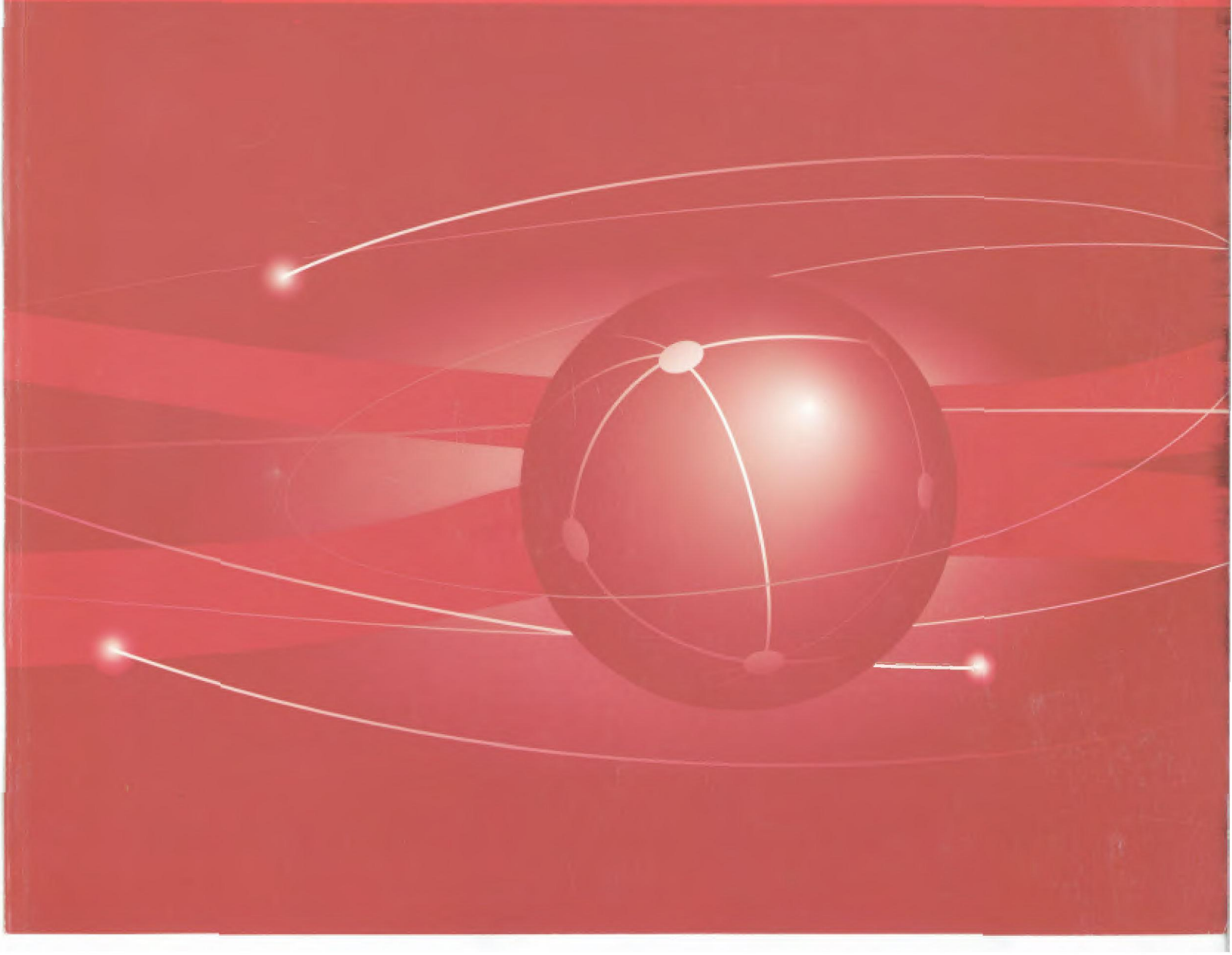
A TELEGEOGRAPHY GUIDE

TeleGeography 2002

GLOBAL TRAFFIC STATISTICS & COMMENTARY



TeleGeography 2002

Global Telecommunications Traffic Statistics and Commentary

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Preface

TeleGeography has been called the "bible" of the worldwide communications industry. At WorldCom, we couldn't agree more. That's why we're proud to sponsor this report once again and to continue our long-standing support of the *TeleGeography* series.

Despite the challenges that our industry has experienced in recent years, global communications continues to be one of the world's most dynamic, high-growth, and fast-changing industries. Profound changes have transformed the industry for many decades, but the pace of change accelerated in the 1990s. For example, the 1993 *TeleGeography* report counted only 13 competitive markets in the world. Today there are more than 40 and counting. Also in 1993, only 19 international carriers operated in the United States. Now there are over 1,500. Worldwide, the number of competitive carriers has mushroomed from a mere 56 in 1993 to more than 4,000 this year. And the 43 billion minutes of international traffic recorded in 1993 surged to over 130 billion minutes in 2000.

Needless to say, tracking this ever-expanding and rapidly shifting marketplace has become more challenging with each passing year. Indeed, the telecommunications and Internet segments of the industry have each grown so much and become so complex that a single report no longer suffices. So for the first time, TeleGeography is publishing separate reports for these two important segments.

In this report, you'll find market shares of the telecom industry's major carriers, international traffic analyses and summaries, and route-by-route PSTN traffic volumes for over 100 countries and 2,000 routes. You'll also find charts highlighting the 40 largest international carriers and the world's leading Voice-over-IP providers.

Notably, the mobile telephony and pricing sections in this year's report have been significantly expanded. The mobile telephony section, for instance, includes authoritative data on how mobile subscriber growth and roaming impact international telecom traffic flows. In addition, this report continues to provide you with updated information on the impact of deregulation and privatization on retail and wholesale pricing worldwide.

On behalf of WorldCom, I am pleased to present to you *TeleGeography 2002*—the most complete, reliable, and authoritative resource for analyzing and understanding our ever-changing industry.

Bob Lacy
Vice President
WorldCom International Expansion Support

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 also owe a debt of gratitude to the Band-X switched minutes trading team, whose industry expertise and historical pricing statistics contributed substantially to the depth and accuracy of this report.

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: Bram Dov Abramson, Linda Blake, Teddy Chu, Simon Dodsworth, Eric Hill, Cathy Hsu, Tim Kelly, Jessica Marantz, Bill Marmon, Michael Minges, Paul Newnes, Alexandra Rehak, Rebecca Rohtbart, Rob Schult, Ewan Sutherland, Heather Tinsley, and Monica Wells.

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The Editors

Executive Summary

EXECUTIVE SUMMARY

Executive Summary

> "The half-dozen new international carriers which will cut their teeth in the early 1990s...may have a harder time of it than the first generation."
> —*TeleGeography 1993*

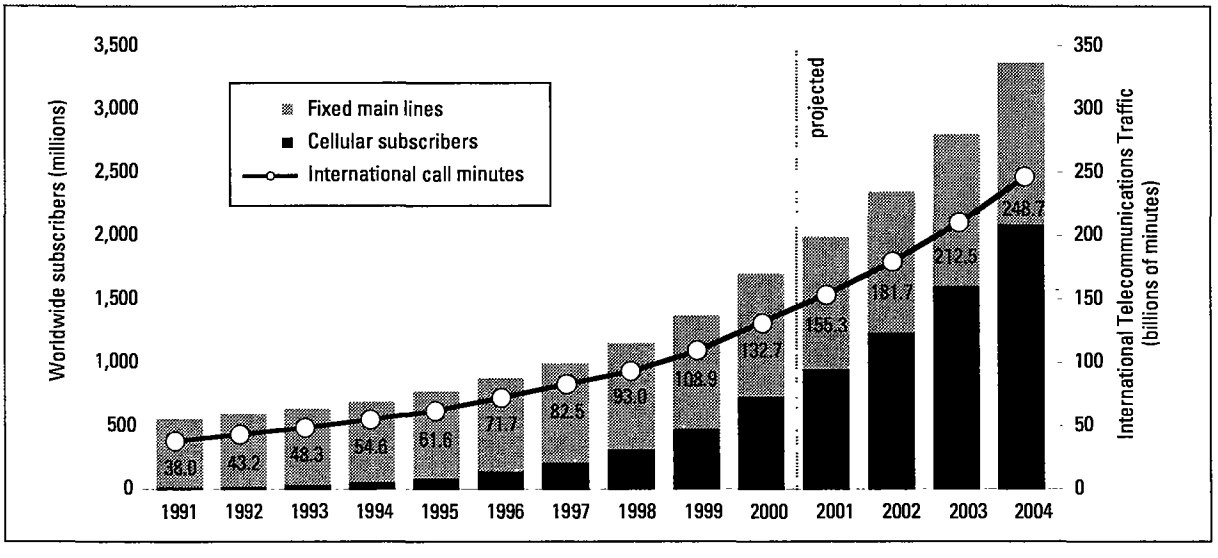
For more than a decade, the annual series of *TeleGeography* reports has documented the trends and key issues shaping the international telephony market. While the report's focus has always been on benchmarking rather than forecasting the state of the industry, there's no question that the above projection, written eight years ago, was accurate—albeit somewhat understated.

The past year and a half have marked a watershed for the industry. After a decade-long boom, capital markets and the telecom industry as a whole have gone sour, and many international carriers have fallen out of favor with investors. For all of the turmoil, however, closer inspection reveals a number of positive industry trends.

Traffic Growth

International voice traffic grew by over 21 percent to 132.7 billion minutes in 2000—solid growth for an industry that's over a hundred years old (see Figure 1. International Traffic and Main Line Growth). With the exceptions of Eastern Europe and Africa, each region of the world reported double-digit traffic growth. The continuing rise in international traffic has been propelled by two broader trends: the liberalization of inter-

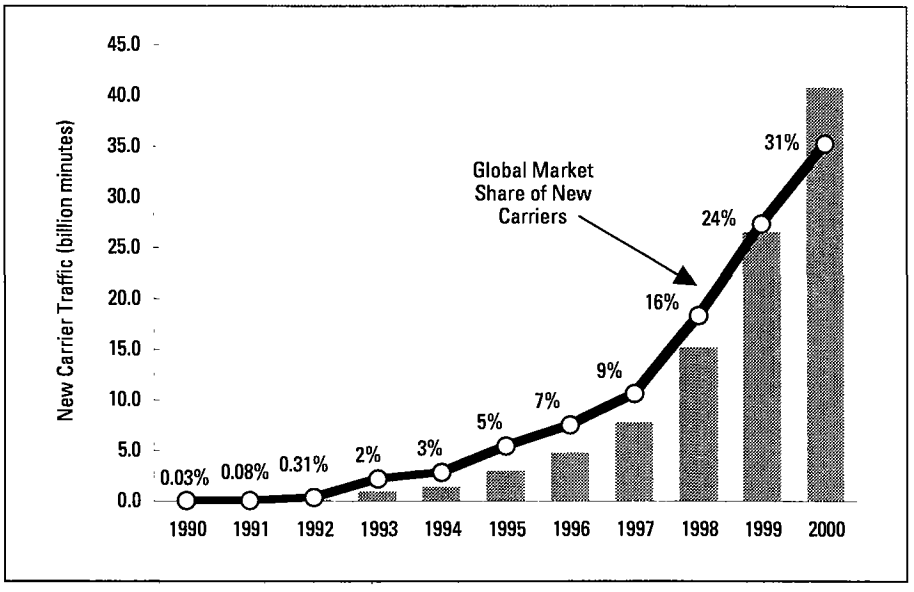
Figure 1. International Traffic and Main Line Growth



Note: Data include outbound international traffic on public networks only. Projections assume 15% traffic growth, 5% main line growth, and 30% mobile subscriber growth annually.

Source: TeleGeography research and ITU

Figure 2. Charge of the Challengers



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

national telecom markets (leading to greater competition) and the growth of mobile telephony. Traffic growth in competitive telecom markets has consistently outpaced growth in countries that have not liberalized their telecom markets.

Carriers

While several prominent international carriers have permanently shut their doors in recent years, more companies entered the international long-distance market than left it in 2000. Worldwide, the number of licensed international carriers grew by more than 40 percent to just over 4,000. The market share of new carriers—the generation of companies founded in the 1990s to compete with incumbent telcos—continued on its steadily upward trend, increasing to 31 percent of global minutes in 2000 (see Figure 2. Charge of the Challengers). Moreover, for the first time ever, a non-incumbent carrier took the top spot in TeleGeography's annual ranking of international carriers (see Figure 3. Top 10 International Carriers). With 12.4 billion minutes of U.S.-originated traffic and an aggregated total of more than 16 billion minutes of international traffic worldwide, WorldCom has emerged as the largest carrier in the U.S. and the world.

Pricing

While carriers' fierce price competition has cut into their gross revenues, a more detailed analysis of pricing data reveals that they have also been able to reduce their costs substantially. Plummeting international bandwidth costs and sharp decreases in both settlement rates and interconnection charges have enabled many carriers to send traffic at lower-than-ever-costs. For example, U.S. carriers' per-minute settlement

Figure 3. Top 10 International Carriers

Rank	Carrier	Country	Outgoing Traffic (millions of minutes) 2000	1999	Change 1999-2000
1.	WorldCom	U.S.	12,399.5	8,294.9	49.5%
2.	AT&T	U.S.	9,680.1	10,816.5	-10.5%
3.	BT	U.K.	4,559.3	4,029.1	13.2%
4.	Deutsche Telekom	Germany	4,525.0	4,385.0	3.2%
5.	France Télécom	France	4,393.0	4,390.0	0.1%
6.	Sprint	U.S.	3,922.8	3,714.4	5.6%
7.	Cable & Wireless	U.K.	3,487.6	2,528.9	37.9%
8.	Telecom Italia	Italy	2,706.0	2,390.0	13.2%
9.	China Telecom	China	2,050.0	1,950.0	5.1%
10.	Swisscom	Switzerland	2,050.0	2,259.0	-9.3%

Note: Traffic figures are for outgoing traffic from each carrier's home market only.
Source: TeleGeography research

outpayments in 2000 were almost 50 percent lower than in 1997. While average costs have traced a steady downwards path, the cost of sending traffic on individual routes can vary unpredictably—in particular, carriers' costs of sending calls to mobile phones and to developing countries fluctuate wildly.

Voice-over-IP

International Voice-over-IP (VoIP) traffic has continued to grow at a blistering pace, increasing from 1.6 billion minutes in 1999 to 5.3 billion in 2000. While most of this traffic is carried by specialist VoIP carriers, such as iBasis and ITXC, many minutes are originated by traditional PSTN operators who have chosen to outsource some of their international traffic to VoIP operators. On the basis of trends in the first half of 2001, international VoIP traffic is likely to reach 10 billion minutes in the current year, equivalent to six percent of the world's projected traffic in 2001.

Mobile Telephony

The impact of the mobile telephony boom on the international long-distance market cannot be overstated. Mobile phones generated approximately 20 percent of international call volumes in regions as diverse as Europe, Asia, and Africa. While some of this traffic is simply a replacement for calls from fixed-line phones, much of it is genuinely new traffic driven by international mobile roaming.

Unfortunately, mobile telephony has also had a tremendous impact on carriers' costs. Mobile termination charges in many countries, particularly in Europe, are as much as sixteen times higher than the cost of termination to fixed-line phones. In Italy, for example, mobile phones account for approximately 35 percent of inbound international traffic but an astonishing 85 percent of call termination charges paid by carriers.

Figure 4. Ten Years of Change

Indicator	1990	1995	2000
International Traffic (billions of minutes)	33.5	61.6	132.7
Revenues from International Traffic (billions of US$)	$37	$55	$70
Countries Permitting Carrier Competition	6	18	49
Top 20 Carriers' Share of World Traffic	86%	72%	50%
Market Share of New Carriers	<1%	5%	31%
Countries Permitting International Simple Resale (ISR)	0	2	35

Note: New carriers include only carriers that began facilities-based operation after 1989.
Source: TeleGeography research

Conclusion

The international telecom industry has changed dramatically since TeleGeography first launched its self-titled research series more than a decade ago. In 1990, international call volumes reached approximately 33.5 billion minutes, six countries allowed international services competition, and none permitted international carriers to interconnect directly with domestic carriers. Ten years later, traffic has more than quadrupled, nearly 50 countries allowed at least limited international services competition, and 35 countries permitted international carriers to interconnect directly with domestic phone companies (see Figure 4. Ten Years of Change).

The tremendous growth and increasing diversity of the telecom industry have compelled TeleGeography to change the way we research the industry and present our findings. Previous editions of the *TeleGeography* report dealt not only with international telephony but also with international bandwidth and cross-border Internet connectivity. The scale and complexity of each of these industries, however, has grown to the point where they cannot be covered adequately in a single report. In the spring of 2001, TeleGeography released *International Bandwidth 2001* (http://www.internationalbandwidth.com), an in-depth analysis of international fiber optic and satellite networks. In September 2001, TeleGeography published the new *Packet Geography 2002* (http://www.packetgeography.com) report, the first in-depth statistical guide to international Internet infrastructure.

By dedicating a full report to each of these topics, TeleGeography has been able to provide greater depth of information than ever before. With more detailed and extensive data on telecom costs and pricing, international mobile telephony, and the burgeoning VoIP sector, *TeleGeography 2002* is our most exhaustive report ever on international telephony. As always, we welcome your questions, comments, and criticisms to help improve future editions. Please send your correspondence to the coordinates listed on the title page of this book.

Carriers

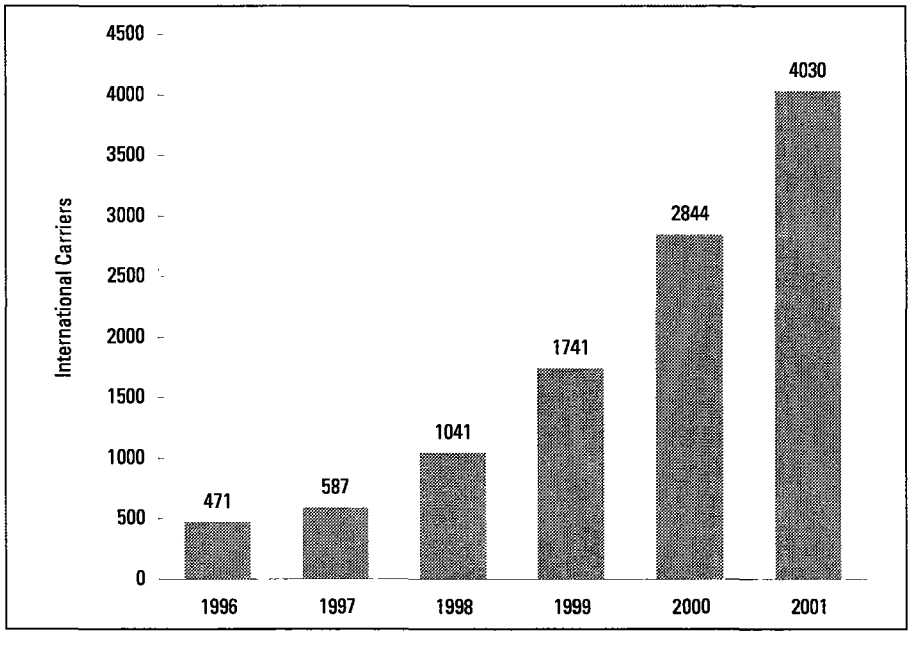
The Growth of International Carrier Competition

Slower Growth in Competition

As of July 2001, more than 4,000 companies worldwide were authorized to build facilities to offer international telephone service. Four years before, there were less than 600 (see Figure 1. Global Growth of International Carriers, July 1996-July 2001). But the rate of growth has slowed to 42 percent in 2001 from an average of 57 percent between 1996 and 2000. To most observers, this will come as no surprise. Access to start-up capital has become increasingly scarce over the last 12 months, and many existing carriers have fallen out of favor with investors. In fact, five of the top ten U.S. international carriers went out of business in 2000.

One might assume that closing the door to capital would further impede new entrants, but this isn't the whole story. Many new carriers do not own extensive submarine cable capacity and switching assets, so their start-up costs can be minimal. Furthermore, bankruptcy-induced network fire sales are making it cheaper than ever to buy a network. Also, there are still many markets that have only recently opened to competition (e.g., Argentina, Singapore, Taiwan), and others that are about to explode (e.g.,

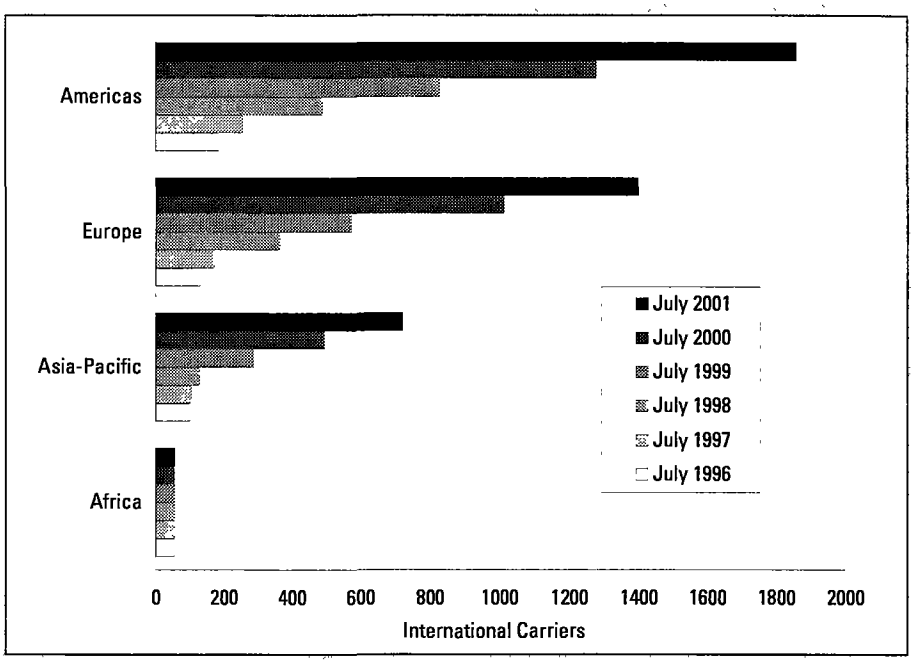
Figure 1. Global Growth of International Carriers, July 1996-July 2001



Notes: Figures include all carriers authorized to provide international facilities-based service or international simple resale (ISR).

Source: TeleGeography research

Figure 2. Regional Growth of Licensed International Carriers, 1996-2001



Notes: Figures include all carriers authorized to provide international facilities-based service or international simple resale (ISR).

Source: TeleGeography research

Brazil, China, India). So, although stock markets continue to be inhospitable hosts for international carriers, we expect the growth of competition to remain steady for the coming year.

The New Breed of Virtual Carrier

In total, the facilities-based carriers which started business since 1989 now carry 31% of the world's international telephone traffic (see the "Overview of International Traffic Trends" in the Traffic Analysis section below). The relationship between the network builders and the swarm of "virtual" carriers—which repackage the facilities and services of network builders—is one of symbiosis. New market entrants, while they represent a competitive threat, can also be the incumbent's best customers. And, in some cases, new specialist wholesale carriers are serving up their facilities in the other direction—to established carriers that are encumbered by marketing expenses and bureaucratic processes.

Both facilities-based and virtual carriers alike are always on the hunt for new ways to cut prices without shrinking profit margins. The latest development in alternative traffic routing is creating a new kind of packet-switched symbiosis. Once the network builders determine how to send commercial grade traffic on IP networks reliably and how to devise a way to settle accounts properly, the ranks of international carriers will swell even more rapidly. Indeed, IP connectivity may lead to unregulated international carriers on virtually every street corner, in every corner of the world.

Figure 3. Countries with International Telephone Service Competition

		Number of Authorized International Carriers					
Rank	Country	July 2001	July 2000	July 1999	July 1998	July 1997	July 1996
1.	United States	1,600	1,100	679	393	175	115
2.	United Kingdom	410	306	215	144	100	65
3.	Hong Kong	225	150	80	4	1	1
4.	Japan	185	115	50	13	3	3
5.	Canada	130	75	49	21	21	19
6.	Germany	130	90	40	32	1	1
7.	France	125	89	50	29	1	1
8.	Italy	125	90	15	9	1	1
9.	Netherlands	85	60	30	23	3	1
10.	Singapore	85	40	1	1	1	1
11.	Switzerland	70	50	40	21	1	1
12.	Australia	59	40	28	14	10	8
13.	Norway	57	35	14	7	1	1
14.	Austria	54	40	17	13	1	1
15.	Ireland	53	40	25	5	3	3
16.	Denmark	52	45	18	11	9	7
17.	Spain	52	30	16	9	1	1
18.	Korea, Rep.	50	40	24	3	2	2
19.	Sweden	40	26	16	13	11	9
20.	Finland	36	20	8	8	8	8
21.	Russia*	30	30	30	1	1	1
22.	Belgium	28	21	18	11	1	1
23.	Peru	28	22	18	1	1	1
24.	New Zealand	27	21	19	11	9	9
25.	Portugal	21	15	1	1	1	1
26.	Mexico	19	16	16	15	9	1
27.	Luxembourg	15	10	4	1	1	1
28.	Iceland	14	8	3	1	1	1
29.	Philippines	12	12	12	12	9	9
30.	Chile	11	10	10	9	9	9
31.	El Salvador	10	10	10	10	1	1
32.	Guatemala	9	2	2	1	1	1
33.	Argentina	8	4	2	1	1	1
34.	Malaysia	5	5	5	5	5	5
35.	Taiwan	4	4	1	1	1	1
36.	Colombia	3	3	3	3	1	1
37.	Dominican Republic	3	3	3	3	3	3
38.	Ecuador	3	3	3	3	3	1
39.	Israel	3	3	3	3	3	1
40.	Kazakhstan	3	3	3	3	1	1
41.	Bermuda	2	2	2	2	2	2
42.	Brazil	2	2	2	1	1	1
43.	Brunei	2	2	2	2	2	2
44.	China	2	2	2	2	2	2
45.	Dominica	2	2	2	1	1	1
46.	Georgia	2	2	2	1	1	1
47.	Indonesia	2	2	2	2	2	2
48.	Nepal	2	2	1	1	1	1
49.	Ukraine*	2	2	2	2	2	2
50.	Greece	2	1	1	1	1	1

* Estimates include Russian and Ukrainian carriers authorized to provide service only in certain municipalities.

Notes: Figures include all carriers licensed to provide facilities-based international service or International Simple Resale as of July 1 for each year.

