5.	Turkey	461.0	2.5%
6.	Ukraine	242.8	1.3%
7.	Germany	205.0	1.1%
8.	Belarus	188.8	1.0%
9.	United Kingdom	183.0	1.0%
10.	Turkmenistan	125.3	0.7%
11.	Azerbaijan	115.3	0.6%
12.	China	100.0	0.5%
13.	France	72.0	0.4%
14.	Netherlands	61.0	0.3%
15.	United Arab Emirates	40.0	0.2%
16.	India	30.0	0.2%
17.	Switzerland	30.0	0.2%
18.	Iran	24.0	0.1%
19.	Italy	18.0	0.1%
20.	Korea, Rep.	15.0	0.1%
	Others	370.0	2.0%
	TOTAL	**18,255.7**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	36.4	42.3	44.5
Outgoing	23.1	23.5	18.3
Surplus (Deficit)	13.3	18.8	26.3
Total Volume	59.5	65.8	62.8

Note: National traffic data are in millions of minutes of public switched telecommunications traffic; route data are in thousands of minutes of public switched telecommunications traffic.

Latvia

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Russia	12.6	20.0%
2.	Lithuania	7.3	11.6%
3.	Germany	5.5	8.7%
4.	Estonia	4.3	6.8%
5.	Ukraine	3.2	5.1%
6.	Belarus	2.8	4.4%
7.	Sweden	2.7	4.3%
8.	France	2.4	3.8%
9.	United States	2.3	3.7%
10.	Finland	2.2	3.5%
11.	United Kingdom	2.2	3.5%
12.	Denmark	1.7	2.7%
13.	Poland	1.4	2.2%
14.	Italy	1.0	1.6%
15.	Ireland	0.9	1.4%
16.	Norway	0.9	1.4%
17.	Netherlands	0.7	1.1%
18.	Austria	0.6	1.0%
19.	Switzerland	0.6	1.0%
20.	Spain	0.4	0.6%
	Others	7.3	11.6%
	TOTAL	**63.0**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	90.1	105.3	110.6
Outgoing	54.8	64.7	63.0
Surplus (Deficit)	35.3	40.6	47.6
Total Volume	144.9	170.0	173.6

Note: Data are in millions of minutes of public switched telecommunications traffic.

Luxembourg

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	France	100.0	24.2%
2.	Germany	92.0	22.2%
3.	Belgium	91.0	22.0%
4.	Portugal	27.0	6.5%
5.	Italy	20.0	4.8%
6.	United Kingdom	20.0	4.8%
7.	Netherlands	15.0	3.6%
8.	Switzerland	12.0	2.9%
9.	United States	9.0	2.2%
10.	Spain	6.5	1.6%
	Others	21.5	5.2%
	TOTAL	**414.0**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	n.a.	n.a.	n.a.
Outgoing	381.0	394.6	414.0
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

Note: Data are in millions of minutes of public switched telecommunications traffic.

Macau

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	China	64.4	42.2%
2.	Hong Kong	52.8	34.5%
3.	Taiwan	9.2	6.0%
4.	United States	5.9	3.9%
5.	United Kingdom	3.5	2.3%
6.	Philippines	3.3	2.1%
7.	Canada	3.0	2.0%
8.	Portugal	2.7	1.8%
9.	Australia	2.5	1.7%
10.	Thailand	1.2	0.8%
11.	Singapore	0.7	0.5%
12.	Japan	0.6	0.4%
13.	Malaysia	0.5	0.3%
14.	Korea, Rep.	0.5	0.3%
15.	Vietnam	0.4	0.3%
16.	France	0.3	0.2%
17.	New Zealand	0.2	0.1%
18.	Indonesia	0.2	0.1%
19.	Germany	0.1	0.1%
20.	Myanmar	0.1	0.1%
	Others	0.6	0.4%
	TOTAL	**152.7**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	103.2	111.9	114.0
Outgoing	152.1	156.5	152.7
Surplus (Deficit)	(48.9)	(44.6)	(38.7)
Total Volume	255.2	268.4	266.7

Note: Data are in millions of minutes of public switched telecommunications traffic.

Macedonia

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Serbia and Montenegro	15.5	23.9%
2.	Germany	6.6	10.3%
3.	Greece	5.3	8.3%
4.	Bulgaria	5.1	7.9%
5.	Switzerland	4.2	6.5%
6.	Italy	4.1	6.3%
7.	Turkey	2.5	3.9%
8.	Croatia	2.2	3.5%
9.	Slovenia	2.0	3.2%
10.	Austria	1.8	2.7%
11.	United States	1.6	2.5%
12.	Albania	1.4	2.1%
13.	France	1.2	1.9%
14.	Bosnia-Herzegovina	1.1	1.7%
15.	United Kingdom	1.1	1.7%
16.	Monaco	0.9	1.5%
17.	Netherlands	0.9	1.4%
18.	Sweden	0.7	1.1%
19.	Hungary	0.7	1.0%
20.	Belgium	0.7	1.0%
	Others	4.8	7.4%
	TOTAL	**64.7**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	166.4	197.2	192.5
Outgoing	73.2	66.3	64.7
Surplus (Deficit)	93.2	131.0	127.8
Total Volume	239.6	263.5	257.2

Note: Data are in millions of minutes of public switched telecommunications traffic.

Malaysia

LARGEST TELECOMMUNICATIONS ROUTES, FY 2002/2003

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Singapore	415.0	42.3%
2.	Indonesia	107.0	10.9%
3.	Thailand	67.0	6.8%
4.	United States	46.0	4.7%
5.	China	34.0	3.5%
6.	Japan	34.0	3.5%
7.	Australia	31.0	3.2%
8.	Philippines	30.0	3.1%
9.	India	27.0	2.7%
10.	Hong Kong	26.0	2.6%
11.	United Kingdom	24.0	2.4%
12.	Taiwan	20.0	2.0%
13.	Bangladesh	15.0	1.5%
14.	Myanmar	14.0	1.4%
15.	Brunei	10.0	1.0%
16.	Germany	9.0	0.9%
17.	Korea, Rep.	7.0	0.7%
18.	Canada	5.0	0.5%
19.	France	4.0	0.4%
20.	New Zealand	4.0	0.4%
	Others	53.0	5.4%
	TOTAL	**982.0**	

NATIONAL TRAFFIC BALANCE

Minutes	FY 2000/2001	FY 2001/2002	FY 2002/2003
Incoming	765.0	810.0	1,050.0
Outgoing	840.0	845.0	982.0
Surplus (Deficit)	(75.0)	(35.0)	68.0
Total Volume	1,605.0	1,655.0	2,032.0

Note: Data are in millions of minutes of public switched telecommunications traffic. Fiscal year ends 31 March.

Maldives

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	India	2.1	20.2%
2.	Sri Lanka	2.0	19.2%
3.	Italy	1.2	11.7%
4.	United Kingdom	0.9	8.5%
5.	Singapore	0.5	4.6%
6.	Bangladesh	0.4	3.9%
7.	Germany	0.4	3.7%
8.	Switzerland	0.3	2.9%
9.	France	0.3	2.7%
10.	Malaysia	0.3	2.5%
11.	Australia	0.2	1.8%
12.	Thailand	0.1	1.4%
13.	Japan	0.1	1.3%
14.	Russia	0.1	1.3%
15.	United Arab Emirates	0.1	1.3%
16.	United States	0.1	1.0%
17.	Indonesia	0.1	0.9%
18.	Austria	0.1	0.7%
19.	Pakistan	0.1	0.7%
20.	Philippines	0.1	0.6%
	Others	0.9	9.0%
	TOTAL	**10.3**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	7.2	8.2	n.a.
Outgoing	5.6	7.0	10.3
Surplus (Deficit)	1.6	1.1	n.a.
Total Volume	12.8	15.2	n.a.

Note: Data are in millions of minutes of public switched telecommunications traffic.

Malta

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United Kingdom	13.6	31.0%
2.	Italy	5.9	13.5%
3.	Germany	3.4	7.7%
4.	France	2.0	4.6%
5.	Libya	1.8	4.1%
6.	United States	1.3	2.9%
7.	Netherlands	1.2	2.7%
8.	Australia	1.1	2.5%
9.	Spain	1.0	2.3%
10.	Switzerland	0.9	2.1%
11.	Russia	0.9	2.0%
12.	Belgium	0.8	1.9%
13.	Sweden	0.7	1.5%
14.	Austria	0.6	1.4%
15.	Tunisia	0.5	1.2%
16.	Ireland	0.5	1.1%
17.	Canada	0.5	1.0%
18.	Greece	0.5	1.0%
19.	Norway	0.4	0.9%
20.	Turkey	0.4	0.8%
	Others	6.0	13.7%
	TOTAL	**43.8**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	56.5	65.5	65.6
Outgoing	43.0	45.6	43.8
Surplus (Deficit)	13.4	19.9	21.8
Total Volume	99.5	111.0	109.3

Note: Data are in millions of minutes of public switched telecommunications traffic.

Mauritius

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	France	8.2	22.1%
2.	United Kingdom	5.1	13.7%
3.	Réunion	3.6	9.8%
4.	South Africa	3.1	8.5%
5.	India	2.8	7.6%
6.	Italy	1.3	3.6%
7.	Australia	1.2	3.2%
8.	Germany	0.9	2.4%
9.	China	0.9	2.3%
10.	Seychelles	0.7	2.0%
11.	Switzerland	0.7	1.9%
12.	Madagascar	0.6	1.6%
13.	United States	0.5	1.5%
14.	Belgium	0.5	1.4%
15.	Hong Kong	0.5	1.3%
16.	Singapore	0.4	1.2%
17.	Canada	0.3	0.8%
18.	Taiwan	0.2	0.6%
19.	Spain	0.2	0.5%
20.	Netherlands	0.2	0.5%
	Others	4.9	13.3%
	TOTAL	**37.1**	

NATIONAL TRAFFIC BALANCE

Minutes	FY 2000/2001	2001	2002
Incoming	49.0	56.2	64.0
Outgoing	35.1	35.6	37.1
Surplus (Deficit)	13.9	20.6	26.9
Total Volume	84.0	91.8	101.1

Note: Data are in millions of minutes of public switched telecommunications traffic.

Mexico

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United States	1,688.8	84.6%
2.	Spain	20.5	1.0%
3.	France	19.4	1.0%
4.	United Kingdom	18.2	0.9%
5.	Canada	17.3	0.9%
6.	Guatemala	15.9	0.8%
7.	Argentina	12.9	0.6%
8.	Cuba	12.7	0.6%
9.	Germany	9.7	0.5%
10.	Colombia	7.8	0.4%
	Others	244.5	12.2%
	TOTAL	**1,996.9**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	5,896.0	5,347.5	5,836.9
Outgoing	1,981.0	2,037.9	1,996.9
Surplus (Deficit)	3,915.0	3,309.6	3,840.0
Total Volume	7,877.0	7,385.4	7,833.8

Note: Data are in millions of minutes of public switched telecommunications traffic.

Moldova

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Russia	21.4	32.6%
2.	Ukraine	14.9	22.6%
3.	Romania	8.1	12.3%
4.	Italy	5.3	8.1%
5.	Germany	2.3	3.5%
6.	Turkey	1.8	2.8%
7.	Belarus	1.5	2.3%
8.	Portugal	1.4	2.1%
9.	France	0.9	1.3%
10.	Greece	0.9	1.3%
11.	Israel	0.7	1.0%
12.	Spain	0.6	0.9%
13.	United States	0.5	0.8%
14.	Bulgaria	0.5	0.7%
15.	Poland	0.5	0.7%
16.	Czech Republic	0.4	0.7%
17.	United Kingdom	0.4	0.6%
18.	Ireland	0.3	0.5%
19.	Belgium	0.3	0.4%
20.	Cyprus	0.1	0.1%
	Others	2.8	4.3%
	TOTAL	**65.8**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	120.8	161.8	191.4
Outgoing	50.8	52.3	65.8
Surplus (Deficit)	70.1	109.6	125.6
Total Volume	171.6	214.1	257.1

Note: Data are in millions of minutes of public switched telecommunications traffic.

Namibia

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (thousands)	Percent of Outgoing Traffic
1.	South Africa	49,200.0	81.2%
2.	Germany	1,800.0	3.0%
3.	United Kingdom	1,000.0	1.7%
4.	Botswana	950.0	1.6%
5.	Zimbabwe	890.0	1.5%
6.	Angola	850.0	1.4%
7.	United States	660.0	1.1%
8.	Zambia	510.0	0.8%
9.	Spain	500.0	0.8%
10.	France	245.0	0.4%
11.	Portugal	220.0	0.4%
12.	Italy	190.0	0.3%
13.	Russia	190.0	0.3%
14.	China	140.0	0.2%
15.	Norway	140.0	0.2%
16.	Netherlands	130.0	0.2%
17.	Switzerland	130.0	0.2%
18.	Australia	120.0	0.2%
19.	Austria	120.0	0.2%
20.	Nigeria	110.0	0.2%
	Others	2,500.0	4.1%
	TOTAL	**60,600.0**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	50.7	46.2	52.1
Outgoing	60.2	64.8	60.6
Surplus (Deficit)	(9.5)	(18.7)	(8.5)
Total Volume	110.8	111.0	112.7

Note: National traffic data are in millions of minutes of public switched telecommunications traffic; route data are in thousands of minutes of public switched telecommunications traffic.

Netherlands

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Germany	545.0	15.5%
2.	Belgium	445.0	12.6%
3.	United Kingdom	345.0	9.8%
4.	United States	220.0	6.2%
5.	France	215.0	6.1%
6.	Italy	90.0	2.6%
7.	Spain	90.0	2.6%
8.	Switzerland	90.0	2.6%
9.	Turkey	75.0	2.1%
10.	Poland	70.0	2.0%
11.	Canada	55.0	1.6%
12.	Morocco	44.0	1.2%
13.	Sweden	40.0	1.1%
14.	Denmark	36.0	1.0%
15.	Portugal	36.0	1.0%
16.	Australia	35.0	1.0%
17.	Austria	32.0	0.9%
18.	Greece	30.0	0.9%
19.	Ireland	30.0	0.9%
20.	Suriname	25.0	0.7%
	Others	977.0	27.7%
	TOTAL	**3,525.0**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	n.a.	n.a.	n.a.
Outgoing	2,830.0	3,300.0	3,525.0
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

Note: Data are in millions of minutes of public switched telecommunications traffic.

New Zealand

LARGEST TELECOMMUNICATIONS ROUTES, FY 2002/2003

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Australia	450.0	45.7%
2.	United Kingdom	160.0	16.3%
3.	United States	85.0	8.6%
4.	Canada	49.0	5.0%
5.	Philippines	25.0	2.5%
6.	Hong Kong	16.0	1.6%
7.	South Africa	15.0	1.5%
8.	Japan	14.0	1.4%
9.	Malaysia	12.0	1.2%
10.	Singapore	12.0	1.2%
11.	Fiji	11.0	1.1%
12.	China	9.0	0.9%
13.	India	9.0	0.9%
14.	Samoa	9.0	0.9%
15.	Taiwan	6.0	0.6%
	Others	102.0	10.4%
	TOTAL	**984.0**	

NATIONAL TRAFFIC BALANCE

Minutes	FY 2000/2001	FY 2001/2002	FY 2002/2003
Incoming	n.a.	n.a.	n.a.
Outgoing	950.0	965.0	984.0
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

Note: Data are in millions of minutes of public switched telecommunications traffic. Fiscal year ends 30 June.

Nicaragua

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United States	15.0	34.0%
2.	Costa Rica	9.0	20.5%
3.	Guatemala	3.1	7.0%
4.	Honduras	2.5	5.7%
5.	El Salvador	2.4	5.6%
6.	Mexico	1.3	2.8%
7.	Panama	1.2	2.7%
8.	Spain	0.6	1.4%
9.	Canada	0.4	1.0%
10.	Colombia	0.3	0.7%
11.	Italy	0.2	0.4%
12.	Cuba	0.2	0.4%
13.	Dominican Republic	0.1	0.3%
14.	Brazil	0.1	0.3%
15.	Germany	0.1	0.3%
16.	Venezuela	0.1	0.2%
17.	Peru	0.1	0.2%
18.	United Kingdom	0.1	0.2%
19.	Chile	0.1	0.2%
20.	Argentina	0.1	0.2%
	Others	7.0	15.9%
	TOTAL	**44.0**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	n.a.	n.a.	n.a.
Outgoing	50.0	50.0	44.0
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

Note: Data are in millions of minutes of public switched telecommunications traffic.

Nigeria

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United Kingdom	26.4	30.4%
2.	United States	24.0	27.6%
3.	India	3.1	3.6%
4.	Germany	2.8	3.2%
5.	Lebanon	2.7	3.1%
6.	South Africa	2.5	2.9%
7.	France	2.4	2.8%
8.	Italy	2.2	2.6%
9.	Netherlands	1.9	2.2%
10.	Canada	1.5	1.7%
11.	Ghana	1.2	1.4%
12.	Ireland	1.0	1.1%
13.	Israel	1.0	1.1%
14.	Benin	0.9	1.1%
15.	Belgium	0.9	1.0%
16.	Switzerland	0.8	1.0%
17.	Spain	0.7	0.9%
18.	Côte d'Ivoire	0.7	0.8%
19.	Philippines	0.6	0.7%
20.	Egypt	0.5	0.6%
	Others	9.0	10.4%
	TOTAL	**86.9**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	n.a.	238.0	n.a.
Outgoing	66.0	60.7	86.9
Surplus (Deficit)	n.a.	177.3	n.a.
Total Volume	n.a.	298.7	n.a.

Note: Data are in millions of minutes of public switched telecommunications traffic.

Norway

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Sweden	210.0	24.1%
2.	Denmark	105.0	12.0%
3.	United Kingdom	95.0	10.9%
4.	United States	70.0	8.0%
5.	Germany	50.0	5.7%
6.	Netherlands	36.0	4.1%
7.	Spain	35.0	4.0%
8.	Finland	24.0	2.8%
9.	France	21.0	2.4%
10.	Australia	13.0	1.5%
11.	Belgium	13.0	1.5%
12.	Italy	12.0	1.4%
13.	Poland	12.0	1.4%
14.	Russia	11.0	1.3%
15.	Canada	9.0	1.0%
16.	Switzerland	9.0	1.0%
17.	Greece	7.0	0.8%
18.	Turkey	7.0	0.8%
19.	Iceland	5.0	0.6%
20.	Ireland	5.0	0.6%
	Others	122.4	14.0%
	TOTAL	**871.4**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	n.a.	n.a.	n.a.
Outgoing	737.0	796.0	871.4
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

Note: Data are in millions of minutes of public switched telecommunications traffic.

Oman

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	India	55.6	33.5%
2.	United Arab Emirates	40.4	24.4%
3.	Pakistan	11.2	6.8%
4.	Bangladesh	8.9	5.4%
5.	Egypt	6.3	3.8%
6.	United Kingdom	5.9	3.5%
7.	Saudi Arabia	3.6	2.2%
8.	Bahrain	3.4	2.1%
9.	Jordan	2.4	1.5%
10.	United States	2.2	1.3%
11.	Kuwait	2.0	1.2%
12.	Sri Lanka	1.9	1.2%
13.	Qatar	1.9	1.2%
14.	Philippines	1.8	1.1%
15.	Morocco	1.7	1.0%
16.	Tanzania	1.5	0.9%
17.	Sudan	1.4	0.8%
18.	Lebanon	0.9	0.5%
19.	Germany	0.8	0.5%
20.	France	0.8	0.5%
	Others	11.2	6.8%
	TOTAL	**165.8**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	n.a.	108.0	n.a.
Outgoing	116.8	159.3	165.8
Surplus (Deficit)	n.a.	(51.3)	n.a.
Total Volume	n.a.	267.3	n.a.

Note: Data are in millions of minutes of public switched telecommunications traffic. Data exclude some cross-border traffic to the United Arab Emirates.

Pakistan

LARGEST TELECOMMUNICATIONS ROUTES, FY 2002/2003

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Saudi Arabia	22.1	17.2%
2.	United Kingdom	18.4	14.3%
3.	United Arab Emirates	18.1	14.1%
4.	United States	17.7	13.8%
5.	Germany	4.1	3.2%
6.	Canada	3.4	2.7%
7.	Iran	3.3	2.6%
8.	Hong Kong	3.2	2.5%
9.	Bangladesh	2.8	2.2%
10.	Italy	2.7	2.1%
11.	Kuwait	2.7	2.1%
12.	China	2.1	1.7%
13.	France	1.8	1.4%
14.	India	1.6	1.3%
15.	Japan	1.5	1.2%
16.	Oman	1.5	1.2%
17.	Singapore	1.3	1.0%
18.	Qatar	1.3	1.0%
19.	Bahrain	1.1	0.9%
20.	Turkey	1.1	0.8%
	Others	16.3	12.7%
	TOTAL	**128.3**	

NATIONAL TRAFFIC BALANCE

Minutes	FY 2000/2001	FY 2001/2002	FY 2002/2003
Incoming	896.1	1,165.1	1,530.4
Outgoing	98.6	110.0	128.3
Surplus (Deficit)	797.4	1,055.2	1,402.1
Total Volume	994.7	1,275.1	1,658.8

Note: Data are in millions of minutes of public switched telecommunications traffic. Fiscal year ends 30 June. Data exclude some cross-border traffic to India.

Palestinian Territory

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Jordan	16.8	41.1%
2.	Egypt	4.2	10.3%
3.	United States	3.7	9.1%
4.	Saudi Arabia	2.4	5.9%
5.	United Arab Emirates	1.8	4.4%
6.	United Kingdom	0.9	2.1%
7.	Germany	0.8	1.9%
8.	Syria	0.6	1.4%
9.	Bahrain	0.5	1.3%
10.	Turkey	0.5	1.3%
11.	Italy	0.5	1.2%
12.	France	0.4	1.1%
13.	Lebanon	0.4	1.1%
14.	Qatar	0.4	1.0%
15.	China	0.4	0.9%
16.	Canada	0.4	0.9%
17.	Kuwait	0.3	0.8%
18.	Morocco	0.3	0.8%
19.	Iraq	0.3	0.7%
20.	Ukraine	0.2	0.6%
	Others	4.9	12.0%
	TOTAL	**40.9**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	37.2	47.9	n.a.
Outgoing	45.6	45.3	40.9
Surplus (Deficit)	(8.4)	2.6	n.a.
Total Volume	82.8	93.1	n.a.

Note: Data are in millions of minutes of public switched telecommunications traffic. Data exclude traffic with Israel.

Paraguay

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Argentina	9.4	33.0%
2.	Brazil	8.2	28.8%
3.	United States	2.9	10.4%
4.	Uruguay	1.3	4.5%
5.	Germany	0.9	3.2%
6.	Chile	0.9	3.1%
7.	Spain	0.6	2.1%
8.	Bolivia	0.5	1.9%
9.	Peru	0.3	1.0%
10.	Italy	0.3	0.9%
11.	Taiwan	0.3	0.9%
12.	France	0.2	0.8%
13.	Canada	0.2	0.8%
14.	Japan	0.2	0.7%
15.	Korea, Rep.	0.2	0.6%
16.	Switzerland	0.2	0.6%
17.	Lebanon	0.1	0.5%
18.	Colombia	0.1	0.5%
19.	China	0.1	0.4%
20.	United Kingdom	0.1	0.4%
	Others	1.5	5.2%
	TOTAL	**28.4**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	71.6	75.8	71.4
Outgoing	33.3	35.3	28.4
Surplus (Deficit)	38.4	40.6	43.0
Total Volume	104.9	111.1	99.8

Note: Data are in millions of minutes of public switched telecommunications traffic.

Peru

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United States	57.0	40.2%
2.	Spain	12.0	8.5%
3.	Argentina	10.0	7.0%
4.	Chile	8.5	6.0%
5.	Brazil	4.5	3.2%
6.	Ecuador	4.5	3.2%
7.	Venezuela	4.5	3.2%
8.	Colombia	4.3	3.0%
9.	Mexico	4.2	3.0%
10.	Bolivia	3.6	2.5%
11.	Italy	3.6	2.5%
12.	Japan	3.4	2.4%
13.	Canada	2.2	1.6%
14.	Germany	1.8	1.3%
15.	France	1.3	0.9%
	Others	16.5	11.6%
	TOTAL	**141.9**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	458.6	792.7	1,090.7
Outgoing	108.3	112.7	141.9
Surplus (Deficit)	350.3	680.0	948.8
Total Volume	566.9	905.4	1,232.6

Note: Data are in millions of minutes of public switched telecommunications traffic.

Philippines

LARGEST TELECOMMUNICATIONS ROUTES, FY 2002/2003

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United States	125.0	27.1%
2.	Japan	63.0	13.7%
3.	Saudi Arabia	49.0	10.6%
4.	Singapore	35.0	7.6%
5.	Canada	21.0	4.6%
6.	Taiwan	21.0	4.6%
7.	Korea, Rep.	20.0	4.3%
8.	Australia	19.0	4.1%
9.	Hong Kong	15.0	3.3%
10.	India	11.0	2.4%
	Others	82.0	17.8%
	TOTAL	**461.0**	

NATIONAL TRAFFIC BALANCE

Minutes	FY 2000/2001	FY 2001/2002	FY 2002/2003
Incoming	2,703.0	3,597.0	3,939.2
Outgoing	327.0	449.0	461.0
Surplus (Deficit)	2,376.0	3,148.0	3,478.2
Total Volume	3,030.0	4,046.0	4,400.2

Note: Data are in millions of minutes of public switched telecommunications traffic. Fiscal year ends 31 March.

Portugal

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	France	154.0	15.9%
2.	Spain	134.0	13.8%
3.	United Kingdom	84.0	8.7%
4.	Brazil	79.0	8.1%
5.	Germany	72.0	7.4%
6.	Switzerland	41.0	4.2%
7.	United States	40.0	4.1%
8.	Ukraine	39.0	4.0%
9.	Italy	26.0	2.7%
10.	Angola	24.0	2.5%
11.	Netherlands	24.0	2.5%
12.	Cape Verde	22.0	2.3%
13.	Belgium	17.0	1.8%
14.	Guinea-Bissau	16.0	1.6%
15.	Canada	15.0	1.5%
16.	Morocco	15.0	1.5%
17.	Moldova	13.0	1.3%
18.	Romania	13.0	1.3%
19.	Luxembourg	9.0	0.9%
20.	Mozambique	8.0	0.8%
	Others	125.0	12.9%
	TOTAL	**970.0**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	n.a.	n.a.	n.a.
Outgoing	720.0	942.0	970.0
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

Note: Data are in millions of minutes of public switched telecommunications traffic. 1999 data are for Portugal Telecom only, and may exclude some cross-border traffic to Spain.

Qatar

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	India	38.3	16.4%
2.	United Arab Emirates	32.3	13.8%
3.	Saudi Arabia	22.2	9.5%
4.	Egypt	19.6	8.4%
5.	Bahrain	17.9	7.7%
6.	Pakistan	8.3	3.6%
7.	Jordan	7.2	3.1%
8.	Sudan	6.9	3.0%
9.	Kuwait	5.9	2.5%
10.	Bangladesh	5.8	2.5%
11.	Lebanon	4.5	1.9%
12.	United Kingdom	4.1	1.8%
13.	Syria	3.3	1.4%
14.	Sri Lanka	3.2	1.4%
15.	Oman	3.1	1.3%
16.	Yemen	2.6	1.1%
17.	Iran	2.0	0.9%
18.	Morocco	1.7	0.7%
19.	Philippines	1.4	0.6%
20.	France	1.2	0.5%
	Others	42.0	18.0%
	TOTAL	**233.5**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	95.5	113.5	134.6
Outgoing	143.0	171.6	233.5
Surplus (Deficit)	(47.5)	(58.1)	(98.9)
Total Volume	238.6	285.1	368.1

Note: Data are in millions of minutes of public switched telecommunications traffic.

Russia

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Ukraine	329.9	27.1%
2.	Belarus	129.3	10.6%
3.	Kazakhstan	118.7	9.7%
4.	Azerbaijan	70.1	5.7%
5.	Moldova	56.7	4.7%
6.	Germany	51.2	4.2%
7.	Uzbekistan	47.7	3.9%
8.	Georgia	38.2	3.1%
9.	Armenia	30.8	2.5%
10.	Tajikistan	28.0	2.3%
11.	Kyrgyzstan	21.8	1.8%
12.	Lithuania	18.0	1.5%
13.	Latvia	17.9	1.5%
14.	Italy	11.1	0.9%
15.	Turkmenistan	9.0	0.7%
16.	Israel	8.2	0.7%
17.	China	7.7	0.6%
18.	Poland	7.3	0.6%
19.	Spain	6.0	0.5%
20.	France	5.8	0.5%
	Others	205.8	16.9%
	TOTAL	**1,219.2**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	n.a.	869.3	1,005.4
Outgoing	944.0	1,081.6	1,219.2
Surplus (Deficit)	n.a.	(212.3)	(213.8)
Total Volume	n.a.	1,950.9	2,224.6

Note: Data are in millions of minutes of public switched telecommunications traffic. Data are for Rostelecom only.

Saint Kitts and Nevis

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United States	4.2	37.4%
2.	Jamaica	1.0	8.4%
3.	Antigua and Barbuda	0.9	8.0%
4.	Anguilla	0.7	5.9%
5.	Barbados	0.6	5.5%
6.	Guyana	0.5	4.2%
7.	Trinidad and Tobago	0.4	3.7%
8.	Canada	0.4	3.6%
9.	Saint Vincent and the Grenadines	0.4	3.3%
10.	Saint Lucia	0.3	2.9%
11.	United Kingdom	0.3	2.6%
12.	Grenada	0.3	2.3%
13.	Dominica	0.3	2.2%
14.	Netherlands Antilles	0.1	0.9%
15.	Bermuda	0.1	0.4%
16.	Guadeloupe	0.1	0.4%
	Others	0.2	1.8%
	TOTAL	**11.3**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	n.a.	n.a.	21.9
Outgoing	13.8	3.0	11.3
Surplus (Deficit)	n.a.	n.a.	10.5
Total Volume	n.a.	n.a.	33.2

Note: Data are in millions of minutes of public switched telecommunications traffic.

Saint Lucia

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United States	4.9	31.7%
2.	Barbados	2.0	12.8%
3.	Trinidad and Tobago	1.7	11.1%
4.	Martinique	1.4	9.1%
5.	Jamaica	0.8	5.2%
6.	United Kingdom	0.8	5.0%
7.	Saint Vincent and the Grenadines	0.6	3.5%
8.	Dominica	0.5	3.1%
9.	Antigua and Barbuda	0.4	2.5%
10.	Grenada	0.4	2.5%
11.	Saint Kitts and Nevis	0.4	2.5%
12.	Canada	0.4	2.4%
13.	Guyana	0.2	1.4%
14.	Cayman Islands	0.1	0.8%
15.	Anguilla	0.1	0.7%
16.	Guadeloupe	0.1	0.7%
	Others	0.3	2.1%
	TOTAL	**15.6**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	n.a.	n.a.	41.0
Outgoing	20.5	13.4	15.6
Surplus (Deficit)	n.a.	n.a.	25.4
Total Volume	n.a.	n.a.	56.5

Note: Data are in millions of minutes of public switched telecommunications traffic.

Saint Vincent & the Grenadines

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (thousands)	Percent of Outgoing Traffic
1.	United States	2,350.0	22.4%
2.	Barbados	1,700.0	16.2%
3.	Trinidad and Tobago	1,660.0	15.8%
4.	Cuba	600.0	5.7%
5.	Grenada	550.0	5.2%
6.	Jamaica	520.0	5.0%
7.	Saint Lucia	520.0	5.0%
8.	Canada	430.0	4.1%
9.	United Kingdom	410.0	3.9%
10.	Antigua and Barbuda	260.0	2.5%
11.	Saint Kitts and Nevis	180.0	1.7%
12.	Dominica	130.0	1.2%
13.	Guyana	100.0	1.0%
14.	Anguilla	70.0	0.7%
15.	Bermuda	70.0	0.7%
16.	Martinique	70.0	0.7%
17.	France	50.0	0.5%
18.	Cayman Islands	40.0	0.4%
	Others	240.0	2.3%
	TOTAL	**10,500.0**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	n.a.	n.a.	43.8
Outgoing	13.0	3.0	10.5
Surplus (Deficit)	n.a.	n.a.	33.3
Total Volume	n.a.	n.a.	54.3

Note: National traffic data are in millions of minutes of public switched telecommunications traffic; route data are in thousands of minutes of public switched telecommunications traffic.

Saudi Arabia

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	India	289.2	15.1%
2.	Egypt	282.4	14.7%
3.	Pakistan	203.0	10.6%
4.	Sudan	123.2	6.4%
5.	Bangladesh	118.9	6.2%
6.	Yemen	106.1	5.5%
7.	United Arab Emirates	87.0	4.5%
8.	Syria	83.8	4.4%
9.	Philippines	83.6	4.4%
10.	Bahrain	55.3	2.9%
11.	Kuwait	51.9	2.7%
12.	Jordan	47.7	2.5%
13.	Morocco	38.5	2.0%
14.	Lebanon	37.2	1.9%
15.	Indonesia	36.5	1.9%
16.	United Kingdom	32.1	1.7%
17.	United States	30.1	1.6%
18.	Turkey	28.2	1.5%
19.	Qatar	20.9	1.1%
20.	Sri Lanka	17.8	0.9%
	Others	143.0	7.5%
	TOTAL	**1,916.3**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	n.a.	705.5	815.2
Outgoing	1,194.9	1,516.6	1,916.3
Surplus (Deficit)	n.a.	(811.2)	(1,101.1)
Total Volume	n.a.	2,222.1	2,731.5

Note: Data are in millions of minutes of public switched telecommunications traffic.

Serbia and Montenegro

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Germany	43.5	15.3%
2.	Austria	26.8	9.4%
3.	Croatia	26.5	9.3%
4.	Bosnia-Herzegovina	22.2	7.8%
5.	Switzerland	21.5	7.6%
6.	Macedonia	21.0	7.4%
7.	Italy	20.3	7.2%
8.	France	12.4	4.4%
9.	Hungary	9.5	3.3%
10.	Slovenia	8.4	3.0%
11.	Greece	7.5	2.6%
12.	United Kingdom	6.8	2.4%
13.	United States	6.2	2.2%
14.	Sweden	5.9	2.1%
15.	Russia	5.9	2.1%
16.	Romania	4.9	1.7%
17.	Netherlands	4.8	1.7%
18.	Turkey	4.6	1.6%
19.	Bulgaria	4.0	1.4%
20.	Belgium	3.0	1.1%
	Others	18.6	6.5%
	TOTAL	**284.2**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	n.a.	582.2	587.1
Outgoing	286.9	275.5	284.2
Surplus (Deficit)	n.a.	306.7	302.9
Total Volume	n.a.	857.7	871.2

Note: Data are in millions of minutes of public switched telecommunications traffic.

Singapore

LARGEST TELECOMMUNICATIONS ROUTES, FY 2002/2003

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Malaysia	590.0	30.0%
2.	United Kingdom	160.0	8.1%
3.	Hong Kong	145.0	7.4%
4.	China	95.0	4.8%
5.	Indonesia	95.0	4.8%
6.	Australia	80.0	4.1%
7.	United States	80.0	4.1%
8.	Japan	75.0	3.8%
9.	Thailand	55.0	2.8%
10.	Philippines	51.0	2.6%
11.	India	45.0	2.3%
12.	Taiwan	39.0	2.0%
13.	Korea, Rep.	19.0	1.0%
14.	Bangladesh	18.0	0.9%
15.	Germany	12.0	0.6%
	Others	406.0	20.7%
	TOTAL	**1,965.0**	

NATIONAL TRAFFIC BALANCE

Minutes	FY 2000/2001	FY 2001/2002	FY 2002/2003
Incoming	n.a.	n.a.	n.a.
Outgoing	1,515.0	1,870.7	1,965.0
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

Note: Data are in millions of minutes of public switched telecommunications traffic. Fiscal year ends 31 March.

Slovak Republic

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Czech Republic	70.0	36.1%
2.	Germany	27.0	13.9%
3.	Austria	15.0	7.7%
4.	Hungary	10.0	5.2%
5.	Italy	8.0	4.1%
6.	Poland	8.0	4.1%
7.	United Kingdom	7.0	3.6%
8.	United States	6.0	3.1%
9.	France	4.0	2.1%
10.	Switzerland	3.5	1.8%
	Others	35.5	18.3%
	TOTAL	**194.0**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	233.1	n.a.	n.a.
Outgoing	162.7	176.3	194.0
Surplus (Deficit)	70.4	n.a.	n.a.
Total Volume	395.7	n.a.	n.a.

Note: Data are in millions of minutes of public switched telecommunications traffic.

South Africa

LARGEST TELECOMMUNICATIONS ROUTES, FY 2002/2003

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United Kingdom	109.2	19.3%
2.	Zimbabwe	44.4	7.8%
3.	United States	36.8	6.5%
4.	Namibia	35.8	6.3%
5.	Mozambique	33.9	6.0%
6.	Botswana	30.4	5.4%
7.	Germany	21.3	3.8%
8.	Swaziland	18.3	3.2%
9.	Australia	16.5	2.9%
10.	Lesotho	15.0	2.6%
11.	Netherlands	10.0	1.8%
12.	Zambia	10.0	1.8%
13.	India	9.5	1.7%
14.	France	9.4	1.7%
15.	Malawi	8.3	1.5%
16.	Portugal	7.7	1.4%
17.	Nigeria	7.6	1.3%
18.	Canada	7.2	1.3%
19.	Pakistan	6.6	1.2%
20.	Italy	6.5	1.1%
	Others	122.9	21.7%
	TOTAL	**567.2**	

NATIONAL TRAFFIC BALANCE

Minutes	FY 2000/2001	FY 2001/2002	FY 2002/2003
Incoming	700.0	736.0	811.8
Outgoing	494.6	510.7	567.2
Surplus (Deficit)	205.4	225.3	244.6
Total Volume	1,194.6	1,246.7	1,379.0

Note: Data are in millions of minutes of public switched telecommunications traffic. Fiscal year ends 31 March.

Spain

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United Kingdom	630.0	13.3%
2.	Germany	565.0	11.9%
3.	France	530.0	11.2%
4.	Italy	235.0	5.0%
5.	Portugal	195.0	4.1%
6.	Morocco	170.0	3.6%
7.	United States	155.0	3.3%
8.	Netherlands	120.0	2.5%
9.	Switzerland	105.0	2.2%
10.	Ecuador	100.0	2.1%
11.	Belgium	99.0	2.1%
12.	Cuba	89.0	1.9%
13.	Colombia	87.0	1.8%
14.	Ireland	75.0	1.6%
15.	Argentina	70.0	1.5%
16.	Romania	70.0	1.5%
17.	Sweden	63.0	1.3%
18.	Andorra	50.0	1.1%
19.	Peru	49.0	1.0%
20.	Dominican Republic	44.0	0.9%
	Others	1,239.0	26.1%
	TOTAL	**4,740.0**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	n.a.	n.a.	n.a.
Outgoing	3,215.0	4,275.0	4,740.0
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

Note: Data are in millions of minutes of public switched telecommunications traffic. Total traffic volumes may include some refile traffic to Latin America originated outside of Spain.

Swaziland

LARGEST TELECOMMUNICATIONS ROUTES, FY 2002/2003

	Destination	Minutes (thousands)	Percent of Outgoing Traffic
1.	South Africa	19,275.9	82.7%
2.	Mozambique	736.3	3.2%
3.	United Kingdom	471.2	2.0%
4.	Zimbabwe	311.9	1.3%
5.	Botswana	293.9	1.3%
6.	United States	183.4	0.8%
7.	Lesotho	141.0	0.6%
8.	Taiwan	130.0	0.6%
9.	India	112.1	0.5%
10.	Kenya	109.8	0.5%
11.	Zambia	104.5	0.4%
12.	China	88.4	0.4%
13.	Tanzania	67.9	0.3%
14.	Uganda	60.7	0.3%
15.	Portugal	56.1	0.2%
16.	Namibia	48.1	0.2%
17.	Ghana	42.4	0.2%
18.	Italy	42.0	0.2%
19.	Canada	37.9	0.2%
20.	Malawi	37.3	0.2%
	Others	960.0	4.1%
	TOTAL	**23,314.8**	

NATIONAL TRAFFIC BALANCE

Minutes	FY 2000/2001	FY 2001/2002	FY 2002/2003
Incoming	22.5	n.a.	18.3
Outgoing	25.1	26.3	23.3
Surplus (Deficit)	(2.6)	n.a.	(5.0)
Total Volume	47.6	n.a.	41.6

Note: National traffic data are in millions of minutes of public switched telecommunications traffic; route data are in thousands of minutes of public switched telecommunications traffic. Fiscal year ends 31 March.

Sweden

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Norway	250.0	14.2%
2.	Finland	245.0	14.0%
3.	United Kingdom	230.0	13.1%
4.	Denmark	195.0	11.1%
5.	United States	175.0	10.0%
6.	Germany	160.0	9.1%
7.	Poland	100.0	5.7%
8.	France	70.0	4.0%
9.	Netherlands	60.0	3.4%
10.	Switzerland	60.0	3.4%
11.	Spain	35.0	2.0%
12.	Italy	30.0	1.7%
13.	Austria	25.0	1.4%
14.	Turkey	25.0	1.4%
15.	Serbia and Montenegro	14.0	0.8%
	Others	81.0	4.6%
	TOTAL	**1,755.0**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	n.a.	n.a.	n.a.
Outgoing	1,550.0	1,710.0	1,755.0
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

Note: Data are in millions of minutes of public switched telecommunications traffic.

Switzerland

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Germany	710.0	20.3%
2.	France	480.0	13.7%
3.	Italy	415.0	11.9%
4.	United Kingdom	195.0	5.6%
5.	United States	170.0	4.9%
6.	Austria	145.0	4.1%
7.	Spain	140.0	4.0%
8.	Portugal	115.0	3.3%
9.	Serbia and Montenegro	100.0	2.9%
10.	Netherlands	65.0	1.9%
11.	Belgium	45.0	1.3%
12.	Canada	45.0	1.3%
13.	Turkey	45.0	1.3%
14.	Macedonia	30.0	0.9%
15.	Croatia	27.0	0.8%
16.	Bosnia-Herzegovina	25.0	0.7%
17.	Sweden	24.0	0.7%
18.	Liechtenstein	21.0	0.6%
19.	Russia	18.0	0.5%
20.	Brazil	17.0	0.5%
	Others	663.0	19.0%
	TOTAL	**3,495.0**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	n.a.	n.a.	n.a.
Outgoing	2,780.0	3,230.0	3,495.0
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

Note: Data are in millions of minutes of public switched telecommunications traffic.

Syria

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Lebanon	44.7	24.9%
2.	Saudi Arabia	40.4	22.5%
3.	United Arab Emirates	12.8	7.1%
4.	Jordan	10.4	5.8%
5.	Iraq	9.5	5.3%
6.	Egypt	5.2	2.9%
7.	Kuwait	3.7	2.1%
8.	Turkey	3.4	1.9%
9.	France	2.7	1.5%
10.	Germany	2.6	1.4%
11.	Bahrain	2.2	1.2%
12.	Qatar	2.2	1.2%
13.	Italy	1.8	1.0%
14.	Sudan	1.2	0.7%
15.	Morocco	1.2	0.7%
16.	United States	1.1	0.6%
17.	Russia	1.1	0.6%
18.	Iran	1.1	0.6%
19.	Greece	1.0	0.6%
20.	Yemen	0.9	0.5%
	Others	30.8	17.1%
	TOTAL	**179.8**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	286.0	325.8	n.a.
Outgoing	140.0	150.0	179.8
Surplus (Deficit)	146.0	175.8	n.a.
Total Volume	426.0	475.8	n.a.

Note: Data are in millions of minutes of public switched telecommunications traffic.

Taiwan

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	China	749.1	34.8%
2.	United States	222.1	10.3%
3.	Philippines	141.5	6.6%
4.	Japan	104.9	4.9%
5.	Hong Kong	92.7	4.3%
6.	Thailand	80.0	3.7%
7.	Vietnam	43.7	2.0%
8.	Canada	43.7	2.0%
9.	Singapore	34.8	1.6%
10.	Australia	33.6	1.6%
11.	Indonesia	28.8	1.3%
12.	United Kingdom	25.4	1.2%
13.	Malaysia	24.9	1.2%
14.	Korea, Rep.	18.4	0.9%
15.	Germany	12.4	0.6%
16.	France	8.4	0.4%
17.	New Zealand	7.6	0.4%
18.	Myanmar	5.7	0.3%
19.	India	5.2	0.2%
20.	Macau	5.1	0.2%
	Others	466.0	21.6%
	TOTAL	**2,154.0**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	n.a.	n.a.	n.a.
Outgoing	1,160.0	1,522.2	2,154.0
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

Note: Data are in millions of minutes of public switched telecommunications traffic.

Tajikistan

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (thousands)	Percent of Outgoing Traffic
1.	Russia	6,509.9	65.0%
2.	Uzbekistan	1,537.8	15.4%
3.	Kazakhstan	736.7	7.4%
4.	Kyrgyzstan	374.7	3.7%
5.	Ukraine	138.8	1.4%
6.	Turkmenistan	119.5	1.2%
7.	Belarus	62.6	0.6%
8.	Azerbaijan	19.6	0.2%
9.	Armenia	12.2	0.1%
10.	Georgia	12.0	0.1%
11.	Moldova	11.6	0.1%
	Others	500.0	5.0%
	TOTAL	**10,009.3**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	18.5	n.a.	n.a.
Outgoing	6.8	8.6	10.0
Surplus (Deficit)	11.7	n.a.	n.a.
Total Volume	25.3	n.a.	n.a.

Note: National traffic data are in millions of minutes of public switched telecommunications traffic; route data are in thousands of minutes of public switched telecommunications traffic. The "Others" category may include routes to non-members of the Commonwealth of Independent States that rank among the top destinations for outgoing traffic.

Tanzania

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United Kingdom	2.0	17.8%
2.	South Africa	1.9	16.7%
3.	India	1.0	9.0%
4.	United States	0.7	6.5%
5.	United Arab Emirates	0.5	4.2%
6.	Zambia	0.3	2.5%
7.	France	0.3	2.2%
8.	Oman	0.2	2.0%
9.	Zimbabwe	0.2	1.8%
10.	Netherlands	0.2	1.8%
11.	Germany	0.2	1.8%
12.	Kenya	0.2	1.7%
13.	Switzerland	0.2	1.5%
14.	Australia	0.2	1.5%
15.	Malawi	0.2	1.3%
16.	Pakistan	0.1	1.3%
17.	China	0.1	1.2%
18.	Egypt	0.1	1.2%
19.	Uganda	0.1	1.1%
20.	Spain	0.1	1.0%
	Others	2.5	21.8%
	TOTAL	**11.4**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	n.a.	n.a.	n.a.
Outgoing	13.0	9.4	11.4
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

Note: Data are in millions of minutes of public switched telecommunications traffic.

Thailand

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Japan	40.7	9.7%
2.	United States	39.8	9.5%
3.	Malaysia	35.6	8.5%
4.	Singapore	30.0	7.2%
5.	Laos	23.9	5.7%
6.	United Kingdom	22.0	5.2%
7.	China	19.4	4.6%
8.	Australia	18.8	4.5%
9.	Taiwan	17.7	4.2%
10.	Hong Kong	16.9	4.0%
11.	Myanmar	14.3	3.4%
12.	Germany	12.6	3.0%
13.	Korea, Rep.	9.3	2.2%
14.	India	9.1	2.2%
15.	France	8.1	1.9%
16.	Philippines	6.6	1.6%
17.	Indonesia	5.7	1.4%
18.	Sweden	5.2	1.2%
19.	Switzerland	5.0	1.2%
20.	Italy	4.5	1.1%
	Others	73.9	17.6%
	TOTAL	**419.1**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	426.6	555.0	305.0
Outgoing	355.2	377.7	419.1
Surplus (Deficit)	71.4	177.4	(114.1)
Total Volume	781.8	932.6	724.1

Note: Data are in millions of minutes of public switched telecommunications traffic. 1999 data exclude some cross-border traffic with Laos, Malaysia, and Myanmar.

Togo

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	France	4.2	19.2%
2.	Benin	2.5	11.4%
3.	United States	2.1	9.5%
4.	Burkina Faso	1.5	6.6%
5.	Côte d'Ivoire	1.4	6.3%
6.	Belgium	1.3	5.7%
7.	United Kingdom	1.2	5.4%
8.	Ghana	1.0	4.6%
9.	Nigeria	0.9	4.0%
10.	Germany	0.8	3.6%
11.	Senegal	0.4	1.9%
12.	Lebanon	0.4	1.8%
13.	Mali	0.4	1.8%
14.	Niger	0.4	1.7%
15.	Gabon	0.3	1.5%
16.	Portugal	0.3	1.4%
17.	Switzerland	0.2	0.9%
18.	Gambia	0.2	0.7%
19.	Netherlands	0.2	0.7%
20.	Cameroon	0.1	0.6%
	Others	2.3	10.6%
	TOTAL	**22.1**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	12.2	48.8	n.a.
Outgoing	10.2	14.1	22.1
Surplus (Deficit)	2.0	34.6	n.a.
Total Volume	22.4	62.9	n.a.

Note: Data are in millions of minutes of public switched telecommunications traffic.

Trinidad and Tobago

LARGEST TELECOMMUNICATIONS ROUTES, FY 2002/2003

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United States	40.4	50.3%
2.	Canada	7.7	9.6%
3.	United Kingdom	6.5	8.1%
4.	Barbados	3.9	4.9%
5.	Grenada	3.2	4.0%
6.	Guyana	3.1	3.9%
7.	Jamaica	2.5	3.1%
8.	Venezuela	2.3	2.9%
9.	Saint Vincent and the Grenadines	2.0	2.5%
10.	Saint Lucia	1.6	2.0%
11.	Antigua and Barbuda	1.3	1.6%
12.	Netherlands Antilles	0.5	0.6%
13.	Saint Kitts and Nevis	0.5	0.6%
14.	Dominica	0.5	0.6%
15.	Germany	0.4	0.5%
16.	India	0.4	0.5%
17.	Bahamas	0.3	0.4%
18.	Netherlands	0.3	0.4%
19.	Dominican Republic	0.2	0.3%
	Others	2.5	3.1%
	TOTAL	**80.2**	

NATIONAL TRAFFIC BALANCE

Minutes	FY 2000/2001	FY 2001/2002	FY 2002/2003
Incoming	167.7	189.2	276.6
Outgoing	80.5	80.9	80.2
Surplus (Deficit)	87.2	108.3	196.4
Total Volume	248.2	270.0	356.7

Note: Data are in millions of minutes of public switched telecommunications traffic. Fiscal year ends 31 March.

Turkey

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Germany	155.0	23.8%
2.	United Kingdom	47.0	7.2%
3.	United States	30.0	4.6%
4.	France	29.0	4.5%
5.	Netherlands	26.0	4.0%
6.	Bulgaria	20.0	3.1%
7.	Austria	14.0	2.2%
8.	Belgium	13.0	2.0%
9.	Greece	13.0	2.0%
10.	Italy	13.0	2.0%
11.	Russia	13.0	2.0%
12.	Switzerland	13.0	2.0%
13.	Romania	12.0	1.8%
14.	Azerbaijan	9.0	1.4%
15.	Ukraine	8.5	1.3%
16.	Saudi Arabia	8.0	1.2%
17.	Moldova	7.5	1.2%
18.	Israel	7.0	1.1%
19.	Iran	6.0	0.9%
20.	Sweden	6.0	0.9%
	Others	200.0	30.8%
	TOTAL	**650.0**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	1,240.0	1,100.0	1,100.0
Outgoing	731.8	675.0	650.0
Surplus (Deficit)	508.2	425.0	450.0
Total Volume	1,971.8	1,775.0	1,750.0

Note: Data are in millions of minutes of public switched telecommunications traffic.

Turkmenistan

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Russia	7.9	32.7%
2.	Azerbaijan	2.2	9.1%
3.	Kazakhstan	1.8	7.7%
4.	Uzbekistan	1.6	6.8%
5.	Ukraine	1.2	5.0%
6.	Kyrgyzstan	0.6	2.5%
7.	Armenia	0.4	1.9%
8.	Belarus	0.4	1.6%
9.	Georgia	0.4	1.5%
10.	Tajikistan	0.2	1.0%
11.	Moldova	0.0	0.2%
	Others	7.2	29.9%
	TOTAL	**24.1**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	11.3	n.a.	n.a.
Outgoing	15.7	19.3	24.1
Surplus (Deficit)	(4.5)	n.a.	n.a.
Total Volume	27.0	n.a.	n.a.

Note: Data are in millions of minutes of public switched telecommunications traffic. The "Others" category may include routes to non-members of the Commonwealth of Independent States that rank among the top destinations for outgoing traffic.

Ukraine

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Russia	238.5	58.9%
2.	Belarus	19.7	4.9%
3.	Poland	15.8	3.9%
4.	Germany	14.6	3.6%
5.	Moldova	13.5	3.3%
6.	Italy	7.3	1.8%
7.	Czech Republic	6.0	1.5%
8.	Armenia	4.9	1.2%
9.	Azerbaijan	4.9	1.2%
10.	Kazakhstan	4.1	1.0%
11.	Hungary	4.1	1.0%
12.	Turkey	4.0	1.0%
13.	United States	3.9	1.0%
14.	Georgia	3.8	0.9%
15.	United Kingdom	2.8	0.7%
16.	Uzbekistan	2.7	0.7%
17.	Israel	2.6	0.6%
18.	Lithuania	2.4	0.6%
19.	Bulgaria	2.0	0.5%
20.	Greece	2.0	0.5%
	Others	45.5	11.2%
	TOTAL	**405.0**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	269.5	n.a.	n.a.
Outgoing	363.0	388.0	405.0
Surplus (Deficit)	(93.4)	n.a.	n.a.
Total Volume	632.5	n.a.	n.a.

Note: Data are in millions of minutes of public switched telecommunications traffic.