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
Argentina												
Telefónica Larga Distancia de Argentina												54.5
Telecom International												45.5
Australia												
Telstra			100.0	98.0	87.0	76.3	73.4	62.0	55.0	49.0	49.5	38.9
Optus				2.0	13.0	21.9	23.4	27.0	26.0	22.0	21.9	21.7
Primus									3.0	4.0	5.0	13.2
AAPT									11.0	13.4	13.6	12.7
WorldCom												6.0
Teleglobe										4.4	4.4	5.4
Others						1.8	3.2	11.0	5.0	7.2	5.6	2.1
Austria												
Telekom Austria									100.0	95.0	65.3	48.0
UTA Telekom										1.5	6.1	12.7
Cable & Wireless											5.7	9.8
Tele2											5.0	6.7
Others										3.5	14.0	22.9
Belgium												
Belgacom									100.0	87.0	81.0	69.6
WorldCom												9.8
Others										13.0	19.0	20.5
Brazil												
EMBRATEL											100.0	90.7
Intelig												9.3
Canada*												
Bell Canada											27.0	26.0
AT&T Canada					1.0	5.0	8.0	9.0	10.0	14.0	19.0	21.0
Sprint Canada							15.0	21.0	17.0	18.0	19.0	14.0
Teleglobe	29.0	30.0	30.0	31.0	29.0	33.0	30.0	23.0	26.0	24.0	17.0	16.0
Telus											6.0	8.0
Primus											9.0	9.0
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	3.0	6.0
Chile*												
CTC Mundo				<1.0	17.5	31.2	31.0	31.5	33.0	35.0	33.0	31.7
ENTEL Chile			100.0	80.0	57.5	40.0	40.6	37.3	33.0	31.0	31.0	29.2
Chile Sat				20.0	25.0	19.7	19.4	15.2	17.0	13.0	15.0	16.5
BellSouth Chile						6.6	6.8	10.0	10.0	10.0	10.4	12.5
TransAm							<1.0	2.8	3.0	3.0	3.0	3.2
FirstCom Long Distance						1.2	<1.0	2.8	3.0	5.0	2.7	1.9
Others							<1.0	<1.0	<1.0	3.0	5.0	5.0
Colombia												
Telecom Colombia									100.0	88.0	57.9	50.8
Orbitel										7.0	18.2	22.2
ETB										5.0	15.9	18.3
Others											8.0	8.7

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.

*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.

*Chile: CTC Mundo/Globus market shares prior to 1998 merger aggregate CTC Mundo and Globus (formerly VTR) traffic.

Source: TeleGeography research

Country/Carrier	Percentage of Outgoing Minutes											
	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Denmark												
Tele Danmark							100.0	92.5	84.4	67.5	55.3	47.2
Tele2								4.0	6.6	12.4	13.2	13.3
Telia								3.5	6.3	9.9	10.7	9.1
Interoute											3.7	8.1
Equant											6.6	7.9
Others									2.7	10.3	10.5	14.6
Dominican Republic												
CODETEL				100.0	90.0	85.8	83.0	77.0	73.8	72.2	78.1	77.4
Tricom						6.7	7.5	12.8	12.9	15.5	14.2	15.5
AACR						7.5	9.5	10.2	13.3	12.3	7.7	7.1
Finland*												
Sonera					100.0	90.0	72.8	66.0	58.9	54.7	54.0	49.3
Finnet International						5.0	19.1	24.2	28.2	28.0	25.7	26.9
Song Networks						3.0	7.7	8.8	9.3	12.0	8.6	8.5
RSL Com											5.6	6.4
Others						2.0	0.4	0.9	3.5	5.2	6.0	8.8
France												
France Telecom									100.0	93.0	85.0	67.6
Cegetel										1.9	8.4	13.3
Siris												4.8
Teleglobe										3.6	4.4	4.6
WorldCom												4.0
Cable & Wireless												3.1
Others										<1.0	2.2	2.8
Germany												
Deutsche Telekom									100.0	80.3	58.0	47.3
WorldCom										1.8	6.4	10.1
Primus											3.7	5.9
COLT											3.3	5.2
Viag Interkom										1.4	3.0	4.7
Cable & Wireless											2.6	4.1
Teleglobe										1.8	2.1	3.5
Arcor										1.0	1.8	2.9
Telia											1.4	2.1
Others										13.7	17.7	14.1
Hong Kong												
PCCW Hong Kong Telecom									100.0	90.0	61.3	55.3
New World Telephone										2.0	14.3	14.6
New T&T Hong Kong										2.0	12.0	13.0
WorldCom												5.8
Teleglobe											5.1	5.4
Others										6.0	7.3	5.9
Indonesia												
PT Indosat					100.0	99.5	95.4	88.5	84.8	88.3	86.5	89.2
PT Satelindo						0.5	4.6	11.5	15.2	11.7	13.5	10.8
Ireland												
Eircom								100.0	91.0	78.0	73.8	75.0
WorldCom									3.0	3.0	6.5	10.6
Esat Telecommunications									5.0	8.0	9.9	8.3
Teleglobe											2.0	2.1
Others									1.0	11.0	7.8	4.0
Israel												
Bezeq								100.0	72.5	51.4	45.9	42.5
Barak ITC									15.0	24.8	30.0	26.9
Golden Lines									12.5	23.7	24.1	22.3
Others												8.3

Notes: See page 20.

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

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
Italy*												
Telecom Italia									100.0	88.6	80.9	65.4
Infostrada/Wind										4.5	8.3	10.9
Albacom										1.0	1.3	8.0
Cable & Wireless												6.1
Teleglobe										3.8	3.5	5.5
Others										2.0	5.9	4.2
Japan*												
KDDI	93.3	88.0	73.3	69.7	66.9	66.3	66.2	63.9	62.7	58.0	51.1	36.9
C&W IDC	3.7	6.5	13.3	15.3	16.9	17.3	17.3	18.7	18.4	18.2	17.5	19.3
NTT Communications Corp.											1.2	17.5
Japan Telecom	3.0	5.5	13.4	15.0	16.2	16.4	16.5	17.5	19.0	18.3	17.4	14.1
WorldCom											4.9	7.8
Teleglobe											3.2	2.8
Others										5.5	4.7	1.6
Korea, Rep.												
Korea Telecom			100.0	79.9	74.5	68.7	72.6	73.5	69.0	66.6	59.5	51.9
DACOM Corporation				20.1	25.5	31.3	27.4	26.5	27.0	21.9	24.7	23.6
Onse Telecom									4.0	11.5	15.8	15.3
Others												9.2
Malaysia												
Telekom Malaysia							100.0	90.0	80.0	77.0	58.5	57.3
Maxis Communications										7.6	11.2	14.9
Celcom								8.0	11.0	10.0	14.5	8.4
TIME Telekom										5.0	8.7	8.3
Digi Telecommunications											7.2	5.1
Others								2.0	9.0	<1.0	<1.0	6.0
Mexico												
Telmex								100.0	83.0	78.0	68.0	62.8
Alestra									8.5	10.5	16.0	18.6
Avantel									7.5	8.5	10.0	11.9
Teleglobe											2.0	1.9
Others									1.0	3.0	4.0	4.8
Netherlands												
PTT Telecom Netherlands (KPN)								100.0	95.0	84.9	68.3	57.8
Telfort											16.8	19.4
WorldCom											5.4	10.8
Primus												3.5
Cable & Wireless												2.2
Teleglobe											1.4	2.1
Others									5.0	15.1	8.1	4.2
Norway												
Telenor									100.0	93.5	73.0	71.8
Tele2											7.0	7.0
Facilicom											6.0	6.0
Enitel										5.0	5.0	5.0
Others										1.5	9.0	10.2
Philippines*												
PLDT			100.0	91.6	84.2	69.0	68.0	79.0	73.0	69.0	59.2	62.1
Globe Telecom								2.0	7.0	8.6	17.6	14.6
Digitel								2.0	3.0	4.3	5.8	6.0
Eastern Telecommunications						7.0	6.0	5.0	7.0	6.4	4.0	5.6
Bayan Tel							<1.0	4.0	5.0	5.7	5.5	5.5
Capitol Wireless						<1.0	<1.0	1.0	1.0	3.5	4.6	3.7
Philippine Global Communications				8.4	15.8	23.0	23.0	6.0	3.0	1.1	1.8	1.5
Islacom								<1.0	<1.0	<1.0	1.4	1.1
Others						1.0	3.0	1.0	1.0	1.0	<1.0	<1.0

Notes: See page 20.

*Italy: Wind and Infostrada were merged in 2001.

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

*Philippines: PLDT market shares include Smart Communications traffic prior to 1999 acquisition.

Source: TeleGeography research

Country/Carrier	Percentage of Outgoing Minutes											
	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Portugal												
Companhia Portuguesa Radio Marconi											100.0	83.3
Cable & Wireless												8.6
Maxitel												4.2
Jazztel												2.0
Others												1.9
Spain												
Telefónica									100.0	90.5	86.0	77.2
Cable & Wireless												4.1
Retevisión										4.5	6.9	3.9
Teleglobe											2.0	3.1
Lince											2.3	2.3
Others										5.0	2.8	9.3
Sweden												
Telia				100.0	92.0	87.0	76.0	69.0	66.0	62.0	53.0	50.1
Tele2					8.0	13.0	21.0	22.0	22.0	24.0	18.0	13.7
WorldCom											4.0	13.0
RSL Com											8.0	6.1
Telenordia											7.0	4.6
World Access											4.0	3.4
Teleglobe											2.0	2.8
Others							3.0	9.0	12.0	14.0	4.0	6.3
Switzerland*												
Swisscom									100.0	93.5	82.7	64.2
Sunrise										3.7	11.8	22.0
WorldCom												6.4
Cable & Wireless												4.6
Others										2.8	5.5	2.8
Taiwan												
Chunghwa Telecom											100.0	91.2
Others												8.8
United Kingdom*												
BT	91.0	86.0	81.0	76.8	74.2	68.6	67.7	60.0	54.9	51.6	39.7	39.4
Cable & Wireless	9.0	14.0	19.0	23.2	24.0	28.1	25.8	26.8	30.3	32.2	31.3	30.2
WorldCom								6.6	5.1	5.1	10.0	11.8
Teleglobe										4.2	4.8	5.6
Energis Carrier Services												4.5
Primus												3.5
Telia												2.1
Others					1.8	3.3	6.5	6.6	9.7	6.9	14.2	7.1
United States*												
WorldCom	10.2	14.6	17.8	21.2	25.4	28.6	32.0	32.9	31.2	28.8	28.0	33.0
AT&T Corp.	83.3	78.4	74.8	70.3	62.2	60.1	54.3	50.2	44.7	39.6	36.5	25.7
Sprint	5.8	6.4	6.3	7.3	10.3	11.1	11.3	13.2	12.0	11.7	12.5	10.4
World Access									2.9	5.1	3.9	4.8
Teleglobe USA									1.3	3.3	4.8	4.0
Viatel									0.3	0.8	3.0	3.0
Primus									0.3	0.5	2.9	2.9
Star Telecommunications									0.5	1.8	2.7	2.6
Startec Global Communications										0.1	0.7	1.1
RSL Communications										0.9	1.3	1.0
Others	0.7	0.7	1.1	1.2	2.1	0.2	2.4	3.7	6.8	7.4	3.3	11.5

Notes: See page 20.

* *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. WorldxChange market shares include ACC Long Distance prior to 1999 acquisition.

* United States: Market shares for U.S. carriers prior to 1993 exclude traffic to Canada and Mexico. WorldCom market shares prior to 1998 merger aggregate MCI and WorldCom traffic. World Access market shares include Facilicom traffic prior to 1999 merger.

Source: TeleGeography research

Top 40 International Carriers

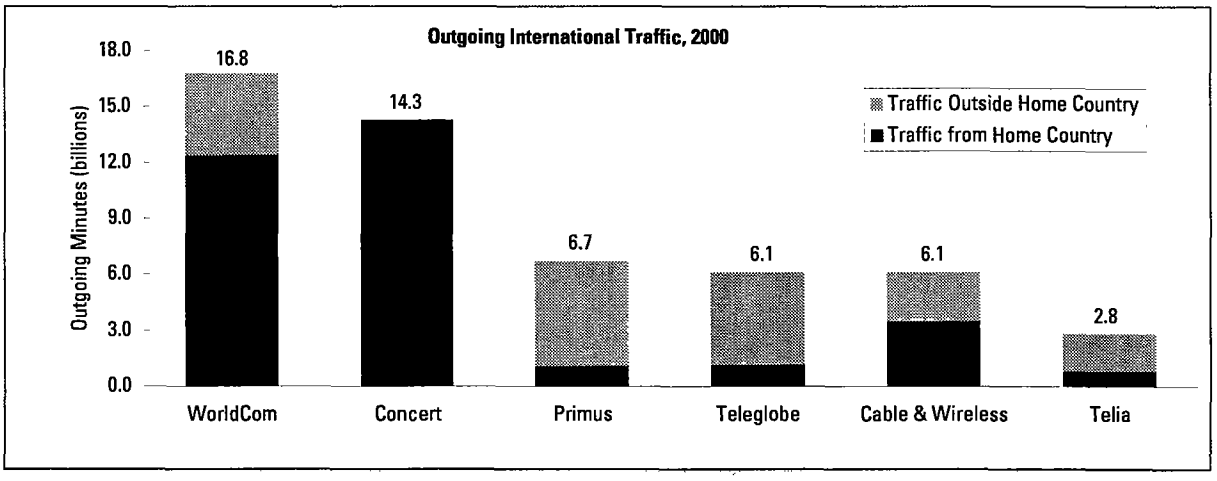
Rank	Company	Origin Country	Outgoing Traffic (millions of minutes) 2000	1999	Change '99-'00	2000 Revenue (US$ billions) Total	Int'l Service
1.	WorldCom	United States	12,399.5	8,294.9	49.5%	39.1	6.8
2.	AT&T Corp.	United States	9,680.1	10,816.5	-10.5%	66.0	5.4
3.	BT*	United Kingdom	4,559.3	4,029.1	13.2%	45.0	n.a.
4.	Deutsche Telekom	Germany	4,525.0	4,385.0	3.2%	37.9	0.8
5.	France Télécom	France	4,393.0	4,390.0	0.1%	31.1	1.1
6.	Sprint	United States	3,922.8	3,714.4	5.6%	23.6	1.2
7.	Cable & Wireless*	United Kingdom	3,487.6	2,528.9	37.9%	6.0	n.a.
8.	Telecom Italia	Italy	2,706.0	2,390.0	13.2%	26.0	3.7
9.	China Telecom	China	2,050.0	1,950.0	5.1%	20.8	n.a.
10.	Swisscom	Switzerland	2,050.0	2,259.0	-9.3%	8.4	0.2
11.	Telefónica	Spain	1,985.0	1,665.0	19.2%	26.4	4.2
12.	Bell Canada	Canada	1,900.0	1,600.0	18.8%	15.8	n.a.
13.	PCCW Hong Kong Telecom*	Hong Kong	1,701.6	1,668.3	2.0%	0.9	0.7
14.	PTT Telecom (KPN)	Netherlands	1,636.0	1,625.0	0.7%	12.5	1.4
15.	AT&T Canada	Canada	1,524.8	1,113.0	37.0%	1.0	n.a.
16.	Teleglobe U.S.	United States	1,517.7	1,430.0	6.1%	2.3	n.a.
17.	WorldCom U.K.	United Kingdom	1,447.3	1,015.0	42.6%	39.1	n.a.
18.	Sprint Canada	Canada	1,445.0	1,130.0	27.9%	1.3	n.a.
19.	Singapore Telecom*	Singapore	1,440.0	1,350.0	6.7%	2.9	0.7
20.	Belgacom	Belgium	1,277.6	1,288.0	-0.8%	4.8	0.5
21.	Saudi Telecom	Saudi Arabia	1,194.9	1,060.0	12.7%	n.a.	n.a.
22.	Telmex	Mexico	1,183.1	1,063.1	11.3%	10.8	1.2
23.	Teleglobe Canada	Canada	1,180.9	1,130.0	4.5%	2.3	n.a.
24.	Etisalat	United Arab Emirates	1,123.6	963.0	16.7%	n.a.	n.a.
25.	Primus	United States	1,082.5	868.5	24.6%	1.2	n.a.
26.	Chunghwa Telecom	Taiwan	1,058.4	949.3	11.5%	8.9	n.a.
27.	Telstra*	Australia	1,030.0	1,046.0	-1.5%	13.5	0.5
28.	WorldCom Germany	Germany	964.7	485.0	99.0%	39.1	n.a.
29.	KDDI	Japan	950.0	1,000.0	-5.0%	10.7	n.a.
30.	Rostelecom	Russia	944.0	928.2	1.7%	0.6	0.3
31.	Eircom*	Ireland	936.9	749.1	25.1%	2.0	n.a.
32.	Cegetel	France	867.2	435.0	99.0%	4.8	n.a.
33.	Telia	Sweden	822.0	725.0	13.4%	5.9	n.a.
34.	OTE	Greece	793.2	725.7	9.3%	3.3	0.4
35.	Türk Telekomünikasyon	Turkey	731.8	698.4	4.8%	n.a.	n.a.
36.	Telekom Austria	Austria	724.0	852.5	-15.1%	3.6	n.a.
37.	Sunrise	Switzerland	702.0	320.0	119.0%	0.1	n.a.
38.	Teleglobe U.K.	United Kingdom	682.8	486.1	40.5%	2.3	n.a.
39.	Telekomunikacja Polska	Poland	675.8	624.0	8.3%	3.8	n.a.
40.	Telecom New Zealand*	New Zealand	651.0	590.6	10.2%	2.6	0.2

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: Concert (AT&T/BT), WorldCom, 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.

* Data are for the fiscal year ending March 31, 2001. Telstra's and Telecom New Zealand's fiscal year ends June 30, 2001.

Source: TeleGeography research, FCC, and company reports.

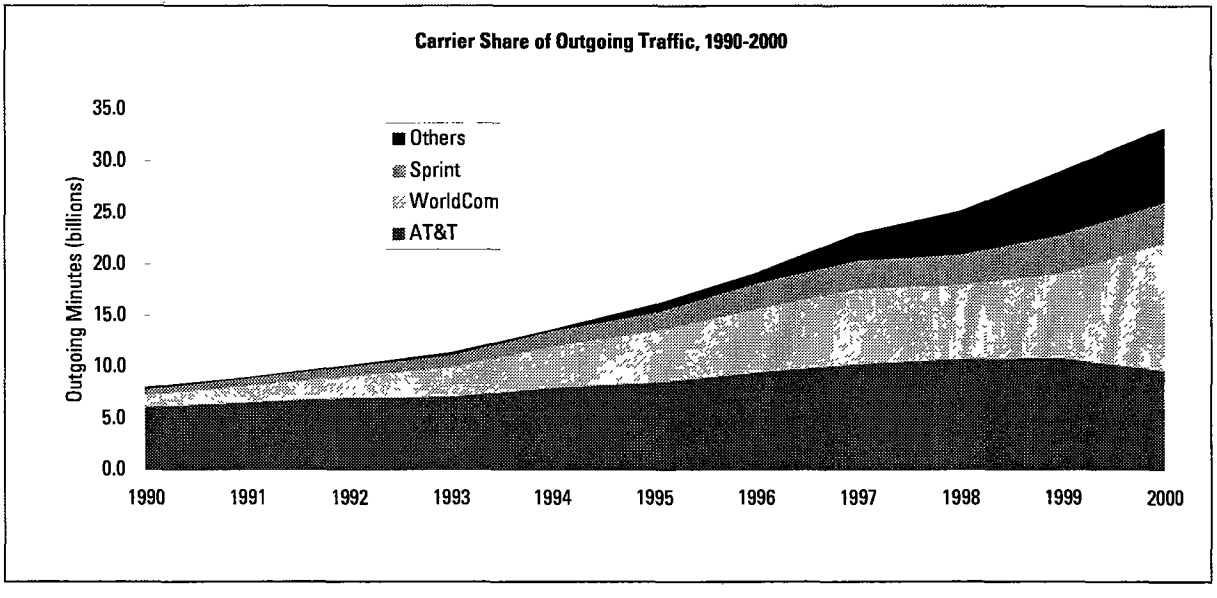
Traffic Base of Selected Multinational Carriers



Note: Figures represent total outbound international traffic, including some refile and transit traffic. Concert has two "home" countries, the U.S. and U.K.; approximately 32 percent of Concert traffic is from the U.K. Cable & Wireless figures include Cable & Wireless' European, Caribbean, and U.S. operations, as well as C&W IDC.

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.

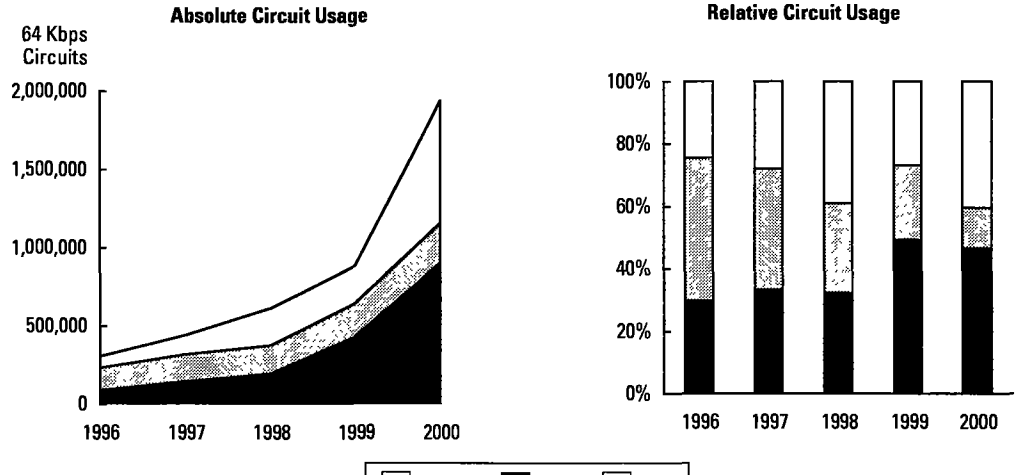
Source: TeleGeography research and FCC carrier filings

International Circuit Usage by U.S. Carriers

Each year, the U.S. Federal Communications Commission (FCC) releases aggregate circuit usage statistics based on reports filed by the three largest U.S. facilities-based carriers (AT&T, WorldCom, and Sprint). Although the rapid entry of new carriers reduces the relative importance of the top three carriers each year, the statistics are still useful for baseline comparisons along two axes. First, the data illuminates year-to-year growth trends in overall cable connectivity. Second, the statistics break down how much capacity is used for public switched telephone network (PSTN) traffic and international private lines (IPLs), as well as how much capacity is reported "idle" each year.

Although private lines can carry voice traffic, the circuit usage statistics provide a rough proxy for determining the balance of voice and data traffic on international networks connecting to the U.S. Assuming that increased IPL circuit deployment represents increased data traffic flows, the voice/data "crossover"—occurred sometime in 1998. Over the past six years, the PSTN's share of used capacity dropped from 83 to 22 percent. If the trend continues, public telephone lines may contribute only 14 percent of used capacity by next year.

Figure 1. International Circuit Usage Summary, 1996-2000



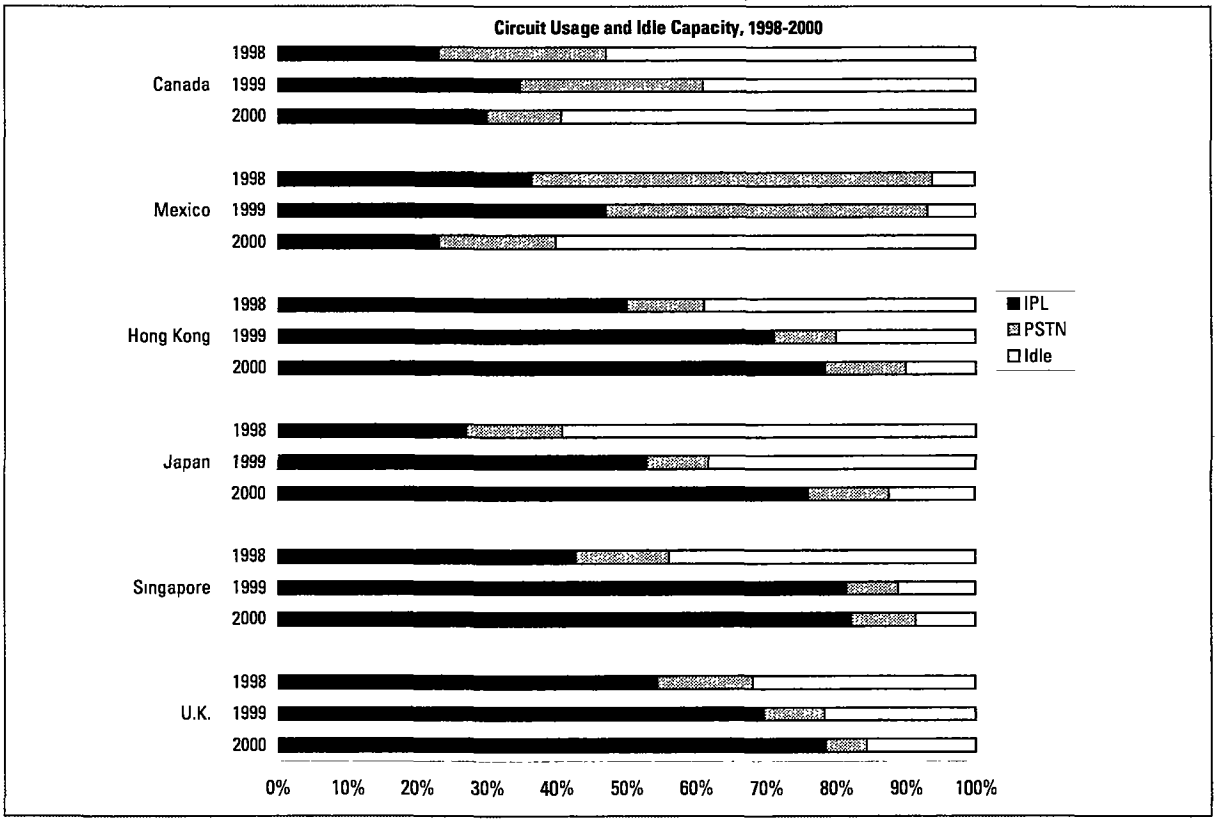
64 Kbps Circuit Usage

	IPL	PSTN	Idle	Total Available	Usage %
1996	91,362	140,518	74,762	306,642	75.6%
1997	147,408	170,717	123,751	441,876	72.0%
1998	198,369	177,049	241,052	616,470	60.9%
1999	436,134	211,569	238,763	886,466	73.1%
2000	903,282	252,077	784,164	1,939,523	59.6%

Source: FCC

Figure 2. International Circuit Usage for Selected Routes, 1998-2000

		U.S. Carrier 64 Kbps Circuit Usage				
		For Private Lines	For Public Switched Network	Total Circuits In Use	Idle Circuits	Total Available
Canada	1998	53,302	54,719	108,021	120,961	228,982
	1999	97,830	72,970	170,800	108,871	279,671
	2000	213,391	75,443	288,834	419,270	708,104
Mexico	1998	24,463	38,301	62,764	4,080	66,844
	1999	51,564	50,259	101,823	7,414	109,237
	2000	89,754	64,399	154,153	230,957	385,110
Hong Kong	1998	4,685	1,027	5,712	3,623	9,335
	1999	7,362	924	8,286	2,065	10,351
	2000	9,669	1,412	11,081	1,238	12,319
Japan	1998	11,907	6,098	18,005	26,042	44,047
	1999	39,057	6,401	45,458	28,120	73,578
	2000	58,696	8,830	67,526	9,528	77,054
Singapore	1998	1,959	608	2,567	1,999	4,566
	1999	7,130	638	7,768	973	8,741
	2000	7,266	818	8,084	749	8,833
United Kingdom	1998	47,410	11,818	59,228	27,671	86,899
	1999	110,009	13,695	123,704	34,100	157,804
	2000	306,126	22,711	328,837	60,800	389,637



Notes: Data based on year-end FCC circuit status reports filed by AT&T, WorldCom, and Sprint for circuits originating in the continental U.S. as well as Puerto Rico, Guam, and other U.S. territories. "Idle" circuits are owned by a carrier at year end but not in use. The FCC estimates that 25-30 percent of total submarine cable capacity landed in the U.S. is controlled by foreign carriers and thus not reported here.

Source: FCC

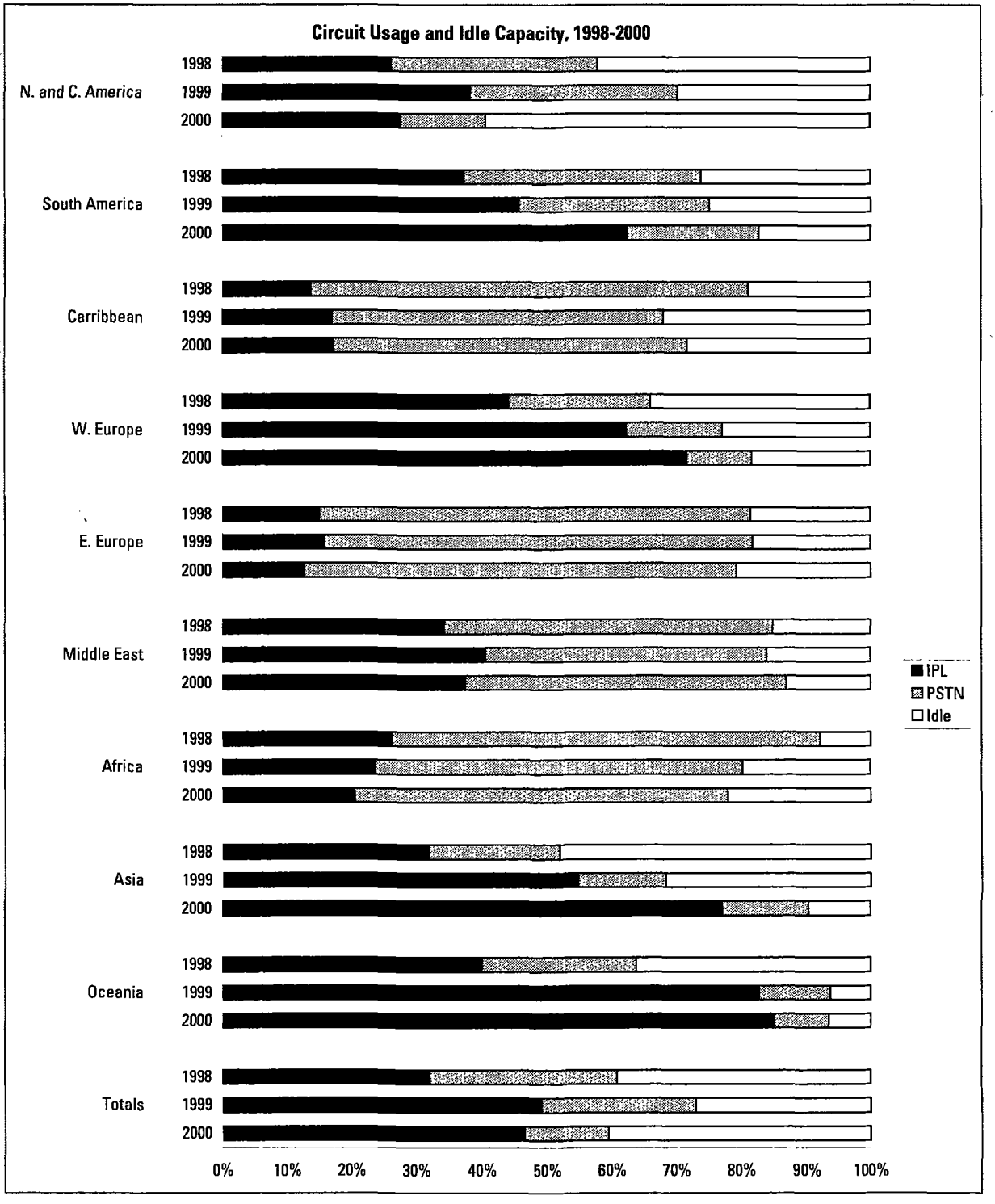
Figure 3. International Circuit Usage by Region, 1998-2000

		U.S. Carrier 64 Kbps Circuit Usage				
		For Private Lines	For Public Switched Network	Total Circuits In Use	Idle Circuits	Total Available
N. and C. America	1998	78,601	94,952	173,553	126,197	299,750
	1999	150,736	125,299	276,035	116,653	392,688
	2000	304,714	142,175	446,889	650,754	1,097,643
South America	1998	7,958	7,716	15,674	5,536	21,210
	1999	12,301	7,882	20,183	6,670	26,853
	2000	28,308	9,172	37,480	7,782	45,262
Caribbean	1998	1,439	7,026	8,465	1,977	10,442
	1999	2,192	6,520	8,712	4,068	12,780
	2000	2,438	7,636	10,074	3,970	14,044
W. Europe	1998	69,051	34,133	103,184	52,937	156,121
	1999	163,767	38,705	202,472	59,880	262,352
	2000	381,844	53,027	434,871	97,240	532,111
E. Europe	1998	1,004	4,418	5,422	1,231	6,653
	1999	1,162	4,828	5,990	1,330	7,320
	2000	1,023	5,319	6,342	1,653	7,995
Middle East	1998	1,920	2,807	4,727	844	5,571
	1999	2,749	2,934	5,683	1,085	6,768
	2000	2,482	3,253	5,735	860	6,595
Africa	1998	1,080	2,712	3,792	320	4,112
	1999	1,104	2,634	3,738	917	4,655
	2000	1,048	2,912	3,960	1,120	5,080
Asia	1998	30,563	19,262	49,825	45,915	95,740
	1999	80,707	19,932	100,639	46,536	147,175
	2000	144,980	24,959	169,939	18,007	187,946
Oceania	1998	6,753	4,023	10,776	6,095	16,871
	1999	21,392	2,835	24,227	1,624	25,851
	2000	36,421	3,624	40,045	2,778	42,823
Totals	1998	198,369	177,049	375,418	241,052	616,470
	1999	436,134	211,569	647,703	238,763	886,466
	2000	903,282	252,077	1,155,359	784,164	1,939,523

Notes: Data based on year-end FCC circuit status reports filed by AT&T, WorldCom, and Sprint for circuits originating in the continental U.S. as well as Puerto Rico, Guam, and other U.S. territories. "Idle" circuits are owned by a carrier at year end but not in use. The FCC estimates that 25-30 percent of total submarine cable capacity landed in the U.S. is controlled by foreign carriers and thus not reported here.

Source: FCC

Figure 4. Idle Circuits of U.S. Carriers by Region, 1998-2000



Notes: Data based on year-end FCC circuit status reports filed by AT&T, WorldCom, and Sprint for circuits originating in the continental U.S. as well as Puerto Rico, Guam, and other U.S. territories. "Idle" circuits are owned by a carrier at year end but not in use. The FCC estimates that 25-30 percent of total submarine cable capacity landed in the U.S. is controlled by foreign carriers and thus not reported here.

Source: FCC

Pricing

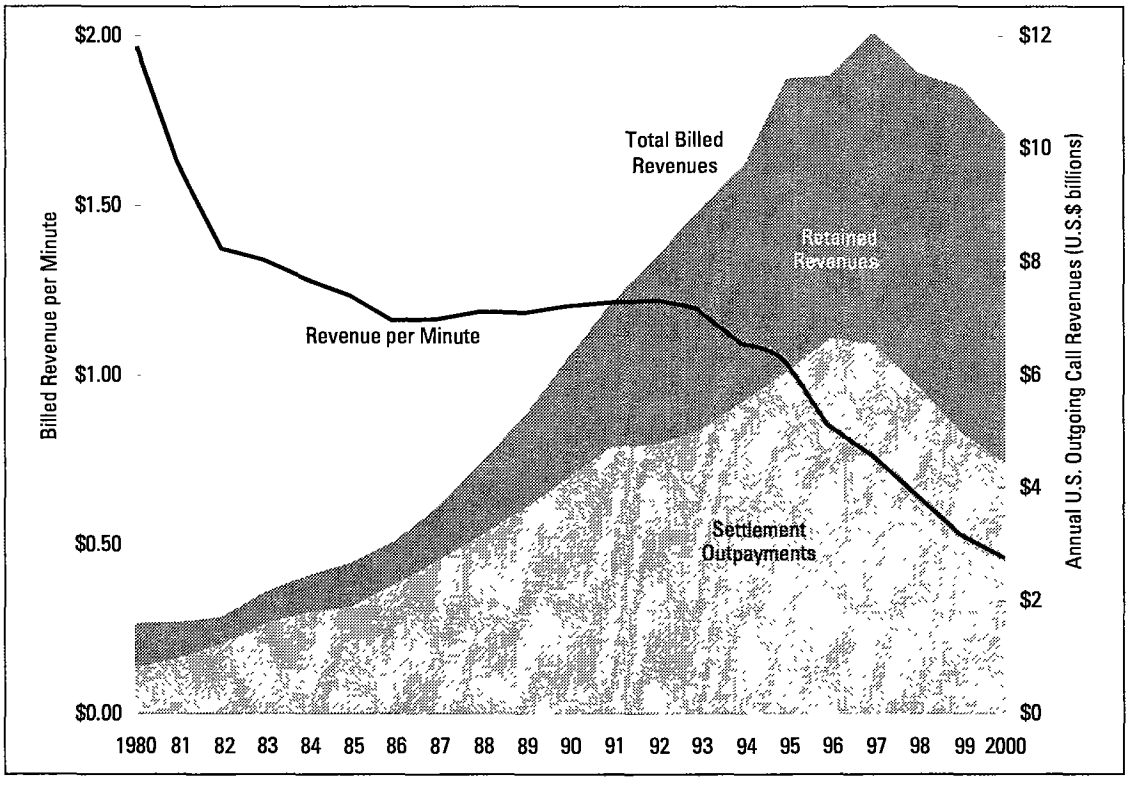
PRICING

Overview of International Pricing Trends

For many years now, observers have predicted the "death of distance" for the international telecom service market. According to their theory, both the cost to carriers of sending an international call and the price they hand down to consumers for this service would soon fall to the point that service providers would no longer charge on a per call basis. Instead, like email sent over the Internet, customers would pay a monthly subscription fee and make as many calls as they wished. Carriers would no longer bother with careful tracking of where these calls traveled, or even how many calls were made.

Average call prices and costs have indeed drifted predictably—some might say monotonously—downward (see Figure 1. U.S. Carrier Revenues and Settlement Outpayments, 1980-2000). Yet, just under the calm surface, a number of turbulent currents are shaping the industry. These include the end of "one country, one rate" settlement schemes and price instability on gray market routes. The following analysis explores

Figure 1. U.S. Carrier Revenues and Settlement Outpayments, 1980-2000



Note: Excludes calls to Canada and Mexico.

Source: FCC carrier filings and TeleGeography research

Figure 2. U.S. Carrier Revenues for International Voice Service, 1997 and 2000

	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
1997									
AT&T	8,077.0	3,754.5	4,322.6	1,305.4	5,628.0	0.78	0.36	0.42	0.13
MCI & WorldCom	4,734.4	2,817.9	1,916.4	817.7	2,734.2	0.65	0.39	0.26	0.11
Sprint	1,455.8	992.3	463.5	341.6	805.1	0.53	0.36	0.17	0.12
Top 3 Total	**14,267.2**	**7,564.7**	**6,702.5**	**2,464.7**	**9,167.3**	**0.70**	**0.37**	**0.33**	**0.12**
2000									
AT&T	5,395.5	1,829.4	3,566.1	511.6	4,077.7	0.56	0.19	0.37	0.11
WorldCom	6,814.9	2,559.8	4,255.1	636.7	4,891.9	0.55	0.21	0.34	0.12
Sprint	1,181.0	594.1	586.9	197.6	784.5	0.30	0.15	0.15	0.10
Top 3 Total	**13,391.4**	**4,983.3**	**8,408.1**	**1,345.9**	**9,754.0**	**0.52**	**0.19**	**0.32**	**0.11**
Change 1997-2000									
AT&T	-33%	-51%	-18%	-61%	-28%	-29%	-48%	-12%	-12%
WorldCom	44%	-9%	122%	-22%	79%	-16%	-47%	30%	4%
Sprint	-19%	-40%	27%	-42%	-3%	-43%	-58%	-11%	-22%
Top 3 Total	**-6%**	**-34%**	**25%**	**-45%**	**6%**	**-26%**	**-48%**	**-2%**	**-8%**

Note: This table breaks down international voice service revenue for the three largest U.S. international carriers. In 2000, for example, AT&T collected $5.4 billion from customers for U.S. international outgoing calls and paid foreign carriers $1.8 billion to terminate those calls. Thus, the company gained $3.6 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 ($512 million) on foreign settlement inpayments, netting $4.1 billion on international voice service.

Source: FCC carrier filings and TeleGeography research

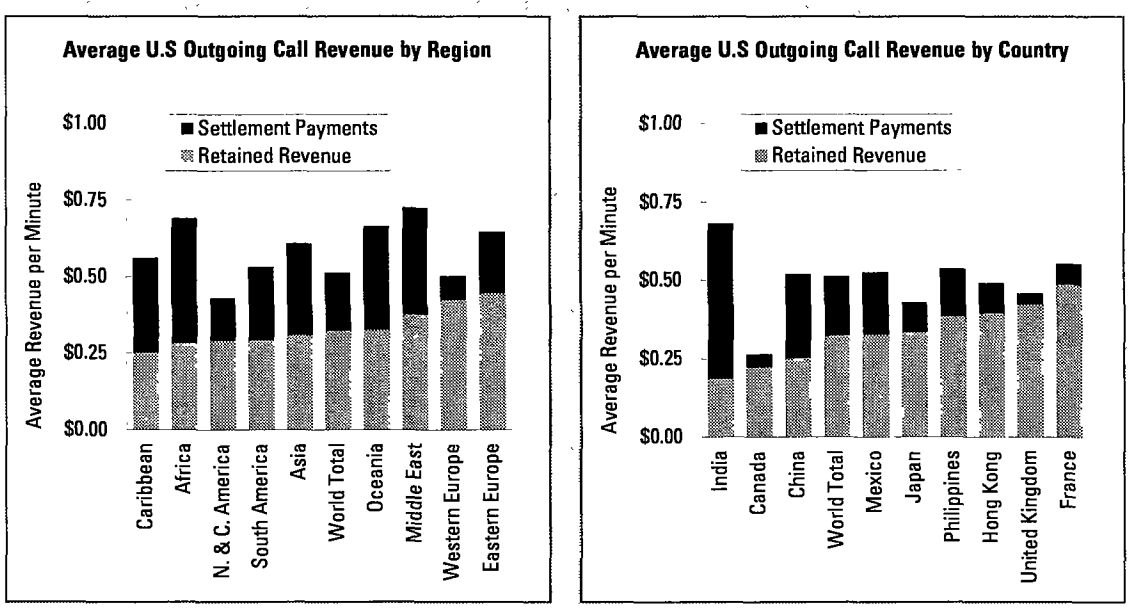
why carrier costs are falling, how the interconnect fee system is evolving into a multi-tiered structure, where price instability exists, and why these trends will affect wholesale and retail customers.

Race to the Bottom

The international call sector was once the cash cow for national telco monopolies. As governments have dismantled regulatory restrictions and introduced more competition over the last decade, however, telcos have trimmed fat profit margins to the bone. To retain customers, carriers have been forced to lower the prices they charge for international calls. To counter the effects of the resulting revenue erosion, carriers have searched for ways to slash their costs. International carriers in most countries have been engaged in a furious race to determine which would fall faster: their revenues or their costs.

For many carriers, the effort at cost control appears to be winning the race—at least for now. Bandwidth costs have fallen by a spectacular 50 percent a year in many parts of the world, making it cheaper for carriers to deploy international circuits. Yet bandwidth

Figure 3. U.S. Carrier International Call Revenue by Destination, 2000



Note: Data show wholesale prices from the Band-X London switch to fixed and mobile dialing codes in European destinations. Ranked from most to least expensive as of August 2001, the fixed destinations include Finland, Italy, France, Belgium, Switzerland, Germany, Spain, Denmark, Netherlands, Ireland, and Sweden. Calls to mobile phones are for the same country destinations, ranked as follows from the most to least expensive as of August 2001: Belgium, Netherlands, Denmark, Germany, Sweden, Spain, Switzerland, Ireland, Italy, Finland, and France.

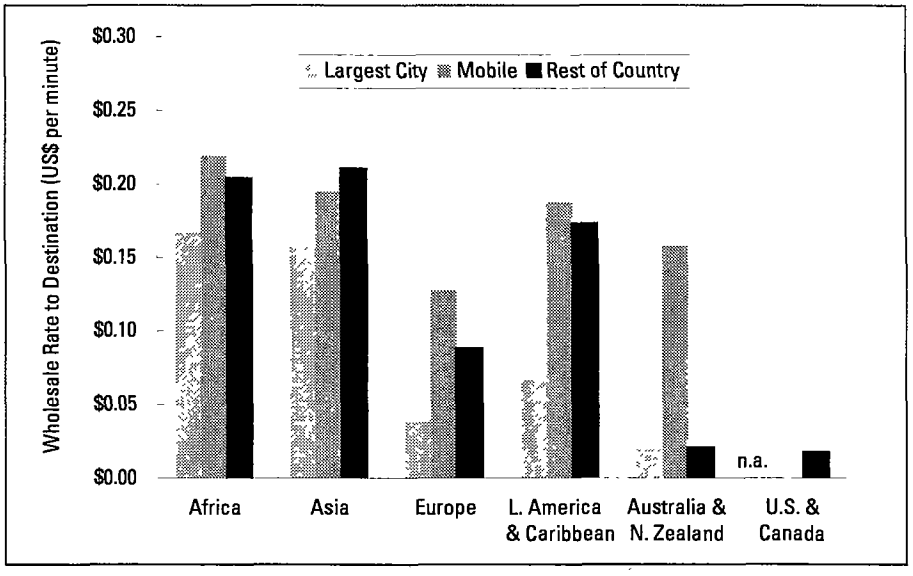
Source: Band-X Ltd.

costs have been in decline for many years and rarely account for more than one percent of international call costs. Far more important to international carriers are settlement payments—the fees they must pay to foreign telcos to send calls to their final destinations. Luckily for carriers generating high international traffic volumes, settlement rates and other interconnect fees are also on the decline. Average prices for the largest three U.S. carriers, for example, fell from $0.70 per minute in 1997 to $0.52 per minute in 2000, but revenue after settlement outpayments to foreign carriers declined by a mere penny—thanks in large part to falling interconnect costs (see Figure 2. U.S. Carrier Revenues for International Voice Service, 1997 and 2000). Despite recent declines, these costs still eat nearly half of call revenues on most routes (see Figure 3. U.S. Carrier International Call Revenue by Destination, 2000). That's good news for carriers, as it provides plenty of room for further cost cuts.

The Demise of "One Country, One Rate"

When the international settlement regime ruled, determining interconnection costs was relatively straightforward. A carrier would negotiate a per-minute settlement rate with carriers in each country to which it sent traffic. It did not matter if the call traveled to the most densely wired megalopolis or to the most remote hamlet; 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.

Figure 4. Wholesale Rates by Destination Type and Region, 2001



Note: Rates are from the Band-X London Switch as of August 2001. Wholesale rates to major cities and mobile destinations in the U.S. and Canada are not separate from rest-of-country prices.

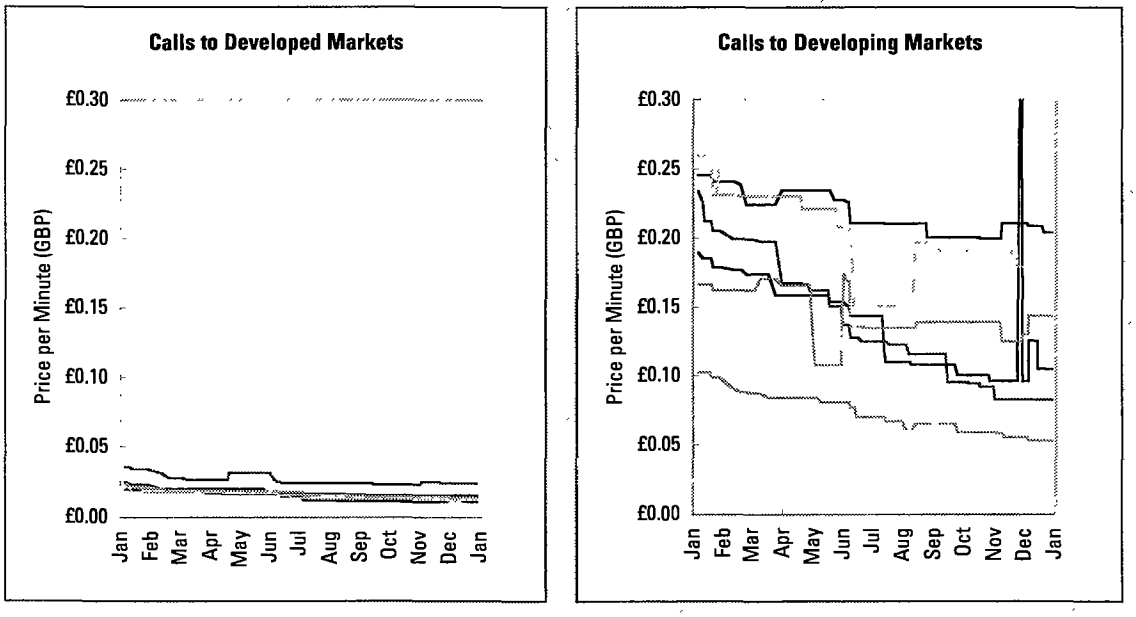
Source: Band-X Ltd.

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. 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. Thus, interconnect rates still matter—as traffic changes hands, so do termination payments.

The different options international carriers have to terminate their traffic is leading to a three-tiered fee structure for international calls (see Figure 4. Wholesale Rates by Destination Type and Region, 2001). The cheapest among these three tiers are calls to major cities. Large international carriers often have acquired relatively large amounts of capacity linking into their own network Points of Presence (PoPs) in major cities. Aside from network upkeep, the only other significant cost they must incur to complete an international call is a fee for interconnection to the Local Exchange Carrier (LEC).

At the middle tier are calls to fixed line telephones outside large city centers. While international carriers may establish PoPs in major cities, they rarely find it cost effective to wire every foreign municipality to their network. To complete calls travelling outside major cities, carriers must pay a domestic long distance provider a fee on top of the local termination charge.

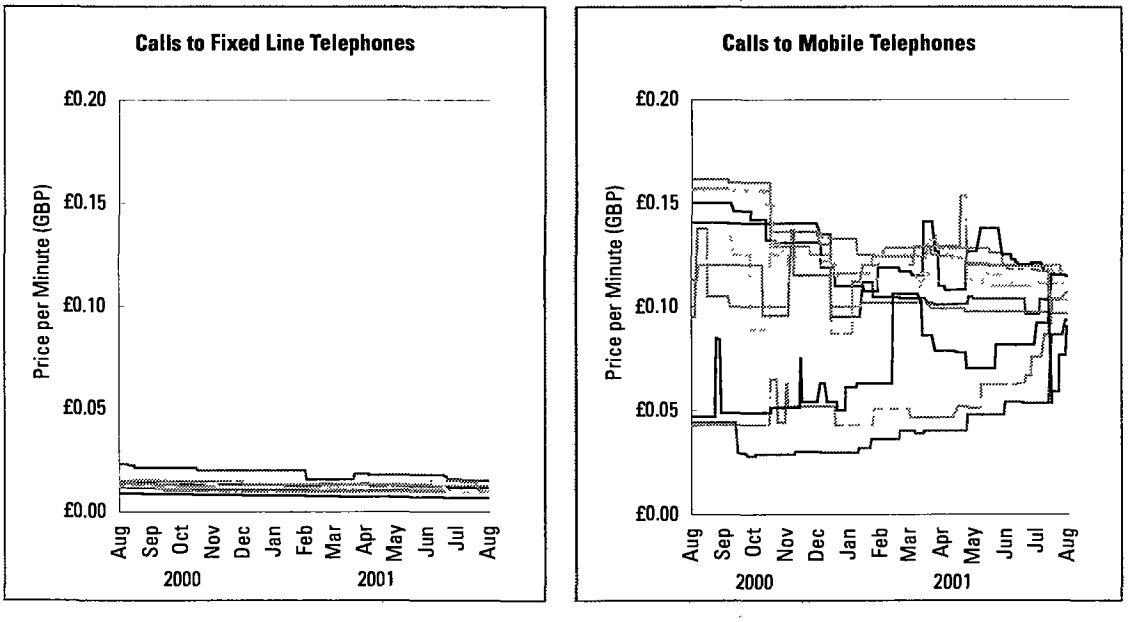
Figure 5. Call Prices to Developed versus Developing Country Markets, 2000



Note: Data show wholesale prices from the Band-X London switch. Ranked from most to least expensive as of December 31, 2000, the developed markets include Japan, Australia, Switzerland, Canada, the United States, and Germany. Ranked from most to least expensive as of December 31, 2000, the developing markets include Egypt, Somalia, Bolivia, Bahrain, Kuwait, and China.

Source: Band-X Ltd.