United Arab Emirates

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	India	514.8	27.2%
2.	Pakistan	214.4	11.3%
3.	Egypt	108.9	5.8%
4.	Saudi Arabia	93.4	4.9%
5.	Philippines	80.1	4.2%
6.	Bangladesh	77.7	4.1%
7.	United Kingdom	66.5	3.5%
8.	Oman	61.2	3.2%
9.	Syria	60.5	3.2%
10.	Iran	42.7	2.3%
11.	Jordan	41.8	2.2%
12.	Lebanon	41.1	2.2%
13.	United States	38.1	2.0%
14.	Bahrain	33.1	1.7%
15.	Qatar	31.8	1.7%
16.	Sudan	31.0	1.6%
17.	Kuwait	27.6	1.5%
18.	Sri Lanka	24.1	1.3%
19.	Yemen	22.9	1.2%
20.	Morocco	22.1	1.2%
	Others	259.6	13.7%
	TOTAL	**1,893.6**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	n.a.	n.a.	n.a.
Outgoing	1,123.6	1,395.9	1,893.6
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

Note: Data are in millions of minutes of public switched telecommunications traffic.

United Kingdom-Outgoing

LARGEST TELECOMMUNICATIONS ROUTES, FY 2002/2003

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United States	2,635.0	18.1%
2.	Germany	947.8	6.5%
3.	France	845.6	5.8%
4.	Ireland	691.1	4.8%
5.	Spain	644.6	4.4%
6.	Australia	478.0	3.3%
7.	Italy	478.0	3.3%
8.	Canada	464.5	3.2%
9.	Netherlands	352.3	2.4%
10.	Switzerland	292.1	2.0%
11.	Sweden	258.2	1.8%
12.	Pakistan	256.4	1.8%
13.	India	245.1	1.7%
14.	Belgium	233.2	1.6%
15.	Japan	200.9	1.4%
16.	Brazil	193.1	1.3%
17.	South Africa	189.7	1.3%
18.	Greece	189.4	1.3%
19.	Turkey	183.0	1.3%
20.	Russia	170.5	1.2%
	Others	4,596.7	31.6%
	TOTAL	**14,545.4**	

NATIONAL TRAFFIC BALANCE

Minutes	FY 2000/2001	FY 2001/2002	FY 2002/2003
Incoming	7,463.2	7,664.8	9,569.6
Outgoing	12,242.7	13,941.2	14,545.4
Surplus (Deficit)	(4,779.5)	(6,276.4)	(4,975.8)
Total Volume	19,705.9	21,606.0	24,115.1

Note: Data are in millions of minutes of public switched telecommunications traffic. Fiscal year ends 31 March.

United Kingdom-Incoming

LARGEST TELECOMMUNICATIONS ROUTES, FY 2002/2003

	Destination	Minutes (millions)	Percent of Incoming Traffic
1.	United States	1,694.1	17.7%
2.	Germany	781.3	8.2%
3.	France	661.5	6.9%
4.	Ireland	560.5	5.9%
5.	Italy	457.6	4.8%
6.	Australia	415.0	4.3%
7.	Spain	413.0	4.3%
8.	Canada	341.6	3.6%
9.	Netherlands	258.0	2.7%
10.	Switzerland	245.5	2.6%
11.	Sweden	239.6	2.5%
12.	Greece	237.6	2.5%
13.	Belgium	174.8	1.8%
14.	Russia	119.2	1.2%
15.	India	106.9	1.1%
16.	South Africa	100.4	1.0%
17.	Turkey	59.3	0.6%
18.	Japan	52.9	0.6%
19.	Brazil	52.8	0.6%
20.	Pakistan	30.7	0.3%
	TOTAL	**9,569.6**	

NATIONAL TRAFFIC BALANCE

Minutes	FY 2000/2001	FY 2001/2002	FY 2002/2003
Incoming	7,463.2	7,664.8	9,569.6
Outgoing	12,242.7	13,941.2	14,545.4
Surplus (Deficit)	(4,779.5)	(6,276.4)	(4,975.8)
Total Volume	19,705.9	21,606.0	24,115.1

Note: Data are in millions of minutes of public switched telecommunications traffic. Fiscal year ends 31 March.

United States-Outgoing

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Mexico	5,201.4	12.9%
2.	Canada	4,861.0	12.1%
3.	Philippines	2,251.5	5.6%
4.	India	1,722.6	4.3%
5.	United Kingdom	1,722.4	4.3%
6.	Dominican Republic	1,186.2	2.9%
7.	Germany	1,064.1	2.6%
8.	Brazil	952.2	2.4%
9.	Guatemala	908.8	2.3%
10.	Japan	895.6	2.2%
11.	Italy	730.5	1.8%
12.	El Salvador	722.6	1.8%
13.	Colombia	721.9	1.8%
14.	China	660.9	1.6%
15.	Jamaica	647.3	1.6%
16.	France	632.6	1.6%
17.	Pakistan	615.2	1.5%
18.	Australia	579.4	1.4%
19.	Ecuador	473.1	1.2%
20.	Korea, Rep.	471.5	1.2%
	Others	13,316.6	33.0%
	TOTAL	**40,337.2**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	13,010.7	13,400.0	14,249.8
Outgoing	37,594.8	38,821.9	40,337.2
Surplus (Deficit)	(24,584.1)	(25,421.9)	(26,087.4)
Total Volume	50,605.6	52,221.9	54,587.0

Note: Data are in millions of minutes of public switched telecommunications traffic.

United States-Incoming

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Incoming Traffic
1.	Canada	4,263.7	29.9%
2.	Mexico	1,445.0	10.1%
3.	United Kingdom	1,443.5	10.1%
4.	Germany	906.0	6.4%
5.	Japan	374.4	2.6%
6.	France	356.2	2.5%
7.	Brazil	329.9	2.3%
8.	Australia	310.3	2.2%
9.	Korea, Rep.	256.1	1.8%
10.	Dominican Republic	244.2	1.7%
11.	Italy	208.6	1.5%
12.	Philippines	120.9	0.8%
13.	Colombia	117.2	0.8%
14.	Jamaica	100.1	0.7%
15.	India	95.2	0.7%
16.	El Salvador	83.6	0.6%
17.	China	79.3	0.6%
18.	Guatemala	74.6	0.5%
19.	Ecuador	40.5	0.3%
20.	Pakistan	13.6	0.1%
	TOTAL	**14,249.8**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	13,010.7	13,400.0	14,249.8
Outgoing	37,594.8	38,821.9	40,337.2
Surplus (Deficit)	(24,584.1)	(25,421.9)	(26,087.4)
Total Volume	50,605.6	52,221.9	54,587.0

Note: Data are in millions of minutes of public switched telecommunications traffic.

Uzbekistan

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Russia	33.9	55.7%
2.	Kazakhstan	6.2	10.2%
3.	Kyrgyzstan	2.8	4.6%
4.	Tajikistan	2.3	3.8%
5.	Ukraine	1.5	2.5%
6.	Turkmenistan	1.4	2.3%
7.	Belarus	0.5	0.9%
8.	Azerbaijan	0.4	0.6%
9.	Armenia	0.2	0.4%
10.	Georgia	0.2	0.3%
11.	Moldova	0.1	0.1%
	Others	11.4	18.7%
	TOTAL	**60.8**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	54.3	n.a.	n.a.
Outgoing	71.4	58.3	60.8
Surplus (Deficit)	(17.0)	n.a.	n.a.
Total Volume	125.7	n.a.	n.a.

Note: Data are in millions of minutes of public switched telecommunications traffic. The "Others" category may include routes to non-members of the Commonwealth of Independent States that rank among the top destinations for outgoing traffic.

Yemen

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Saudi Arabia	19.0	43.2%
2.	United Arab Emirates	5.0	11.4%
3.	Egypt	2.5	5.7%
4.	United States	1.7	3.9%
5.	Jordan	1.5	3.4%
6.	United Kingdom	1.5	3.4%
7.	Iraq	1.0	2.3%
8.	Sudan	0.8	1.9%
9.	Bahrain	0.7	1.5%
10.	Germany	0.6	1.5%
11.	Syria	0.6	1.5%
12.	China	0.6	1.3%
13.	France	0.5	1.2%
14.	Qatar	0.5	1.1%
15.	Kuwait	0.4	1.0%
16.	Lebanon	0.4	1.0%
17.	Ethiopia	0.4	0.9%
18.	Djibouti	0.3	0.7%
19.	Italy	0.3	0.7%
20.	Oman	0.3	0.7%
	Others	5.1	11.6%
	TOTAL	**43.9**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	105.6	n.a.	186.9
Outgoing	36.3	43.1	43.9
Surplus (Deficit)	69.3	n.a.	143.0
Total Volume	142.0	n.a.	230.8

Note: Data are in millions of minutes of public switched telecommunications traffic.

Zambia

LARGEST TELECOMMUNICATIONS ROUTES, 2002

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	South Africa	5.5	35.1%
2.	Kenya	1.7	11.2%
3.	United Kingdom	1.4	9.0%
4.	Zimbabwe	1.3	8.1%
5.	United States	0.7	4.6%
6.	Tanzania	0.7	4.6%
7.	India	0.5	3.2%
8.	Botswana	0.4	2.3%
9.	Malawi	0.3	1.7%
10.	Congo, Dem. Rep.	0.2	1.3%
11.	Australia	0.2	1.0%
12.	Hong Kong	0.1	0.9%
13.	Italy	0.1	0.8%
14.	Namibia	0.1	0.7%
15.	Japan	0.1	0.7%
16.	Canada	0.1	0.6%
17.	Netherlands	0.1	0.6%
18.	Germany	0.1	0.6%
19.	Sweden	0.1	0.5%
20.	Belgium	0.1	0.5%
	Others	1.8	11.7%
	TOTAL	**15.6**	

NATIONAL TRAFFIC BALANCE

Minutes	2000	2001	2002
Incoming	30.5	n.a.	n.a.
Outgoing	13.2	14.3	15.6
Surplus (Deficit)	17.3	n.a.	n.a.
Total Volume	43.7	n.a.	n.a.

Note: Data are in millions of minutes of public switched telecommunications traffic.

Methodology

The traffic statistics in *TeleGeography 2004* were compiled primarily from an independent survey of telecommunications service providers. For some countries and carriers, traffic data have been estimated based upon annual reports, government publications, and industry interviews.

To enable comparisons of countries' international traffic statistics, TeleGeography has endeavored to apply a consistent methodology. When reviewing the traffic statistics in *TeleGeography 2004,* however, readers should keep in mind the following issues.

Public Switched Network vs. Private Line Traffic

Traffic volumes in *TeleGeography 2004* are generally reported in minutes. In most cases, the statistics refer to paid minutes on public switched circuits and thus include voice as well as fax traffic.

Traffic volumes include traffic carried by wholesale carriers that is resold by "pure" resellers. These resellers do not own or lease their own international transmission facilities. Instead, they resell the services of other carriers; thus, pure resale traffic is counted as part of the minutes for the facilities-based carrier whose services are resold. Many companies act both as carriers of traffic and as reselllers of other carriers' services. To avoid double counting, TeleGeography's carrier survey specifically counts only traffic actually carried by the company.

Traffic carried by International Simple Resale (ISR) carriers is also included. ISR carriers lease international private lines (IPLs) for switched services by interconnecting their IPLs to the public switched network at one or both ends and resell this capacity.

Illicit Bypass

While traffic volumes include ISR, they generally do not include illicit bypass traffic that bypasses the international settlement rate regime. One form of illicit bypass is Voice-over-Internet-Protocol (VoIP). For an overview of Voice-over-IP traffic volumes, see "VoIP Routes and Traffic."

Cross-Border Traffic

Neighboring countries may not classify local cross-border traffic in the same way. That is, one country may treat some cross-border traffic as domestic while its neighbor counts all such traffic as international.

Transit Traffic

Unless otherwise stated, *TeleGeography 2004* excludes refile and transit traffic from the totals of countries acting as transit hubs. Notable exceptions include the U.K. and U.S. statistics, which do include some traffic reoriginated from other countries.

Inbound vs. Outbound Statistics

Comparisons of inbound traffic statistics reported by the United States and the United Kingdom may not match up exactly with outbound traffic reported by the originating country. Reasons for discrepancies may include differences in reporting methodologies (e.g. billing point vs. originating point) and inclusion of some refile or bypass traffic. Carriers or regulators may also exclude some cross-border traffic (e.g., between Ireland and Northern Ireland).

Fixed vs. Mobile Traffic

Traffic volumes include international calls originated and terminated on both fixed and mobile networks.

Rounding

Rounding may cause the figures on total national incoming and outgoing traffic to appear inconsistent with other national data.

Revised Data

Some differences exist between the historical statistics reported in *TeleGeography 2004* and data published in prior TeleGeography reports or Direction of Traffic. The variations reflect corrections and/or revised data subsequently provided to TeleGeography.

Bandwidth

Bandwidth

The statistics and analysis presented on the following pages are excerpted from International Bandwidth 2003, *published in March 2003*.

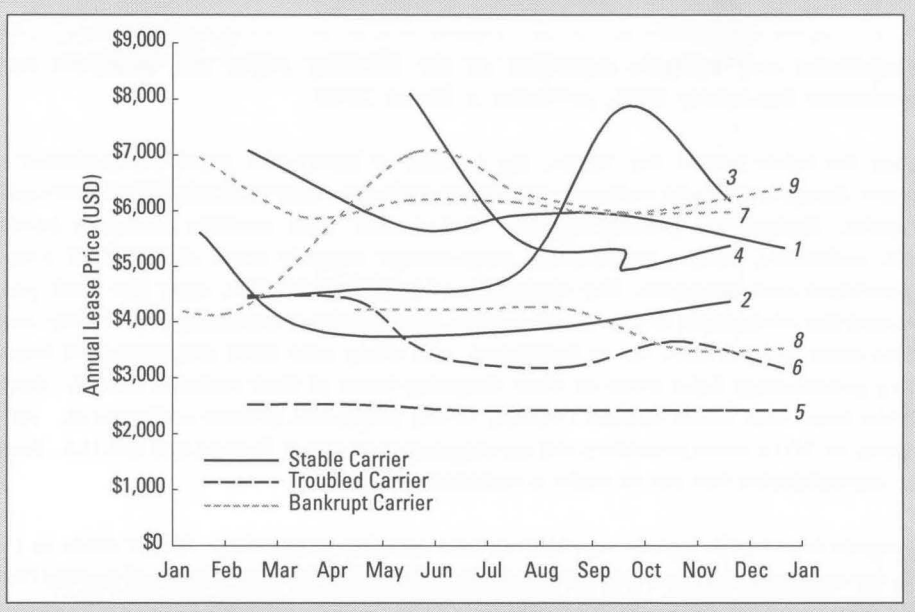
During the latter half of the 1990s, the number of bandwidth providers exploded as telecom deregulation and investor optimism fueled the rapid deployment of fiber-optic networks. Rather than piecing together "half circuits" from multiple monopoly incumbents, customers seeking to purchase cross-border 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. Many 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.

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.

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 frequency with which providers have modified their prices in the past year suggests that few carriers have a "grand strategy" with respect to price. Given the current state of turmoil in the industry, it is not surprising that carriers are having difficulties adjusting to the market. Some companies have simply kept prices high and accept that they will win little new business. Others have adjusted their prices on an almost monthly basis, in an effort to adapt to the changes they perceive in the market. Interestingly, there is little evidence, thus far, to support the widespread theory that carriers coming out of Chapter 11 are using their reduced debt levels to price services more aggressively than rival carriers (see Figure 1. London-Paris STM-1 Annual Lease Price by Carrier, 2002-2003).

The overarching factor driving prices is the dire state of the bandwidth market—and, by extension, bandwidth sellers' financial health. Many bandwidth providers will acknowledge that circuit prices are ruinously low. However, many suppliers have found

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



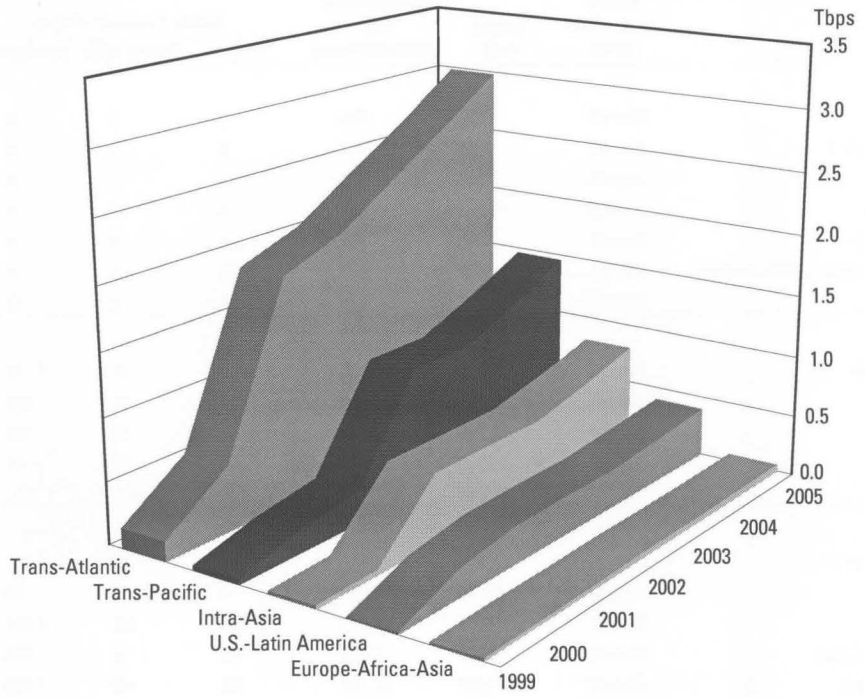
Notes: Prices reflect STM-1 annual lease prices offered by major carriers from January 2002 through January 2003.
Source: TeleGeography research, *International Bandwidth 2003* © PriMetrica, Inc. 2003

themselves long on capacity and short on revenues. Unless they cut prices to meet or beat their rivals, they will face the prospect of no revenues. Consequently, many suppliers have opted to slash prices, even selling below long-term costs.

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 among industry players. Plummeting prices, as well, seem a quotidian feature of the bandwidth market. Even bankruptcy has lost its former stigma—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.

Submarine Cable Systems

Figure 1. Lit Submarine Cable Capacity Trends by Route, 1999-2005



Lit Submarine Cable Capacity (Gbps)

	1999	2000	2001	2002	2003	2004	2005	Fully Upgraded
Trans-Atlantic	163.0	533.0	1,843.0	2,022.4	2,337.9	2,641.9	2,982.3	12,297.9
Trans-Pacific	42.9	182.9	262.9	1,042.9	1,042.9	1,230.9	1,456.5	6,502.9
Intra-Asia	25.0	40.0	560.0	560.0	560.0	670.0	802.0	15,810.0
U.S.-Latin America	13.1	213.1	293.1	303.1	303.1	345.6	396.6	5,165.6
Europe-Africa-Asia	21.1	31.1	31.1	41.1	41.1	49.1	58.7	251.1

Notes: Capacity figures denote lit, protected capacity at the end of the respective year. Projected capacity assumes cables with upgradeable capacity will increase total capacity 20 percent each year until fully upgradeable capacity is achieved. Intra-Asia capacity includes cables with landings in both Hong Kong and Japan. Trans-Pacific capacity excludes Southern Cross and PacRim East. Trans-Atlantic capacity excludes Atlantis-2. Cables retired prior to year-end 2003 are excluded from Fully Upgraded capacity.

Source: TeleGeography research, *International Bandwidth 2003*

Submarine Cable Systems

Figure 2. Major Submarine Networks: Length, Cost, and Capacity

	Ready for Service (RFS)	Length (km)	Construction Cost (US$ Millions)	Cable Capacity (Gbps)		
				RFS	March 2003	Maximum
Baltic Sea						
Baltica	Mar-97	437	$16	5	5	15
Germany-Denmark 2	Dec-95	60	$3	5	5	15
Kattegat	Aug-95	180	$13	3	3	15
Sweden-Estonia	Jun-95	240	$7	3	3	15
Sweden-Lithuania	Nov-97	200	$4	3	3	20
Black Sea Fiber Optic Cable System	Sep-01	1,300	$55	5	5	20
Georgia-Russia	Dec-00	433	n.a.	3	3	10
Europe-Africa-Asia						
FLAG Europe-Asia	Nov-97	28,000	$1,600	10	10	10
SAFE	Apr-02	13,500	$290	10	10	130
SAT-3/WASC	Apr-02	14,350	$507	20	20	120
SeaMeWe-3	Sep-99	38,000	$1,173	10	20	40
SeaMeWe-4	Dec-04	38,000	$720	n.a.	n.a.	n.a.
Intra-Asia						
A2A Cable Network	Dec-04	4,600	n.a.	40	40	1,920
APCN	Feb-97	5,234	$550	5	10	10
APCN-2	Dec-01	19,000	$1,060	160	160	2,560
Australia-Japan Cable	Dec-01	12,000	$550	40	40	320
C2C Cable Network	Dec-01	17,000	$2,100	160	160	7,680
East Asia Crossing	Jan-01	19,500	$1,280	80	80	2,560
FLAG North Asia Loop/ REACH North Asia Loop	Jun-01	9,504	$750	120	120	2,880
Guam-Philippines (G-P) Cable System	Mar-99	3,600	$100	5	5	40
i2i Cable Network	Apr-02	11,400	$650	160	160	8,400
Korea-Japan Cable Network	Mar-02	500	$60	50	50	2,880
Nava-1	Dec-04	4,750	n.a.	120	120	2,400
Thailand-Indonesia-Singapore	Nov-03	1,200	$40	30	30	320
Intra-Europe						
FARICE	Dec-03	1,394	n.a.	40	40	640
Finland Estonia Connection	Jan-00	250	n.a.	5	5	3,840
Tyco Northern Europe	Mar-02	600	n.a.	160	160	3,840
Tyco Western Europe	Jun-02	3,578	$90	120	120	3,840
Irish Sea						
ESAT-1	Aug-99	200	$13	5	5	960
ESAT-2	Sep-99	240	$16	5	5	960
Solas	Apr-99	200	$20	15	15	60
Mediterranean						
ALPAL-2	Jul-02	312	$15	3	3	160
Lev Submarine System	Mar-99	2,600	$66	5	5	40
MedNautilus Submarine System	Nov-01	7,000	n.a.	40	40	3,840

Source: TeleGeography research, *International Bandwidth 2003*

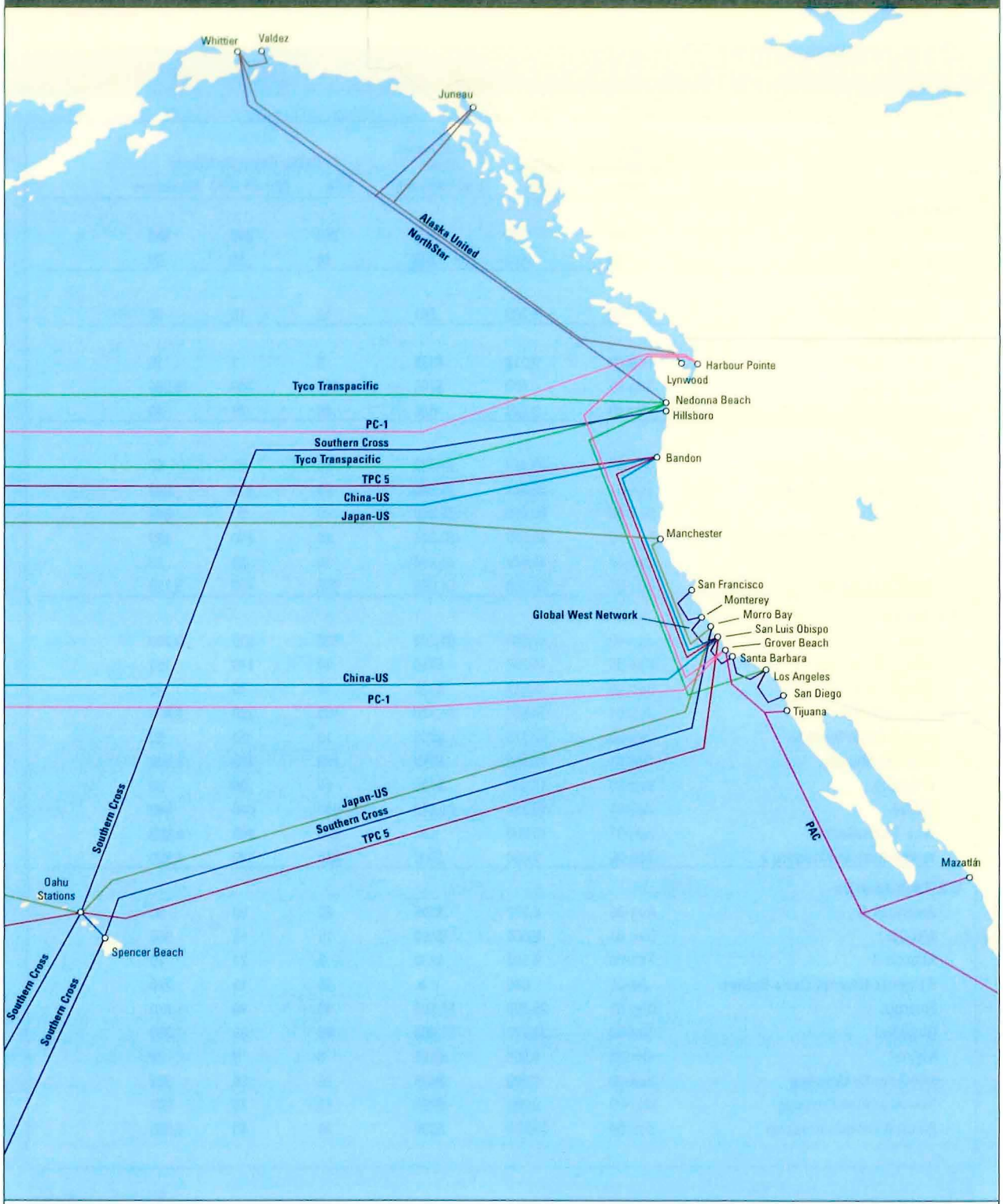
Submarine Cable Systems

Figure 2. Major Submarine Networks: Length, Cost, and Capacity

	Ready for Service (RFS)	Length (km)	Construction Cost (US$ Millions)	Cable Capacity (Gbps)		
				RFS	March 2003	Maximum
North Sea						
NorSea Com	Jul-99	930	$30	240	240	960
UK-Germany 6	Oct-98	560	$50	40	40	80
Persian Gulf						
Fiber Optic Gulf	Jun-98	1,300	$81	15	15	30
U.S. Domestic						
Alaska United	Feb-99	3,218	$125	3	3	10
Global West Network	Sep-01	930	$160	160	160	15,360
NorthStar	Oct-99	3,229	n.a.	20	20	30
U.S.-Asia						
China-U.S. Cable Network	Jan-00	30,476	$1,400	80	80	80
Japan-U.S. Cable Network	Sep-01	22,682	$1,000	80	400	640
Pacific Crossing-1	Dec-99	20,900	$1,200	20	80	640
Southern Cross Cable Network	Nov-00	30,500	$1,300	20	240	480
TPC 5	Jan-97	24,602	$1,240	10	20	20
Tyco Transpacific	Dec-02	22,300	$1,900	460	460	5,120
U.S.-Europe						
Apollo	Jan-03	13,000	$1,200	320	320	3,200
Atlantic Crossing-1	May-98	14,500	$750	40	140	160
Columbus-III	Dec-99	9,833	$236	10	40	40
FLAG Atlantic-1	Jun-01	14,500	$1,100	160	160	2,400
Gemini Cable System	Feb-98	12,115	$600	10	60	60
Hibernia Atlantic	Apr-01	12,200	$770	160	160	1,920
TAT-12/13	Sep-96	12,930	$750	10	30	30
TAT-14	Apr-01	15,295	$1,400	640	640	640
Tyco Transatlantic	Jun-01	13,000	n.a.	280	460	2,560
Yellow/Atlantic Crossing-2	Sep-00	6,000	$800	320	320	1,280
U.S.-Latin America						
Americas-II	Aug-00	8,373	$365	80	80	80
ARCOS	Dec-01	8,600	$400	15	15	960
Atlantis-2	Feb-00	8,500	$230	5	20	20
Bahamas Internet Cable System	Jul-01	600	n.a.	15	15	240
Emergia	Mar-01	25,000	$1,600	40	40	1,920
GlobeNet	Oct-00	22,770	$1,000	80	80	1,360
Maya-1	Oct-00	4,400	$152	8	8	20
Mid-Atlantic Crossing	Jun-00	7,500	$415	20	30	320
Pan-American Crossing	Mar-00	9,000	$280	10	20	240
South American Crossing	Sep-00	20,000	$800	40	60	1,280