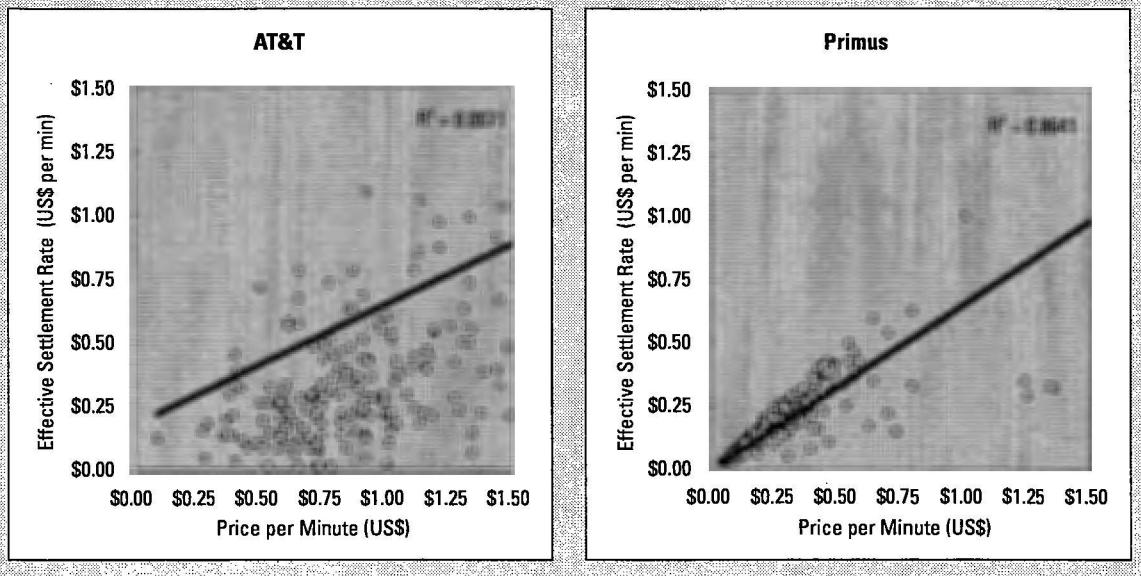
Figure 6. Call Prices to Fixed versus Mobile Telephones, 2000-2001



Note: Data show wholesale prices from the Band-X London switch to fixed and mobile dialing codes in European destinations. Ranked from most to least expensive as of August 2001, the fixed destinations include Finland, Italy, France, Belgium, Switzerland, Germany, Spain, Denmark, Netherlands, Ireland, and Sweden. Calls to mobile phones are for the same country destinations, ranked as follows from the most to least expensive as of August 2001: Belgium, Netherlands, Denmark, Germany, Sweden, Spain, Switzerland, Ireland, Italy, Finland, and France.

Source: Band-X Ltd.

Figure 7. Relationship between Effective Settlement Rate and Price per Minute, 2000



Note: Each point represents the price per minute charged and settlement paid to a single country. Price per minute reflects average billed revenues per minute. Effective settlement rate reflects total settlement outpayments per minute to a country.

Source: FCC carrier filings and TeleGeography research

Calls to mobile phones stand at the peak of the new international rate structure. Worldwide mobile subscribership continues to grow at spectacular rates—averaging 51 percent per year for the past five years. To help fund aggressive cellular buildout, mobile operators have levied astonishingly high interconnect fees. In Europe, termination rates to mobiles are sometimes *sixteen* times higher than fees to fixed networks. International wholesale prices reflect these charges. For example, while carriers charged only 2.2¢ per minute to send wholesale traffic from the Band-X London switch to a fixed line telephone in Italy, they charged 24.2¢ if the call was to a mobile handset. One major exception to this trend is in the U.S. market, where mobile interconnect fees are comparable to fixed termination rates. (For more on mobile issues, please see "International Traffic from Mobile Phones" on page 75.)

Price Instability

Although international call prices have largely settled into a three-tiered charge structure, rates on many individual routes are wildly variable. Price swings to developing markets have proven particularly dramatic (see Figure 5. Call Prices to Developed versus Developing Markets, 2000). The wild peaks and troughs 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. (For more on illicit bypass and how it works, see "Illicit Bypass" on page 65.) Over time, local authorities spot these gray market links and shut them down. With the average of an illicit bypass link measured in months if not weeks, wholesale rates to such countries are volatile. When authorities

step in, an international route made available at bargain basement prices on one day may not work the next day, forcing international carriers to shift their traffic back to "official"—and relatively costly—links.

Trends in wholesale prices to many mobile destinations appear strikingly similar to price movements for calls to gray market countries. As with calls that bypass 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 6. Call Prices to Fixed versus Mobile Telephones, 2000-2001).

Translating Interconnect Fees to Prices

We've already seen that termination costs affect the prices international carriers charge for their services. Calls to fixed line telephones are relatively cheap; calls to mobile phones are relatively expensive. Yet just how closely interconnect costs correlate to prices depends on the carrier. Carriers, such as Primus, that operate largely as carriers for the traffic of other telecom service providers must offer rates closely correlated with actual costs (see Figure 7. Relationship between Effective Settlement Rate and Price per Minute, 2000). Because the customers of these wholesale carriers are themselves telcos with a high degree of market knowledge, wholesale carriers must continually adjust their rates to match market realities. In contrast, incumbent telcos such as AT&T carry a much larger proportion of retail traffic from individual homes and businesses. Such customers are far less sensitive to fluctuations in the international call charges to specific routes than are the customers of wholesale carriers. Customer loyalty stems from factors other than price. Retail carriers also incur different costs (for example, marketing) than wholesale carriers, which focus primarily on interconnect charges. As a result, international prices offered by retail-oriented carriers do not correlate well with the interconnect charges they must pay (again, see Figure 7).

Conclusion

Will retail charges for international calling drift from differentiated rates toward a modest subscription fee as predicted by the death of distance theory? Perhaps in time. Certainly, average call prices and the costs that shape them are drifting ever downward. However, interconnect fees—still the most significant incremental cost in providing international phone service—have shifted from a "one country, one rate" settlement scheme to a multi-tiered fee structure. Wholesale carriers whose business models are based on carrying the traffic of other service providers have been careful to match their rates to the new fee structure. Retail-oriented carriers tend to set their international call prices on other factors besides interconnect fees. Yet, with increasing volumes of traffic flowing to (expensive) mobile destinations, even these carriers cannot afford to ignore the new termination rate structure. Late in 2000, for example, AT&T announced new rates to consumers that charged a premium on international calls to many mobile destinations. "One world, one rate" subscription plans may still lie in the future for international call pricing. For now, however, understanding international traffic and interconnect rates—and knowing how to manipulate these rates to one's own cost advantage—remains as important to carriers as ever.

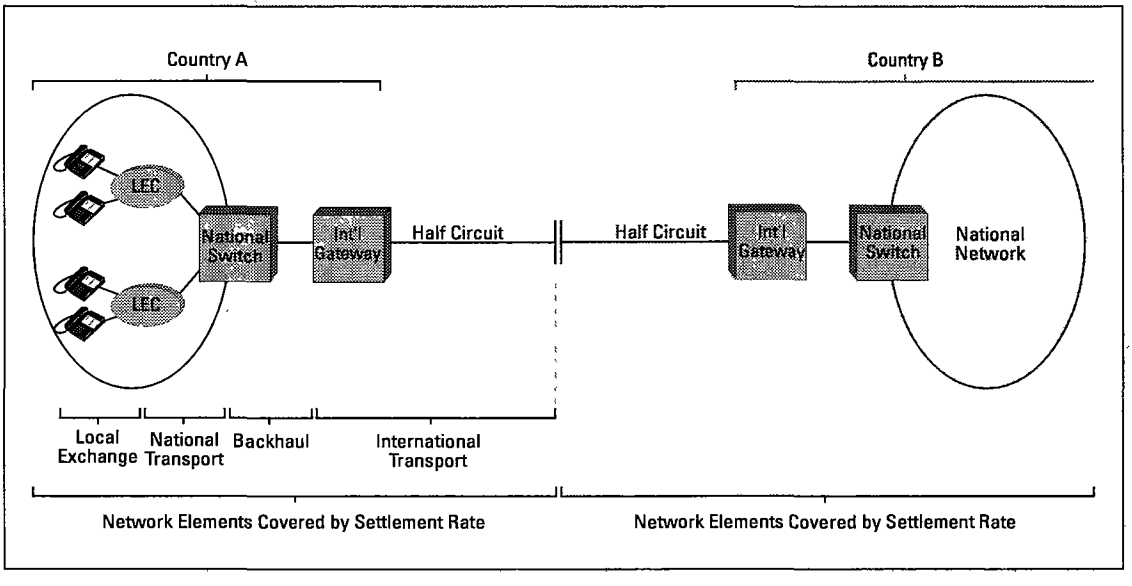
Elements of an International Call

An international service provider has a number of options to send its customers' calls abroad. Referring to the tables on the following pages, let's use a call from Washington, DC to Berlin as an example. As of August 2001, the average retail price for such a call would be around 17¢ per minute. Not including call-back, refile, and other forms of non-traditional traffic switching, a U.S. carrier has five basic methods for transporting a customer's call to its destination in Germany:

1. Ownership/Settlement. 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 0.9¢ per minute. The carrier shifts the call onto the international "half circuit" it owns, 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: 0.02¢ per minute. The settlement rate, at 10.0¢ per minute, is far more expensive. Total cost: 10.9¢ per minute.

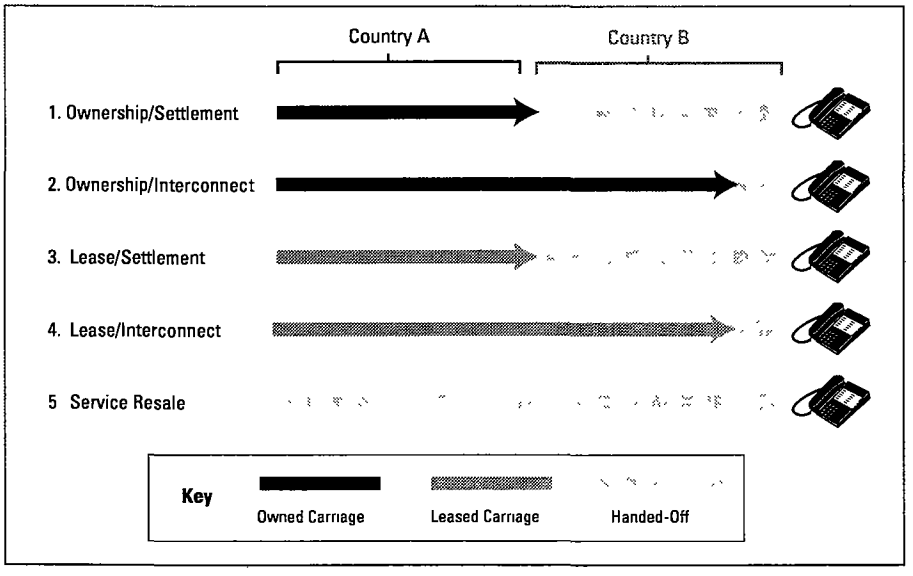
2. Ownership/Interconnect. Competition rules in Germany permit foreign carriers to interconnect directly with the domestic telephone network. Rather than financing a half circuit and paying a settlement fee, a U.S.

Figure 1. International Call Components



Source: TeleGeography research

Figure 2. Basic Call Transport Methods



Source: TeleGeography research

carrier can purchase a whole circuit all the way to an international gateway in Germany, then pay the German carrier a 1.4¢ per minute fee to switch the call to Berlin. Total cost, including origination and backhaul: 2.3¢ per minute.

3. Lease/Settlement. A carrier is not required to own the circuits that it uses. Instead, it can lease both the domestic capacity between cities and the half-circuit to Germany. Total cost, including origination, backhaul, half-circuit private line lease, and settlement payment: 11.1¢ per minute.

4. Lease/Interconnect. Also known as International Simple Resale (ISR), a carrier can lease capacity to carry the call over a whole circuit from Washington to Berlin. Total cost, including origination, backhaul, private line lease, and interconnection in Germany: 2.5¢ per minute.

5. 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. Total cost: 1.9¢ 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), August 2001							
	Origination Cost	Int'l Circuit Ownership	Int'l Circuit Lease	Settlement Rate	Interconnect Rate	Wholesale Rate	**Total Cost**	**Retail Price/ Profit (Loss)**
Americas								
U.S.-Canada (Toronto)								**7.0**
Own - Settlement	0.7	0.02	—	10.0	—	—	**10.7**	(3.7)
Own - Interconnect	0.7	0.02	—	—	0.2	—	**0.9**	6.1
Lease - Settlement	0.8	—	0.05	10.0	—	—	**10.9**	(3.9)
Lease - Interconnect	0.8	—	0.05	—	0.2	—	**1.1**	6.0
Wholesale for resellers	—	—	—	—	—	2.0	**2.0**	5.0
U.S.-Mexico								**39.0**
Own - Settlement	0.7	0.1	—	13.5	—	—	**14.3**	24.7
Own - Interconnect	—	—	—	—	—	—	**n.a.**	n.a.
Lease - Settlement	0.8	—	0.6	13.5	—	—	**14.9**	24.1
Lease - Interconnect	—	—	—	—	—	—	**n.a.**	n.a.
Wholesale for resellers	—	—	—	—	—	11.8	**11.8**	27.2
U.S.-Chile								**45.0**
Own - Settlement	0.7	0.3	—	35.0	—	—	**36.0**	9.0
Own - Interconnect	0.7	0.3	—	—	1.5	—	**2.5**	42.5
Lease - Settlement	0.8	—	0.7	35.0	—	—	**36.5**	8.5
Lease - Interconnect	0.8	—	0.7	—	1.5	—	**3.0**	42.0
Wholesale for resellers	—	—	—	—	—	3.4	**3.4**	41.6
Europe								
U.S.-Germany								**17.0**
Own - Settlement	0.7	0.02	—	10.0	—	—	**10.7**	6.3
Own - Interconnect	0.7	0.02	—	—	1.4	—	**2.1**	14.9
Lease - Settlement	0.8	—	0.1	10.0	—	—	**10.9**	6.1
Lease - Interconnect	0.8	—	0.1	—	1.4	—	**2.3**	14.7
Wholesale for resellers	—	—	—	—	—	1.9	**1.9**	15.1
U.S.-U.K.								**10.0**
Own - Settlement	0.7	0.02	—	10.0	—	—	**10.7**	(0.7)
Own - Interconnect	0.7	0.02	—	—	1.7	—	**2.4**	7.6
Lease - Settlement	0.8	—	0.1	10.0	—	—	**10.9**	(0.9)
Lease - Interconnect	0.8	—	0.1	—	1.7	—	**2.6**	7.5
Wholesale for resellers	—	—	—	—	—	1.8	**1.8**	8.2

Notes: See following page.

Source: TeleGeography research

	Per Minute Cost (U.S. cents), August 2001							
	Origination Cost	Int'l Circuit Ownership	Int'l Circuit Lease	Settlement Rate	Interconnect Rate	Wholesale Rate	**Total Cost**	**Retail Price/ Profit (Loss)**
Asia								
U.S.-Australia								**17.0**
Own -Settlement	0.7	0.6	—	14.0	—	—	**15.3**	1.8
Own - Interconnect	0.7	0.6	—	—	1.6	—	**2.9**	14.2
Lease - Settlement	0.8	—	1.3	14.0	—	—	**16.1**	0.9
Lease - Interconnect	0.8	—	1.3	—	1.6	—	**3.7**	13.3
Wholesale for resellers	—	—	—	—	—	2.8	**2.8**	14.2
U.S.-Hong Kong								**25.0**
Own - Settlement	0.7	0.5	—	6.0	—	—	**7.2**	17.8
Own - Interconnect	0.7	0.5	—	—	1.6	—	**2.8**	22.2
Lease - Settlement	0.8	—	1.0	6.0	—	—	**7.8**	17.2
Lease - Interconnect	0.8	—	1.0	—	1.6	—	**3.4**	21.6
Wholesale for resellers	—	—	—	—	—	3.0	**3.0**	22.0
U.S.-India								**66.0**
Own - Settlement	0.7	2.0	—	43.0	—	—	**45.7**	20.3
Own - Interconnect	—	—	—	—	—	—	**n.a.**	n.a.
Lease - Settlement	0.8	—	4.4	43.0	—	—	**48.2**	17.8
Lease - Interconnect	—	—	—	—	—	—	**n.a.**	n.a.
Wholesale for resellers	—	—	—	—	—	35.8	**35.8**	30.2
U.S.-Japan								**26.0**
Own - Settlement	0.7	0.1	—	13.0	—	—	**13.8**	12.2
Own - Interconnect	0.7	0.1	—	—	1.6	—	**2.4**	23.6
Lease - Settlement	0.8	—	0.5	13.0	—	—	**14.3**	11.7
Lease - Interconnect	0.8	—	0.5	—	1.6	—	**2.9**	23.1
Wholesale for resellers	—	—	—	—	—	3.2	**3.2**	22.8

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 from Washington, D.C. at peak hours. All rates are current as of August 2001.
4. 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. Circuit ownership costs reflect half circuit ownership for India. All other circuit ownership costs are for whole circuits.
6. Circuit ownership costs include price of backhaul.
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. Rates for Chile and Australia are estimated.
9. Direct interconnection by foreign carriers to the domestic public switched telephone network is not permitted in India or Mexico.
10. Settlement rates are for peak rate traffic terminated by the largest foreign carrier.
11. U.S.-Mexico settlement rates vary by carrier. Although the official recognized settlement rate was 19¢, the actual prevailing rate was 13.5¢ as of August 2001.
12. Retail rates are based on the WorldCom International Weekends Plan.
13. Wholesale rates reflect prices from the Band-X New York switch.

Source: TeleGeography research

International Carrier Call Costs to the U.S.

	Per Minute Cost (U.S. cents), August 2001							
	Origination Cost	Int'l Circuit Ownership	Int'l Circuit Lease	Settlement Rate	Interconnect Rate	Wholesale Rate	**Total Cost**	**Retail Price/ Profit (Loss)**
Americas								
Canada-U.S.								**13.0**
Own - Settlement	0.2	0.02	—	10.0	—	—	**10.2**	2.8
Own - Interconnect	0.2	0.02	—	—	0.7	—	**0.9**	12.1
Lease - Settlement	0.2	—	0.05	10.0	—	—	**10.3**	2.8
Lease - Interconnect	0.2	—	0.05	—	0.7	—	**1.0**	12.1
Mexico-U.S.								**34.0**
Own - Settlement	1.3	0.1	—	13.5	—	—	**14.9**	19.1
Own - Interconnect	—	—	—	—	—	—	**n.a.**	n.a.
Lease - Settlement	1.3	—	0.6	13.5	—	—	**15.4**	18.6
Lease - Interconnect	—	—	—	—	—	—	**n.a.**	n.a.
Chile-U.S.								**38.0**
Own - Settlement	1.5	0.3	—	35.0	—	—	**36.8**	1.2
Own - Interconnect	1.5	0.3	—	—	0.7	—	**2.5**	35.5
Lease - Settlement	1.5	—	0.7	35.0	—	—	**37.2**	0.8
Lease - Interconnect	1.5	—	0.7	—	0.7	—	**2.9**	35.1
Europe								
Germany-U.S.								**11.3**
Own - Settlement	1.4	0.02	—	10.0	—	—	**11.4**	(0.1)
Own - Interconnect	1.4	0.02	—	—	0.7	—	**2.1**	9.2
Lease - Settlement	1.4	—	0.1	10.0	—	—	**11.5**	(0.2)
Lease - Interconnect	1.4	—	0.1	—	0.7	—	**2.2**	9.1
U.K.-U.S.								**29.3**
Own - Settlement	1.7	0.02	—	10.0	—	—	**11.7**	17.6
Own - Interconnect	1.7	0.02	—	—	0.7	—	**2.4**	26.9
Lease - Settlement	1.7	—	0.05	10.0	—	—	**11.8**	17.6
Lease - Interconnect	1.7	—	0.05	—	0.7	—	**2.5**	26.9

Notes: See following page.

Source: TeleGeography research

	Per Minute Cost (U.S. cents), August 2001							
	Origination Cost	Int'l Circuit Ownership	Int'l Circuit Lease	Settlement Rate	Interconnect Rate	Wholesale Rate	**Total Cost**	**Retail Price/ Profit (Loss)**
Asia								
Australia-U.S.								**20.0**
Own - Settlement	1.6	0.6	—	14.0	—	—	**16.2**	3.9
Own - Interconnect	1.6	0.6	—	—	0.7	—	**2.9**	17.2
Lease - Settlement	1.6	—	1.3	14.0	—	—	**16.9**	3.1
Lease - Interconnect	1.6	—	1.3	—	0.7	—	**3.6**	16.4
Hong Kong-U.S.								**25.5**
Own - Settlement	1.6	0.5	—	6.0	—	—	**8.1**	17.4
Own - Interconnect	1.6	0.5	—	—	0.7	—	**2.8**	22.7
Lease - Settlement	1.6	—	1.0	6.0	—	—	**8.6**	16.9
Lease - Interconnect	1.6	—	1.0	—	0.7	—	**3.3**	22.2
India-U.S.								**102.0**
Own - Settlement	1.4	2.0	—	43.0	—	—	**46.4**	55.6
Own - Interconnect	—	—	—	—	—	—	**n.a.**	n.a.
Lease - Settlement	1.4	—	4.4	43.0	—	—	**48.8**	53.2
Lease - Interconnect	—	—	—	—	—	—	**n.a.**	n.a.
Japan-U.S.								**56.0**
Own - Settlement	1.6	0.1	—	13.0	—	—	**14.7**	41.3
Own - Interconnect	1.6	0.1	—	—	0.7	—	**2.4**	53.6
Lease - Settlement	1.6	—	0.5	13.0	—	—	**15.1**	40.9
Lease - Interconnect	1.6	—	0.5	—	0.7	—	**2.8**	53.2

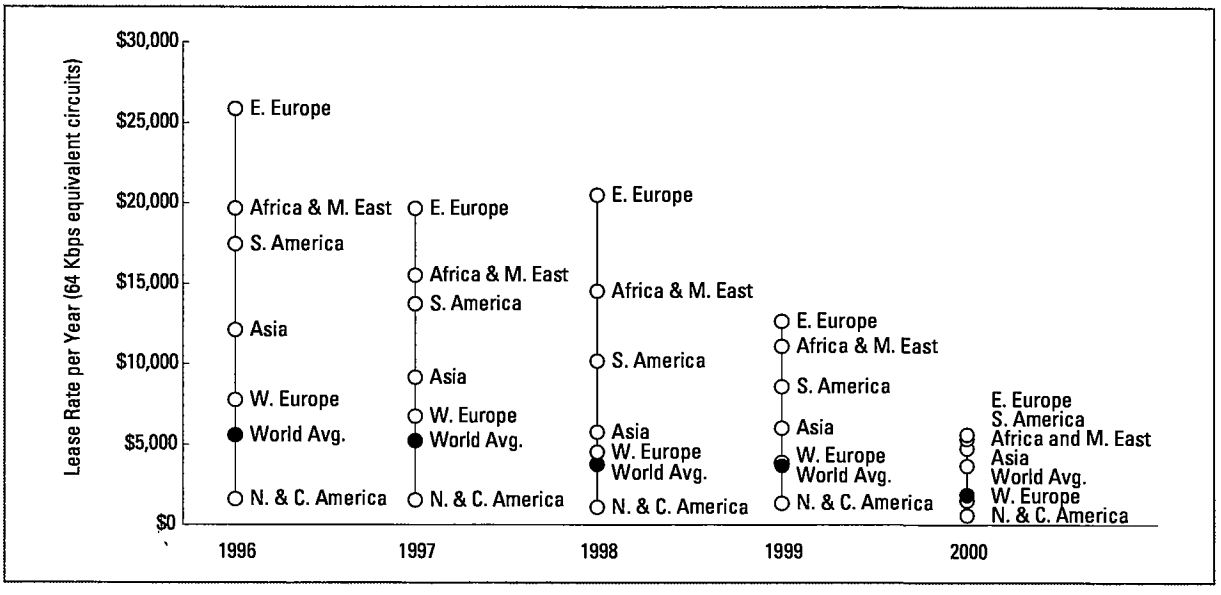
Notes:

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. Retail rates are based on residential discount call plans of the largest carrier in the origination market.
4. All rates reflect international calls terminating in Washington, D.C. at peak hours and are current to August 2001.
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 ownership costs reflect half circuit ownership for India. All other circuit ownership costs are for whole circuits.
7. Circuit ownership costs include price of backhaul.
8. Origination costs for India, Chile, and Australia are estimated.
9. 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.
10. Direct interconnection by foreign carriers to the domestic public switched telephone network is not permitted with India or Mexico.
11. Settlement rates are for peak rate traffic terminated by the domestic carrier.
12. Mexico-U.S. settlement rates vary by carrier. Although the official recognized settlement rate was 19¢ as of August 2001, the actual prevailing rate was 13.5¢.

Source: TeleGeography research

International Private Line Prices

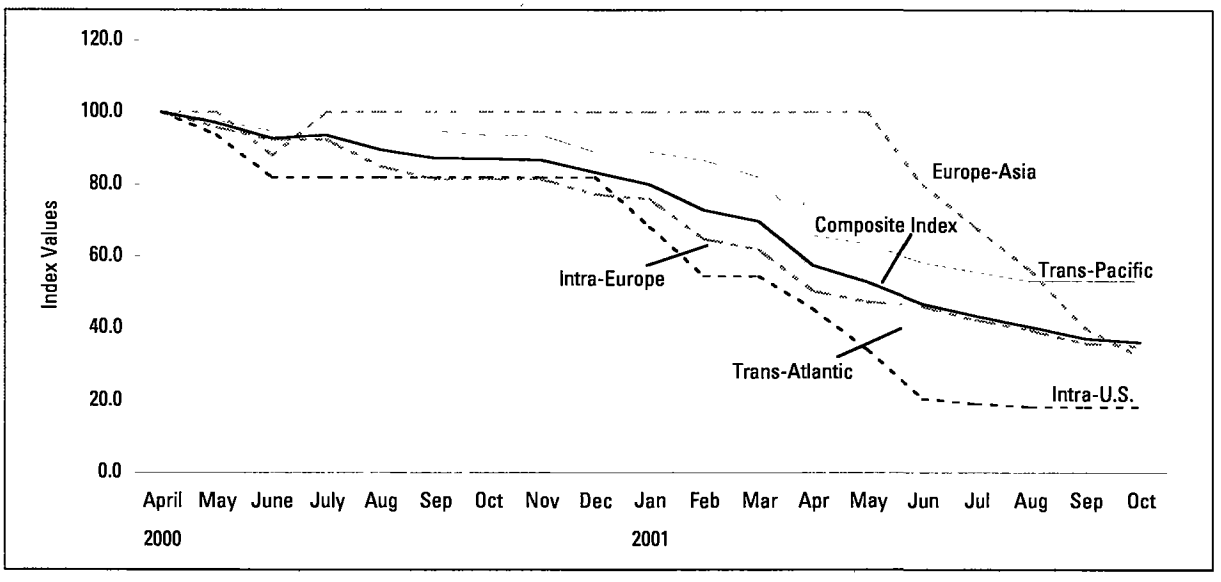
Figure 1. International Private Line Lease Prices from U.S., 1996-2000



Notes: Data reflect averages of annual revenues collected by U.S. international carriers for 64 Kbps circuit leases to countries within each region.