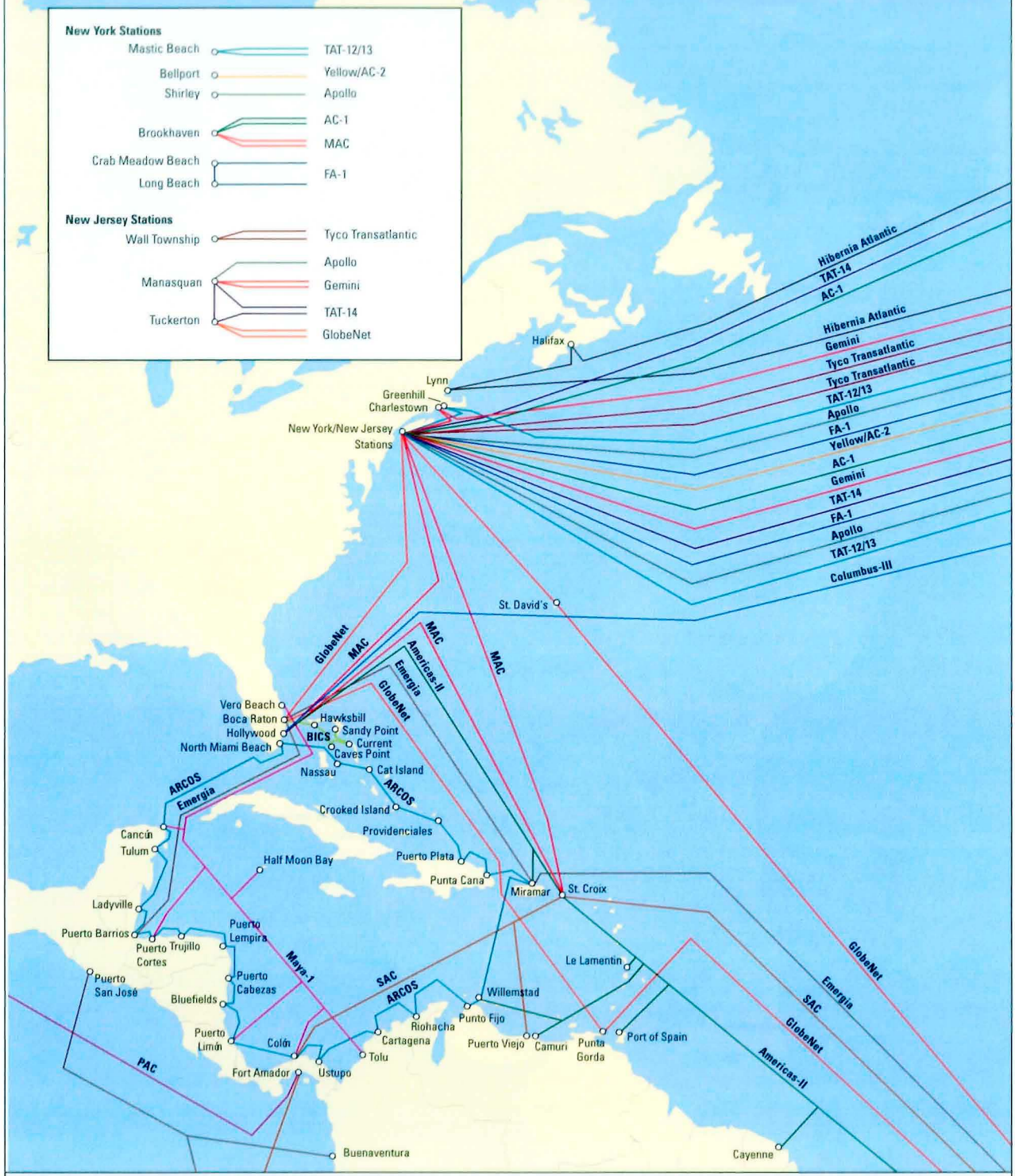
Source: TeleGeography research, *International Bandwidth 2003*

Figure 3. Map of Major Submarine Cable Systems in North America (Pacific Coast)



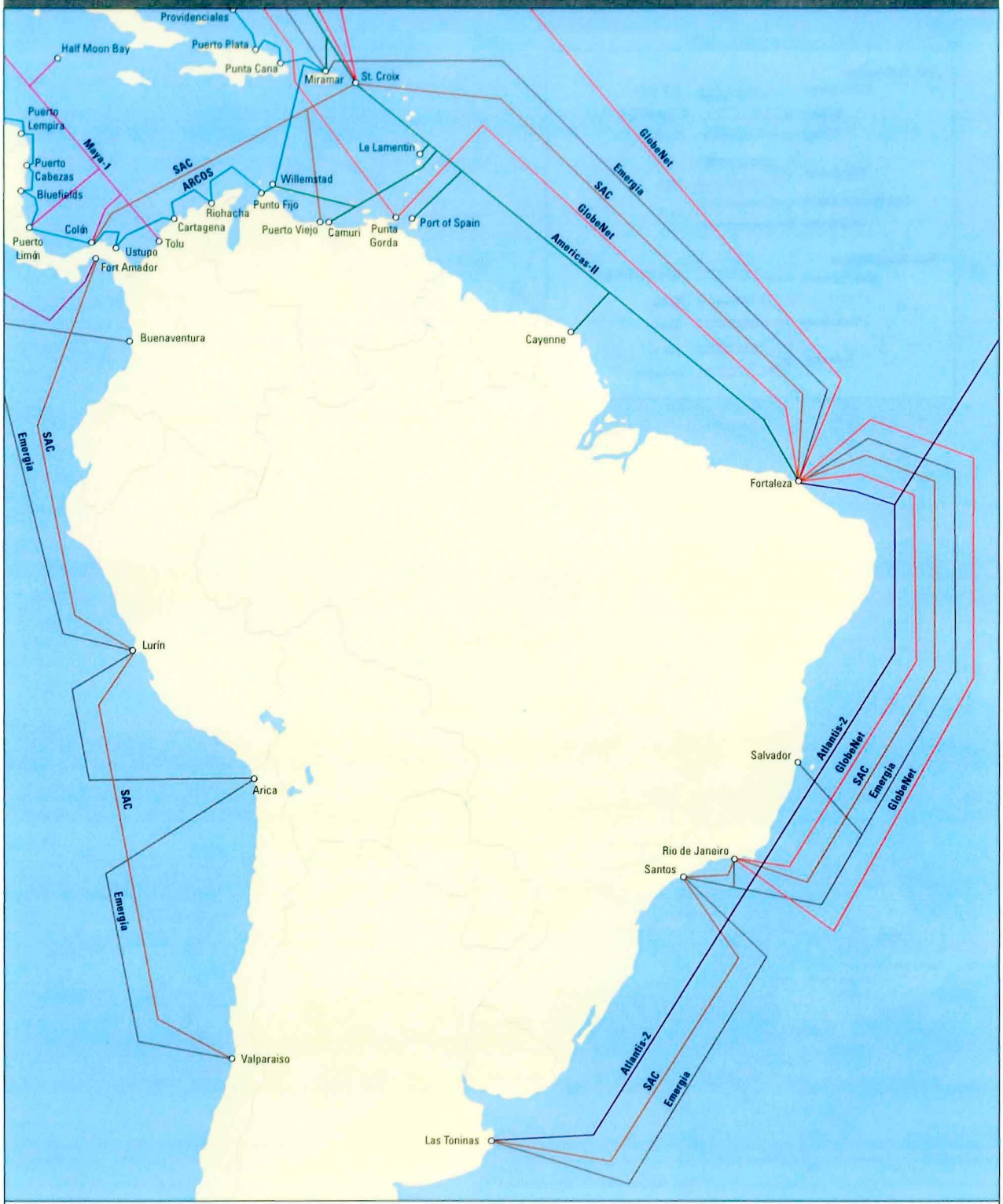
Source: TeleGeography research, *International Bandwidth 2003*

Figure 4. Map of Major Submarine Cable Systems in North America (Atlantic Coast) & Caribbean



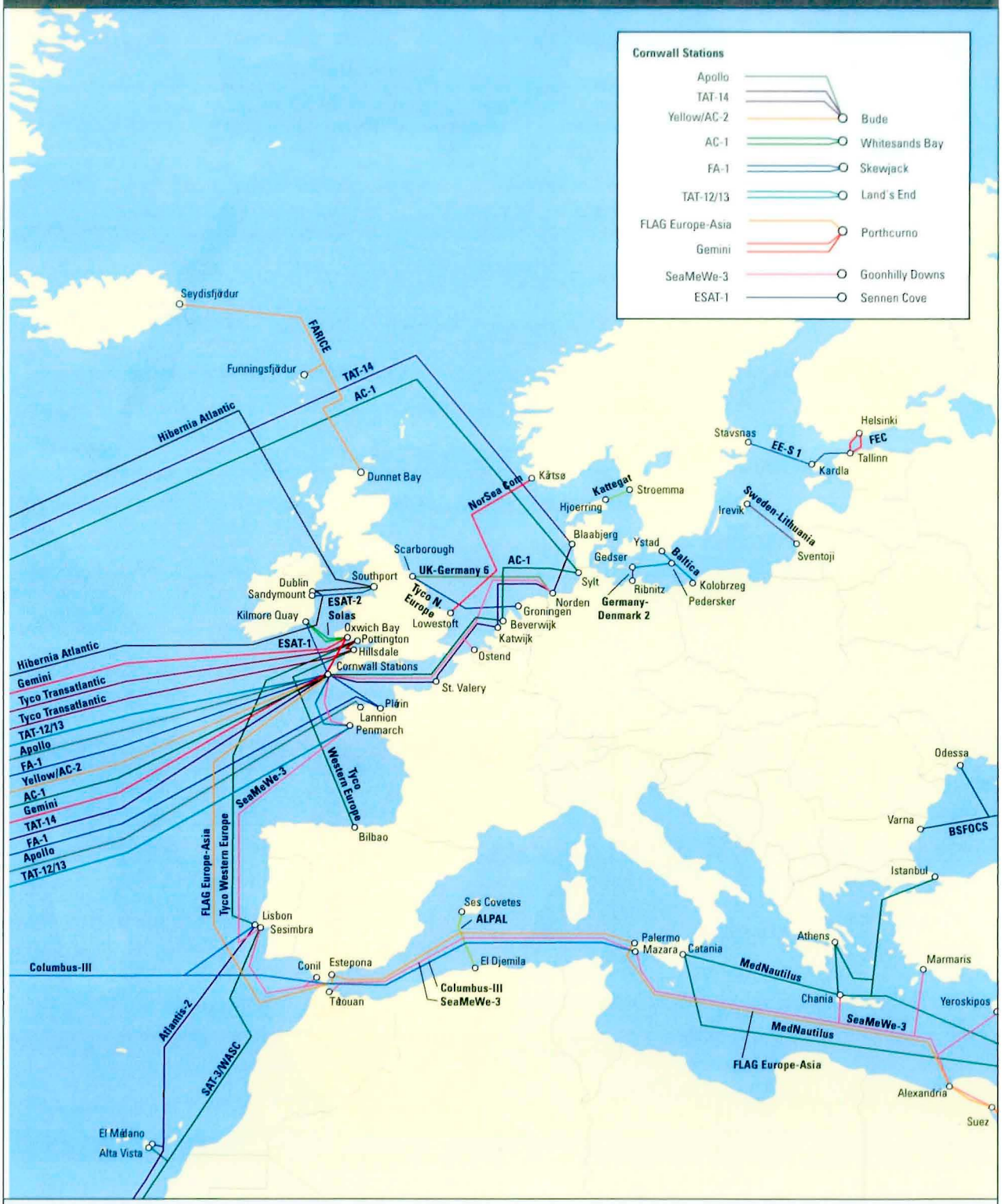
Source: TeleGeography research, *International Bandwidth 2003*

Figure 5. Map of Major Submarine Cable Systems in South America & Caribbean



Source: TeleGeography research, *International Bandwidth 2003*

Figure 6. Map of Major Submarine Cable Systems in Europe

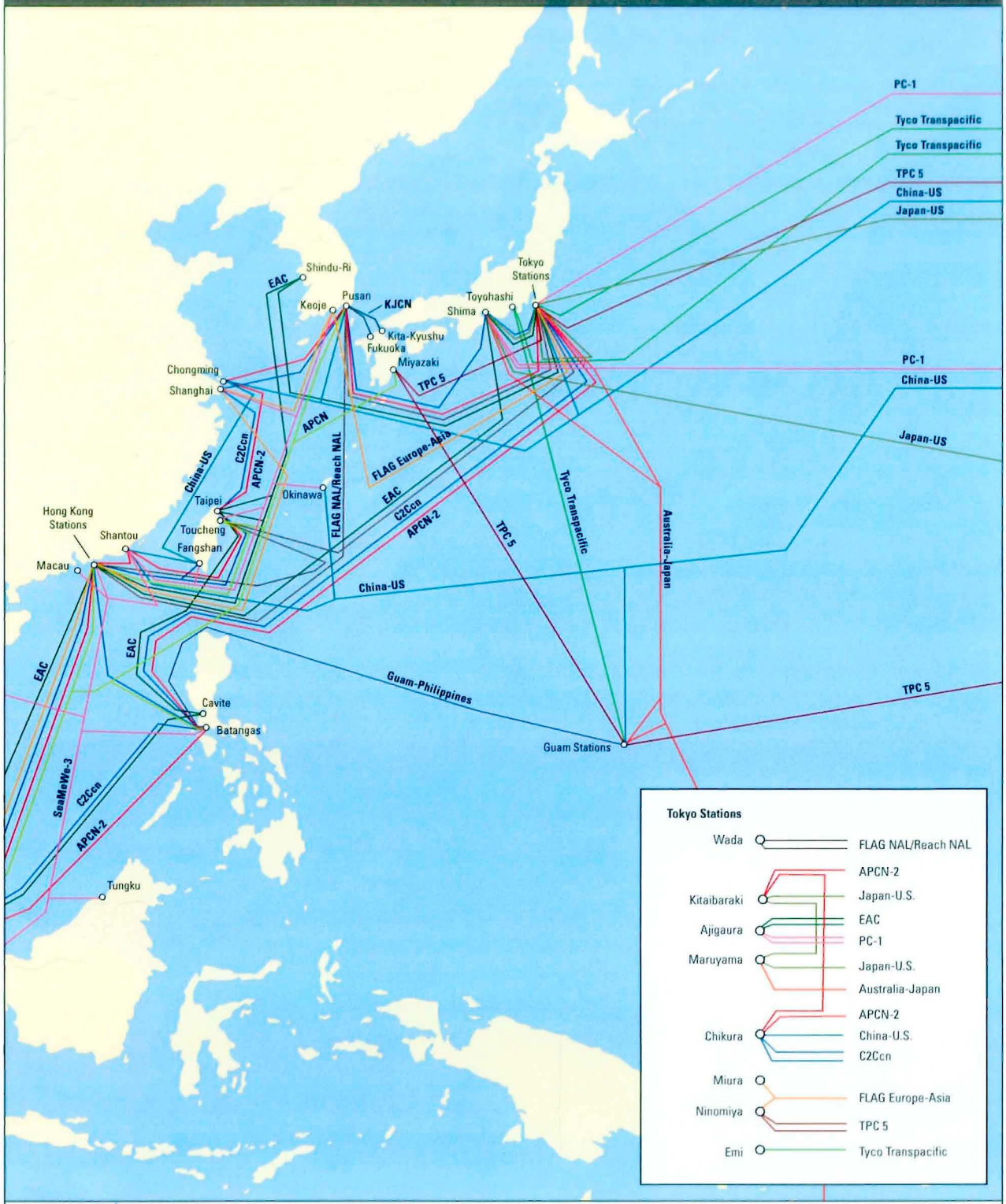


Source: TeleGeography research, *International Bandwidth 2003*

Figure 7. Map of Major Submarine Cable Systems in Africa and the Mediterranean

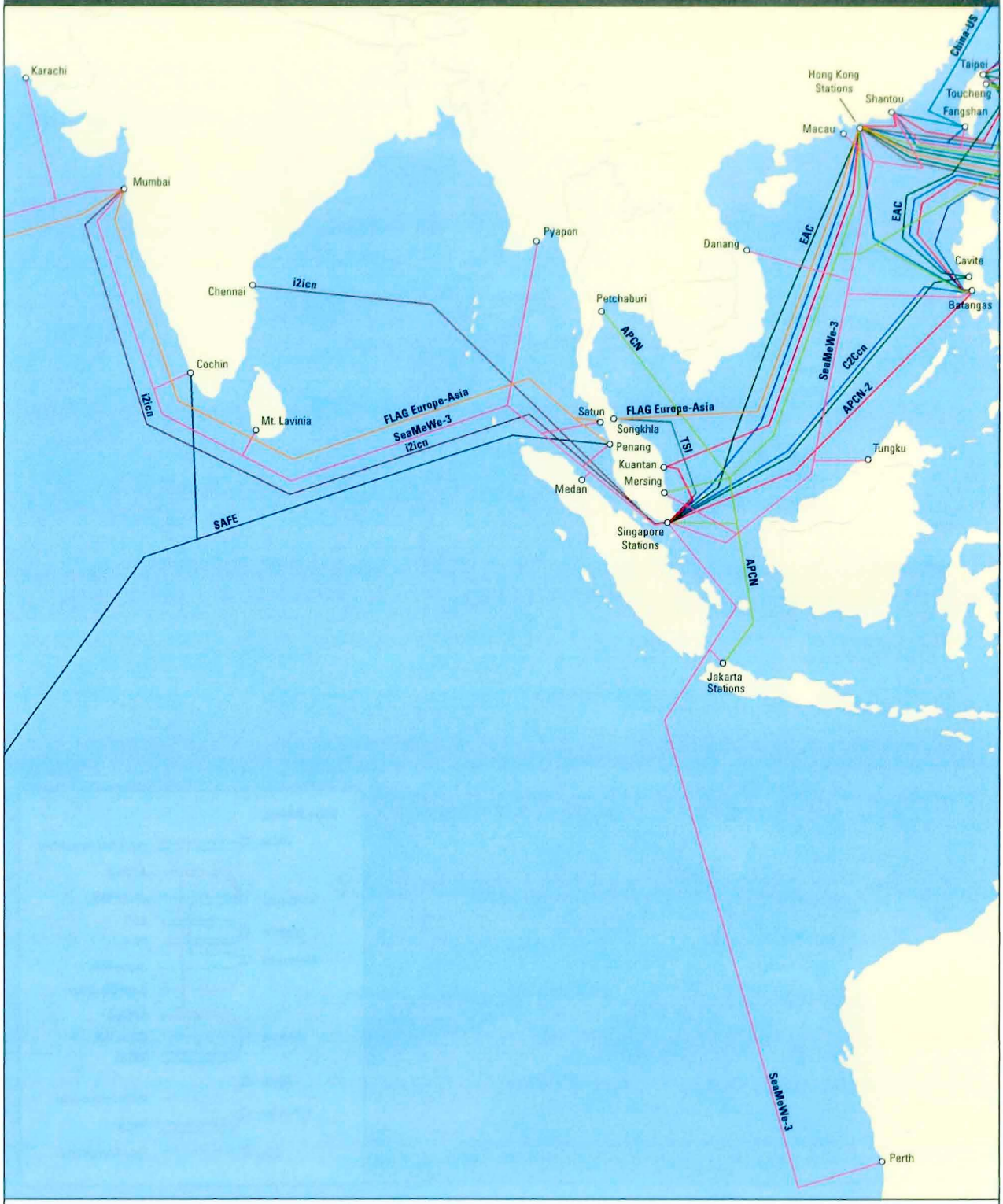
Source: TeleGeography research, *International Bandwidth 2003*

Figure 8. Map of Major Submarine Cable Systems in East Asia



Source: TeleGeography research, *International Bandwidth 2003*

Figure 9. Map of Major Submarine Cable Systems in South Asia



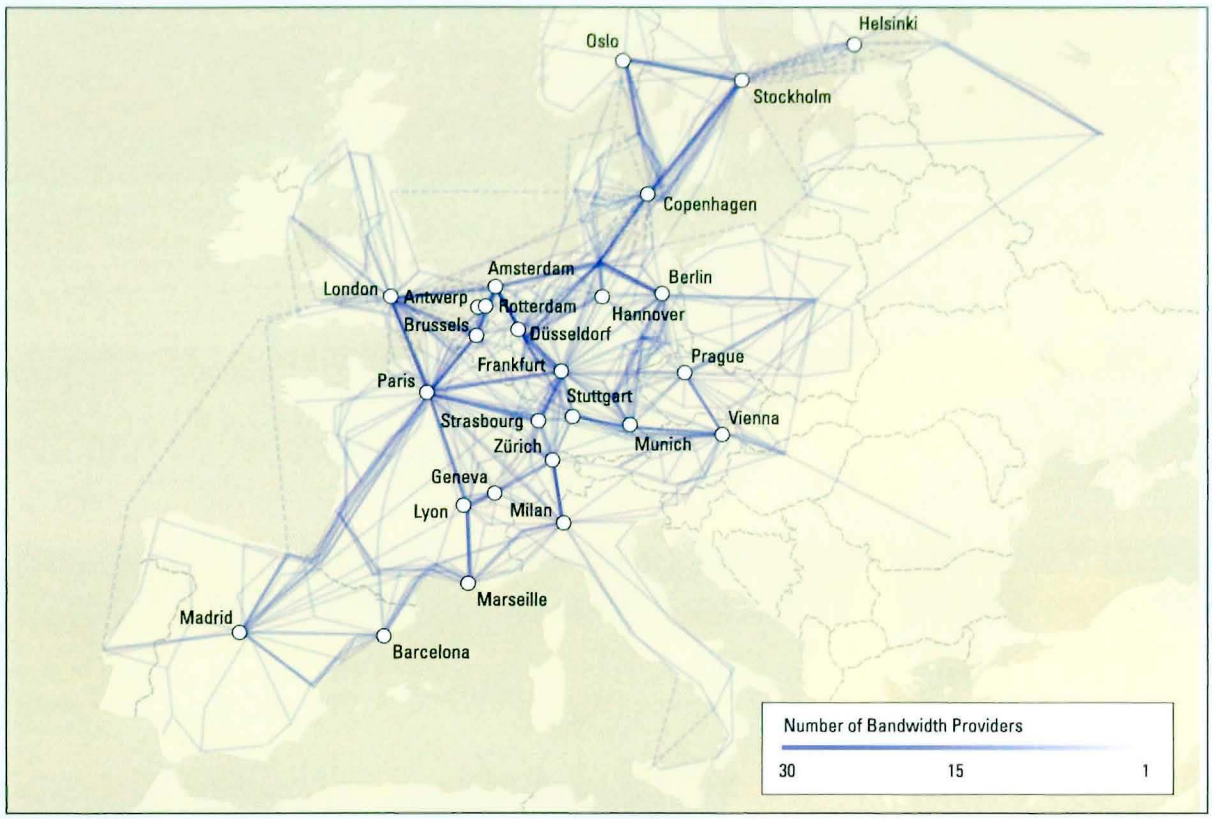
Source: TeleGeography research, *International Bandwidth 2003*

Figure 10. Map of Major Submarine Cable Systems in Oceania

Source: TeleGeography research, *International Bandwidth 2003*

Terrestrial Networks

Figure 1. Overlay Map of Pan-European Terrestrial Networks

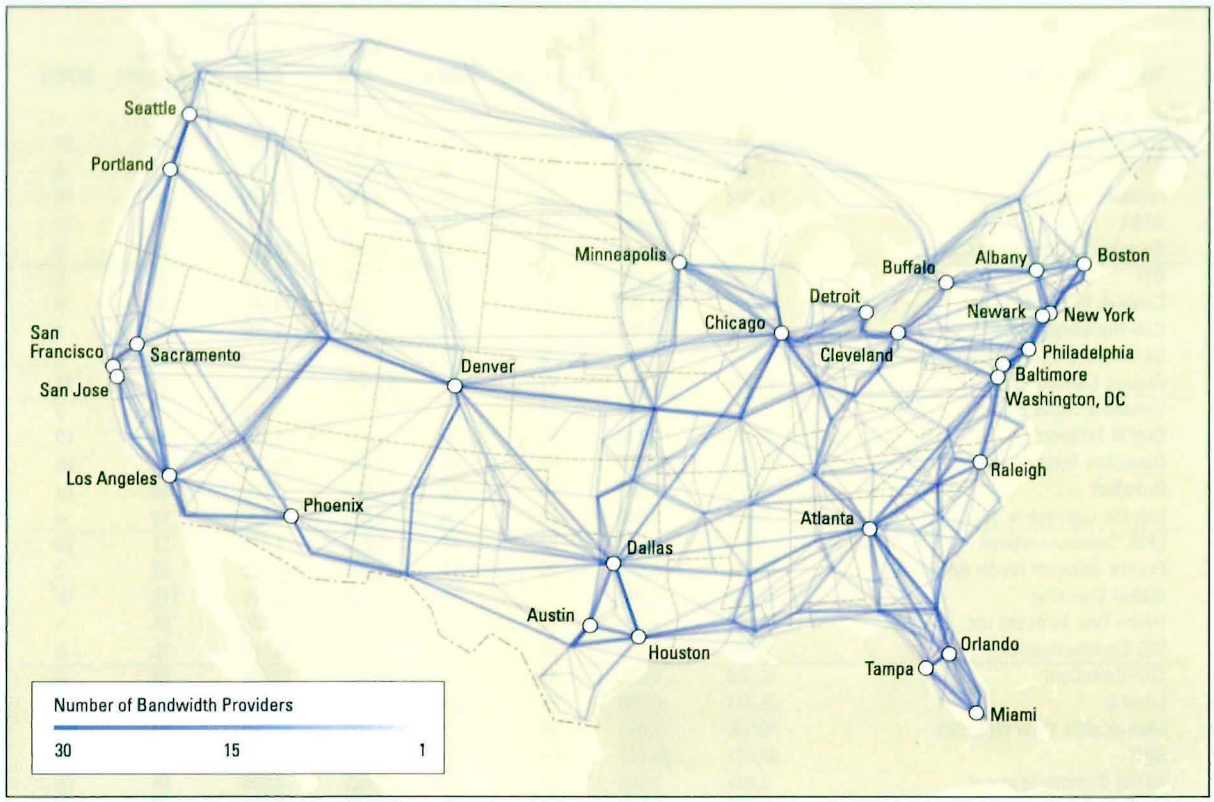


Rank	City	Number of Providers	Rank	City	Number of Providers
1.	London	28	—	Munich	18
—	Frankfurt	28	12.	Madrid	17
3.	Paris	24	—	Milan	17
4.	Amsterdam	23	14.	Zürich	16
5.	Hamburg	21	—	Vienna	16
6.	Brussels	19	16.	Rotterdam	15
—	Stockholm	19	17.	Stuttgart	14
8.	Copenhagen	18	—	Lyon	14
—	Düsseldorf	18	—	Marseille	14
—	Berlin	18	20.	Geneva	13

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 cross-border connectivity 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, *International Bandwidth 2003*

Figure 2. Overlay Map of U.S. Terrestrial Networks



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

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, *International Bandwidth 2003*

Figure 3. Major Terrestrial Networks: Length, Connectivity, and MANs

Terrestrial Network	2002 Route kms	2002 Route miles	2002 Cities Connected	2002 MANs	2003 Route kms	2003 Route miles	2003 Cities Connected	2003 MANs
North America								
360networks	53,097	33,000	46	3	53,097	33,000	78	22
ALLTEL	11,907	7,400	90	0	11,907	7,400	90	0
America's Fiber Network	12,872	8,000	39	18	12,872	8,000	58	18
AT&T	115,848	72,000	176	12	-	-	176	12
Broadwing Communications	29,767	18,500	79	0	29,767	18,500	79	0
BTI	7,080	4,400	30	0	7,080	4,400	30	0
Cable & Wireless	30,191	18,761	36	0	30,191	18,761	36	0
Call-Net Enterprises	14,000	8,700	47	1	14,000	8,700	47	1
Cambrian Communications	-	-	5	5	-	-	5	5
Cogent Communications	31,376	19,500	31	23	31,376	19,500	31	23
Columbia Transcom	447	278	7	0	447	278	7	0
Digital Teleport	9,171	5,700	28	10	9,171	5,700	28	10
Dominion Telecom	16,090	10,000	58	10	16,090	10,000	74	22
DukeNet	2,574	1,600	18	12	2,574	1,600	19	15
Electric Lightwave, Inc.	7,241	4,500	19	6	7,241	4,500	19	6
EPIK Communications	2,977	1,850	12	10	2,977	1,850	12	10
France Telecom North America	25,744	16,000	15	1	25,744	16,000	22	2
Global Crossing	31,762	19,740	115	16	31,762	19,740	115	16
Hydro One Telecom Inc.	4,000	2,486	21	1	4,000	2,486	25	1
ICG Communications	8,850	5,500	15	0	8,850	5,500	15	0
ITC^DeltaCom	16,058	9,980	48	0	16,235	10,088	48	0
Level 3	25,744	16,000	57	26	28,158	17,500	62	26
Metromedia Fiber Network	16,090	10,000	23	22	16,090	10,000	23	22
MCI	96,921	60,237	106	106	96,921	60,237	106	106
NEON Communications	4,031	2,505	59	16	4,031	2,505	59	16
Norlight Telecommunications	8,850	5,500	55	0	9,654	6,000	55	0
Onvoy	3,218	2,000	13	2	3,218	2,000	13	2
PalmettoNet	2,574	1,600	16	0	3,862	2,400	42	0
Progress Telecom	13,242	8,230	27	27	13,242	8,230	27	27
Qwest	41,030	25,500	145	0	41,030	25,500	145	0
Southern Telecom	1,931	1,200	12	4	1,963	1,220	12	4
Sprint	54,947	34,150	152	13	54,947	34,150	152	17
T-Systems International	-	-	11	0	-	-	11	0
Teleglobe	24,000	14,914	20	3	24,000	14,914	20	3
TeliaSonera	18,000	11,185	11	0	18,000	11,185	11	0
TELUS	16,500	10,253	45	24	18,390	11,428	53	25
Time Warner Telecom	27,981	17,390	44	0	27,981	17,390	44	0
Touch America	33,789	21,000	47	1	33,789	21,000	49	1
Tyco Telecommunications	-	-	5	0	-	-	5	0
WilTel Communications	53,097	33,000	113	34	53,097	33,000	113	34
XO Communications	25,744	16,000	66	48	25,744	16,000	66	48
Xspedius Communications	47,948	29,800	44	0	47,948	29,800	44	0
Latin America								
Alestra	5,700	3,542	36	8	5,700	3,542	36	8
Avantel	8,000	4,971	43	3	8,000	4,971	43	3
Bestel	6,308	3,920	26	4	6,308	3,920	26	4
Embratel	28,800	17,896	19	8	28,800	17,896	19	8

Notes: Terrestrial systems listed include those on which capacity may be leased in increments of at least 155 Mbps (one STM-1) as part of standard products and service offerings. European systems include only cross-border European networks.

Source: TeleGeography research, *International Bandwidth 2003*

Figure 3. Major Terrestrial Networks: Length, Connectivity, and MANs (continued)

Terrestrial Network	2002 Route kms	2002 Route miles	2002 Cities Connected	2002 MANs	2003 Route kms	2003 Route miles	2003 Cities Connected	2003 MANs
Latin America (continued)								
Geodex Communications	11,000	6,835	13	8	11,000	6,835	13	10
Global Crossing	3,506	2,179	4	0	3,506	2,179	4	0
Impsat	8,800	5,468	25	15	8,800	5,468	25	15
Intelig	15,000	9,321	123	10	15,000	9,321	123	10
Latin American Nautilus	5,400	3,356	3	0	5,400	3,356	3	0
Marcatel	2,000	1,243	14	5	2,000	1,243	14	5
Silica Networks	3,300	2,051	7	0	3,300	2,051	7	0
Telemar Norte Leste	33,000	20,506	167	76	33,000	20,506	167	76
Europe								
4cE	-	-	45	-	-	-	45	0
Belgacom	15,300	9,507	13	6	16,500	10,253	15	6
BT Ignite	57,000	35,420	33	0	48,000	29,827	33	0
Cable & Wireless	7,500	4,661	29	3	7,500	4,661	29	3
CECOM	2,500	1,554	9	0	3,500	2,175	11	0
COLT	20,000	12,428	57	32	20,000	12,428	58	32
Crisscross Communications	8,666	5,385	30	5	8,666	5,385	30	5
eTel	4,500	2,796	10	8	5,000	3,107	10	8
Fibernet	13,400	8,327	51	2	-	-	51	2
Finnet International	18,500	11,496	20	13	18,500	11,496	20	13
France Telecom	20,000	12,428	40	4	23,000	14,292	40	4
Global Crossing	24,986	15,526	33	7	24,986	15,526	33	7
GlobalConnect	2,100	1,305	5	5	2,100	1,305	5	5
Golden Telecom	-	-	3	1	-	-	4	2
Interoute	14,500	9,010	46	9	14,500	9,010	46	12
KPN	8,000	4,971	24	1	8,000	4,971	24	1
LambdaNet Communications	22,000	13,671	106	13	22,000	13,671	110	14
LDCOM Networks	11,000	6,835	26	26	12,000	7,457	33	33
Level 3	6,000	3,728	16	9	6,000	3,728	16	9
LinxTelecom	1,200	746	3	0	10,000	6,214	16	0
Memorex Telex Communications	3,000	1,864	15	0	3,000	1,864	15	0
Metromedia Fiber Network	-	-	10	10	-	-	10	10
MCI	19,159	11,905	75	44	19,159	11,905	75	44
Rostelecom	-	-	53	0	-	-	57	0
Song Networks	-	-	47	22	-	-	47	22
T-Systems International	-	-	38	8	-	-	46	9
TDC	9,500	5,903	21	0	9,500	5,903	21	0
Telecom Italia	9,100	5,655	10	0	12,000	7,457	13	5
Telekom Austria	-	-	11	0	-	-	18	0
Telenor Global Services	5,000	3,107	7	1	5,000	3,107	7	1
TeliaSonera	22,000	13,671	39	4	35,398	13,671	39	4
Tiscali International Network	14,000	8,700	47	7	14,000	8,700	47	7
TransTelecom	45,000	27,963	158	0	46,000	28,584	158	0
Tyco Telecommunications	-	-	7	0	5,764	3,582	8	0
Utfors	3,500	2,175	6	6	3,500	2,175	7	6
Verizon Europe	5,910	3,672	8	0	5,910	3,672	8	0
Versatel	4,000	2,486	49	45	-	-	49	45
Viatel	7,000	4,350	19	0	7,000	4,350	19	0

Notes: Terrestrial systems listed include those on which capacity may be leased in increments of at least 155 Mbps (one STM-1) as part of standard products and service offerings. European systems include only cross-border European networks.

Source: TeleGeography research, *International Bandwidth 2003*

Internet Backbones

International Internet Backbones

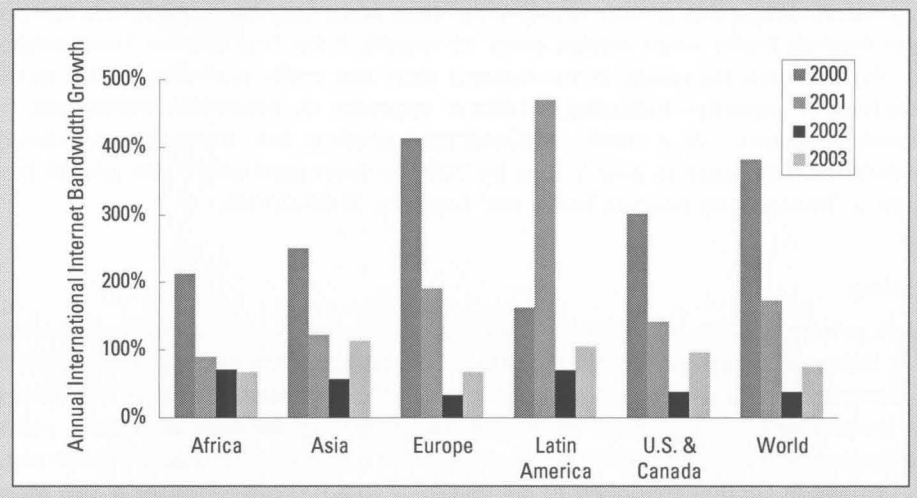
The statistics and analysis presented on the following pages are excerpted from Global Internet Geography 2004 *published in August 2003.*

Internet traffic growth rates have been the subject of considerable speculation before, during, and after the dotcom boom. One common tenet of early Internet apocrypha stipulated that traffic was doubling every 100 days. Conversely, in the aftermath of the telecom sector implosion, conventional wisdom held that Internet traffic was increasing far more slowly than previously believed. In *Global Internet Geography 2004* TeleGeography assembled exclusive international Internet traffic and bandwidth data that uncover the state of the market and provide insights into its future.

Supply

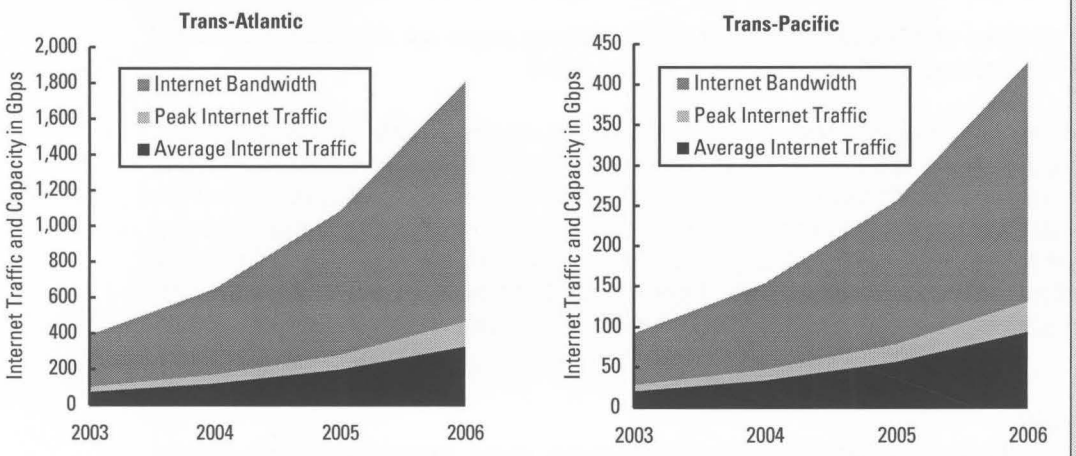
Despite the lingering malaise in the telecom sector, global Internet backbones evolved at a rapid pace during 2003. The international Internet capacity growth rate reaccelerated, increasing 74 percent for 2003, up from just 38 percent in 2002. The renewed growth came as a result of rapid network deployments in all regions. Asia led the way, growing 114 percent, while Latin America's capacity grew 105 percent (see Figure 1. International Internet Bandwidth Growth by Region, 2000-2003). Even the more mature Internet market of Europe grew faster in 2003 than in the previous year. Europe, which accounts for 78 percent of the world's cross-border bandwidth, experienced an international capacity increase of 67 percent, an increase over the 33 percent growth rate recorded in 2002.

Figure 1. International Internet Bandwidth Growth by Region, 2000-2003



Notes: Data as of mid-year.
Source: TeleGeography research, *Global Internet Geography 2004*

Figure 2. Transoceanic Internet Traffic and Capacity, 2003-2006



		2003	2004	2005	2006
Trans-Atlantic	Internet Bandwidth (Gbps)	388	*648*	*1,082*	*1,806*
	Peak Internet Traffic (Gbps)	100	*167*	*279*	*466*
	Average Internet Traffic (Gbps)	70	*117*	*195*	*326*
Trans-Pacific	Internet Bandwidth (Gbps)	92	*153*	*256*	*427*
	Peak Internet Traffic (Gbps)	28	*47*	*78*	*130*
	Average Internet Traffic (Gbps)	20	*33*	*56*	*93*

Notes: Traffic projections beyond 2003 assume 67 percent annual average traffic growth and constant peak-to-average traffic ratios. Internet capacity estimates assume 67 percent annual growth.

Source: TeleGeography research, *Global Internet Geography 2004*

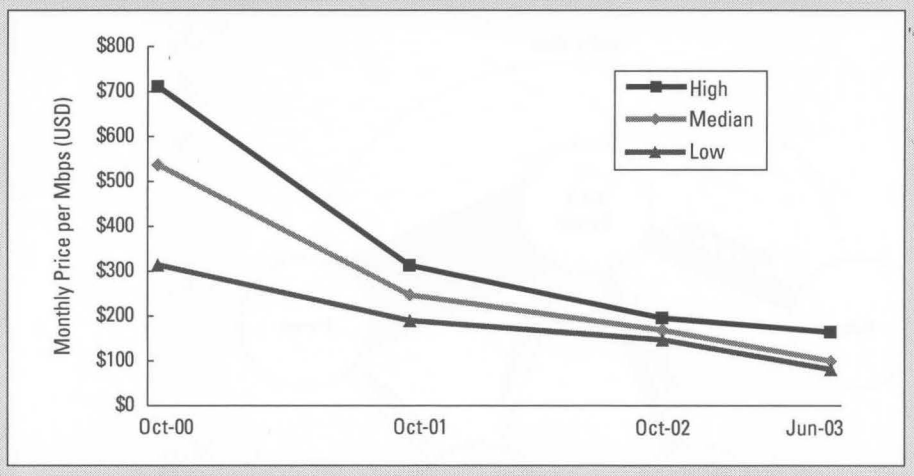
Traffic

TeleGeography's first systematic research on Internet traffic suggests that growth rates are in fact remarkably robust—at least on international routes. Based on data from the first quarter of 2003, international Internet traffic is growing at an annual rate of 67 percent. While this growth rate is lower than some may have predicted, international Internet traffic would double every 16 months if the first-quarter trend continues. Furthermore, the results of the research show that traffic is growing as fast as the underlying IP capacity—indicating a rational approach to bandwidth deployment by network operators. As a result, TeleGeography predicts that trans-Atlantic Internet bandwidth will increase to over 1 Tbps by 2005 to keep pace with traffic growth (see Figure 2. Transoceanic Internet Traffic and Capacity, 2003-2006).

Pricing

Transit pricing is rarely transparent. Even list prices—which can exceed market prices by a factor of three—are in short supply. Based on anonymous survey research, TeleGeography has collected wholesale IP transit prices for access to major backbones. Not surprisingly, the price of IP transit has fallen significantly in recent years. TeleGeography research reveals that, in the second quarter of 2003, the median price of IP transit in London continued to fall, declining to $100 per Mbps for a 155 Mbps

Figure 3. Median STM-1 IP Transit Prices in London, 2000-2003



Notes: Data prior to 2003 is based on prices on the Band-X London IP Transit Exchange.
Source: TeleGeography research and Band-X Ltd., *Global Internet Geography 2004* © PriMetrica, Inc. 2003

commitment (see Figure 3. Median STM-1 IP Transit Prices in London, 2000-2003). The U.S., however, has the lowest and most uniform prices for IP transit. Unlike in Europe, where prices still vary among cities, transit prices tend to exhibit parity across major U.S. cities. Prices in developing transit markets in Asia have much further to drop before reaching levels similar to Europe and the U.S.

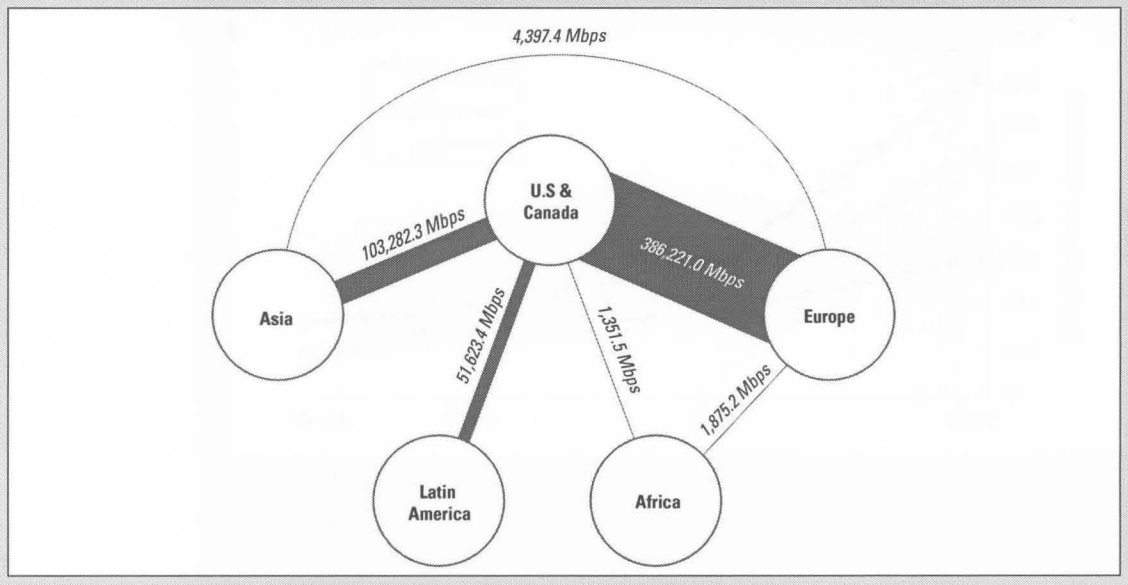
Our comparison of pricing strategies casts doubt on a common theory on the effect of bankruptcy in the market. There is little evidence, thus far, to support the widespread belief that carriers coming out of Chapter 11 bankruptcy are using their reduced debt levels to price services more aggressively than rival carriers. Companies that have emerged from bankruptcy are rarely the lowest-priced provider in the markets surveyed by TeleGeography. Often, companies that are on the edge of bankruptcy are the ones charging the lowest transit prices.

Making a Comeback

After the slow pace of growth in 2002, the supply of International Internet bandwidth resumed rapid growth during 2003. But will this rate of growth continue? In theory, international Internet traffic on current networks could double before users see a serious degradation in network performance.

Will providers let deployments slip while traffic catches up to capacity? Probably not. However, if consolidation continues, some providers may withdraw IP transit services from certain regions or cities, while other providers may exit the transit business altogether. Narrowing the field a bit further could have a stabilizing impact on prices. So far, this has not happened.

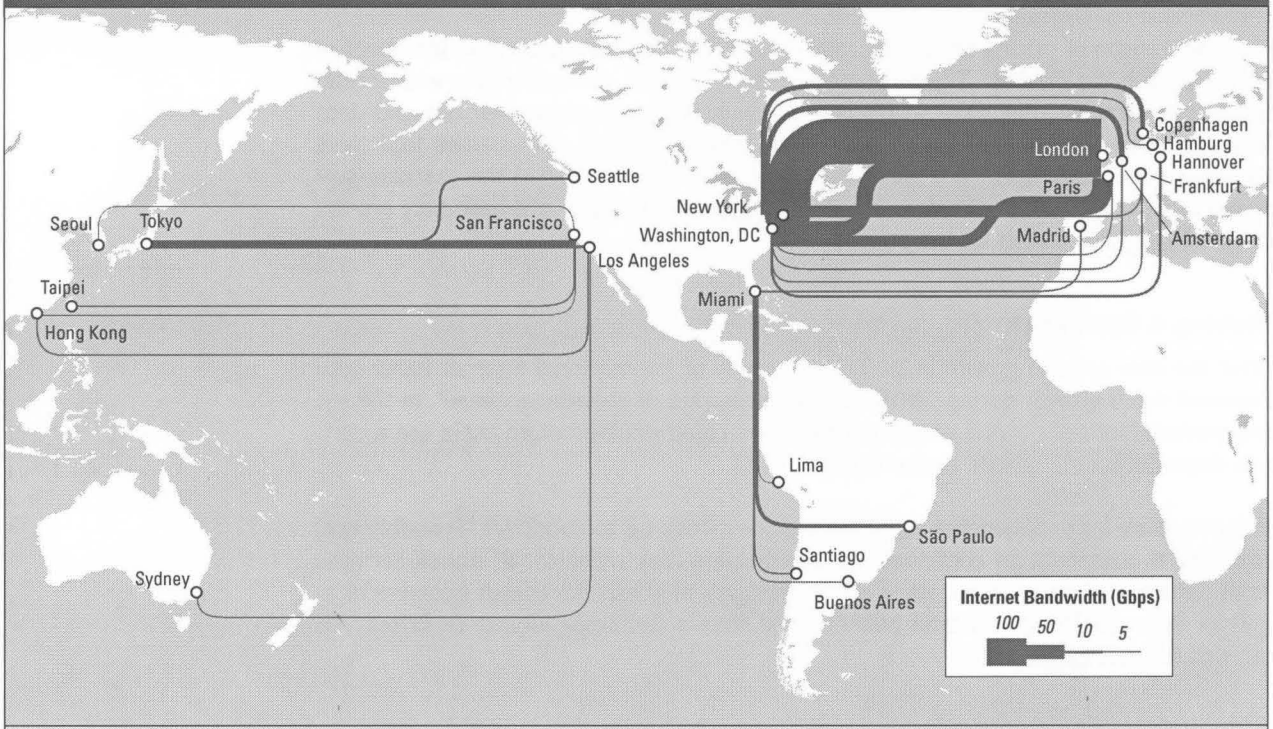
Figure 4. Interregional Internet Bandwidth, 2003



Notes: Data as of mid-2003. Interregional Internet bandwidth below 1,000 Mbps not depicted.

Source: TeleGeography research, *Global Internet Geography 2004*

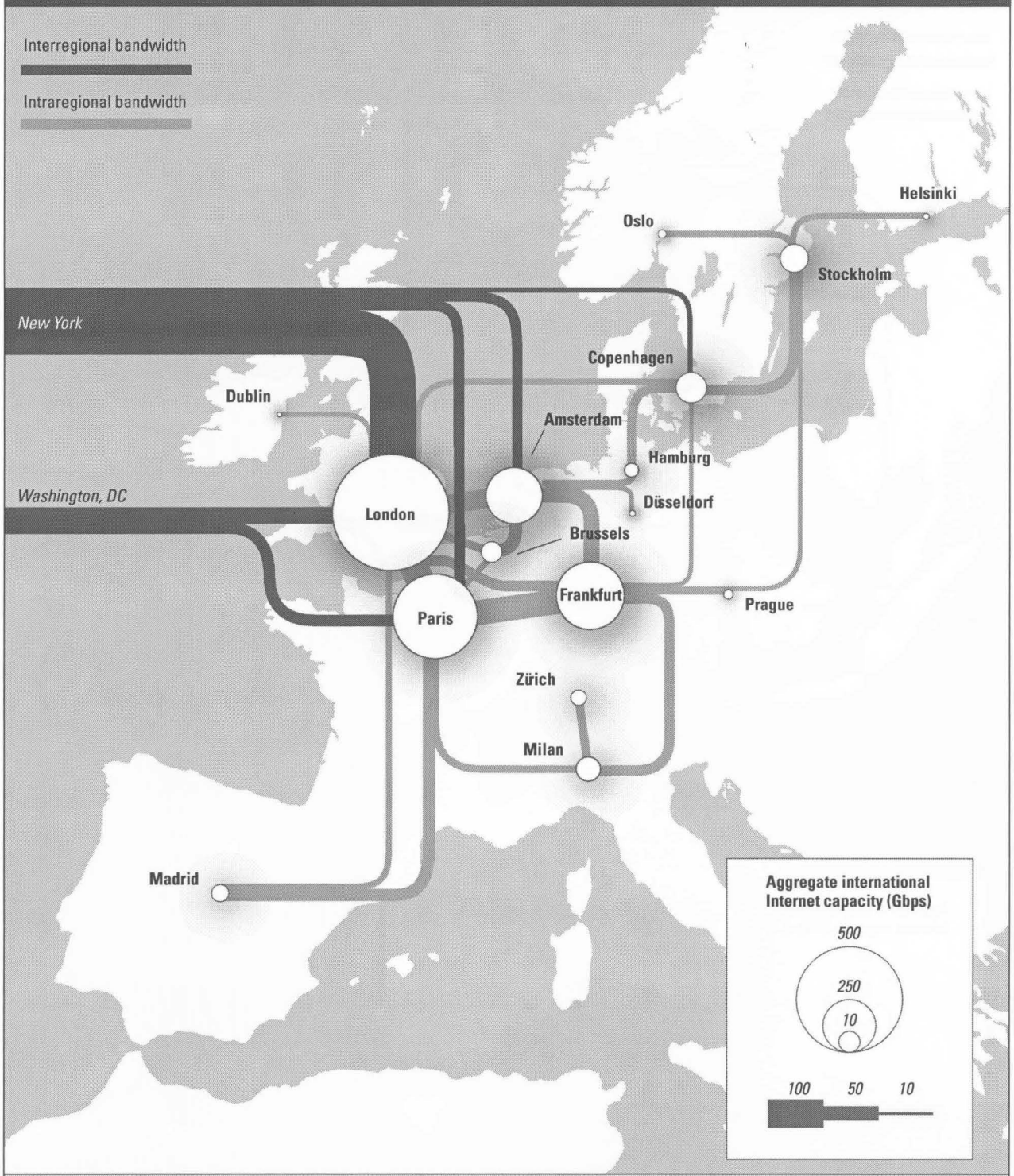
Figure 5. Map of Major Interregional Internet Routes, 2003



Notes: Map includes interregional Internet routes with at least 2.5 Gbps of aggregate capacity. Figures represent Internet bandwidth connected across international borders to each Consolidated Metropolitan Statistical Area or equivalent. Domestic routes are omitted. Data as of mid-2003.