Source: FCC carrier filings and TeleGeography research

Figure 2. Band-X Bit Index, 2000-2001



Notes: The Band-X Bit Index measures relative price movement for one-year E-1, T-1, or STM-1 circuit leases (depending upon the geographic area) on major routes. This chart summarizes index values into regional indices, based on simple averages for the following groupings: Europe-Asia (London to Hong Kong); Trans-Pacific (Los Angeles to Beijing, Tokyo); Trans-Atlantic (New York to Frankfurt, London, Moscow); Intra-Europe (London to Amsterdam, Brussels, Frankfurt, Madrid, Milan, Paris); Intra-U.S. (New York to Los Angeles); and Composite (all tracked routes).

Source: Band-X Ltd.

International Settlement Rates

Destination	United States 1999	2000	2001	United Kingdom 1999	2000
Andorra	0.26	0.26	0.26	0.13	0.07
Argentina	0.28	0.19	0.19	0.56	0.33
Australia	0.15	0.15	0.14	0.24/0.08	0.16
Austria	0.13	0.13	0.13	0.19	0.15
Bahamas	0.15	0.15	0.15	0.36	0.27
Bahrain	0.55	0.19	0.19	0.64	0.40
Bangladesh	0.69	0.31	0.31	0.97	0.64
Belarus	0.35	0.22	0.22	0.34	0.24
Belgium	0.13	0.13	0.13	0.10	0.05
Bolivia	0.37	0.28	0.19	0.89	0.53
Brazil	0.30	0.19	0.19	0.36	0.20
Canada	0.10/0.06	0.10/0.06	0.10/0.06	0.10/0.04	0.10
Chile	0.35	0.35	0.35	0.89	0.67
China	0.50	0.35	0.35	0.89	0.40
Colombia	0.33	0.28	0.19	0.56	0.33
Costa Rica	0.28	0.21	0.19	0.47	0.39
Croatia	0.26	0.21	0.18	0.33	0.15
Cyprus	0.15	0.15	0.15	0.20	0.09
Czech Republic	0.17	0.17	0.17	0.20	0.11
Denmark	0.10	0.10	0.10	0.07	0.05
Dominican Republic	0.19	0.19	0.19	0.56	0.40
El Salvador	0.30	0.24	0.19	1.18	0.98
Finland	0.13	0.13	0.13	0.13	0.08
France	0.10	0.10	0.10	0.10	0.04
French Polynesia	0.15	0.15	0.15	1.27	0.98
Germany	0.10	0.10	0.10	0.10/0.04	0.08
Ghana	0.38	0.30	0.30	0.52	0.25
Greece	0.15	0.13	0.13	0.24	0.16
Guyana	0.85	0.85	0.85	0.89	0.80
Hong Kong	0.07	0.07	0.06	0.42	0.07
Hungary	0.19	0.14	0.14	0.18	0.11
Iceland	0.13	0.13	0.13	0.23	0.11
India	0.54	0.43	0.43	0.87	0.47
Indonesia	0.43	0.25	0.25	0.64	0.33
Iran	0.78	0.50	0.19	1.18	0.80
Ireland	0.10	0.10	0.10	0.16	0.03
Israel	0.15	0.15	0.15	0.24	0.15
Italy	0.10	0.10	0.10	0.13	0.07
Japan	0.13	0.13	0.13	0.48	0.20

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; and 2001: 1SDR=$1.2457. Gold francs were converted using a linking coefficient value of $1=2.5374 GF.
2. Average U.S. settlement rates in 1999 are for the month of August. Rates in subsequent years are for July.
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 and OFTEL

International Settlement Rates (continued)

Destination	United States 1999	United States 2000	United States 2001	United Kingdom 1999	United Kingdom 2000
Jordan	0.50	0.44	0.44	0.97	0.49
Kazakhstan	0.34	0.25	0.16	0.64	0.47
Korea, Rep.	0.36	0.26	0.19	0.50	0.32
Kuwait	0.15	0.15	0.15	0.80	0.67
Luxembourg	0.14	0.07	0.07	0.24	0.06
Macau	0.15	0.15	0.15	0.51	0.43
Malaysia	0.35	0.19	0.19	0.50	0.20
Mexico	0.19	0.19	0.14	0.44	0.27
Moldova	1.04	1.04	1.04	0.24	0.20
Netherlands	0.07	0.07	0.06	0.06	0.04
New Zealand	0.14	0.14	0.13	0.19	0.11
Norway	0.08	0.08	0.08	0.07	0.06
Oman	0.60	0.60	0.60	0.80	0.67
Pakistan	0.60	0.42	0.36	0.64	0.55
Panama	0.35	0.20	0.19	0.64	0.47
Paraguay	0.40	0.25	0.19	0.80	0.67
Peru	0.33	0.25	0.25	0.72	0.60
Philippines	0.29	0.19	0.19	0.48	0.28
Poland	0.19	0.19	0.19	0.25	0.15
Portugal	0.15	0.10	0.10	0.18/0.14	0.08
Russia	0.30	0.20	0.20	0.27	0.07
Saudi Arabia	0.50	0.14	0.14	0.89	0.53
Singapore	0.15	0.15	0.15	0.32	0.23
Slovak Republic	0.20	0.13	0.13	0.19/0.10	0.07
Slovenia	0.35	0.17	0.17	0.16/0.09	0.11
South Africa	0.35	0.30	0.19	0.48	0.27
Spain	0.13	0.13	0.13	0.16	0.05
Sri Lanka	0.60	0.45	0.45	0.89	0.43
Sweden	0.06	0.06	0.06	0.12	0.07
Switzerland	0.13	0.13	0.13	0.08/0.04	0.04
Taiwan	0.15	0.15	0.15	0.44	0.27
Thailand	0.30	0.24	0.19	0.80	0.33
Turkey	0.33	0.25	0.21	0.30	0.17
Ukraine	0.22	0.17	0.17	0.29	0.23
United Arab Emirates	0.15	0.15	0.15	0.32	0.24
United Kingdom	0.11/0.07	0.10/0.06	0.10/0.06	n.a.	n.a.
Uruguay	0.31	0.19	0.19	0.95	0.51
United States	n.a.	n.a.	n.a.	0.12/0.08	0.10
Uzbekistan	0.45	0.19	0.19	0.80	0.40
Venezuela	0.32	0.19	0.19	0.80	0.40
Vietnam	0.79	0.64	0.56	1.29	0.80
Yugoslavia	0.35	0.29	0.25	0.27	n.a.

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; and 2001: 1SDR=$1.2457. Gold francs were converted using a linking coefficient value of $1=2.5374 GF.
2. Average U.S. settlement rates in 1999 are for the month of August. Rates in subsequent years are for July.
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 and OFTEL

FCC and ITU Settlement Benchmarks

Motivated by the annual multi-billion dollar settlements outflow of U.S. carriers, the Federal Communications Commission (FCC) proposed in 1996 a set of "benchmark" or model settlement rates. Beginning in 1999, these benchmarks capped the amount U.S. carriers could pay their foreign correspondents for traffic exchange at rates ranging from $0.15 to $0.23 per minute. The FCC calculated benchmarks based on the price for the three network elements used to provide international phone services, including international transmission facilities, international switching facilities, and national extension facilities (domestic transport and termination).

The FCC adopted the Benchmarks Order in August 1997, with implementation staggered over several years, based on national incomes. Settlement rates to high, upper-middle and lower-middle income countries have already been affected, following the 2000 deadline. As the table below demonstrates, most countries in the upper and upper-middle income brackets have adopted settlement rates at or below benchmarks. Settlement rates for countries that have already met FCC benchmarks are shown in bold.

Separate from the FCC's efforts, a Focus Group of the International Telecommunication Union (ITU), issued a recommended set of "indicative target" settlement rates in November 1998. The Focus Group established seven benchmark brackets based on country teledensity, with separate categories established for small island states and least developed countries (LDCs). Adopted in June 1999, the ITU settlement targets were calculated using the average of the lowest 20 percent of published settlement rates for each bracket. Initially, the ITU's proposed rates ranged well outside the FCC's prescribed band—from $0.06 to $0.45 per minute compared to the FCC's $0.15 to $0.23 . However, as the average of the lowest 20 percent is recalculated annually, the current targets ($0.05 to $0.21) are now much lower than when first established, particularly for countries in the low teledensity brackets. The settlement rate targets take effect December 31, 2001, with an extension to 2004 for LDCs.

Figure 1. FCC Benchmarks and ITU Target Recommendations (U.S. cents)

Country	ITU Target Rate 2000	ITU Target Rate 2001	FCC Settlement Benchmarks	August 2001 Settlement Rate with U.S.
Upper Income Bracket: Effective January 1, 1999				
Australia	4.9	4.7	15.0	**14.0**
Austria	10.7	7.6	15.0	**13.0**
Bahamas	15.5	7.6	15.0	**15.0**
Belgium	4.9	4.7	15.0	**13.0**
Denmark	4.9	4.7	15.0	**10.0**
France	4.9	4.7	15.0	**10.0**
Germany	4.9	4.7	15.0	**10.0**
Hong Kong	4.9	4.7	15.0	**6.0**
Ireland	10.7	7.6	15.0	**10.0**
Israel	10.7	7.6	15.0	**15.0**

Source: FCC and ITU

Figure 1. FCC Benchmarks and ITU Target Recommendations (continued)

Country	ITU Target Rate 2000	ITU Target Rate 2001	FCC Settlement Benchmarks	August 2001 Settlement Rate with U.S.
Italy	10.7	7.6	15.0	**10.0**
Japan	10.7	7.6	15.0	**13.0**
Kuwait	14.9	12.7	15.0	**15.0**
Netherlands	4.9	4.7	15.0	**6.0**
New Zealand	10.7	7.6	15.0	**13.0**
Norway	4.9	4.7	15.0	**13.0**
Portugal	10.7	7.6	15.0	**10.0**
Singapore	4.9	4.7	15.0	**15.0**
Spain	10.7	7.6	15.0	**13.0**
Sweden	4.9	4.7	15.0	**6.0**
Switzerland	4.9	4.7	15.0	**13.0**
Taiwan	4.9	4.7	15.0	**15.0**
United Arab Emirates	10.7	7.6	15.0	**14.0**
United Kingdom	4.9	4.7	15.0	**10.0/6.0**
Upper Middle Income Bracket: Effective January 1, 2000				
Argentina	14.9	12.7	19.0	**19.0**
Barbados	15.5	12.7	19.0	**19.0***
Brazil	15.3	12.3	19.0	**19.0**
Chile	14.9	12.7	19.0	**19.0***
Czech Republic	10.7	7.6	19.0	**17.0**
Greece	4.9	4.7	19.0	**13.0**
Hungary	10.7	7.6	19.0	**14.0**
Korea, Rep.	10.7	7.6	19.0	**19.0***
Malaysia	14.9	12.7	19.0	**19.0**
Mexico	15.3	12.3	19.0	**19.0**
South Africa	15.3	12.3	19.0	**19.0***
Trinidad & Tobago	14.9	12.7	19.0	**19.0***
Uruguay	14.9	12.7	19.0	**19.0**
Lower Middle Income Bracket: Effective January 1, 2001				
Colombia	15.3	12.3	19.0	**19.0***
Costa Rica	14.9	12.7	19.0	**19.0***
Dominican Republic	19.1	14.3	19.0	**19.0**
Ecuador	19.1	14.3	19.0	**19.0***
El Salvador	19.1	14.3	19.0	**19.0***
Guatemala	19.1	14.3	19.0	**19.0***
Indonesia	21.9	17.7	19.0	25.0
Jamaica	15.3	12.3	19.0	**19.0***
Jordan	19.1	14.3	19.0	44.0
Panama	15.3	12.3	19.0	**19.0***
Peru	19.1	14.3	19.0	25.0
Philippines	21.9	17.7	19.0	**19.0**
Poland	14.9	12.7	19.0	**19.0**
Russia	15.3	12.3	19.0	20.0
Thailand	19.1	14.3	19.0	**19.0***
Turkey	14.9	12.7	19.0	21.0
Venezuela	15.3	12.3	19.0	**19.0***
Lower Income Bracket: Effective January 1, 2002				
China	19.1	14.3	23.0	35.0
Egypt	19.1	14.3	23.0	**23.0***
Guyana	19.1	14.3	23.0	85.0
Haiti	29.6	20.5	23.0	46.0
Honduras	21.9	17.7	23.0	28.0
India	21.9	17.7	23.0	42.5
Kenya	29.6	20.5	23.0	36.0
Nicaragua	29.6	17.7	23.0	27.0
Pakistan	21.9	17.7	23.0	36.0
Vietnam	21.9	17.7	23.0	56.0

Notes: Rates that became compliant with FCC benchmarks in 2001 are noted with an asterisk (*). ITU target rates are established in Special Drawing Rights (SDRs). Equivalent U.S. dollar values are subject to exchange rate adjustments.

Source: FCC and ITU

National Interconnection Rates

	Local Termination (U.S. cents)			Regional Termination (U.S. cents)			National Termination (U.S. cents)			Fixed to Mobile Termination (U.S. cents)	
	1999	2000	2001	1999	2000	2001	1999	2000	2001	2000	2001
Argentina	2.35	1.10	1.04	2.35	1.10	1.04	2.35	1.10	1.04	n.a.	n.a.
Australia	2.15	0.82	n.a.	2.18	1.42	n.a.	4.00	1.65	n.a.	n.a.	12.60
Austria	1.90	0.97	0.81	1.90	1.46	1.24	2.50	2.15	2.01	22.48	12.34
Belgium	1.11	0.78	0.57	1.87	1.22	0.92	2.67	1.58	1.23	18.00	n.a.
Canada	n.a.	n.a.	n.a.	0.78	0.51	0.21	n.a.	n.a.	n.a.	n.a.	n.a.
Chile	n.a.	1.79	n.a.	n.a.	1.79	n.a.	n.a.	1.79	n.a.	n.a.	n.a.
China	n.a.	1.50	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Colombia	n.a.	2.82	n.a.	n.a.	2.82	n.a.	n.a.	2.82	n.a.	n.a.	n.a.
Denmark	1.03	0.81	2.52	1.92	1.52	2.52	2.33	1.83	2.52	17.00	15.78
Finland	1.67	1.36	0.45	1.67	n.a.	n.a.	4.12	1.44	0.60	21.00	19.50
France	0.63	0.56	0.48	1.56	1.13	0.96	2.32	1.69	1.43	20.00	10.30
Germany	1.05	0.83	0.57	2.26	1.80	0.87	2.74	2.18	1.37	24.00	n.a.
Hong Kong	1.65	1.65	1.62	1.65	1.65	1.62	1.65	1.65	1.62	0.13	0.65
Hungary	n.a.	6.61	7.97	n.a.	6.61	7.97	n.a.	6.61	7.97	n.a.	13.04
Ireland	1.08	0.98	0.57	1.67	1.41	0.87	2.36	1.93	1.18	16.68	15.89
Israel	0.80	0.80	1.53	1.30	1.30	1.53	2.50	2.50	1.53	n.a.	12.00
Italy	1.03	0.96	0.67	1.86	1.55	1.19	2.69	2.19	1.61	23.00	16.85
Japan	1.74	1.54	1.26	3.31	2.38	1.61	n.a.	n.a.	n.a.	29.99	n.a.
Luxembourg	2.34	1.43	1.32	2.34	1.43	1.32	2.34	1.43	1.32	n.a.	15.16
Mexico	n.a.	n.a.	n.a.	2.61	2.61	1.25	n.a.	n.a.	n.a.	18.00	20.94
Netherlands	1.16	0.91	0.53	1.74	1.30	0.69	2.11	1.39	0.85	18.00	14.26
New Zealand	1.43	1.38	0.85	n.a.	n.a.	1.49	6.66	n.a.	2.77	n.a.	n.a.
Norway	1.00	0.82	0.46	1.38	1.17	0.56	1.63	1.75	0.70	15.60	7.55
Peru	2.90	1.68	1.44	2.90	1.68	1.44	2.90	1.68	1.44	15.62	n.a.
Portugal	2.87	0.63	0.47	5.74	1.24	0.80	11.48	2.15	1.34	n.a.	21.19
Spain	1.03	0.86	0.68	1.66	1.44	1.04	3.20	2.55	1.98	20.00	16.16
Sweden	0.77	0.62	0.50	1.07	0.82	0.68	1.52	1.00	0.82	n.a.	9.56
Switzerland	n.a.	n.a.	n.a.	2.73	2.16	1.16	3.87	3.10	1.81	29.54	n.a.
U.K.	0.62	0.56	0.55	0.82	0.82	0.79	1.76	1.68	1.69	20.42	18.73
U.S. (Verizon)	n.a.	n.a.	n.a.	1.20	0.97	0.65	n.a.	n.a.	n.a.	2.64	n.a.

Notes:

1. All interconnection charges are for peak period.
2. All rates are established in national currencies. Equivalent U.S. dollar values are subject to exchange rate fluctuation.
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 0.79¢ as of August 2001.

Source: National regulatory agencies and ITU

Wholesale Rates by Country, 2000 and 2001

	Rate to Largest City (US¢)		Rate to Mobiles (US¢)		Rate to Rest of Country (US¢)	
Africa	**2000**	**2001**	**2000**	**2001**	**2000**	**2001**
Algeria	n.a.	n.a.	n.a.	n.a.	14.2	12.8
Egypt	31.6	19.1	36.0	24.6	31.5	21.1
Nigeria	17.7	12.7	39.0	28.6	29.8	23.5
South Africa	10.7	7.6	17.2	11.1	14.2	8.5
Africa Average	**20.0**	**16.6**	**27.4**	**21.9**	**24.3**	**20.4**
Asia						
China	6.2	3.4	13.2	7.4	10.0	5.3
Hong Kong	n.a.	n.a.	2.5	2.4	2.2	2.7
India	24.0	18.5	44.8	41.0	41.5	37.9
Israel	4.6	4.1	12.0	13.0	5.2	4.5
Japan	3.1	2.9	13.5	16.8	3.6	3.2
Malaysia	5.1	3.4	5.9	4.5	5.5	3.5
Pakistan	n.a.	34.8	n.a.	36.0	42.6	35.5
Philippines	10.9	9.6	11.6	10.1	11.2	10.2
Saudi Arabia	n.a.	14.3	37.3	23.5	34.2	20.2
Singapore	n.a.	n.a.	4.2	1.6	3.7	1.5
Taiwan	4.3	3.1	7.4	9.6	5.2	3.9
Thailand	7.5	5.7	18.9	14.2	17.2	14.2
Vietnam	52.1	51.2	57.0	53.3	54.9	49.6
Asia Average	**16.8**	**15.7**	**22.8**	**19.4**	**25.8**	**21.0**
Europe						
Austria	1.6	1.2	13.6	14.8	2.1	1.9
Finland	3.4	2.1	6.6	12.9	3.4	2.1
France	1.9	1.5	22.5	16.4	2.1	1.6
Germany	0.9	1.0	21.1	14.7	1.8	1.4
Greece	4.6	2.6	11.1	7.7	8.8	3.9
Ireland	2.1	1.3	14.3	13.8	2.1	1.3
Italy	1.8	1.4	24.2	16.7	2.2	1.8
Netherlands	1.6	1.5	20.1	15.8	1.8	1.4
Poland	6.1	3.4	11.9	9.6	9.9	5.1
Russia	3.3	2.5	10.0	9.8	10.5	9.1
Spain	2.4	1.4	23.4	16.3	2.7	1.4
Sweden	1.1	0.8	7.0	15.2	1.3	0.9
Switzerland	1.6	1.2	16.9	17.0	2.2	1.5
Europe Average	**3.9**	**3.9**	**13.3**	**12.8**	**10.3**	**8.8**
Latin America & Caribbean						
Argentina	6.9	3.7	13.6	8.0	11.2	7.6
Brazil	4.5	2.9	14.2	13.4	11.7	10.5
Chile	n.a.	n.a.	8.9	8.2	5.0	3.1
Colombia	5.7	5.5	13.6	9.3	11.2	8.3
Mexico	n.a.	4.1	12.1	12.3	9.4	12.0
Peru	6.5	4.9	21.0	16.8	15.2	11.2
L. America & Carib. Average	**8.0**	**6.7**	**19.1**	**18.7**	**18.8**	**17.3**
Oceania						
Australia	n.a.	n.a.	9.7	15.7	2.4	2.2
New Zealand	2.3	1.9	6.9	15.9	2.3	1.9
Oceania Average	**2.3**	**1.9**	**18.9**	**26.3**	**27.6**	**31.8**
U.S. & Canada						
Canada	n.a.	n.a.	n.a.	n.a.	2.2	1.7
United States	n.a.	n.a.	n.a.	n.a.	1.9	1.8
U.S. & Canada Average	**n.a.**	**n.a.**	**n.a.**	**n.a.**	**2.0**	**1.7**
Global Average	**19.7**	**17.4**	**n.a.**	**9.6**	**18.9**	**17.4**

Notes: Rates are from the Band-X London Switch as of August 2000 and 2001. All rates, originally established in U.K. pounds sterling, are expressed here as U.S. cents based on exchange rate conversions of 1.500 dollars per pound in August 2000 and 1.426 dollars per pound in August 2001. Regional averages are simple, unweighted averages for all countries within a region. The Oceania region includes Australia, New Zealand, and several Pacific Island states. Wholesale rates to major cities and mobile destinations in the U.S. and Canada are not separate from rest-of-country prices.

Source: TeleGeography research

Retail Prices for a Three-Minute Call

From/To	Australia	Austria	Belgium	Canada	Czech Rep.	Denmark	Finland	France
Australia	n.a.	1.20	1.59	0.81	1.66	1.14	1.20	0.97
Austria peak	1.20	n.a.	1.06	1.20	0.85	1.06	1.06	1.06
Austria off-peak	1.06	n.a.	0.89	1.06	0.71	0.89	0.89	0.89
Belgium peak	1.06	0.54	n.a.	0.38	1.30	0.54	0.54	0.38
Belgium off-peak	0.79	0.43	n.a.	0.19	1.06	0.43	0.43	0.19
Canada	0.67	0.30	1.17	n.a.	0.65	0.38	0.44	0.53
Czech Rep. Peak	1.58	0.65	0.74	0.74	n.a.	0.74	1.17	0.74
Czech Rep. off-peak	1.11	0.56	0.65	0.65	n.a.	0.65	0.73	0.65
Denmark	1.86	1.43	0.60	0.71	0.95	n.a.	0.33	0.60
Finland peak	1.20	1.01	1.01	1.01	1.09	0.36	n.a.	1.01
Finland off-peak	0.98	0.63	0.63	0.63	0.78	0.25	n.a.	0.63
France peak	1.45	0.56	0.56	0.56	0.98	0.56	0.58	n.a.
France off-peak	1.04	0.34	0.34	0.34	0.78	0.34	0.43	n.a.
Germany	1.88	0.29	0.29	0.29	0.58	0.29	0.29	0.29
Ireland peak	1.97	1.11	0.87	0.44	1.11	1.11	1.11	0.87
Ireland off-peak	1.00	0.96	0.67	0.35	0.96	0.96	0.96	0.67
Italy	2.26	0.82	0.82	0.82	1.10	0.82	0.82	0.82
Japan peak	5.29	6.96	6.96	3.99	7.98	6.96	6.96	5.38
Japan off-peak	3.34	5.10	5.10	3.16	5.66	5.10	5.10	1.67
Korea, Rep. peak	3.06	3.62	3.62	3.97	3.57	3.62	3.62	3.56
Korea, Rep. off-peak	2.13	2.52	2.52	2.77	2.48	2.52	2.52	2.50
Mexico peak	5.35	4.72	4.72	3.40	4.72	4.72	4.72	4.72
Mexico off-peak	3.57	3.12	3.12	2.24	3.12	3.12	3.12	3.12
Norway	0.19	0.28	0.22	0.28	0.65	0.19	0.28	0.22
Poland	2.39	1.07	1.07	2.39	1.07	1.07	1.17	1.17
Portugal peak	2.31	0.78	0.78	0.78	1.73	0.78	0.78	0.76
Portugal off-peak	1.42	0.51	0.51	0.51	1.07	0.51	0.51	0.49
Singapore	1.04	2.44	1.74	0.68	3.31	1.74	1.74	1.74
Spain peak	2.98	0.66	0.66	1.70	1.35	0.66	0.66	0.66
Spain off-peak	2.73	0.66	0.66	1.41	1.21	0.66	0.66	0.66
Sweden	0.92	0.51	0.32	0.32	1.15	0.25	0.25	0.32
Switzerland peak	0.44	0.22	0.44	0.22	1.10	0.44	0.44	0.22
Switzerland off-peak	0.33	0.16	0.33	0.16	0.82	0.33	0.33	0.16
Turkey peak	6.51	2.57	2.57	3.78	2.57	2.57	2.57	2.57
Turkey off-peak	5.15	1.67	1.67	3.03	1.67	1.67	1.67	1.67
U.K. peak	1.84	1.45	1.08	0.89	1.45	1.08	1.45	1.08
U.K. off-peak	1.48	1.23	0.88	0.79	1.23	0.88	1.23	0.88
U.S. (WorldCom Int'l Weekends)	0.51	0.51	0.51	0.21	1.23	0.51	0.51	0.51
U.S. (WorldCom Direct Dial)	8.07	6.57	6.57	2.67	8.31	6.57	6.57	5.97
U.S. (AT&T One Rate)	0.51	0.87	0.87	0.21	1.89	0.87	0.87	0.51
U.S. (AT&T Basic)	5.34	5.07	5.49	1.71	6.84	5.16	5.22	4.68

Notes:

1. All rates are in US$ and exclusive of taxes and were current on August 31, 2001. Peak hours are between 9:00-19:30, Monday-Friday.
2. Fees are $2 with domestic long distance per month for AT&T One Rate International Value Plan and $3 with domestic long distance per month for WorldCom International Weekends.
3. Rates for calls from the U.S. to Canada and Mexico are from Washington, D.C. to Montreal and Mexico City.