Source: TeleGeography research, *Global Internet Geography 2004*

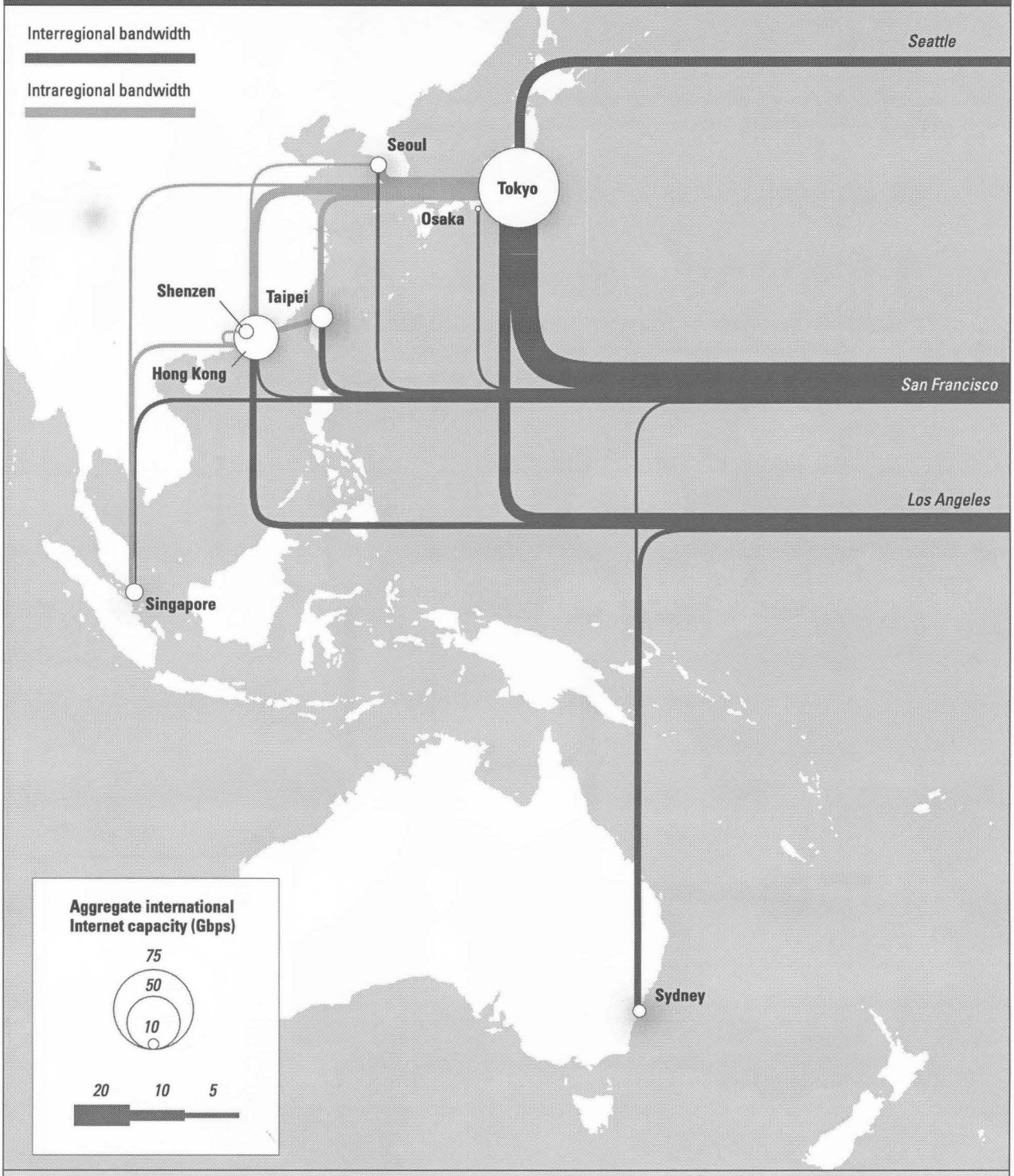
Figure 6. Major International Internet Routes in Europe, 2003



Notes: Map includes international Internet routes with at least 15 Gbps of aggregate capacity. Figures represent Internet bandwidth connected across international borders to each Consolidated Metropolitan Statistical Area or equivalent. Domestic routes are omitted. Data as of mid-2003.

Source: TeleGeography research, *Global Internet Geography 2004*

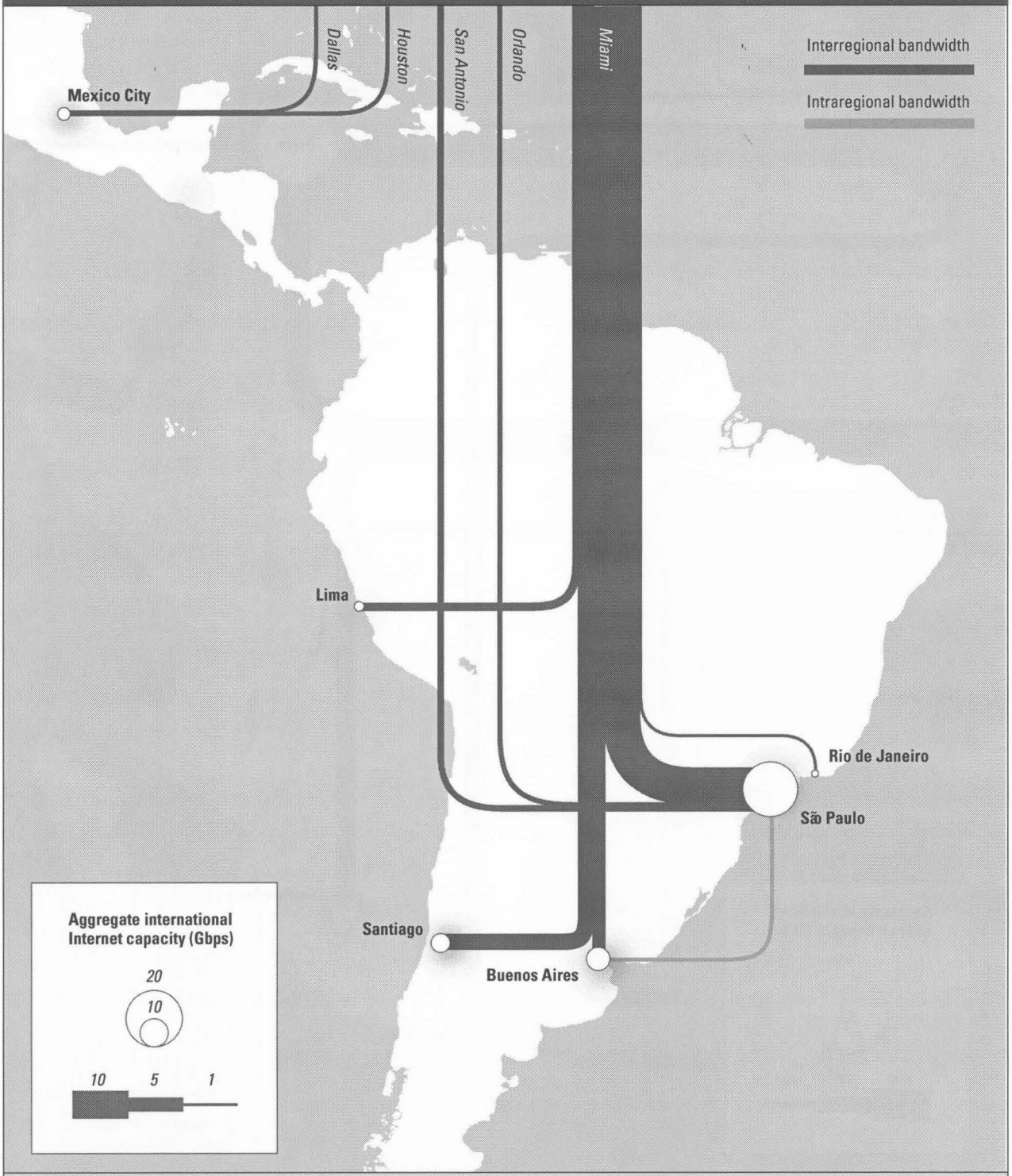
Figure 7. Major International Internet Routes in Asia, 2003



Notes: Map includes international Internet routes with at least 2 Gbps of aggregate capacity. Figures represent Internet bandwidth connected across international borders to each Consolidated Metropolitan Statistical Area or equivalent. Domestic routes are omitted. Data as of mid-2003.

Source: TeleGeography research, *Global Internet Geography 2004*

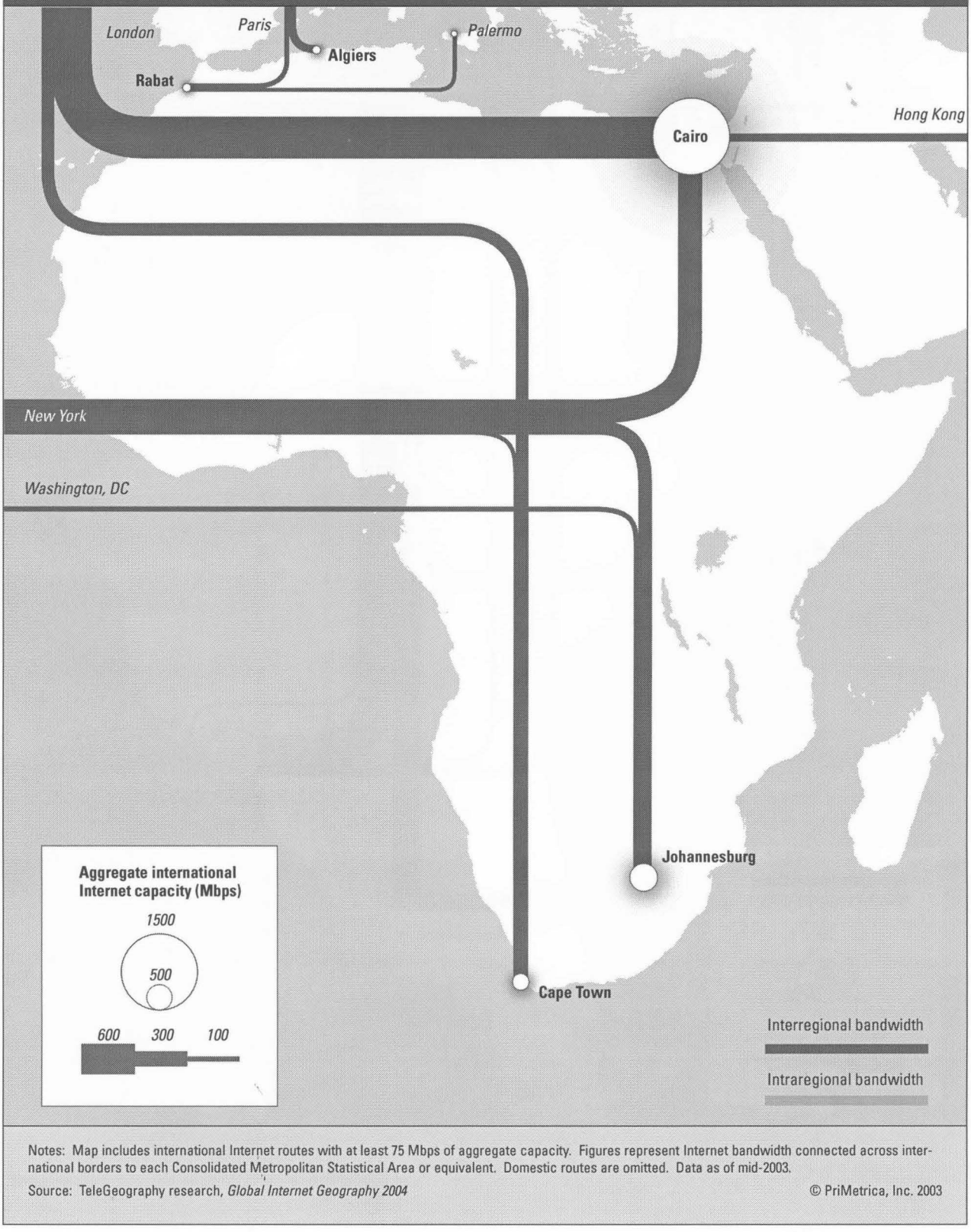
Figure 8. Major International Internet Routes in Latin America, 2003



Notes: Map includes international Internet routes with at least 975 Mbps of aggregate capacity. Figures represent Internet bandwidth connected across international borders to each Consolidated Metropolitan Statistical Area or equivalent. Domestic routes are omitted. Data as of mid-2003.

Source: TeleGeography research, *Global Internet Geography 2004*

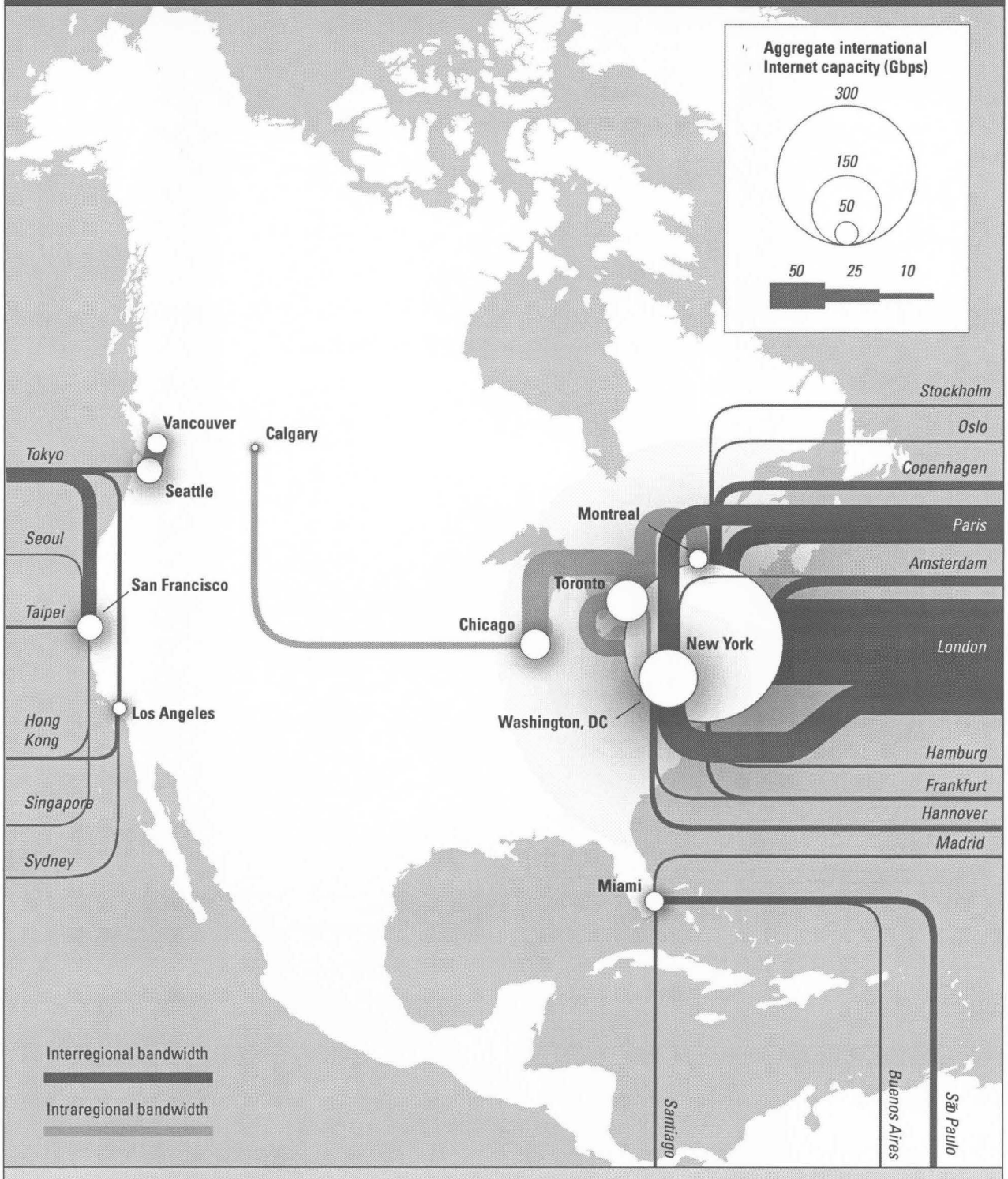
Figure 9. Major International Internet Routes in Africa, 2003



Notes: Map includes international Internet routes with at least 75 Mbps of aggregate capacity. Figures represent Internet bandwidth connected across international borders to each Consolidated Metropolitan Statistical Area or equivalent. Domestic routes are omitted. Data as of mid-2003.

Source: TeleGeography research, *Global Internet Geography 2004*

Figure 10. Major International Internet Routes in U.S. & Canada, 2003



Notes: Map includes international Internet routes with at least 975 Mbps of aggregate capacity. Figures represent Internet bandwidth connected across international borders to each Consolidated Metropolitan Statistical Area or equivalent. Domestic routes are omitted. Data as of mid-2003.

Source: TeleGeography research, *Global Internet Geography 2004*

Reference

National Telecommunications Indicators (A-L)

Countries	GDP 2002 (US$ billions)	Population 2002 (millions)	Main Lines 2002 (thous.)	Lines Per 100 people	Cellular Users 2002 (thous.)	Main Lines & Cell Users 2002 (thous.)	Main Lines & Cell Users per 100 people
Albania	4.7	3.2	220.0	6.9	851	1,071	34
Angola	11.4	13.9	85.0	0.6	130	215	2
Argentina	102.2	37.9	8,009.4	21.1	6,500	14,509	38
Armenia	2.4	3.1	542.8	17.7	72	615	20
Australia	410.6	19.6	10,590.0	54.1	12,579	23,169	118
Austria	203.0	8.1	3,988.0	49.0	6,600	10,588	130
Azerbaijan	6.1	8.2	989.2	12.1	836	1,825	22
Bahrain	7.9	0.7	175.4	26.1	389	564	84
Barbados	2.8	0.3	n.a.	n.a.	n.a.	n.a.	n.a.
Belarus	14.3	9.9	2,967.2	29.9	465	3,432	35
Belgium	247.6	10.3	5,132.4	49.7	8,136	13,268	129
Bolivia	7.7	8.7	563.9	6.5	873	1,437	17
Botswana (a)	5.2	1.7	n.a.	n.a.	415	n.a.	n.a.
Brazil	452.4	174.5	38,810.0	22.2	34,881	73,691	42
Bulgaria	15.6	7.9	2,922.0	37.1	n.a.	n.a.	n.a.
Canada	715.7	31.4	19,962.1	63.5	11,849	31,811	101
Cayman Islands	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Chile	64.2	15.6	3,467.0	22.3	6,446	9,913	64
China	1,237.1	1,281.0	214,420.0	16.7	206,620	421,040	33
Costa Rica	16.9	3.9	478.9	12.1	460	939	24
Cuba	n.a.	11.3	n.a.	n.a.	18	n.a.	n.a.
Cyprus	9.1	0.8	427.4	55.9	418	845	110
Czech Republic	69.6	10.2	2,444.2	23.9	8,610	11,054	108
Denmark	174.8	5.4	3,739.2	69.6	4,478	8,217	153
Dominican Republic	21.3	8.6	582.6	6.7	1,701	2,283	26
Egypt	89.8	66.4	7,430.0	11.2	4,495	11,925	18
Estonia	6.4	1.4	475.0	35.0	881	1,356	100
Finland	130.8	5.2	2,850.0	54.8	4,400	7,250	139
France	1,409.6	59.4	33,994.4	57.2	38,585	72,580	122
Georgia	3.3	5.2	648.5	12.5	504	1,152	22
Germany	1,976.2	82.5	53,720.0	65.1	60,043	113,763	138
Ghana	6.0	20.1	274.3	1.4	449	724	4
Greece	132.8	10.6	n.a.	n.a.	9,239	n.a.	n.a.
Guatemala	23.3	12.0	846.0	7.1	1,577	2,423	20
Hong Kong (a)	161.5	6.8	3,277.9	48.4	6,396	9,674	143
Hungary	65.8	10.2	3,666.4	36.1	6,562	10,228	101
India (a) (b)	515.0	1,048.3	41,215.3	3.9	12,688	53,903	5
Indonesia	172.9	211.7	7,750.0	3.7	11,700	19,450	9
Iran	107.5	65.5	5,090.4	7.8	2,187	7,277	11
Ireland (a) (b)	119.9	3.9	1,975.0	50.9	2,969	4,944	127
Israel	110.4	6.5	3,100.0	47.7	6,334	9,434	145
Italy	1,180.9	57.9	27,452.0	47.4	52,316	79,768	138
Jamaica	8.0	2.6	450.0	17.2	1,400	1,850	71
Japan (a)	3,978.8	127.1	71,149.0	56.0	81,118	152,267	120
Jordan	9.3	5.2	674.5	13.0	1,220	1,894	37
Kazakhstan	24.2	14.8	2,081.9	14.1	828	2,910	20
Korea, Rep.	476.7	47.6	18,600.2	39.0	32,342	50,942	107
Kuwait	32.8	2.1	481.9	22.9	1,227	1,709	81
Kyrgyzstan	1.6	5.0	394.8	7.9	53	448	9
Latvia	8.4	2.3	701.2	30.0	917	1,618	69

Source: TeleGeography research, ITU, and World Bank

International Telephone Traffic (A-L)

Outgoing Minutes (millions)			Incoming Minutes (millions)			Traffic Balance		
2001	2002	% Change	2001	2002	% Change	2001	2002	Countries
65.4	62.0	-5.2%	317.0	400.8	26.4%	251.6	338.8	Albania
32.8	34.3	4.3%	52.2	63.9	22.4%	19.3	29.6	Angola
455.9	426.7	-6.4%	n.a.	n.a.	n.a.	n.a.	n.a.	Argentina
34.6	36.2	4.5%	n.a.	58.3	n.a.	n.a.	22.1	Armenia
3,030.0	3,078.0	1.6%	n.a.	n.a.	n.a.	n.a.	n.a.	Australia
1,480.0	1,603.0	8.3%	n.a.	n.a.	n.a.	n.a.	n.a.	Austria
29.6	32.5	9.7%	n.a.	n.a.	n.a.	n.a.	n.a.	Azerbaijan
109.2	107.1	-1.9%	182.6	n.a.	n.a.	73.4	n.a.	Bahrain
37.6	44.2	17.6%	n.a.	78.8	n.a.	n.a.	34.6	Barbados
209.9	240.6	14.6%	n.a.	n.a.	n.a.	n.a.	n.a.	Belarus
2,155.0	2,365.4	9.8%	n.a.	n.a.	n.a.	n.a.	n.a.	Belgium
31.9	39.1	22.6%	n.a.	n.a.	n.a.	n.a.	n.a.	Bolivia
59.0	63.7	8.0%	41.2	45.7	10.9%	(17.8)	(18.0)	Botswana (a)
772.2	806.0	4.4%	n.a.	n.a.	n.a.	n.a.	n.a.	Brazil
125.0	136.0	8.8%	220.0	213.0	-3.2%	95.0	77.0	Bulgaria
7,915.0	8,183.0	3.4%	n.a.	n.a.	n.a.	n.a.	n.a.	Canada
40.6	34.7	-14.5%	n.a.	37.0	n.a.	n.a.	2.3	Cayman Islands
281.2	294.3	4.7%	n.a.	n.a.	n.a.	n.a.	n.a.	Chile
2,040.0	2,240.0	9.8%	4,270.0	n.a.	n.a.	2,230.0	n.a.	China
131.4	129.4	-1.6%	165.5	158.5	-4.2%	34.1	29.1	Costa Rica
22.4	19.2	-14.5%	258.0	282.9	9.7%	235.5	263.7	Cuba
220.2	253.6	15.2%	166.7	163.7	-1.8%	(53.5)	(89.9)	Cyprus
424.4	475.0	11.9%	n.a.	580.0	n.a.	n.a.	105.0	Czech Republic
995.0	1,050.0	5.5%	n.a.	n.a.	n.a.	n.a.	n.a.	Denmark
227.4	222.6	-2.1%	1,714.6	n.a.	n.a.	1,487.2	n.a.	Dominican Republic
192.3	198.4	3.2%	n.a.	938.3	n.a.	n.a.	739.9	Egypt
93.2	103.2	10.7%	91.9	n.a.	n.a.	(1.3)	n.a.	Estonia
485.0	490.0	1.0%	n.a.	n.a.	n.a.	n.a.	n.a.	Finland
7,605.0	8,170.0	7.4%	n.a.	n.a.	n.a.	n.a.	n.a.	France
105.0	114.4	9.0%	n.a.	n.a.	n.a.	n.a.	n.a.	Georgia
10,320.0	10,620.0	2.9%	n.a.	n.a.	n.a.	n.a.	n.a.	Germany
46.7	58.3	24.7%	139.3	153.0	9.9%	92.5	94.7	Ghana
887.0	998.0	12.5%	891.0	n.a.	n.a.	4.0	n.a.	Greece
156.2	145.9	-6.6%	536.8	817.7	52.3%	380.6	671.8	Guatemala
3,487.3	3,981.1	14.2%	1,942.3	1,745.3	-10.1%	(1,545.0)	(2,235.7)	Hong Kong (a)
326.8	327.0	0.1%	n.a.	n.a.	n.a.	n.a.	n.a.	Hungary
586.4	660.0	12.5%	2,533.6	n.a.	n.a.	1,947.2	n.a.	India (a) (b)
316.2	289.4	-8.5%	365.9	429.4	17.4%	49.7	140.1	Indonesia
179.1	171.2	-4.4%	173.1	118.8	-31.4%	(6.0)	(52.4)	Iran
1,385.0	1,395.0	0.7%	n.a.	n.a.	n.a.	n.a.	n.a.	Ireland (a) (b)
1,120.0	1,193.7	6.6%	728.0	814.1	11.8%	(392.0)	(379.6)	Israel
5,140.0	5,840.0	13.6%	n.a.	n.a.	n.a.	n.a.	n.a.	Italy
95.6	56.3	-41.1%	413.8	349.6	-15.5%	318.2	293.3	Jamaica
2,575.4	2,638.5	2.5%	n.a.	n.a.	n.a.	n.a.	n.a.	Japan (a)
185.3	198.4	7.1%	217.0	236.0	8.8%	31.7	37.6	Jordan
118.6	131.6	11.0%	206.9	260.2	25.8%	88.4	128.7	Kazakhstan
1,120.0	1,041.8	-7.0%	n.a.	928.0	n.a.	n.a.	(113.8)	Korea, Rep.
166.6	189.8	14.0%	n.a.	n.a.	n.a.	n.a.	n.a.	Kuwait
23.5	18.3	-22.3%	42.3	44.5	5.3%	18.8	26.3	Kyrgyzstan
64.7	63.0	-2.6%	105.3	110.6	5.0%	40.6	47.6	Latvia

Notes: Data are in millions of minutes of public switched traffic. VoIP call volumes are excluded.
a. International traffic for year ending March 31. Fiscal year for New Zealand and Pakistan ends June 30.
b. Traffic data exclude some carriers or routes. (See country table for details).
c. 2001 and 2002 traffic data not directly comparable. (See country table for details).