Source: TeleGeography research

Retail Prices for a Three-Minute Call

From/To	Germany	Hong Kong	Ireland	Italy	Japan	Korea, Rep.	Mexico	Neth'lands	Norway
Australia	0.97	0.82	0.82	0.90	0.97	1.48	2.02	1.14	1.20
Austria peak	0.85	1.20	1.06	0.85	1.20	1.20	1.77	1.06	1.06
Austria off-peak	0.71	1.06	0.89	0.71	1.06	1.06	1.60	0.89	0.89
Belgium peak	0.38	1.06	0.54	0.38	1.06	2.17	1.85	0.38	0.54
Belgium off-peak	0.19	0.79	0.43	0.19	0.79	1.87	1.44	0.19	0.43
Canada	0.61	0.20	0.44	0.34	0.38	0.30	0.91	0.20	0.20
Czech Rep. Peak	0.65	1.58	1.17	0.74	1.58	1.58	3.36	0.74	0.74
Czech Rep. off-peak	0.56	1.11	0.73	0.65	1.11	1.11	2.60	0.65	0.65
Denmark	0.43	2.98	0.86	0.60	2.08	3.42	3.42	0.60	0.16
Finland peak	1.01	3.02	1.01	1.01	1.56	3.02	3.60	1.01	0.36
Finland off-peak	0.63	3.02	0.63	0.63	1.56	3.02	3.60	0.63	0.25
France peak	0.56	1.45	0.56	0.56	1.45	1.45	1.85	0.56	0.56
France off-peak	0.34	1.04	0.34	0.34	1.04	1.04	1.45	0.34	0.34
Germany	n.a.	1.88	0.29	0.29	1.88	1.88	2.46	0.29	0.29
Ireland peak	0.87	1.97	n.a.	1.11	1.97	2.82	1.76	0.87	1.11
Ireland off-peak	0.67	1.00	n.a.	0.96	1.00	2.82	1.42	0.67	0.96
Italy	0.82	2.26	0.82	n.a.	2.26	2.26	2.83	0.82	0.82
Japan peak	5.38	4.64	6.96	6.96	n.a.	3.43	6.59	6.96	6.96
Japan off-peak	1.67	2.88	5.10	5.10	n.a.	2.51	4.36	5.10	5.10
Korea, Rep. peak	3.56	2.69	3.62	3.62	2.21	n.a.	4.21	3.56	3.62
Korea, Rep. off-peak	2.50	1.87	2.52	2.52	1.55	n.a.	2.95	2.50	2.52
Mexico peak	4.72	5.35	4.72	4.72	5.35	5.35	n.a.	4.72	4.72
Mexico off-peak	3.12	3.57	3.12	3.12	3.57	3.57	n.a.	3.12	3.12
Norway	0.21	0.28	0.25	0.22	0.28	1.39	1.57	0.22	n.a.
Poland	1.07	4.32	1.17	1.17	4.32	4.32	4.32	1.07	1.17
Portugal peak	0.76	3.00	0.78	0.78	3.00	3.00	2.93	0.78	0.78
Portugal off-peak	0.49	1.83	0.51	0.51	1.83	1.83	1.79	0.51	0.51
Singapore	1.74	1.22	2.44	1.74	1.57	n.a.	3.48	1.74	1.74
Spain peak	0.66	2.98	0.66	0.66	2.98	2.98	2.26	0.66	1.21
Spain off-peak	0.66	2.73	0.66	0.66	2.73	2.73	1.93	0.66	1.08
Sweden	0.32	1.96	0.51	0.51	0.92	2.62	1.96	0.32	0.25
Switzerland peak	0.22	1.10	0.44	0.22	1.10	1.10	2.08	0.44	0.44
Switzerland off-peak	0.16	0.82	0.33	0.16	0.82	0.82	1.64	0.33	0.33
Turkey peak	2.57	6.51	2.57	2.57	6.51	6.51	6.51	2.57	2.57
Turkey off-peak	1.67	5.15	1.67	1.67	5.15	5.15	5.15	1.67	1.67
U.K. peak	1.08	1.84	0.86	1.34	2.54	4.07	4.07	1.08	1.45
U.K. off-peak	0.88	1.48	0.68	0.98	2.04	3.60	3.60	0.88	1.23
U.S. (WorldCom Int'l Weekends)	0.51	0.75	0.51	0.51	0.78	0.81	1.17	0.51	0.51
U.S. (WorldCom Direct Dial)	5.97	8.07	5.97	6.57	8.07	8.07	5.97	7.50	5.97
U.S. (AT&T One Rate)	0.51	0.45	0.51	0.51	0.48	0.45	1.05	0.75	0.87
U.S. (AT&T Basic)	4.41	6.51	4.74	5.31	5.13	6.45	1.71	4.62	4.71

Notes:

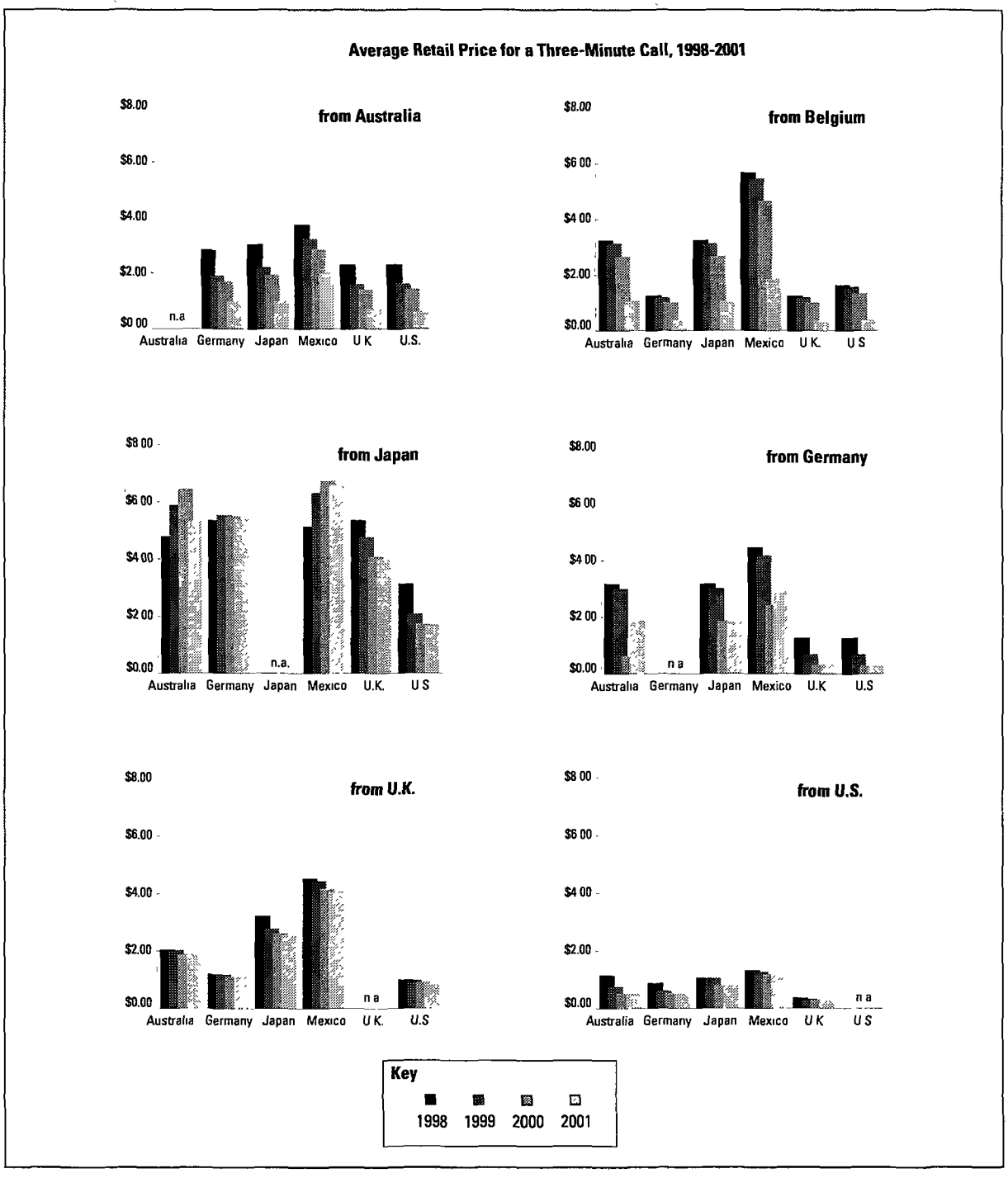
1. All rates are in US$ and exclusive of taxes and were current on August 31, 2001. Peak hours are between 9:00-19:30, Monday-Friday.
2. Fees are $2 with domestic long distance per month for AT&T One Rate International Value Plan and $3 with domestic long distance per month for WorldCom International Weekends.
3. Rates for calls from the U.S. to Canada and Mexico are from Washington, D.C. to Montreal and Mexico City.

Source: TeleGeography research

Poland	Portugal	Singapore	Spain	Sweden	Switzerland	Turkey	U.K.	U.S.	To/From
1.66	2.02	0.90	1.34	0.97	0.97	1.50	0.70	0.60	Australia
1.20	1.20	1.20	1.06	1.06	0.85	1.20	1.06	1.20	Austria peak
1.20	1.06	1.06	0.89	0.89	0.71	1.20	0.89	1.06	Austria off-peak
1.30	0.54	1.06	0.38	0.54	0.54	1.30	0.38	0.38	Belgium peak
1.06	0.43	0.79	0.19	0.43	0.43	1.06	0.19	0.19	Belgium off-peak
0.69	0.49	0.20	0.59	0.34	0.53	0.79	0.28	0.20	Canada
0.65	0.74	3.36	0.74	0.74	0.74	1.58	0.70	0.74	Czech Rep. Peak
0.56	0.65	2.60	0.65	0.65	0.65	1.11	0.65	0.65	Czech Rep. off-peak
0.73	0.97	2.38	0.79	0.16	0.60	1.13	0.43	0.60	Denmark
1.09	1.20	3.02	1.01	0.36	1.20	1.27	1.01	1.01	Finland peak
0.78	0.89	3.02	0.63	0.25	0.89	1.27	0.63	0.63	Finland off-peak
0.98	0.58	1.85	0.56	0.56	0.56	0.98	0.56	0.56	France peak
0.78	0.43	1.45	0.34	0.34	0.34	0.78	0.34	0.34	France off-peak
0.58	0.29	2.60	0.29	0.29	0.29	0.58	0.29	0.29	Germany
1.11	1.11	1.97	1.11	1.11	1.11	2.11	0.42	0.44	Ireland peak
0.96	0.96	1.00	0.96	0.96	0.96	1.83	0.34	0.35	Ireland off-peak
1.10	0.82	2.26	0.82	0.82	0.82	1.54	0.82	0.82	Italy
7.98	6.96	5.10	6.96	6.96	6.96	6.96	3.99	1.67	Japan peak
5.66	5.10	3.71	5.10	5.10	5.10	5.10	1.67	1.11	Japan off-peak
3.57	3.62	2.69	3.62	3.62	3.56	3.57	3.00	1.91	Korea, Rep. peak
2.48	2.52	1.87	2.52	2.52	2.50	2.53	2.10	1.33	Korea, Rep. off-peak
4.72	4.72	5.35	4.72	4.72	4.72	4.72	4.72	1.02	Mexico peak
3.12	3.12	3.57	3.12	3.12	3.12	3.12	3.12	0.67	Mexico off-peak
0.64	0.65	0.50	0.28	0.16	0.28	1.10	0.19	0.25	Norway
n.a.	1.17	4.32	1.17	1.07	1.07	2.39	1.17	2.39	Poland
1.73	n.a.	3.96	0.71	0.78	0.76	3.96	0.76	0.78	Portugal peak
1.07	n.a.	2.42	0.47	0.51	0.49	2.42	0.49	0.51	Portugal off-peak
3.31	3.31	n.a.	2.44	1.74	1.74	3.31	1.03	0.68	Singapore
1.35	0.66	2.98	n.a.	0.66	0.66	3.40	0.66	0.66	Spain peak
1.21	0.66	2.73	n.a.	0.66	0.66	3.05	0.66	0.66	Spain off-peak
0.51	0.92	1.30	0.51	n.a.	0.32	0.92	0.26	0.26	Sweden
1.10	0.44	1.10	0.44	0.44	n.a.	1.10	0.22	0.22	Switzerland peak
0.82	0.33	0.82	0.33	0.33	n.a.	0.82	0.16	0.16	Switzerland off-peak
2.57	2.57	6.51	2.57	2.57	2.57	n.a.	2.57	3.78	Turkey peak
1.67	1.67	5.15	1.67	1.67	1.67	n.a.	1.67	3.03	Turkey off-peak
1.45	1.34	2.20	1.34	1.08	1.08	2.54	n.a.	0.88	U.K. peak
1.23	0.98	1.98	0.98	0.88	0.88	2.04	n.a.	0.79	U.K. off-peak
1.02	0.51	0.72	0.51	0.51	0.51	1.53	0.30	n.a.	U.S. (WorldCom Int'l Weekends)
7.50	7.02	8.07	7.50	5.97	5.97	7.95	5.25	n.a.	U.S. (WorldCom Direct Dial)
0.84	0.75	0.84	0.51	0.60	0.75	1.35	0.30	n.a.	U.S. (AT&T One Rate)
5.61	5.85	5.85	5.70	4.62	4.98	6.51	3.87	n.a.	U.S. (AT&T Basic)

Source: TeleGeography research

Retail Pricing Trends, 1998-2001



Note: All rates are for peak calling and are expressed in US dollars.

Source: Philips Tarifica and TeleGeography research

Traffic Analysis

Overview of International Traffic Trends

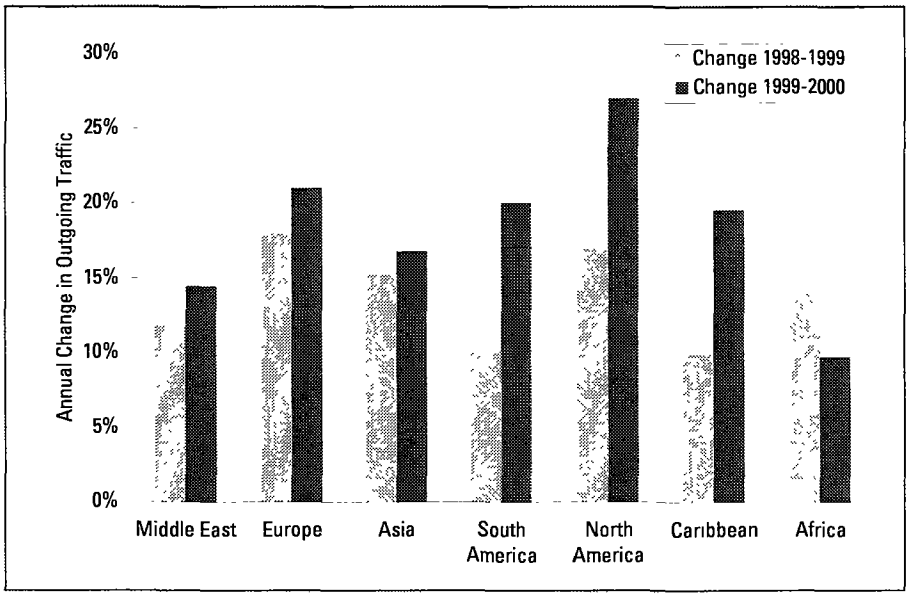
People will talk, given half a chance. And talk they did: in 2000, the total volume of international telephone traffic grew over 21 percent, to 132.7 billion minutes. This strong growth comes on the heels of a 17 percent increase in 1999 (see Figure 1. Regional Traffic Growth 1998-2000). For an industry that has long been described as "mature," international voice telephony showed remarkable vitality in 2000.

Historically, traffic growth has been strongly correlated with overall economic growth. Given the rapid economic growth rates of the late 1990s, it is not surprising that call volumes posted strong gains. However, TeleGeography's in-depth survey of international carriers suggests that there were other market factors at work as well.

Fuel on the Fire

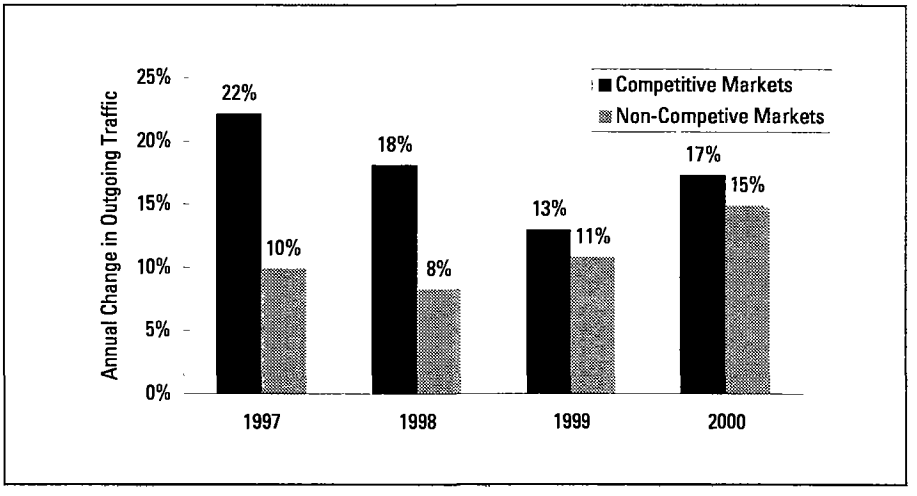
The factors driving the sustained traffic growth will be familiar to industry participants: falling costs and prices, fierce competition for retail customers, and the continued growth of mobile telephone subscribership.

Figure 1. Regional Traffic Growth, 1998-2000



Source: TeleGeography research

Figure 2. Annual Traffic Growth in Competitive and Non-Competitive Telecom Markets, 1997-2000



Note: Competitive markets allow at least limited international services competition; non-competitive telecom markets maintain one monopoly carrier.

Source: TeleGeography research

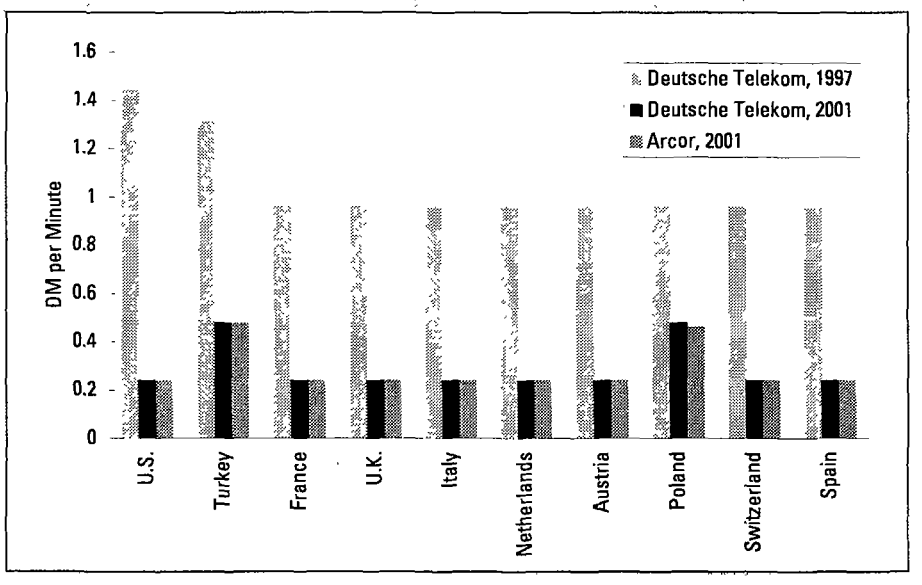
It is hard to overstate how competitive the international long distance marketplace has become or how pronounced the impact of competition has been—both on carriers and on their customers. As of mid-year 2001, 50 countries had authorized international telecom services competition, and the number of licensed international carriers had swelled to 4,030, up from approximately 370 in 1995.

The influence of competition is underscored by the fact that traffic growth in countries that allow international services competition has been twice as fast as in countries that do not (see Figure 2. Annual Traffic Growth in Competitive and Non-Competitive Telecom Markets,1997-2000). In 2000, call volumes grew by over 22 percent in countries allowing international telecom competition, compared with growth of just over 10 percent in countries that retained a monopoly international carrier. Countries with competitive international telecom markets now account for approximately 90 percent of the world's international traffic.

As recently as a year ago, the ascendancy of a new breed of competitive carriers was regarded by many as all but certain. These were seen as smaller, more nimble companies, unhindered by legacy equipment. Moreover, since they had no established customer base, they were able to price their services far more aggressively than their more entrenched rivals.

Incumbent carriers found themselves with a Hobbesian choice: they could either keep prices high and lose customers, or cut prices and lose their margins. However, there was no way that they could sustain their high-margin international long-distance business. After trying to hold out for a few years, it seems that most have acquiesced and slashed prices. Retail prices have plummeted in competitive markets around the world.

Figure 3. International Call Costs from Germany, 1997 and 2000



Note: Call costs are based on advertised retail prices, including VAT.
Source: TeleGeography research

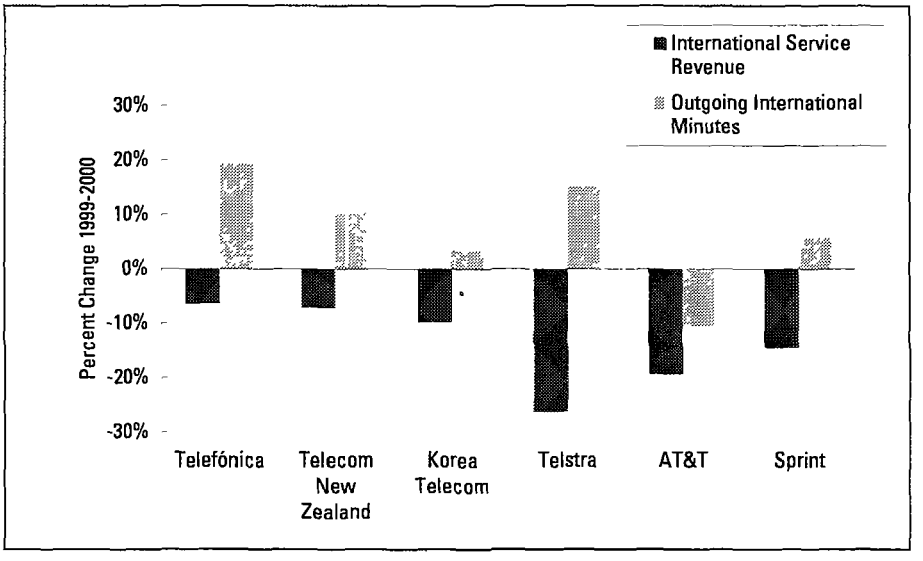
For example, at year-end 1997, on the eve of the competitive era in Europe, Deutsche Telekom charged DM 1.44 per minute for a call to the U.S. By mid-year 2001, Deutsche's retail price for calls to the U.S. stood at DM 0.24 per minute—a drop of more than 80 percent (see Figure 3. International Call Costs from Germany, 1997 and 2000). While a handful of rivals still boast lower prices, Deutsche Telekom's prices are now virtually indistinguishable from those of its chief competitors, greatly reducing the incentive for customers to switch to alternate carriers. This trend is typical of many other countries where competition has recently taken root.

These price cuts seem to be having their desired effect. After three years of declining call volumes, international traffic carried by incumbent carriers appears to have stabilized in the past year. Deutsche Telekom's outbound international traffic, for example, fell by "only" 1.4 percent in 2000. Coming on the heels of an 18 percent decline in 1999, this represents a victory of sorts—albeit a pyrrhic one.

Rain on the Parade

Interestingly, the traffic and pricing data collected by TeleGeography suggest that demand for international long-distance services is highly price-elastic. To enlarge upon the German example cited above, prices in the German market have fallen by approximately 75 percent in the past three years. During this same time period, international call volumes have nearly doubled. Clearly, falling prices have served as a powerful spur to international traffic growth.

Figure 4. Revenue and Call Volume Changes for Major Carriers, 1999-2000



Source: TeleGeography research

However, while Germany's call volumes have doubled, per-minute prices have tumbled even more rapidly, and the number of carriers sharing the traffic revenues has grown 100-fold. Consequently, while price cuts have helped incumbent carriers to stop the decline in their traffic volumes, they have done little to shore up their bottom line (see Figure 4. Revenue and Call Volume Changes for Major Carriers, 1999-2000). Carriers as diverse as Sprint, Telefónica, Telstra, and Korea Telecom have all suffered through the same experience: doing more, but not doing better.

The brutal pace of competition has not treated competitive carriers any more gently than the incumbents. While the established carriers have ceded market share to their new rivals, most have been able to retain 50 percent or more of their home market's international traffic, leaving their rivals to divide the remainder.

For many competitive carriers, that has proven to be too little to survive. Faced with sustained losses, the need for continued investments, and unfavorable capital markets, five of the ten largest U.S. international carriers filed for bankruptcy in the early months of 2001 (see Figure 5. Five of the Ten Largest Carriers Have Failed).

Not all competitive carriers suffered equally from the downdraft. With over 12 billion minutes of outbound traffic from the U.S., WorldCom clearly overtook AT&T to become the largest international carrier in the United States. On the basis of all information available to TeleGeography, WorldCom has emerged as the largest international carrier in the world, with approximately 16 billion minutes of aggregated traffic worldwide.

Figure 5. Five of the Ten Largest U.S. Carriers Have Failed

	Carrier	Outgoing International Minutes 1999	2000
1.	AT&T	10,816.5	9,680.1
2.	WorldCom	8,294.9	12,399.5
3.	Sprint	3,714.4	3,922.8
4.	World Access	1,129.5	Bankrupt, April 2001
5.	Viatel	901.6	Bankrupt, May 2001
6.	STAR	785.8	Bankrupt, March 2001
7.	Pacific Gateway	284.1	Bankrupt, December 2000
8.	RSL Com USA	389.5	Bankrupt, March 2001
9.	Primus	868.5	1,082.5
10.	Startec	207.2	404.3

Notes: 2000 traffic data not available for bankrupt carriers. Ranking based upon 1999 outgoing international minutes from the U.S.

Source: FCC and TeleGeography research

Mobile telephony

At their most basic level, mobile phones contribute to international traffic by simply providing more calling opportunities. More significantly, mobile phones can roam across borders with their subscribers. The impact of mobile roaming on international call volumes has been particularly pronounced in Europe, where countries are small, borders are porous, and mobile phone subscribership numbers are high. Mobile-originated international traffic grew by 66 percent in 2000, more than three times as fast as fixed-line traffic. Worldwide, international calls placed from mobile phones grew to 20.3 billion minutes, equivalent to 15.3 percent of the world's telephone traffic.

The impact of mobile phones on cross-border telephone traffic is frequently overlooked by regulators and industry observers, who focus on competition for fixed-line subscribers. This emphasis on fixed-line international telephony is understandable. The majority of international calls are still placed from fixed-line telephones, and this is the arena in which carriers vie for retail customers. However, from the perspective of international carriers, this yardstick neglects the fact that mobile operators have emerged as increasingly important customers for wholesale international services.