National Telecommunications Indicators (L-Z)

Countries	GDP 2002 (US$ billions)	Population 2002 (millions)	Main Lines 2002 (thous.)	Lines Per 100 people	Cellular Users 2002 (thous.)	Main Lines & Cell Users 2002 (thous.)	Main Lines & Cell Users per 100 people
Luxembourg	20.1	0.4	n.a.	n.a.	473	n.a.	n.a.
Macau	6.2	0.4	153.3	34.6	276	429	97
Macedonia	n.a.	2.0	26.4	1.3	n.a.	n.a.	n.a.
Malaysia (a)	95.2	24.3	4,669.9	19.2	9,241	13,911	57
Malta	3.6	0.4	207.3	52.2	277	484	122
Mauritius	4.5	1.2	327.2	27.0	350	677	56
Mexico	637.2	100.9	14,941.6	14.8	25,928	40,870	40
Moldova	1.6	4.3	n.a.	n.a.	n.a.	n.a.	n.a.
Namibia	2.8	1.8	121.4	6.7	150	271	15
Netherlands	413.7	16.1	10,000.0	61.9	12,100	22,100	137
New Zealand (a)	58.2	3.9	1,719.0	44.4	2,436	4,155	107
Nicaragua	n.a.	5.3	171.6	3.2	240	412	8
Nigeria	43.5	132.8	702.0	0.5	1,633	2,335	2
Norway	189.4	4.5	3,325.0	73.3	3,842	7,167	158
Oman (b)	20.1	2.5	227.6	9.0	465	693	27
Pakistan (a) (b)	60.5	144.9	3,655.0	2.5	1,239	4,894	3
Palestinian Territory	3.0	3.2	298.5	9.3	320	619	19
Paraguay	5.4	5.5	273.2	5.0	1,667	1,940	35
Peru	56,901	26.7	1,766.1	6.6	2,306	4,072	15
Philippines (a)	77.1	79.9	3,310.9	4.1	15,201	18,512	23
Portugal	121.3	10.0	4,361.0	43.5	8,529	12,890	128
Qatar	16.5	0.6	176.5	28.9	267	443	73
Russia (b)	346.5	144.1	35,500.0	24.6	17,668	53,168	37
Saudi Arabia	186.5	22.1	1,719.4	7.8	5,008	6,727	30
Serbia and Montenegro	15.6	10.7	2,017.1	18.9	2,750	4,768	45
Singapore (a)	87.0	4.2	1,927.2	46.3	3,313	5,240	126
Slovak Republic	23.7	5.4	1,118.5	20.7	2,923	4,042	75
South Africa (a)	104.2	43.6	4,002.2	9.2	13,814	17,816	41
Spain (d)	649.8	41.2	18,705.6	45.4	33,475	52,181	127
Swaziland (a)	1.2	1.1	35.1	3.2	63	98	9
Sweden	229.8	8.9	6,579.0	73.7	7,949	14,528	163
Switzerland	268.0	7.2	5,335.0	73.8	5,734	11,069	153
Syria	21.9	17.0	2,099.3	12.3	400	2,499	15
Taiwan	n.a.	n.a.	9,174.8	n.a.	23,905	33,080	n.a.
Tajikistan (b)	1.2	6.3	237.6	3.8	13	251	4
Thailand	126.4	61.6	6,499.8	10.5	16,117	22,617	37
Trinidad and Tobago (a)	9.4	1.3	209.3	15.9	362	571	43
Turkey	182.8	69.6	18,914.9	27.2	23,374	42,289	61
Turkmenistan (b)	7.7	5.5	n.a.	n.a.	n.a.	n.a.	n.a.
Ukraine	41.4	48.7	n.a.	n.a.	n.a.	n.a.	n.a.
United Arab Emirates	n.a.	3.0	672.3	22.0	2,428	3,100	102
United Kingdom (a)	1,552.4	58.9	29,411.4	50.0	49,921	79,332	135
United States	10,416.8	288.4	159,735.2	55.4	140,767	300,502	104
Uzbekistan	9.7	25.4	1,670.0	6.6	187	1,857	7
Yemen	10.4	18.6	542.2	2.9	411	953	5

Source: TeleGeography research, ITU, and World Bank

International Telephone Traffic (L-Z)

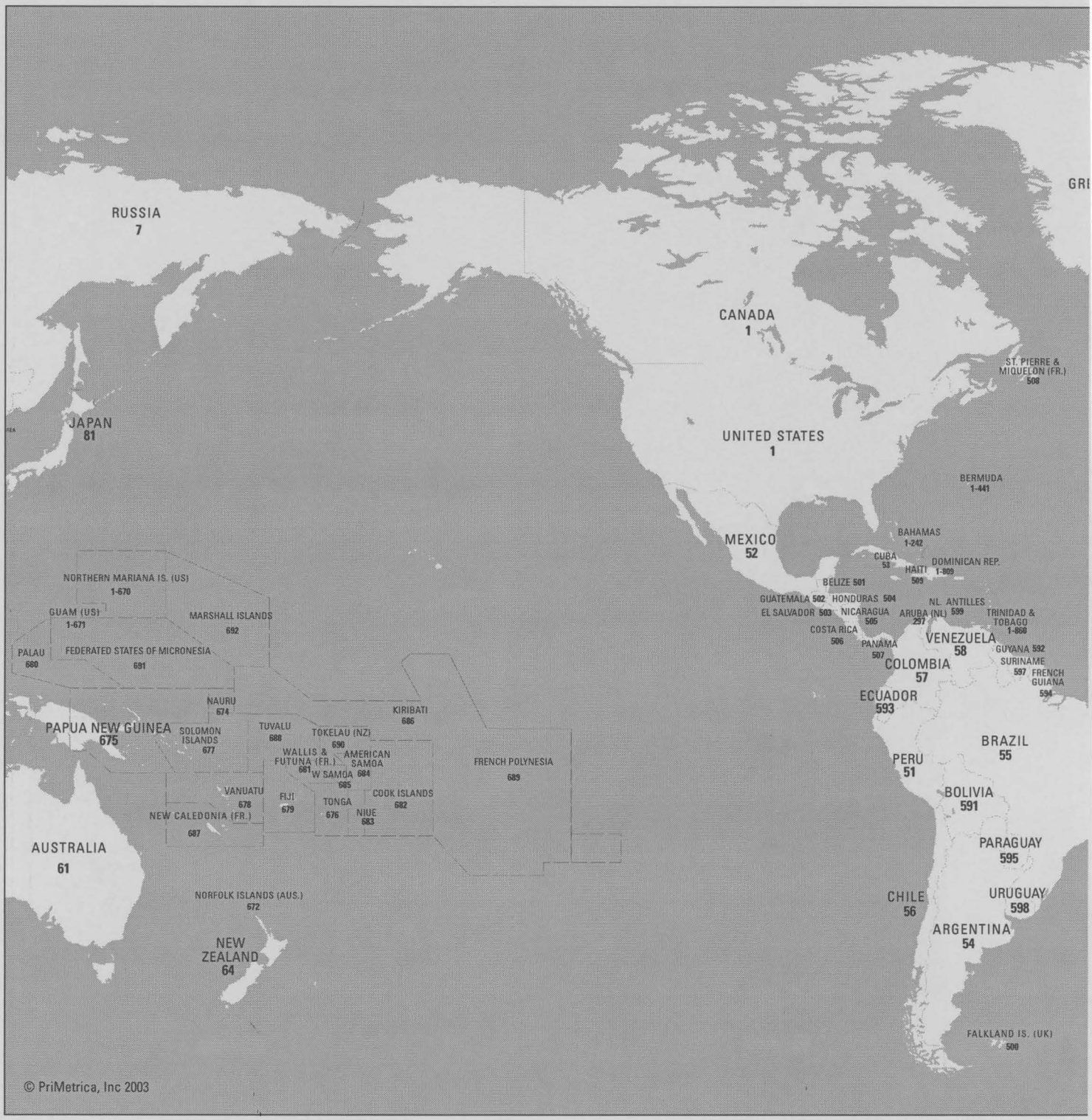
Outgoing Minutes (millions)			Incoming Minutes (millions)			Traffic Balance		
2001	2002	% Change	2001	2002	% Change	2001	2002	Countries
394.6	414.0	4.9%	n.a.	n.a.	n.a.	n.a.	n.a.	Luxembourg
156.5	152.7	-2.4%	111.9	114.0	1.9%	(44.6)	(38.7)	Macau
66.3	64.7	-2.4%	197.2	192.5	-2.4%	131.0	127.8	Macedonia
845.0	982.0	16.2%	810.0	1,050.0	29.6%	(35.0)	68.0	Malaysia (a)
45.6	43.8	-4.0%	65.5	65.6	0.1%	19.9	21.8	Malta
35.6	37.1	4.2%	56.2	64.0	13.9%	20.6	26.9	Mauritius
2,037.9	1,996.9	-2.0%	5,347.5	5,836.9	9.2%	3,309.6	3,840.0	Mexico
52.3	65.8	25.9%	161.8	191.4	18.2%	109.6	125.6	Moldova
64.8	60.6	-6.5%	46.2	52.1	12.9%	(18.7)	(8.5)	Namibia
3,300.0	3,525.0	6.8%	n.a.	n.a.	n.a.	n.a.	n.a.	Netherlands
965.0	984.0	2.0%	n.a.	n.a.	n.a.	n.a.	n.a.	New Zealand (a)
50.0	44.0	-12.0%	n.a.	n.a.	n.a.	n.a.	n.a.	Nicaragua
60.7	86.9	43.1%	238.0	n.a.	n.a.	177.3	n.a.	Nigeria
796.0	871.4	9.5%	n.a.	n.a.	n.a.	n.a.	n.a.	Norway
159.3	165.8	4.1%	108.0	n.a.	n.a.	(51.3)	n.a.	Oman (b)
110.0	128.3	16.7%	1,165.1	1,530.4	31.4%	1,055.2	1,402.1	Pakistan (a) (b)
45.3	40.9	-9.5%	47.9	n.a.	n.a.	2.6	n.a.	Palestinian Territory
35.3	28.4	-19.5%	75.8	71.4	-5.8%	40.6	43.0	Paraguay
112.7	141.9	25.9%	792.7	1,090.7	37.6%	680.0	948.8	Peru
449.0	461.0	2.7%	3,597.0	3,939.2	9.5%	3,148.0	3,478.2	Philippines (a)
942.0	970.0	3.0%	n.a.	n.a.	n.a.	n.a.	n.a.	Portugal
171.6	233.5	36.1%	113.5	134.6	18.7%	(58.2)	(98.9)	Qatar
1,081.6	1,219.2	12.7%	869.3	1,005.4	15.7%	(212.3)	(213.8)	Russia (b)
1,516.6	1,916.3	26.4%	705.5	815.2	15.6%	(811.2)	(1,101.1)	Saudi Arabia
275.5	284.2	3.1%	582.2	587.1	0.8%	306.7	302.9	Serbia and Montenegro
1,870.7	1,965.0	5.0%	n.a.	n.a.	n.a.	n.a.	n.a.	Singapore (a)
176.3	194.0	10.1%	n.a.	n.a.	n.a.	n.a.	n.a.	Slovak Republic
510.7	567.2	11.1%	736.0	811.8	10.3%	225.3	244.6	South Africa (a)
4,275.0	4,740.0	10.9%	n.a.	n.a.	n.a.	n.a.	n.a.	Spain (d)
26.3	23.3	-11.4%	n.a.	18.3	n.a.	n.a.	(5.0)	Swaziland (a)
1,710.0	1,755.0	2.6%	n.a.	n.a.	n.a.	n.a.	n.a.	Sweden
3,230.0	3,495.0	8.2%	n.a.	n.a.	n.a.	n.a.	n.a.	Switzerland
150.0	179.8	19.9%	325.8	n.a.	n.a.	175.8	n.a.	Syria
1,522.2	2,154.0	41.5%	n.a.	n.a.	n.a.	n.a.	n.a.	Taiwan
8.6	10.0	16.9%	n.a.	n.a.	n.a.	n.a.	n.a.	Tajikistan (b)
377.7	419.1	11.0%	555.0	305.0	-45.0%	177.4	(114.1)	Thailand
80.9	80.2	-0.8%	189.2	276.6	46.2%	108.4	196.4	Trinidad and Tobago (a)
675.0	650.0	-3.7%	1,100.0	1,100.0	n.a.	425.0	450.0	Turkey
19.3	24.1	25.0%	n.a.	n.a.	n.a.	n.a.	n.a.	Turkmenistan (b)
388.0	405.0	4.4%	n.a.	n.a.	n.a.	n.a.	n.a.	Ukraine
1,395.9	1,893.6	35.7%	n.a.	n.a.	n.a.	n.a.	n.a.	United Arab Emirates
13,941.2	14,545.4	4.3%	7,664.8	9,569.6	24.9%	(6,276.4)	(4,975.8)	United Kingdom (a)
38,821.9	40,337.2	3.9%	13,400.0	14,249.8	6.3%	(25,421.9)	(26,087.4)	United States
58.3	60.8	4.3%	n.a.	n.a.	n.a.	n.a.	n.a.	Uzbekistan
43.1	43.9	1.8%	n.a.	186.9	n.a.	n.a.	143.0	Yemen

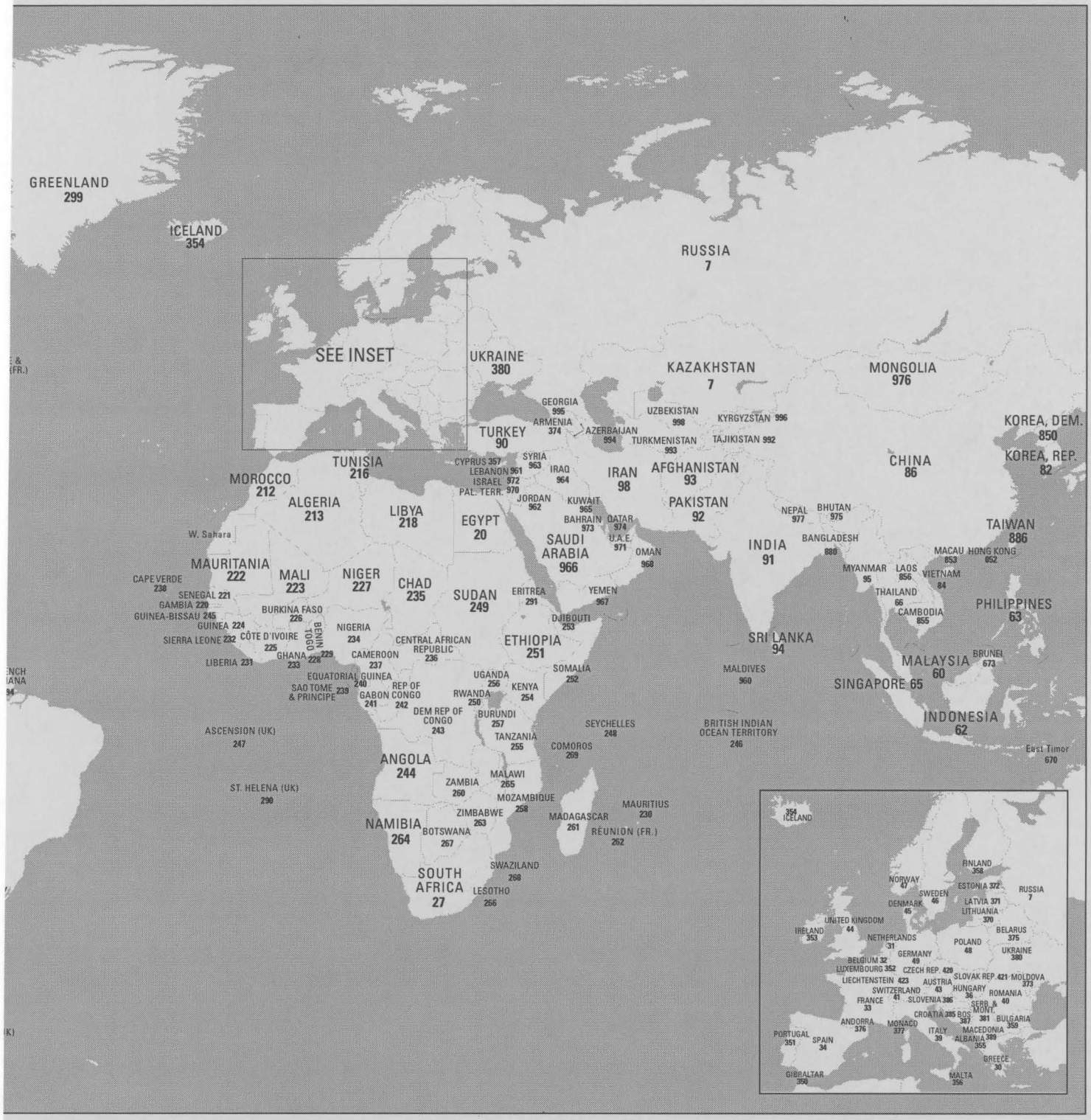
Notes: Data are in millions of minutes of public switched traffic. VoIP call volumes are excluded.
a. International traffic for year ending March 31. Fiscal year for New Zealand and Pakistan ends June 30.
b. Traffic data exclude some carriers or routes. (See country table for details).
c. 2001 and 2002 traffic data not directly comparable. (See country table for details).
d. Data include some refile traffic (See country table for details).

International Dialing Codes, by Country

Afghanistan 93
Albania 355
Tirana 4
Algeria 213
Algiers 21
American Samoa 684
Andorra 376
Angola 244
Luanda 2
Anguilla 1-264
Antigua & Barbuda 1-268
Argentina 54
Buenos Aires 1
Armenia 374
Yerevan 1
Aruba 297
Ascension Island 247
Australia 61
Melbourne 3
Sydney 2
Australian Territories 672
Austria 43
Vienna 1
Azerbaijan 994
Baku 12
Bahamas 1-242
Bahrain 973
Bangladesh 880
Dhaka 2
Barbados 1-246
Belarus 375
Minsk 172
Belgium 32
Brussels 2
Belize 501
Belmopan 8
Benin 229
Bermuda 1-441
Bhutan 975
Bolivia 591
La Paz 2
Bosnia-Herzegovina 387
Sarajevo 33
Botswana 267
Brazil 55
Brasilia 61
Rio de Janeiro 21
São Paulo 11
British Indian Ocean Terr. 246
British Virgin Islands ...1-284
Brunei 673
Bandar Seri Begawan ...2
Bulgaria 359
Sofia 2
Burkina Faso 226
Burundi 257
Cambodia 855
Cameroon 237
Canada 1
Montreal 514/450
Ottawa 613
Toronto 416/647
Vancouver 604/778
Cape Verde 238
Cayman Islands 1-345
Central African Republic ..236
Bangui 61
Chad 235
Chile 56
Santiago 2
China, People's Republic of 86
Beijing 10
Guangzhou 20
Shanghai 21
Colombia 57
Bogota 1
Cocos Islands; Norfolk & Christmas Islands 672
Comoros 269
Congo, Dem. Rep. of 243
Kinshasa 12
Congo, Republic of 242
Brazzaville 81/82/83
Cook Islands 682
Costa Rica 506
Côte d'Ivoire 225
Croatia 385
Zagreb 1
Cuba 53
Havana 7
Cyprus 357
Nicosia 2
Czech Republic 420
Prague 2
Denmark 45
Djibouti 253
Dominica 1-767
Dominican Republic 1-809
East Timor 670
Ecuador 593
Quito 2
Egypt 20
Cairo 2
El Salvador 503
Equatorial Guinea 240
Eritrea 291
Estonia 372
Tallinn 2
Ethiopia 251
Addis Ababa 1
Falkland Islands 500
Faroe Islands 298
Fiji 679
Finland 358
Helsinki 9
France 33
Paris 1
Marseille 491
French Antilles 596
French Guiana 594
French Polynesia 689
Gabon 241
Gambia 220
Georgia 995
Tbilisi 32
Germany 49
Berlin 30
Bonn 228
Frankfurt 69
Munich 89
Ghana 233
Accra 21
Gibraltar 350
Greece 30
Athens 1
Greenland 299
Grenada 1-473
Guadeloupe 590
Guam 1-671
Guatemala 502
Guinea 224
Guinea-Bissau 245
Guyana 592
Georgetown 2
Haiti 509
Honduras 504
Hong Kong 852
Hungary 36
Budapest 1
Iceland 354
India 91
Mumbai 22
Calcutta 33
New Delhi 11
Indonesia 62
Jakarta 21
Inmarsat
Special 870
East Atlantic 871
Pacific 872
Indian 873
West Atlantic 874
International Freephone ..800
Iran 98
Tehran 21
Iraq 964
Baghdad 1
Ireland 353
Dublin 1
Israel 972
Jerusalem 2
Tel Aviv 3
Italy 39
Rome 06
Milan 02
Jamaica 1-876
Japan 81
Osaka 6
Tokyo 3
Jordan 962
Amman 6
Kazakhstan 7
Almaty 3272
Kenya 254
Nairobi 2
Kiribati 686
Korea, Dem. Rep. of 850
Pyongyang 2
Korea, Republic of 82
Seoul 2
Kuwait 965
Kyrgyzstan 996
Bishkek 312
Laos 856
Latvia 371
Lebanon 961
Beirut 1
Lesotho 266
Liberia 231

World Dialing Codes





International Dialing Codes, by Number

1	Canada
	Guam
	Northern Marianas
	United States
	Caribbean
20	Egypt
212	Morocco
213	Algeria
216	Tunisia
218	Libya
220	Gambia
221	Senegal
222	Mauritania
223	Mali
224	Guinea
225	Côte d'Ivoire
226	Burkina Faso
227	Niger
228	Togo
229	Benin
230	Mauritius
231	Liberia
232	Sierra Leone
233	Ghana
234	Nigeria
235	Chad
236	Central African Republic
237	Cameroon
238	Cape Verde
239	Sao Tome & Principe
240	Equatorial Guinea
241	Gabon
242	Congo, Republic of
243	Congo, Dem. Rep. of
244	Angola
245	Guinea-Bissau
246	British Indian Ocean Terr.
247	Ascension Island
248	Seychelles
249	Sudan
250	Rwanda
251	Ethiopia
252	Somalia
253	Djibouti
254	Kenya
255	Tanzania
256	Uganda
257	Burundi
258	Mozambique
260	Zambia
261	Madagascar
262	Réunion Island
263	Zimbabwe
264	Namibia
265	Malawi
266	Lesotho
267	Botswana
268	Swaziland
269	Comoros & Mayotte
27	South Africa
290	St. Helena
291	Eritrea
297	Aruba
298	Faroe Islands
299	Greenland
30	Greece
31	Netherlands
32	Belgium
33	France
34	Spain
350	Gibraltar
351	Portugal
352	Luxembourg
353	Ireland
354	Iceland
355	Albania
356	Malta
357	Cyprus
358	Finland
359	Bulgaria
36	Hungary
370	Lithuania
371	Latvia
372	Estonia
373	Moldova
374	Armenia
375	Belarus
376	Andorra
377	Monaco
378	San Marino
379	Vatican City
380	Ukraine
381	Serbia & Montenegro
385	Croatia
386	Slovenia
387	Bosnia-Herzegovina
389	Macedonia
39	Italy
40	Romania
41	Switzerland
420	Czech Republic
421	Slovak Republic
423	Liechtenstein
43	Austria
44	United Kingdom
45	Denmark
46	Sweden
47	Norway
48	Poland
49	Germany
500	Falkland Islands
501	Belize
502	Guatemala
503	El Salvador
504	Honduras
505	Nicaragua
506	Costa Rica
507	Panama
508	St. Pierre & Miquelon
509	Haiti
51	Peru
52	Mexico
53	Cuba
54	Argentina
55	Brazil
56	Chile
57	Colombia
58	Venezuela
590	Guadeloupe
591	Bolivia
592	Guyana
593	Ecuador
594	French Guiana
595	Paraguay
596	Martinique
597	Suriname
598	Uruguay
599	Netherlands Antilles
60	Malaysia
61	Australia
62	Indonesia
63	Philippines
64	New Zealand
65	Singapore
66	Thailand
670	East Timor
672	Australian Territories
673	Brunei
674	Nauru
675	Papua New Guinea
676	Tonga
677	Solomon Islands
678	Vanuatu
679	Fiji Islands
680	Palau
681	Wallis & Futuna
682	Cook Islands
683	Niue
684	American Samoa
685	Western Samoa
686	Kiribati
687	New Caledonia
688	Tuvalu
689	French Polynesia
690	Tokelau
691	Micronesia
692	Marshall Islands
7	Kazakhstan
	Russia
800	International Freephone
81	Japan
82	Korea, Republic of
84	Vietnam
850	Korea, Dem. Rep. of
852	Hong Kong
853	Macau
855	Cambodia
856	Laos
86	China
870	Inmarsat Special
871	Inmarsat East Atlantic
872	Inmarsat Pacific
873	Inmarsat Indian
874	Inmarsat West Atlantic
880	Bangladesh
886	Taiwan
90	Turkey
91	India
92	Pakistan
93	Afghanistan
94	Sri Lanka
95	Myanmar
960	Maldives
961	Lebanon
962	Jordan
963	Syria
964	Iraq
965	Kuwait
966	Saudi Arabia
967	Yemen
968	Oman
970	Palestinian Territory
971	United Arab Emirates
972	Israel
973	Bahrain
974	Qatar
975	Bhutan
976	Mongolia
977	Nepal
98	Iran
992	Tajikistan
993	Turkmenistan
994	Azerbaijan
995	Georgia
996	Kyrgyzstan
998	Uzbekistan

North American Area Codes, by Number

201	New Jersey
202	Dist. of Columbia
203	Connecticut
204	Manitoba
205	Alabama
206	Washington
207	Maine
208	Idaho
209	California
210	Texas
212	New York
213	California
214	Texas
215	Pennsylvania
216	Ohio
217	Illinois
218	Minnesota
219	Indiana
224	Illinois
225	Louisiana
228	Mississippi
229	Georgia
231	Michigan
234	Ohio
239	Florida
240	Maryland
242	Bahamas
246	Barbados
248	Michigan
250	British Columbia
251	Alabama
252	North Carolina
253	Washington
254	Texas
256	Alabama
260	Indiana
262	Wisconsin
264	Anguilla
267	Pennsylvania
268	Antigua
269	Michigan
270	Kentucky
276	Virginia
281	Texas
284	British Virgin Is.
289	Ontario
301	Maryland
302	Delaware
303	Colorado
304	West Virginia
305	Florida
306	Saskatchewan
307	Wyoming
308	Nebraska
309	Illinois
310	California
312	Illinois
313	Michigan
314	Missouri
315	New York
316	Kansas
317	Indiana
318	Louisiana
319	Iowa
320	Minnesota
321	Florida
323	California
325	Texas
330	Ohio
334	Alabama
336	North Carolina
337	Louisiana
339	Massachusetts
340	U.S. Virgin Is.
345	Cayman Islands
347	New York
351	Massachusetts
352	Florida
360	Washington
361	Texas
386	Florida
401	Rhode Island
402	Nebraska
403	Alberta
404	Georgia
405	Oklahoma
406	Montana
407	Florida
408	California
409	Texas
410	Maryland
411	Directory Assist.
412	Pennsylvania
413	Massachusetts
414	Wisconsin
415	California
416	Ontario
417	Missouri
418	Quebec
419	Ohio
423	Tennessee
425	Washington
430	Texas
432	Texas
434	Virginia
435	Utah
440	Ohio
441	Bermuda
443	Maryland
450	Quebec
469	Texas
473	Grenada
478	Georgia
479	Arkansas
480	Arizona
484	Pennsylvania
500	Pers. Comm. Serv. (PCS)
501	Arkansas
502	Kentucky
503	Oregon
504	Louisiana
505	New Mexico
506	Nebraska
507	Minnesota
508	Massachusetts
509	Washington
510	California
512	Texas
513	Ohio
514	Quebec
515	Iowa
516	New York
517	Michigan
518	New York
519	Ontario
520	Arizona
530	California
540	Virginia
541	Oregon
551	New Jersey
559	California
561	Florida
562	California
563	Iowa
567	Ohio
570	Pennsylvania
571	Virginia
573	Missouri
574	Indiana
580	Oklahoma
585	New York
586	Michigan
601	Mississippi
602	Arizona
603	New Hampshire
604	British Columbia
605	South Dakota
606	Kentucky
607	New York
608	Wisconsin
609	New Jersey
610	Pennsylvania
611	Repair Service
612	Minnesota
613	Ontario
614	Ohio
615	Tennessee
616	Michigan
617	Massachusetts
618	Illinois
619	California
620	Kansas
623	Arizona
626	California
630	Illinois
631	New York
636	Missouri
641	Iowa
646	New York
647	Ontario
649	Turks & Caicos Is.
650	California
651	Minnesota
660	Missouri
661	California
662	Mississippi
664	Montserrat
670	Northern Marianas
671	Guam
679	Michigan
682	Texas
701	North Dakota
702	Nevada
703	Virginia
704	North Carolina
705	Ontario
706	Georgia
707	California
708	Illinois
709	Newfoundland
710	U.S. Government Emergency
712	Iowa
713	Texas
714	California
715	Wisconsin
716	New York
717	Pennsylvania
718	New York
719	Colorado
720	Colorado
724	Pennsylvania
727	Florida
731	Tennessee
732	New Jersey
734	Michigan
740	Ohio
754	Florida
757	Virginia
758	St. Lucia
760	California
763	Minnesota
765	Indiana
767	Dominica
770	Georgia
772	Florida
773	Illinois
774	Massachusetts
775	Nevada
778	British Colombia
780	Alberta
781	Massachusetts
784	St. Vincent & Grenadines
785	Kansas
786	Florida
787	Puerto Rico
800	Toll-free serv.
801	Utah
802	Vermont
803	South Carolina
804	Virginia
805	California
806	Texas
807	Ontario
808	Hawaii
809	Dominican Rep.
810	Michigan
812	Indiana
813	Florida
814	Pennsylvania
815	Illinois
816	Missouri
817	Texas
818	California
819	Quebec
828	North Carolina
830	Texas
831	California
832	Texas
843	South Carolina
845	New York
847	Illinois
848	New Jersey
850	Florida
856	New Jersey
857	Massachusetts
858	California
859	Kentucky
860	Connecticut
862	New Jersey
863	Florida
864	South Carolina
865	Tennessee
867	Northwest Territories/Yukon
868	Trinidad & Tobago
869	St. Kitts & Nevis
870	Arkansas
876	Jamaica
877	Toll-free serv.
878	Pennsylvania
880	Toll-free serv.
881	Toll-free serv.
882	Toll-free serv.
888	Toll-free serv.
900	Info. Servs.
901	Tennessee
902	Nova Scotia & Prince Edward Is.
903	Texas
904	Florida
905	Ontario
906	Michigan
907	Alaska
908	New Jersey
909	California
910	North Carolina
911	Emergency Servs.
912	Georgia
913	Kansas
914	New York
915	Texas
916	California
917	New York
918	Oklahoma
919	North Carolina
920	Wisconsin
925	California
928	Arizona
931	Tennessee
936	Texas
937	Ohio
939	Puerto Rico
940	Texas
941	Florida
947	Michigan
949	California
952	Minnesota
954	Florida
956	Texas
970	Colorado
971	Oregon
972	Texas
973	New Jersey
978	Massachusetts
979	Texas
980	North Carolina
985	Louisiana
989	Michigan

North American Area Codes, by Jurisdiction

Alabama
- Birmingham and west-central Alabama 205
- Mobile and southwestern Alabama 251
- Huntsville and northern Alabama 256
- Montgomery and southern Alabama ...334

Alaska 907

Alberta
- Calgary and southern Alberta 403
- Edmonton and northern Alberta 780

Anguilla 264

Antigua 268

Arizona
- Eastern Phoenix area 480
- Tucson and southeastern Arizona 520
- Central Phoenix 602
- Western Phoenix 623
- Northern and southwestern Arizona ...928

Arkansas
- Fort Smith 479
- Little Rock, Fayetteville and northwestern Arkansas 501
- Jonesboro and southern Arkansas 870

Bahamas 242

Barbados 246

Bermuda 441

British Columbia
- British Columbia except Vancouver area 250
- Vancouver area 604/778

British Virgin Islands 284

California
- Stockton, Fresno, Modesto, and central California 209
- Los Angeles 213
- Malibu, Beverly Hills, and west Los Angeles suburbs 310
- Florence 323
- San Jose, Sunnyvale, and Cupertino ..408
- San Francisco 415
- Oakland and Berkeley areas 510
- Chico, Redding, and northeastern California 530
- Fresno and central California 559
- Long Beach 562
- San Diego and southwestern California 619
- Pasadena 626
- San Mateo, Palo Alto and south San Francisco suburbs 650
- Bakersfield and south central California 661
- Fort Bragg, Eureka, Ukiah, and northern California 707
- Northern Orange County 714
- Ontario and San Bernadino 909
- Barstow, Encito, Palm Springs, and southeastern California 760
- Santa Barbara, Bakersfield, and central western California 805
- Burbank and Glendale areas 818
- Monterey, Santa Cruz, and west-central California 831
- Northern San Diego and Del Mar 858
- Sacramento 916
- Concord, Livermore, Walnut Creek 925
- Anaheim, Irvine, and southern Orange County 949

Cayman Islands 345

Colorado
- Denver area 303/720
- Colorado Springs, Pueblo, and southeastern Colorado 719
- Aspen, Durango, and northwestern Colorado 970

Connecticut
- Bridgeport, New Haven, and southwestern Connecticut 203
- Hartford, Bristol, and northeastern Connecticut 860

Delaware 302

District of Columbia
- Washington 202

Dominica 767

Dominican Republic 809

Florida
- Miami, Key West, and southeastern Florida 305/786
- Orlando and central eastern Florida 321/407
- Gainesville and central Florida 352
- Daytona Beach, area west of Jacksonville 386
- West Palm Beach, Boca Raton, and east central Florida 561/772
- Tampa Bay 727
- St. Petersburg 813
- Pensacola, Tallahassee, and northwestern Florida 850
- Lakeland, Sebring, and south-central Florida 863
- Jacksonville, Daytona, and northeastern Florida 904
- Bradenton, Sarasota, and southwestern Florida 239/941
- Fort Lauderdale 754/954

Georgia
- Albany, Valdosta, and south-central Georgia 229
- Atlanta 404/678/770
- Macon, Swainsboro, and south-central Georgia 478
- N Georgia: Columbus, Augusta 706
- Savannah, Vidalia, and southeastern Georgia 912

Grenada 473

Guam 671

Hawaii 808

Idaho 208

Illinois
- Champaign, Urbana, Springfield, and central Illinois 217
- Northeastern Illinois and northwest Chicago suburbs 224/847
- Peoria, Rock Island, and west-central Illinois 309
- Chicago 312/773
- Southern Chicago suburbs 708
- Alton, Mount Vernon, and southern Illinois 618
- Central Chicago suburbs 630
- La Salle, Rockford, and northern Illinois 815

Indiana
- Gary. Fort Wayne and northern Indiana 219/260/574
- Indianapolis 317
- Central Indiana excluding Indianapolis 765
- Evansville and southern Indiana 812

Iowa
- Cedar Rapids and eastern Iowa 319
- Des Moines, Ames, and central Iowa 515
- Davenport, Dubuque, and notheastern Iowa 563
- Mason City, Pella, and central Iowa 641
- Council Bluffs, Sioux City, and western Iowa 712

Jamaica 876

Kansas
- Dodge City, Wichita, and southern Kansas 316
- Southern Kansas except Wichita metro area 620
- Topeka, Lawrence, and northern Kansas 785
- Kansas City and eastern Kansas 913

Kentucky
- Paducah, Bowling Green, and western Kentucky 270
- Louisville, Shelbyville, and north-central Kentucky 502
- Eastern Kentucky 606
- Richmond, Danville, and northeastern Kentucky 859

Louisiana
- Baton Rouge and central-eastern Louisiana 225
- Shreveport, Monroe, and northern Louisiana 318
- Lake Charles, Lafayette, and southwestern Louisiana 337
- New Orleans and southeastern Louisiana 504
- Southeastern Louisiana except New Orleans and Baton Rouge 985

Maine 207

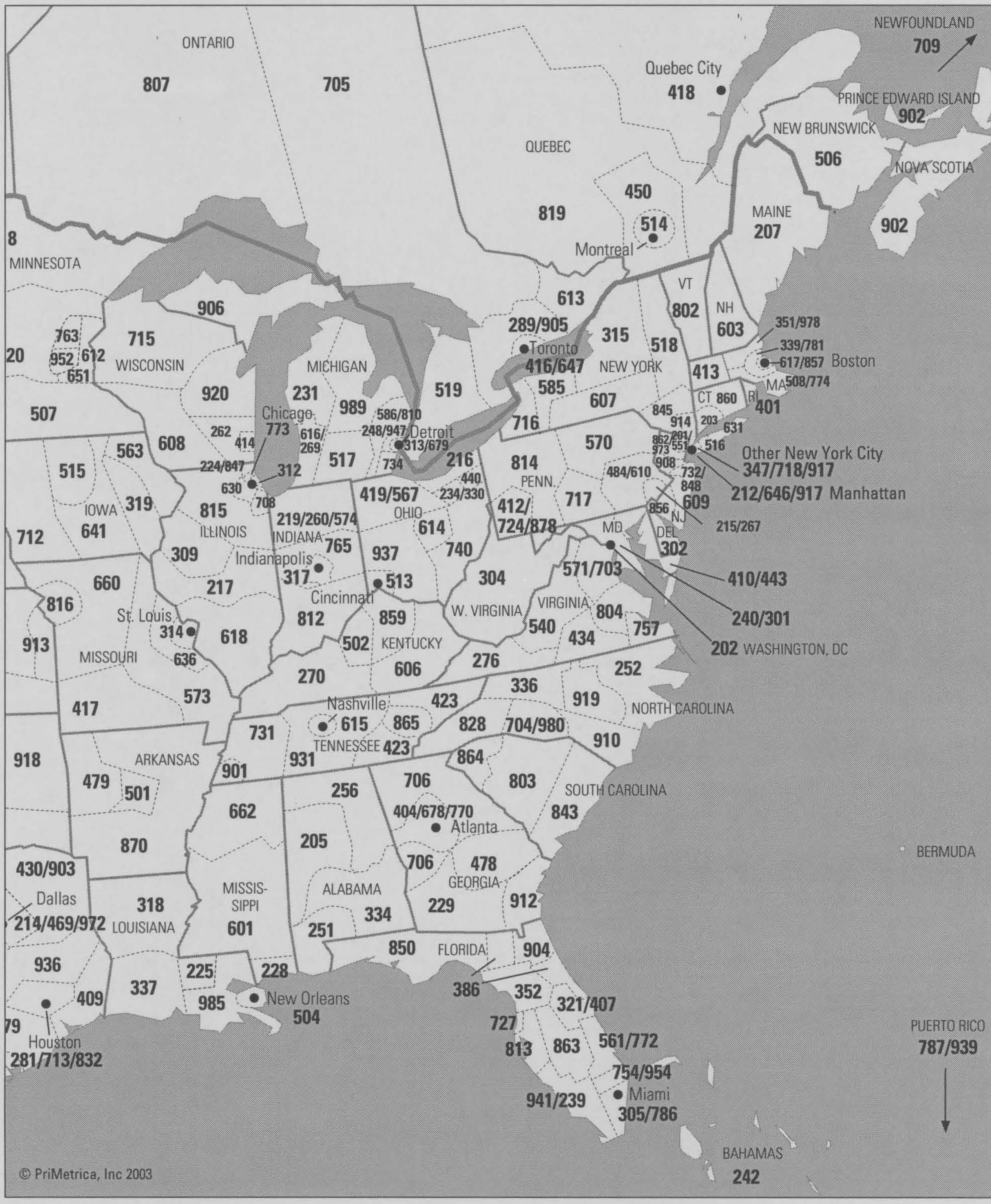
Manitoba 204

Maryland
- Rockville, Hagerstown, and western Maryland 240/301
- Baltimore, Annapolis, and eastern Maryland 410/443

Massachusetts
- Waltham, Lexington, and Boston suburbs 339/781
- Lowell, Salem, and northern Massachusetts 351/978
- Pittsfield, Springfield, and western Massachusetts 413
- Framingham, Cape Cod, and southern Massachusetts 508/774
- Boston 617/857

Michigan
- Traverse City, Muskegon, and northwestern Michigan 231
- Pontiac, Southfield, and Oakland County 248/947
- Detroit 313/679
- Lansing and central Michigan 517
- Flint, Flushing, and southeastern Michigan 586/810
- Grand Rapids, Kalamazoo, and southwestern Michigan 269/616
- Ann Arbor and Wayne 734

North American Area Codes


ONTARIO
807
705
NEWFOUNDLAND
709
Quebec City
418
PRINCE EDWARD ISLAND
902
NEW BRUNSWICK
506
NOVA SCOTIA
902
QUEBEC
450
819
514
Montreal
MAINE
207
MINNESOTA
613
VT
802
NH
603
906
289/905
Toronto
416/647
315
518
351/978
339/781
617/857 Boston
508/774
MA
763
952
612
651
715
WISCONSIN
MICHIGAN
NEW YORK
413
920
231
519
585
607
CT 860
RI
401
507
Chicago
773
989
586/810
845
914
203
631
262
414
616/269
248/947 Detroit
313/679
716
570
862/201/973
551
908
516
Other New York City
347/718/917
608
563
224/847
517
734
216
814
484/610
515
630
312
440
PENN.
732/848
212/646/917 Manhattan
708
419/567
234/330
717
609
IOWA
641
319
815
ILLINOIS
219/260/574
INDIANA
OHIO
614
412/724/878
856
NJ
215/267
712
309
765
937
740
MD
DEL
302
Indianapolis
317
513
Cincinnati
304
571/703
410/443
660
217
816
St. Louis
314
618
812
859
W. VIRGINIA
VIRGINIA
540
804
757
240/301
913
MISSOURI
636
502
KENTUCKY
606
434
202 WASHINGTON, DC
270
276
252
417
573
Nashville
615
423
336
919
NORTH CAROLINA
731
865
828
704/980
910
918
ARKANSAS
901
931
TENNESSEE
423
864
479
501
256
706
803
SOUTH CAROLINA
662
404/678/770
Atlanta
843
870
205
706
478
GEORGIA
BERMUDA
430/903
Dallas
214/469/972
318
LOUISIANA
MISSISSIPPI
601
ALABAMA
334
251
229
912
850
FLORIDA
904
936
337
225
228
New Orleans
504
409
985
386
352
321/407
Houston
281/713/832
727
813
863
561/772
754/954
PUERTO RICO
787/939
941/239
Miami
305/786
BAHAMAS
242
© PriMetrica, Inc 2003

A Primer on Bits

Measuring Bytes Bit by Bit

Below are the standard metric prefixes used in the SI (Système International) conventions for scientific measurement. With units of time (e.g., gigabits per second) or things that come in powers of 10, they retain their usual meanings of multiplication by powers of $1,000 = 10^3$. When used with bytes (e.g., gigabytes of data storage) or other things that naturally come in powers of 2, they usually denote multiplication by powers of $1,024 = 2^{10}$.

	Base 10			Base 2		
1 Kilobit/s	$= 1,000^1 = 10^3$	=	1,000	1 Kilobyte	$= 1,024^1 = 2^{10}$	= 1,024
1 Megabit/s	$= 1,000^2 = 10^6$	=	1,000,000	1 Megabyte	$= 1,024^2 = 2^{20}$	= 1,048,576
1 Gigabit/s	$= 1,000^3 = 10^9$	=	1,000,000,000	1 Gigabyte	$= 1,024^3 = 2^{30}$	= 1,073,741,824
1 Terabit/s	$= 1,000^4 = 10^{12}$	=	1,000,000,000,000	1 Terabyte	$= 1,024^4 = 2^{40}$	= 1,099,511,627,776
1 Petabit/s	$= 1,000^5 = 10^{15}$	=	1,000,000,000,000,000	1 Petabyte	$= 1,024^5 = 2^{50}$	= 1,125,899,906,842,624
1 Exabit/s	$= 1,000^6 = 10^{18}$	=	1,000,000,000,000,000,000	1 Exabyte	$= 1,024^6 = 2^{60}$	= 1,152,921,504,606,846,976
1 Zettabit/s	$= 1,000^7 = 10^{21}$	=	1,000,000,000,000,000,000,000	1 Zettabyte	$= 1,024^7 = 2^{70}$	= 1,180,591,620,717,411,303,424
1 Yottabit/s	$= 1,000^8 = 10^{24}$	=	1,000,000,000,000,000,000,000,000	1 Yottabyte	$= 1,024^8 = 2^{80}$	= 1,208,925,819,614,629,174,706,176

Measuring Telecommunications Bandwidth—DS-0 to OC-192

Carrier Technology	Data Rate (Mbps)	Description	64 Kbps Circuits*
DS-0	0.064	Base rate in the Digital Signal (DS) level hierarchy	1
T-1 (DS-1)	1.544	Primary level of the American T-carrier multiplexing system; capacity is the same as a DS 1 carrier	24
T-2 (DS-2)	6.312	Four times the capacity of T-1	96
T-3 (DS-3)	44.736	28 times the capacity of T-1	672
T-4 (DS-4)	274.176	168 times the capacity of T-1	4,032
E-1	2.048	Primary level of the European E-carrier multiplexing system	30
E-2	8.448	Carries four multiplexed E-1 signals	120
E-3	34.368	Carries four E-2 signals	480
E-4	139.264	Carries four E-3 signals	1,920
E-5	565.148	Carries four E-4 signals	7,680
OC-1/STS-1	51.840	Basic signaling rate of SONET hierarchy	672
OC-3/STM-1	155.520	Exactly three times the capacity of OC-1**	2,016
OC-12/STM-4	622.080	12 times the capacity of OC-1	8,064
OC-24	1,244.160	24 times the capacity of OC-1	16,128
OC-48/STM-16	2,488.320	48 times the capacity of OC-1	32,256
OC-192/STM-64	9,953.280	192 times the capacity of OC-1	129,024

Key

"T" T-carrier system in U.S., Canada, and Japan with 1.544 Mbps as the primary level (24 voice channels x 64 Kbps per channel).

"DS" Digital Signal that travels on the T-carrier or E-carrier.

"E" Used in countries other than U.S., Canada, and Japan. The hierarchy was established by the CEPT (Conférence Européenne des Postes et Télécommunications) with 2.048 Mbps as the primary level ([30 voice channels + 2 channels for overhead] x 64 Kbps per channel).

"OC" Optical Carrier interface designed to work with STS-*n* (Synchronous Transport Signal) signaling rate in a SONET (Synchronous Optical Network).

"STM" Synchronous Transport Module refers to a large carrier (base signal 155.52 Mbps) in a SONET.

"STS" Synchronous Transport Signal is the electrical counterpart to the Optical Carrier (OC).

Notes:

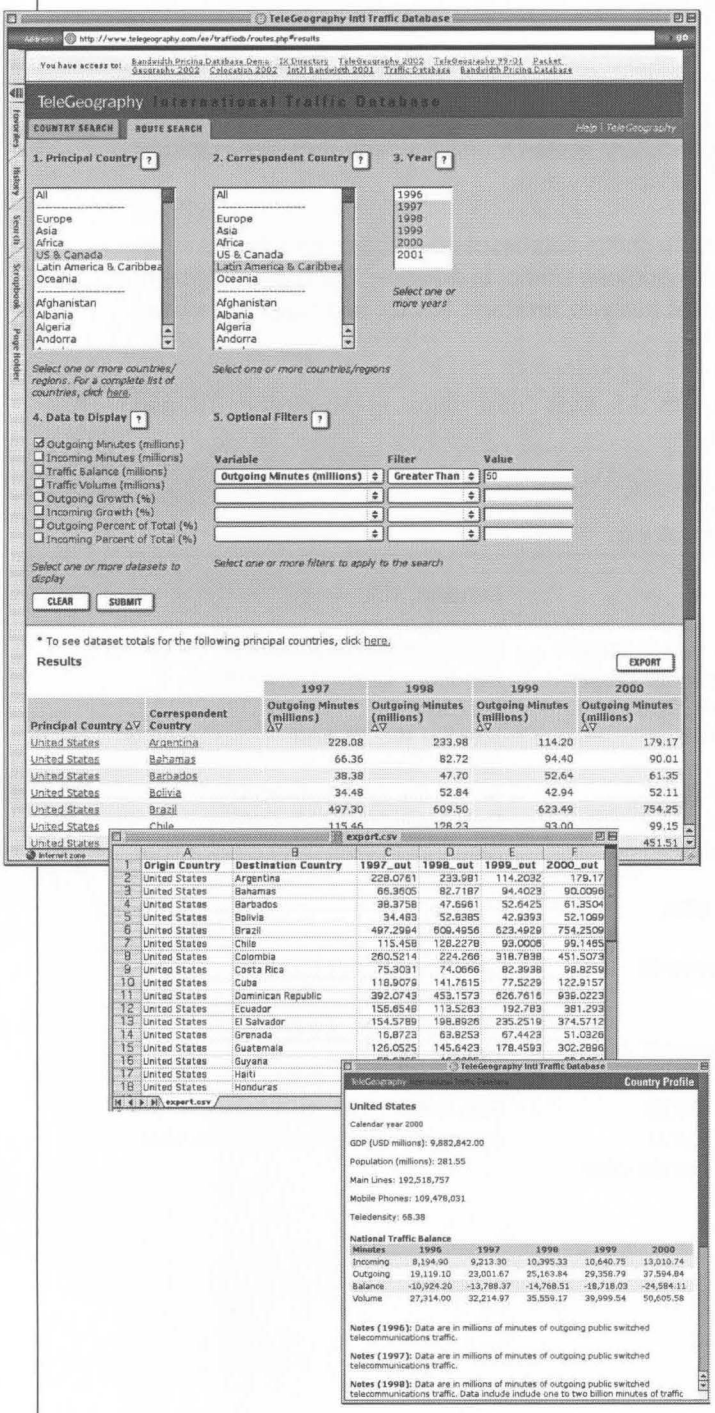
* The number of 64 Kbps is presented for comparative purposes only. The actual number of simultaneous conversations possible over a given carrier may vary depending on the encoding scheme used.

** In the "E" and "T" hierarchies, each higher level is set to be "almost but not exactly" a multiple of the bit rate for the previous order (plesiochronous). To eliminate problems associated with plesiochronous multiplexing, SONET, a synchronous hierarchy, was defined in the United States in 1986. As a result, the "OC" and "STM" carriers are exact bit-rate multiples of their primary levels, OC-1 and STM-1, respectively.

Source: TeleGeography research, Alcatel, *Newton's Telecommunications Dictionary*

INTERNATIONAL TRAFFIC DATABASE

THE ONLY SOURCE FOR ONLINE ACCESS TO SEVEN YEARS OF TRAFFIC VOLUMES ON THOUSANDS OF CROSS-BORDER ROUTES WORLDWIDE



The ***International Traffic Database*** is the most comprehensive source for current and historical cross-border telephone traffic statistics. The database contains seven years of our authoritative research on route-by-route traffic volumes for 120 countries, from *TeleGeography 1997* up to the most recent *TeleGeography 2004*. All data may be viewed on screen with your Web browser or downloaded into spreadsheet format.

- All available route-by-route outgoing and incoming traffic volumes (not just the top 20 printed each year)
- Vital data for your models: country totals for traffic, national income, telephone subscribers, and population
- Search, display, and export data to spreadsheets
- Detailed profiles for more than 120 countries
- Context-sensitive help available for all search categories
- Over ten critical traffic and indicator variables, including incoming and outgoing minutes, growth rate, fixed lines, teledensity, and mobile phones

For more information and how to order the ***International Traffic Database*** contact your account manager:

Europe, Africa, and Asia:
+44 (0) 1392 315563

North and South America:
+1 760 579 0218 x114

Founded in 2002 from the integrated operations of TeleGeography and CIT Publications, PriMetrica's platform of authoritative data sets and objective analysis have provided clear guidance to thousands of clients in over 100 countries. The company's communications industry research delivers time-sensitive statistics and insight on hundreds of markets and thousands of service providers.

PriMetrica offers individual and enterprise subscriptions to online databases and reports on subjects ranging from wireless carrier competition to global Internet backbone traffic. In addition, the company's team of experienced consultants can supply customized market analysis, strategic advice, and support services to clients anywhere in the world.

PriMetrica is headquartered in San Diego, California, with U.S. East Coast offices in Washington, DC and European offices in London and Exeter, U.K.

Sales

North & South America

PriMetrica, Inc. - Headquarters
One Carlsbad Research Center
2382 Faraday Ave, Suite 140
Carlsbad, CA 92008
United States
Tel.: +1 760 579 0218
Fax: +1 760 579 0273
sales@primetrica.com

Europe, Africa, and Asia

CIT Publications Ltd.
3 Colleton Crescent
Exeter, Devon. EX2 4DG
United Kingdom
Tel.: +44 1392 315567
Fax: +44 1392 315556
sales@primetrica.com

Research and Consulting

San Diego

PriMetrica, Inc. - Headquarters
One Carlsbad Research Center
2382 Faraday Ave, Suite 140
Carlsbad, CA 92008
United States
Tel.: +1 760 579 0218
Fax: +1 760 579 0273
consulting@primetrica.com

Washington DC, USA

TeleGeography Research
1909 K St., NW
Suite 380
Washington, DC 20006
United States
Tel.: +1 202 741 0020
Fax: +1 202 741 0021
research.dc@primetrica.com

London, UK

TeleGeography Research
6th Floor Crown House
51 Aldwych
London WC2B 4AX
United Kingdom
Tel.: +44 20 7395 4551
Fax: +44 20 7395 4501
research.london@primetrica.com

Exeter, UK

CIT Publications Ltd.
3 Colleton Crescent
Exeter, Devon. EX2 4DG
United Kingdom
Tel.: +44 1392 315567
Fax: +44 1392 315556
research.exeter@primetrica.com

PriMetrica

PriMetrica, Inc. (Corporate Headquarters)
One Carlsbad Research Center
2382 Faraday Ave, Suite 140
Carlsbad, CA 92008 USA
Tel. +1 760 579-0218
Fax +1 760 579-0273
info@primetrica.com
http://www.primetrica.com

PriMetrica, Inc. (Washington, DC)
TeleGeography
1909 K Street, NW
Suite 380
Washington, DC 20006 USA
Tel. +1 202 741 0079
Fax +1 202 741 0021

PriMetrica, Ltd.
3 Colleton Crescent
Exeter, Devon. EX2 4DG
United Kingdom
Tel. + 44 1392 315567
Fax +44 1392 315556

ISBN: 1-886142-45-9