International Refile Traffic and Accounting Rate Bypass

Until just a few years ago, sending and terminating calls abroad was simple and expensive. International telecommunication companies (typically, incumbent monopolies) shared the cost and revenue for nearly every cross-border public switched call 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 final 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 changes. As long as carriers were predominately monopoly incumbents 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 2000, 90 percent of the world's traffic was originated in countries that allowed international services competition, and traffic imbalances on some large routes, such as the U.S. to Mexico, can amount to billions of minutes.

As competition began to intensify, many carriers 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 of them are entirely legal—but almost all are cheaper than the accounting rate regime.

Legal Bypass

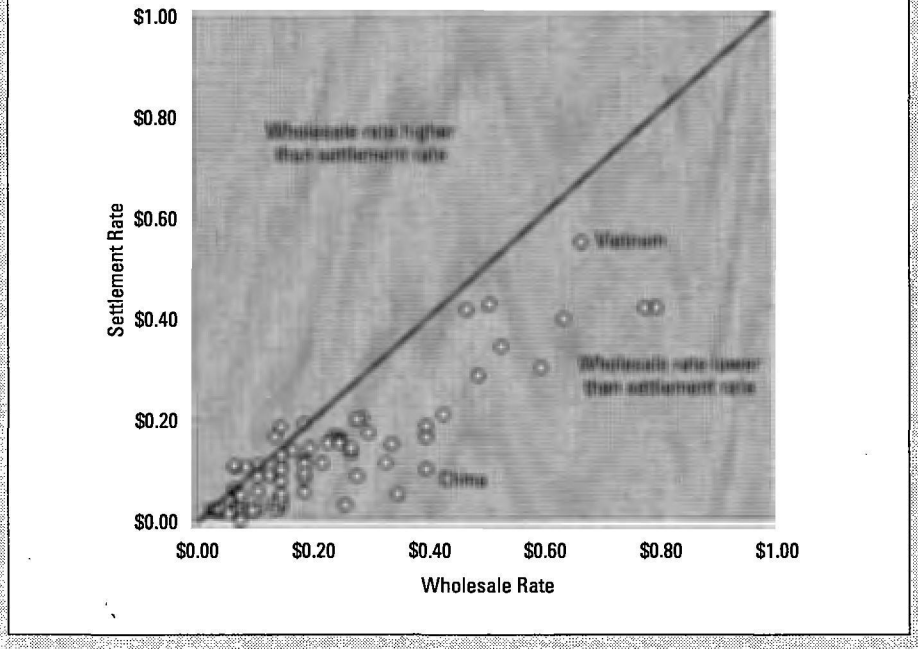
Legal bypass, which eschews traditional international settlement in favor of direct interconnection with foreign local exchange carriers (LECs), accounts for the largest portion of alternatively routed traffic. For many years, the only way for competitive carriers to provide international capacity was to lease international private-line capacity from foreign carriers and "resell" it to their own customers. Although this practice is gradually giving way to new options, such as the outright ownership of bandwidth between and within multiple countries, regulators still often call this type of service International Simple Resale (ISR).

In 2000, 35 countries allowed direct interconnection (effectively, another term for ISR). ISR traffic may only be sent between countries where both countries allow it. For example, while ISR is permitted in the U.S., it is not permitted in Mexico. Consequently, U.S. carriers cannot send ISR to Mexico, nor can Mexican carriers terminate traffic directly with a U.S. LEC.

The 35 countries allowing direct interconnection with one another collectively generate 83 percent of the world's outbound traffic—approximately 110 billion minutes in 2000. About 62 billion minutes, equivalent to slightly less than half of the world's international traffic, is sent between these countries.

The fact that these countries allow ISR does not mean that all traffic between these countries is sent via ISR. TeleGeography's analysis of U.S. carrier filings with the FCC suggests that only about 40 percent of traffic sent by U.S. carriers to countries permitting ISR bypassed the settlement rate system. But this misses a key point: if carriers had found it to their advantage to send their traffic via ISR, they would have. The fact that they did not suggests that they had other, equally economical, means of delivering and terminating their traffic. For carriers sending traffic between countries where ISR is permitted, the term "bypass" has become something of an oxymoron. Bypass what? The term suggests that there is an obstacle that must be overcome, when in fact, this is no longer the case.

Figure 6. Comparison of Wholesale and Settlement Rates, 2000



Note: Wholesale rates reflect country rates available on Band-X during 2000; settlement rates reflect the lower of U.S. and U.K. settlement rates for 2000.

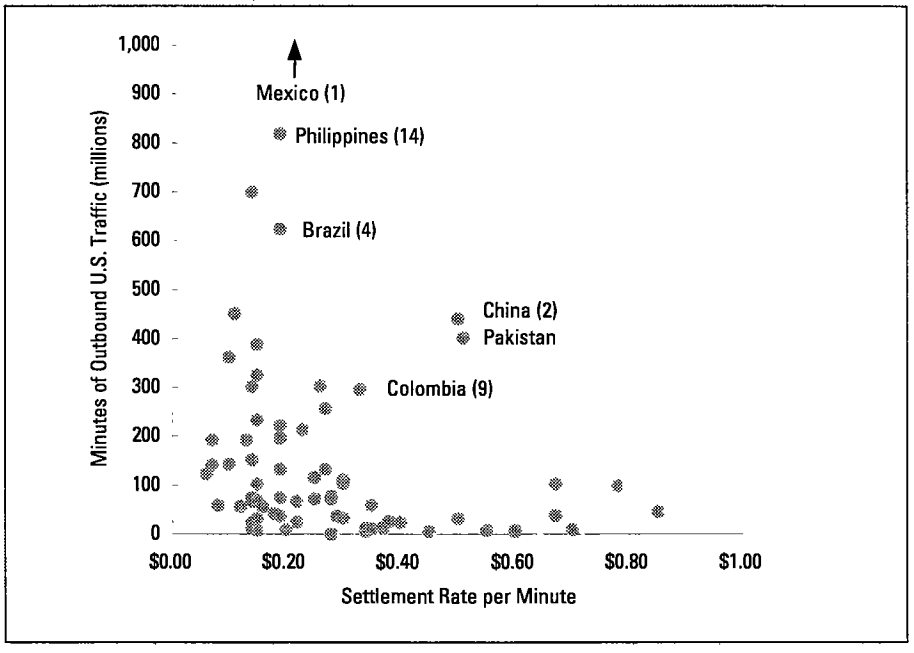
Source: Band-X Ltd., FCC, OFTEL, TeleGeography research

Illicit Bypass

The issue of bypass traffic is far more acute for carriers sending traffic to and from the 200 countries where direct interconnection is not authorized. Calls to countries where ISR is not permitted constitute approximately 53 percent of U.S. outgoing traffic, but 79 percent of U.S. settlement payments (approximately $3.9 billion in 2000). Per-minute settlement rates are approximately three times higher in countries where direct interconnection is not permitted than in countries where it is—averaging $0.36 per minute, compared with $0.13 in countries allowing direct interconnection.

A comparison of wholesale prices charged by carriers on the switched minutes trading floor of TeleGeography's parent company, Band-X with official settlement rates suggests that many carriers have found ways to beat the system. Figure 6 compares wholesale country rates available on Band-X in 2000 with the prevailing settlement rates for that particular country. Each dot in the chart compares the settlement rate with the wholesale price charged for carrying a minute of traffic to that country. Thus, for example, a carrier was offering to carry traffic from Band-X's switch in London to Vietam at a wholesale rate of $0.55 per minute, $0.12 less than the prevailing settlement rate of $0.67 per minute. Since ISR is not permitted in Vietnam, it seems all but certain that this traffic is bypassing the settlement rate.

Figure 7. VoIP and Bypass Targets, 2000



Notes: Number in parenthesis denotes country's rank among international VoIP destinations. U.S. traffic to Mexico exceeds 6 billion minutes.

Source: TeleGeography research

While these "gray market" rates are attractive to carriers, they have the disadvantage of being unpredictable. Gray market rates can fluctuate wildly, and abruptly disappear, when authorities discover and shut down that route (please see the Overview of International Pricing Trends on page 33). The typical life expectancy of such a gray market route can be measured in months, if not weeks.

Bypass-over-IP

The combination of relatively high settlement rates and heavy traffic volumes has historically created large volumes of illicit bypass traffic (e.g., to China, Jamaica, Philippines, Brazil, India, and Mexico). These countries present the greatest cost savings opportunities for bypass of the settlement rate and are, therefore, the most attractive targets for carriers seeking to evade settlement payments (see Figure 7. VoIP and Bypass Targets, 2000). Some countries (appearing in Figure 7 as gray circles hugging the "x" axis) have very high settlement rates but low volumes of incoming traffic. Other countries (stacked along the "y" axis in Figure 7) receive substantial amounts of incoming calls but have low settlement rates.

Not surprisingly, most of the countries that make attractive bypass targets have also emerged as the leading destinations for international voice-over-IP (VoIP) traffic. VoIP holds substantial long-term promise as a means of reducing costs for carriers and as a platform for introducing a host of new communications services. However, in the near term, it has emerged as the most elegant means yet devised of bypassing the account-

Figure 8. The Substitution Effect

The second largest international route in the world—between the U.S. and Mexico—is also the most imbalanced route in the world. U.S. callers send hundreds of millions more minutes of calls to Mexico than they receive, resulting in a huge outflow of payments from U.S. carriers to their Mexican counterparts. During the past decade, U.S. carriers' net settlement outpayments to Mexico have averaged more than $700 million per year.

In 1999, U.S. carriers were able to reach a new deal with Telmex. In January 1999, settlement rates were reduced from $0.39 to $0.23 per minute. Six months later, they were reduced to $0.19 per minute, where they remained throughout 2000. Spurred by this rate cut, traffic from the U.S. to Mexico surged from 4.1 billion minutes in 1999 to 6.1 billion minutes in 2000. Given the close relationship between the U.S. and Mexico and the large number of Mexican immigrants living in the U.S., it is not surprising that demand should be high. That it should increase by half in one year is astonishing. But perhaps call volumes didn't actually grow by a full 50 percent. A far more plausible explanation is that traffic that once bypassed the settlement rate regime has now come into the open and is being documented. Lower settlement rates have reduced (though by no means eliminated) the incentive to smuggle traffic into Mexico via "gray market" channels.

This "substitution effect" (of above-board PSTN service for illicit bypass) may also account for some of the rapid growth we've seen in recent years in Europe and other recently liberalized countries. Prior to the liberalization of the European market, call-back services and illicit leased-line services were widely used throughout Europe. Plummeting prices for international telephony services have eliminated any incentive customers may once have had to use gray market carriers, bringing the traffic once sent through these hidden channels back onto the public network.

Similar shifts in call volumes have been documented in other countries. For example, when leased lines were authorized (for internal company use) in Indonesia in 1999, PSTN call volumes plummeted, as heavy users of international calling services switched to (illicit) ISR carriers. A similar event took place, albeit in reverse, in 1999 in Hong Kong, when ISR was legalized. Outbound traffic from Hong Kong surged—much of it due to substitution, as customers abandoned call-back services in favor of leased-line resellers.

Since TeleGeography's research depends on traffic data compiled by international carriers, it is certain to miss some of the gray and black market traffic that is, intentionally, being hidden from these very carriers. However, occasionally, the swings in documented traffic are so great that they provide evidence of occurrences in these hidden markets.

ing rate regime (for a detailed analysis of VoIP traffic trends, please see VoIP Routes & Traffic on page 69). In 2000, VoIP call volumes reached approximately 5.3 billion minutes, essentially all of which bypassed the accounting rate system.

How much international traffic illegally bypasses the accounting rate system? By virtue of their illicit character, traffic volumes in this "gray market" are extraordinarily difficult to track. Successful bypass operators are generally loathe to advertise their success, and traffic smuggling arrangements are usually transient. Carriers lease a private line, aggressively ramp up international call volumes, and then terminate the operation just as quickly.

TeleGeography estimates that illicit bypass volume was somewhere in the range of five to ten percent of global international traffic in 2000. At least half of this bypass traffic traveled as VoIP and the remainder as switched bypass over leased lines. Although illicit bypass accounts for only a small percentage of total world traffic, it is unevenly distributed. In many countries, such as China, Panama, or Bangladesh, the proportion

of bypass traffic can be far higher—between 40 and 60 percent. The financial loss to carriers in these destination countries easily reaches several hundred million dollars annually.

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 secretly re-routes an outgoing international call through a third country, taking advantage of the intermediate country's lower settlement rate with the final destination country. 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, replacing it with its own country code. This ruse makes economic sense in cases where settlement rate disparity exists between originating countries. For example, in mid-year 2000, the official settlement rate for traffic to Kuwait was $0.15 per minute from the U.S. and $0.67 per minute from the U.K. By charging British carriers a fee somewhere between the U.S. and U.K. rates—say, $0.25 for a one-minute call—a U.S.-based refiler could turn a $0.10 profit. Another winner would be the British carrier, saving $0.41 (minus the negligible transmission costs of re-routing the call through the U.S.). In contrast, the Kuwaiti telco would lose $0.51 in potential settlement income from the transaction.

Based on information gathered in its annual survey of international carriers, TeleGeography estimates that refile traffic accounts for about 25 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 to its destination.

The final question is, who is sending all of this bypass traffic? The simple answer is that everybody's doing it. 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 and the fact that virtually all international carriers are engaged in some form of bypass, the practice will survive as long as there are cost structures that can be circumvented.

VoIP Routes & Traffic

Overview

Just three years ago, the combined traffic of all companies routing international calls over Internet Protocol (IP) networks accounted for less than one-half of one percent of the world's international minutes. Although Voice-over-Internet Protocol (VoIP) has only recently left its infancy as an alternative to traditional circuit-switched calling, the core infrastructure and support systems necessary for making VoIP a serious choice have begun to come online.

In 2000, cross-border VoIP call volumes reached approximately 5.3 billion minutes, up from about 1.6 billion in 1999. Based on TeleGeography's half-year survey results, the total market may reach 10 billion minutes for the calendar year 2001, constituting almost six percent of the world's forecasted international traffic (see Figure 1. International VoIP and PSTN Traffic Summary).

Wholesale VoIP

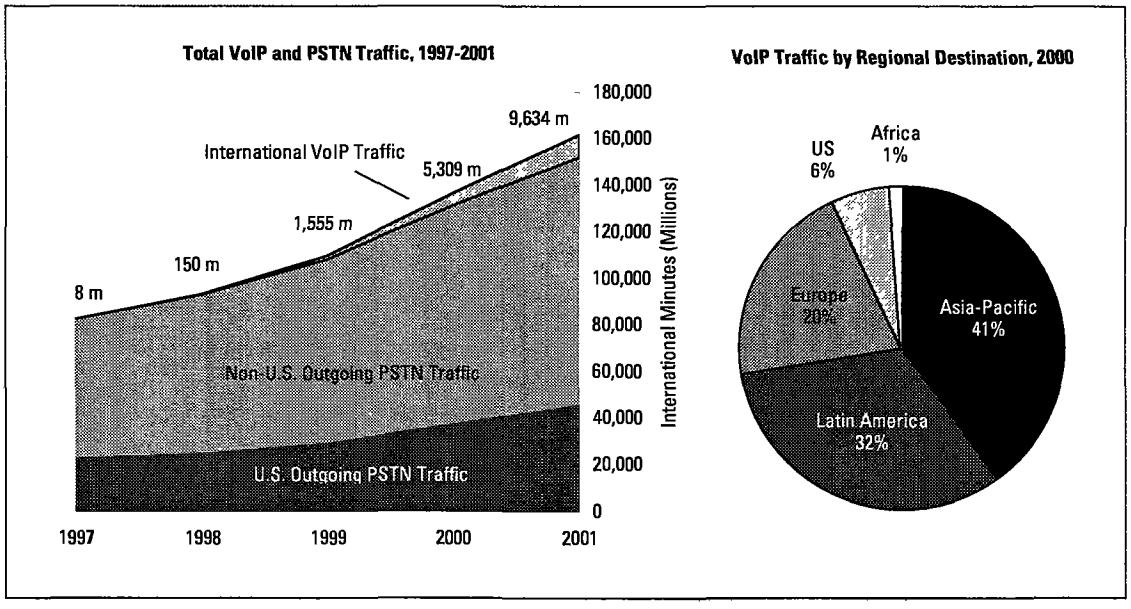
The VoIP industry is still young and unpredictable. While new and incumbent carriers alike are laying plans for IP networks that will carry all of their voice traffic in coming years, they still have a way to go. Most VoIP traffic today is carried by a handful of specialist providers acting as carriers' carriers and clearinghouses for established and emerging phone companies (see Figure 2. Major VoIP Carriers and Traffic). Some of these specialist wholesalers use regular Internet transit to carry their voice traffic; others use private lines running IP. Most use a combination of the two, along with PSTN "failover" circuits where IP connections are too thin, too few, or too congested.

Although their network architectures may differ, most wholesale VoIP carriers share the same goal: arbitrage. They take advantage of differences between official PSTN settlement fees and de facto termination rates by using IP to transport their voice traffic. In some cases, this is done illicitly. Notably, there are few cases where IP is used solely because of its efficiency as a transmission technology.

PSTN phone companies appear to have become serious users of VoIP middle men: in 2000, wholesale traffic accounted for more than half of the world's VoIP minutes. VoIP wholesaler ITXC claims to have 14 of the top 15 U.S. carriers for customers, and its chief competitor, iBasis, is carrying traffic for 11 of the top 12. Furthermore,"next generation" carriers—such as Global Crossing, Level 3, and KPNQwest—have installed totally new infrastructure upon which wholesale VoIP volumes should rise as the new companies ramp up their traffic streams.

Nonetheless, many well-established telephone companies still consider VoIP an experiment and sometimes see it as a threat to existing revenue streams. The threat is even more clear to carriers in monopoly markets, where operators may lose out on outgoing call revenues and incoming settlement payments. But as incumbents become more comfortable with VoIP and as the underlying technology matures, more and more voice traffic is likely to transit IP networks. How much? The answer will largely depend—in the short term—on how many arbitrage opportunities exist (which is tied into how long certain markets stay closed to full competition). In the long term, the answer will

Figure 1. International VoIP and PSTN Traffic Summary



Note: 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 2001 are estimated.

Source: TeleGeography research

depend on how deeply into the home and office IP-enabled devices penetrate and how willing existing carriers are to moth-ball billions of dollars of PSTN switching equipment ahead of their expected depreciation cycle.

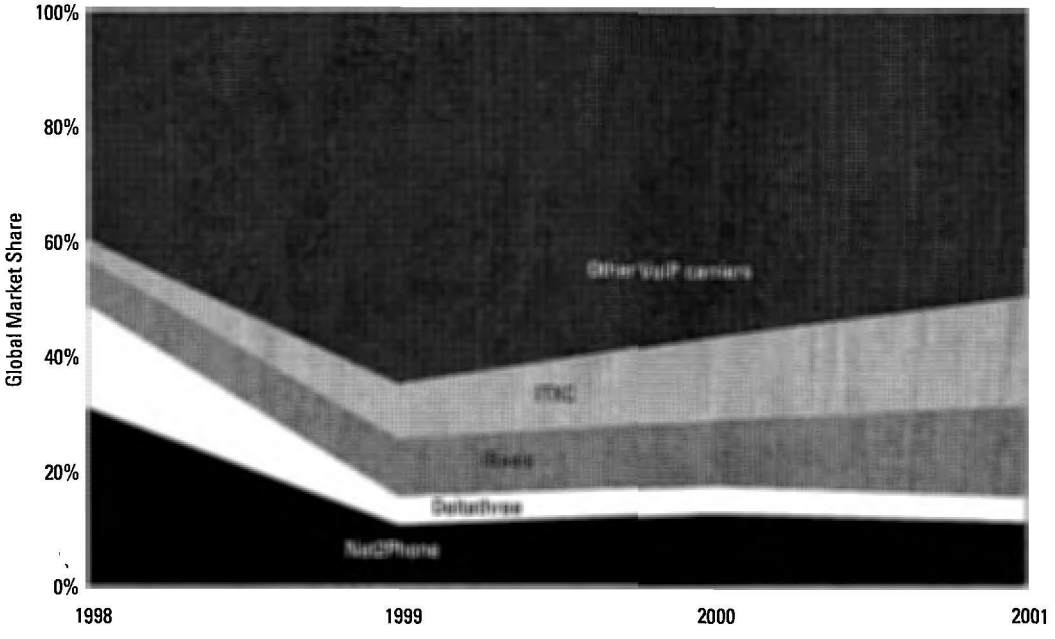
Retail VoIP

In addition to their wholesale businesses, many VoIP specialists are also taking a direct path to the consumer by way of PC-to-PC and PC-to-phone calling plans. (In fact, PC-to-phone calls predate phone-to-phone over IP.) Dozens of new Web-based communications portals offer almost free domestic calling and ultra-low cost international calls to users equipped with the proper hardware and proprietary software. Not only do these carriers employ VoIP arbitrage to cut costs, most also generate sponsorship revenue by way of on-screen advertisements (although not enough to support completely free calling). Last year, Net2Phone, DeltaThree, and DialPad all reported significant volumes of PC-to-phone traffic, comprising more than 20 percent of the world's international VoIP calls in 2000. And almost all VoIP companies also offer some form of calling cards, utilizing networks of dial-around gateways to get PSTN calls onto their networks. Based on our survey data for 2000, approximately 20 to 30 percent of international VoIP traffic can be attributed to calling-card origins.

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 mostly 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 net-

Figure 2. Major VoIP Carriers and Traffic

Market Share of International VoIP Minutes, 1998-2001



Company	2000 (Jan.-Dec.) Traffic (min)	2000 (Jan.-Dec.) Revenues	2001 (Jan.-June) Traffic (min)	2001 (Jan.-June) Revenues	Market Capitalization Oct. 2, 2000	Market Capitalization Oct.2, 2001
Deltathree (NASD: DDDC)	257 m	$30.0 m	111 m	$8.9 m	$104.5m	$19.2 m
iBasis (NASD: IBAS)	604 m	$61.2 m	590 m	$61.3 m	$541.1 m	$28.5 m
ITXC (NASD: ITXC)	769 m	$84.8 m	703 m	$74.9 m	$563.6 m	$118.7 m
Net2Phone (NASD: NTOP)	416 m	$62.5m	675 m	$84.7 m	$1,238.8 m	$189.6 m

Notes: Traffic statistics include only international VoIP minutes; revenue figures include services, software, and equipment in addition to per minute charges for IP voice and fax services. Net2Phone's fiscal year ends July 31.

Source: TeleGeography research and company reports

works. Now in its fourth iteration, H.323 has been reengineered 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.

The relative importance of PC-to-phone—and PC-to-PC—calling may grow rapidly with the introduction of Microsoft's new Windows XP operating system, which integrates SIP into the computer's pre-installed communications software. Although desktop calling software is nothing new to the PC, the level of integration, quality, and functionality may make PC-to-phone calls a much more substantial portion of overall VoIP volumes and may finally take PC-to-PC (or IP-to-IP device) calls mainstream. Depending on how these calls are accounted for, tracking VoIP traffic may become a considerably more complex exercise.

Traffic Survey

Given the still nascent stage of the VoIP industry, the installed base of circuit-switched transmission equipment, and the difficulty of tracking calls terminated in places where you may not want to advertise your success, making predictions is a hazardous business. Therefore, our research focused on acquiring real traffic statistics from real VoIP carriers. The statistics and analysis presented on these pages are based on TeleGeography's second annual VoIP routes survey, concluded in September 2001. (For information on how to participate, please see the contact information at the front of this report.)

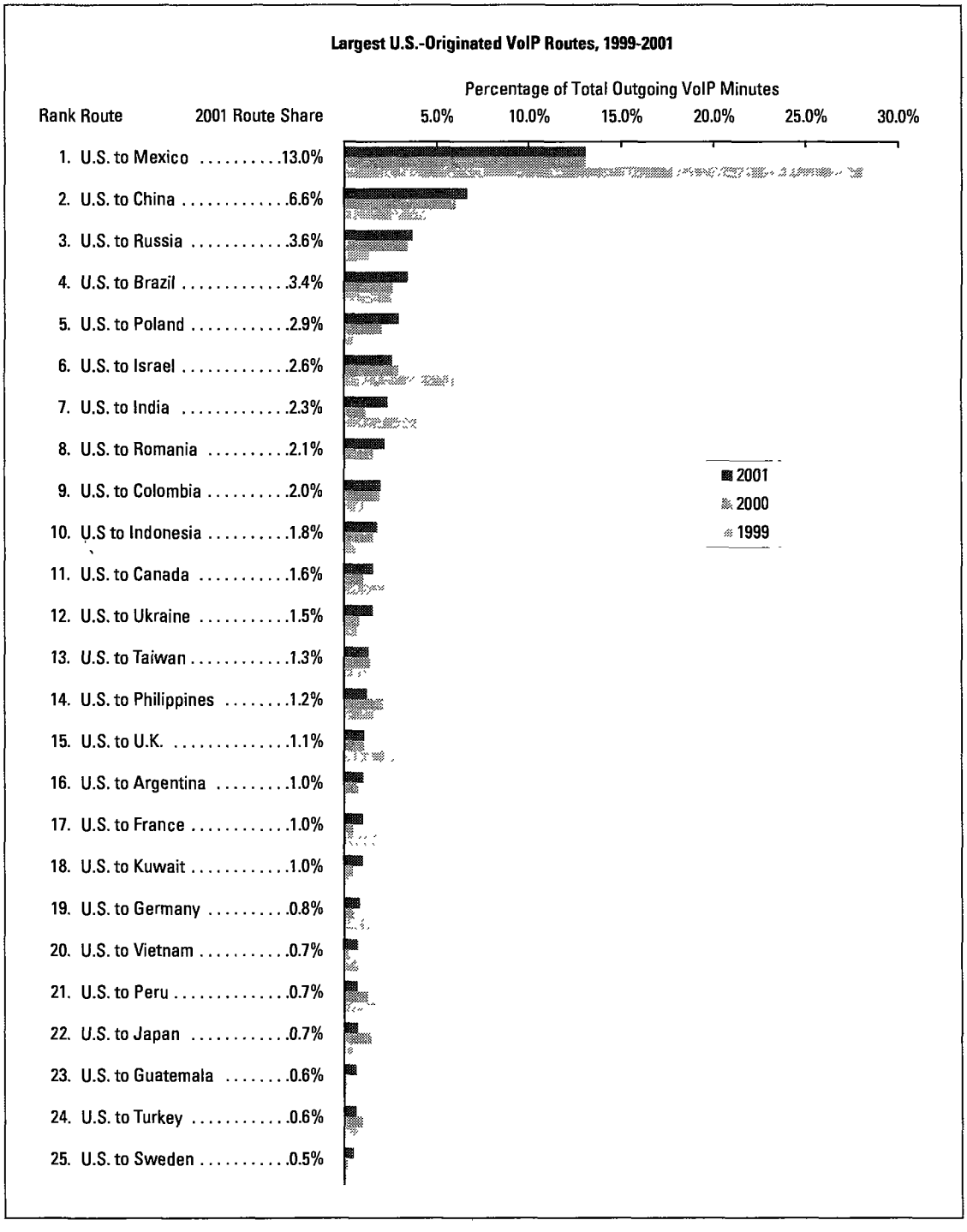
The goal of our survey was twofold: first, to measure how much VoIP traffic transits international networks; and second, to establish where it is going. The data presented here include international phone calls that transit public or private IP networks at some point but are ultimately terminated on 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 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. As a result, the tables in Figure 3 present routes originating at U.S. hubs only, and traffic flows are displayed in relative proportions rather than absolute minutes.

The Results

Overall, our findings proved 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 of the world's VoIP traffic currently originates in the U.S., although the U.K. 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. And, just as the U.S. continues to act 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 (see Figure 3. Top 25 U.S.-Originated VoIP Routes, 1999-2001).

Although VoIP calling patterns run roughly parallel to established PSTN demand, the largest share of VoIP traffic terminated in countries where existing PSTN settlement rates are highest relative to the actual cost of getting the call there (see Figure 4. Traffic, Settlements, and Regulation). Also, because quality expectations may be lower on many popular arbitrage routes, VoIP calls compare favorably to the equally mediocre quality of many circuit-switched calls. The impact on overall traffic flows can be significant—in countries with sufficient infrastructure and high settlement rates, VoIP accounts for up to 10 percent of total incoming traffic.

Figure 3. Top 25 U.S.-Originated VoIP Routes, 1999-2001

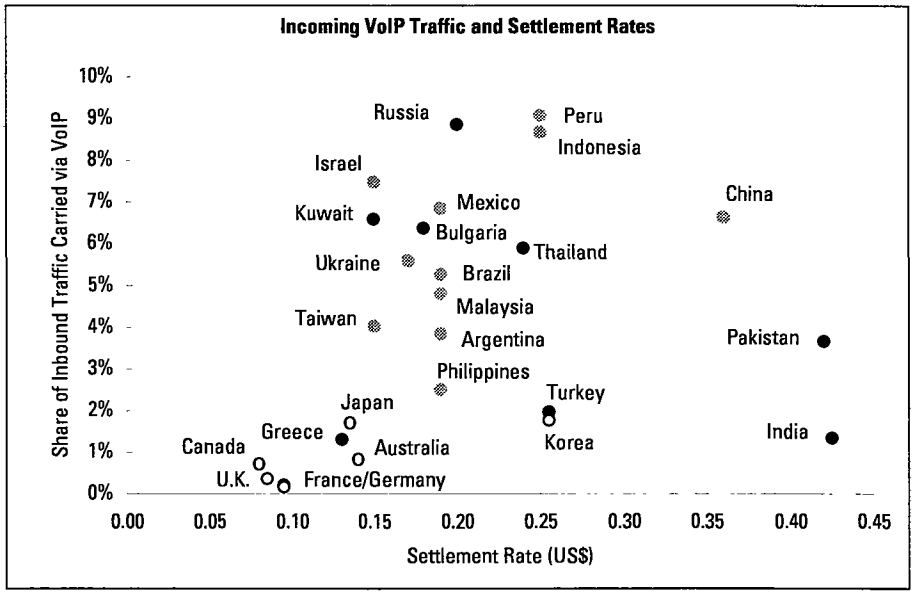


Rank	Route	2001 Route Share
1.	U.S. to Mexico	13.0%
2.	U.S. to China	6.6%
3.	U.S. to Russia	3.6%
4.	U.S. to Brazil	3.4%
5.	U.S. to Poland	2.9%
6.	U.S. to Israel	2.6%
7.	U.S. to India	2.3%
8.	U.S. to Romania	2.1%
9.	U.S. to Colombia	2.0%
10.	U.S to Indonesia	1.8%
11.	U.S. to Canada	1.6%
12.	U.S. to Ukraine	1.5%
13.	U.S. to Taiwan	1.3%
14.	U.S. to Philippines	1.2%
15.	U.S. to U.K.	1.1%
16.	U.S. to Argentina	1.0%
17.	U.S. to France	1.0%
18.	U.S. to Kuwait	1.0%
19.	U.S. to Germany	0.8%
20.	U.S. to Vietnam	0.7%
21.	U.S. to Peru	0.7%
22.	U.S. to Japan	0.7%
23.	U.S. to Guatemala	0.6%
24.	U.S. to Turkey	0.6%
25.	U.S. to Sweden	0.5%

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, so some omissions may have occurred. Year 2001 rankings are based on statistics supplied for the first six months of 2001. In 2001, routes omitted from this table may have accounted for almost 50 percent of U.S. originated VoIP traffic.

Source: TeleGeography research

Figure 4. Traffic, Settlements, and Regulation



Notes: Traffic data based on actual and estimated totals for 2000. Settlement rates based on FCC reported averages for calendar year 2000. Regulatory comparison based on the number of carriers authorized to own international transmission facilities at year end 2000.

Source: TeleGeography research and FCC

The clearest example of this trend is traffic on the U.S.-Mexico route, which accounted for about one-fifth of global VoIP traffic between 1999 and 2001. Routes into China and Russia are also growing fast, with over 300 percent growth between 1999 and 2000. VoIP is a logical alternative on routes like these, where International Simple Resale or direct interconnection are still prohibited but sufficient IP capacity—and the right combination of regulations or lack of enforcement—exists to route calls over Internet connections into the local telephone network. In the near future, we also expect that traffic into other parts of East Europe, Latin America, and Southeast Asia will increase dramatically as VoIP termination arrangements expand and IP infrastructure matures, providing a viable alternative to high PSTN settlement rates.

Conclusion

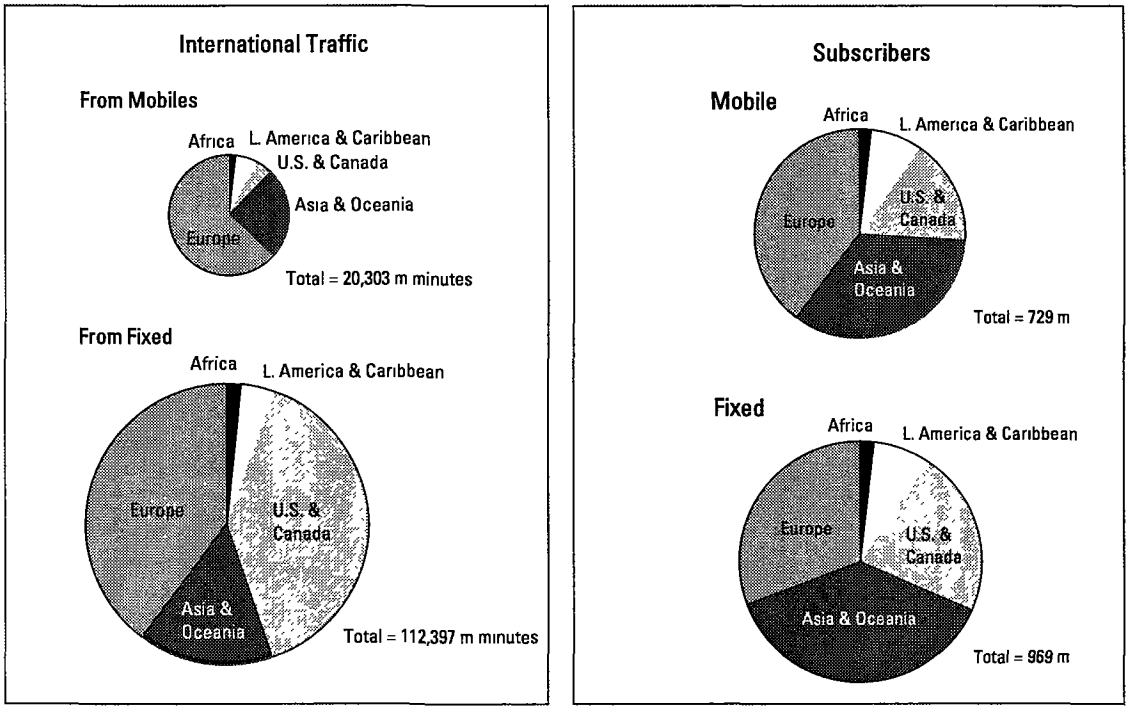
Since TeleGeography began tracking international phone calls more than a decade ago, market forces and technological innovation have driven down prices and increased traffic flows across the globe. The Internet has no doubt played a significant role in accelerating this process in the last few years, 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 five years, mobile telephones have become an integral part of the international telecommunications landscape. Once considered a luxury item for business travelers, mobile phones now outnumber fixed-line connections in a growing number of developed and developing countries. In advanced economies, the popularity and ubiquity of mobile phones have made them almost a necessity; for developing economies, mobile telephony provides a means of circumventing the high construction costs of building out extensive fixed-line networks and eliminating waiting times and high up-front costs for fixed-line installation.

For international long distance carriers, the importance of mobile telecommunications is quite clear. Greater mobile subscribership means an increasing proportion of international traffic will be originated or terminated on mobile devices. In *TeleGeography 2001*, we reported that mobile-originated international telephone traffic grew from eight percent of total international traffic in 1998 to 11.5 percent in 1999. During 2000, the mobile share of international traffic reached 15.3 percent, accounting for over 20 billion minutes. As that proportion grows, mobile-originated and mobile-terminated traffic will become an increasingly significant consideration for long-distance carriers who transport mobile traffic across political borders.

Figure 1. Mobile versus Fixed International Traffic and Subscribership by Region, 2000



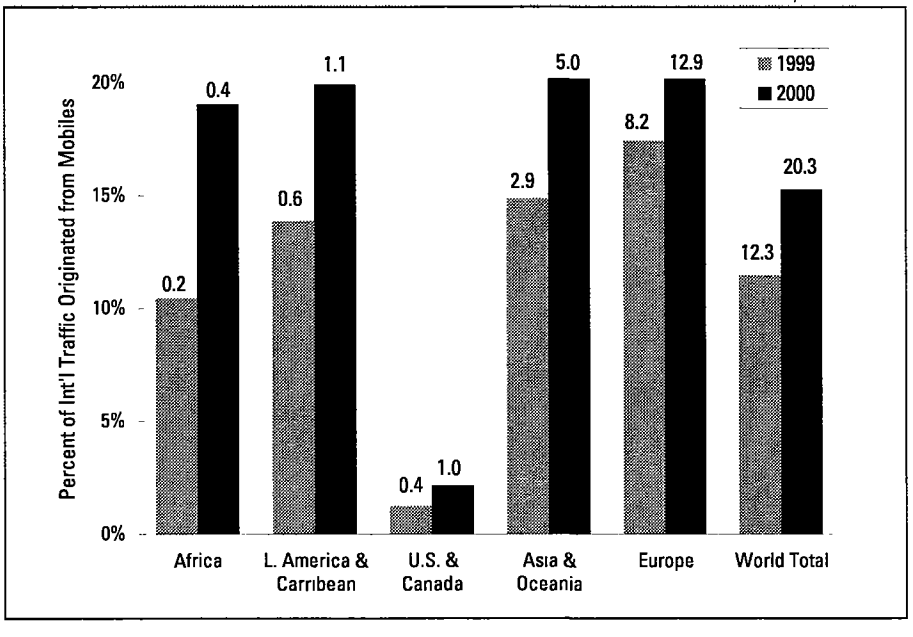
Source: TeleGeography research and ITU

Mobile Traffic: The Year in Review

From 1999 to 2000, the volume of international traffic originated on mobile phones increased 66 percent to 20.3 billion minutes. Growth rates across regions varied widely, from 58 percent in Europe to 127 percent in the U.S. & Canada. Despite the differences in growth rates, regional shares remain relatively unchanged. Europe still accounts for well over half of the world's mobile-originated traffic, with Asia & Oceania a distant second (see Figure 1. Mobile versus Fixed International Traffic and Subscribership by Region, 2000). Mobile-originated international calls account for 19 to 22 percent of total outgoing international traffic for all regions of the world, except in the U.S. & Canada, where only 2.2 percent of international calls originate on mobile networks.

Not surprisingly, the volume of international traffic terminated on mobile phones is roughly on par with mobile-originated international traffic. Based on the information supplied by numerous carriers, TeleGeography estimates the total amount of mobile-terminated international traffic to be 25.4 billion minutes, just over 20 percent of the world's total incoming international traffic. Regional shares of the world's total mobile terminated traffic parallel those of mobile-originated traffic; Europe accounts for 65 percent of the world's total, followed by Asia & Oceania (22.8 percent), Latin America & Caribbean (5.9 percent), Africa (3.8 percent), and the U.S. & Canada (2.8 percent). Within regions, however, the proportions of mobile-originated and mobile-terminated traffic are not as closely linked (see Figure 3. Percent of International Traffic to and from Mobiles, 2000).

Figure 2. Percent of Mobile-Originated International Traffic, 1999-2000



Note: Numbers show total mobile-originated international traffic minutes in billions.

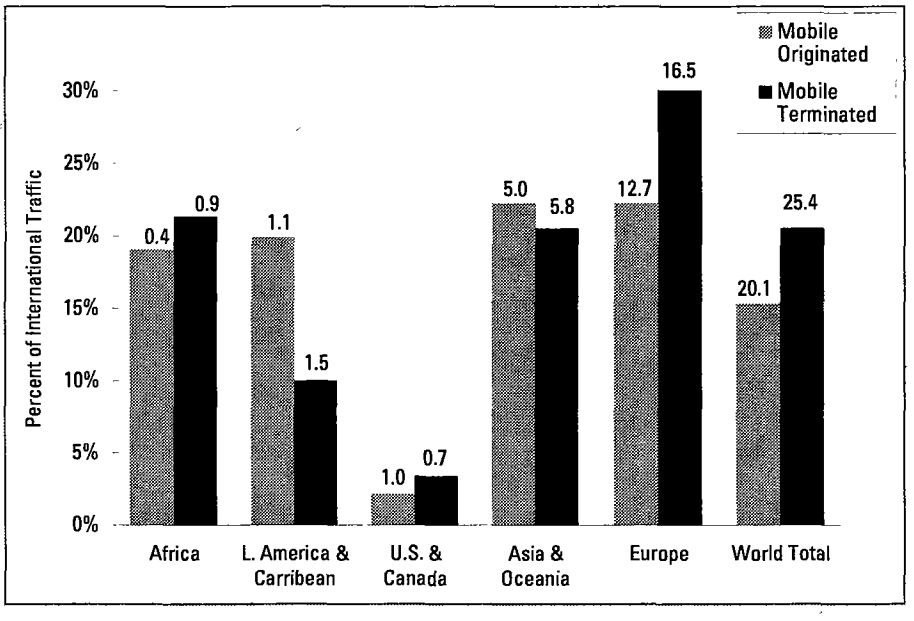
Source: TeleGeography research

The Cost of Termination

While patterns of mobile-originated traffic highlight the increasing role of wireless telecommunications in the international long distance market, patterns of mobile-terminated international traffic are perhaps of more immediate interest to international carriers. Terminating traffic on mobile networks is almost universally more expensive than terminating traffic on fixed networks (Figure 4. Wholesale Rates to Fixed versus Mobile Telephones, 2001).

In order to illustrate the economic effects of terminating international traffic on mobile networks, TeleGeography has estimated the costs of mobile termination using its traffic data and wholesale pricing information from the switched minutes trading floor of Band-X. Though the wholesale rates may not be an exact reflection of the actual costs, they serve as an excellent proxy, as differences in wholesale rates between fixed and mobile termination closely 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. Where the rates for fixed and mobile termination are in line (Africa, for example), mobile traffic does not contribute significantly more to the cost of terminating traffic in a particular country. In regions such as Europe, where the differential is quite significant, mobile traffic contributes disproportionately to the total cost (Figure 5. Estimated Costs of Wholesale Traffic to Fixed and Mobile Destinations, 2000). For Western Europe, in particular, the effect is stunning: though mobile calls account for only 31.8 percent of all incoming international traffic, they represent 80.2 percent of the total cost of terminating international traffic.

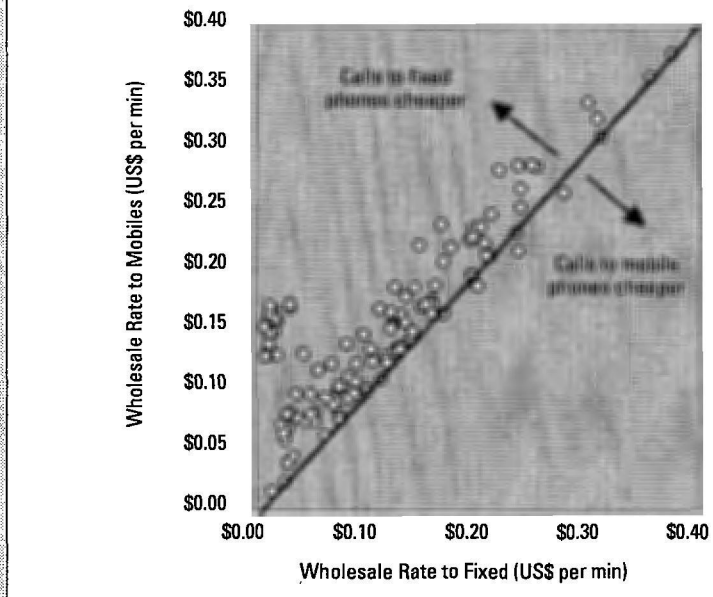
Figure 3. Percent of International Traffic to and from Mobiles, 2000



Note: Numbers show minutes of international traffic in billions.

Source: TeleGeography research

Figure 4. Wholesale Rates to Fixed versus Mobile Telephones, 2001



Note: Rates are from the Band-X London Switch on August 2001. Each point represents the wholesale price per minute from London to fixed and mobile dialing codes within a single country.

Source: Band-X Ltd.

As we reported last year, subscribership trends and international roaming are central to understanding the robust growth of international mobile traffic. In the sections that follow, we review current developments in both areas and examine the regulatory issues that have become increasingly important in the mobile industry, especially as they inform the cost of mobile termination.

Subscribership

Worldwide mobile subscribership grew from almost 91 million to over 720 million between 1995 and 2000, at a compound annual growth rate (CAGR) of 51.3 percent. Explosive growth was not the exclusive domain of more developed markets, however. Africa showed the most dramatic growth (CAGR 77.3 percent), with Europe following at 64.3 percent. By December 2000, the number of mobile subscribers exceeded that of fixed-line subscribers in countries as diverse as Cambodia, Finland, Paraguay, Uganda, Venezuela, Italy, and Portugal. Globally, the ITU estimates that the number of worldwide mobile subscribers will surpass the number of fixed line subscribers by 2003.

While the growth of mobile subscribership has undoubtedly affected the overall growth of international mobile traffic, the factors driving that growth have also shaped the patterns of international mobile traffic. One of the most commonly cited factors contributing to subscribership growth has been the emergence of pre-paid mobile services, which facilitate access to individuals unable to acquire fixed lines due to insufficient credit history. One European carrier, for example, noted that mobile-originated calls

Figure 5. Estimated Costs of Wholesale Traffic to Fixed and Mobile Destinations, 2000

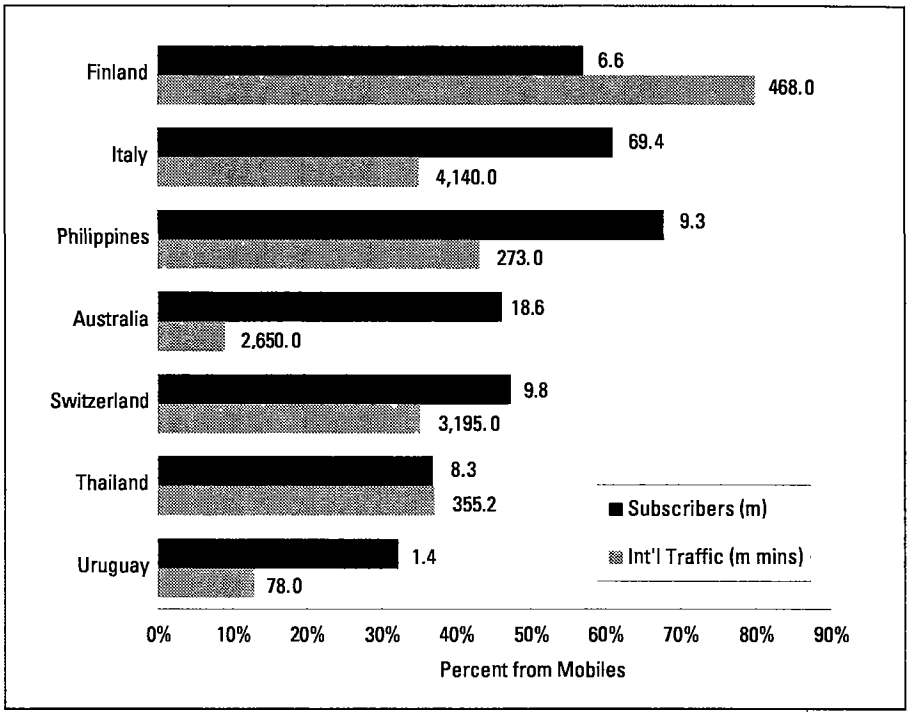
Destination	Global Traffic to Destination (m min.) Total Traffic	% to Mobile	Wholesale Rate to Destination (US$/min) Fixed	Mobile	Total Cost of Traffic (US$ m) Fixed	Mobile	% to Mobile
Africa							
Egypt	620.6	28.5%	$0.31	$0.36	$139.5	$63.9	31.3%
Ghana	135.7	29.4%	$0.16	$0.19	$15.8	$7.8	33.0%
Morocco	622.7	37.0%	$0.23	$0.23	$89.6	$52.7	37.0%
South Africa	700.0	27.3%	$0.14	$0.17	$72.8	$33.0	31.3%
Africa Total	**4,561.0**	**21.4%**	**$0.22**	**$0.24**	**$781.3**	**$238.2**	**23.4%**
L America & Caribbean							
Argentina	859.2	11.4%	$0.11	$0.14	$85.6	$13.4	13.5%
Brazil	1,212.4	22.0%	$0.12	$0.14	$110.7	$37.9	25.5%
Colombia	760.9	7.1%	$0.11	$0.14	$79.6	$7.3	8.4%
Dominican Republic	1,340.0	12.1%	$0.08	$0.10	$95.9	$15.8	14.2%
Nicaragua	81.4	16.7%	$0.22	$0.27	$14.9	$3.6	19.6%
L America & Carib. Total	**15,123.3**	**10.0%**	**$0.12**	**$0.16**	**$1,695.7**	**$236.9**	**12.3%**
U.S. & Canada							
Canada	7,811.9	4.0%	$0.02	$0.02	$166.5	$6.9	4.0%
United States	13,010.7	3.0%	$0.02	$0.02	$236.6	$7.3	3.0%
U.S. & Canada Total	**20,822.6**	**3.4%**	**$0.02**	**$0.02**	**$403.0**	**$14.3**	**3.4%**
Asia & Oceania							
Australia	2,193.7	8.7%	$0.02	$0.10	$48.0	$18.7	28.0%
Bangladesh	232.8	7.9%	$0.40	$0.41	$85.2	$7.5	8.1%
China	1,640.0	11.1%	$0.10	$0.13	$146.5	$24.1	14.1%
Hong Kong	1,858.0	7.8%	$0.02	$0.03	$38.5	$3.7	8.7%
India	2,161.4	3.9%	$0.42	$0.45	$862.9	$37.8	4.2%
Japan	2,423.8	14.8%	$0.04	$0.13	$74.4	$48.3	39.4%
Lebanon	362.1	26.3%	$0.16	$0.34	$42.8	$32.2	42.9%
Philippines	*926.6*	*41.1%*	*$0.11*	*$0.12*	*$61.4*	*$44.0*	*41.7%*
Saudi Arabia	1,935.7	35.0%	$0.34	$0.37	$429.9	$253.3	37.1%
Thailand	426.6	46.1%	$0.17	$0.19	$39.5	$37.2	48.5%
Asia & Oceania Total	**28,221.6**	**20.5%**	**$0.15**	**$0.16**	**$3,289.0**	**$927.5**	**22.0%**
Europe							
Belgium	1,944.6	29.7%	$0.02	$0.24	$28.7	$136.0	82.6%
Czech Republic	496.9	30.4%	$0.09	$0.13	$30.4	$19.9	39.6%
Denmark	1,016.0	29.0%	$0.02	$0.06	$13.7	$18.8	57.7%
France	6,444.3	24.6%	$0.02	$0.22	$102.1	$356.0	77.7%
Italy	4,356.9	36.1%	$0.02	$0.24	$60.6	$380.4	86.3%
Netherlands	2,094.2	38.4%	$0.02	$0.20	$23.6	$161.6	87.3%
Poland	1,283.6	25.7%	$0.10	$0.12	$94.4	$39.2	29.3%
Spain	1,901.8	44.8%	$0.03	$0.23	$28.0	$199.4	87.7%
Sweden	1,213.6	30.3%	$0.01	$0.07	$10.9	$25.9	70.4%
Turkey	1,240.0	23.2%	$0.14	$0.17	$131.5	$48.1	26.8%
Europe Total	**55,041.9**	**30.0%**	**$0.04**	**$0.16**	**$1,404.4**	**$2,617.3**	**65.1%**

Notes: Global traffic to destination equals total incoming traffic to each country in 2000 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 2000. 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: TeleGeography research and Band-X Ltd.

Figure 6. Mobile Subscribers and Mobile-Originated International Traffic for Select Countries, 2000



Note: Numbers show absolute levels of subscribership and call minutes from mobiles. Lengths of bars show relative levels from mobiles.

Source: TeleGeography research and ITU

accounted for a significant portion of traffic on thin routes between developed and developing countries, as many newly arrived immigrants were able to acquire pre-paid mobile phone services long before they established sufficient credit to have fixed-line services installed.

Roaming

An increase in mobile subscribership has a potentially greater impact on international voice traffic than a comparable increase in fixed line subscribership: 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 a German mobile user traveling in Austria. Upon activating her handset, the German traveler will select an Austrian host network on which to operate, either by manually choosing a host network or allowing her handset to choose a network based on pre-programmed preferences. This selection process establishes a connection between the home and host networks, allowing the home 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 Austrian 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 mark-up 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 but may be managed by the operators themselves.

In the above example, we've made a few 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 other major assumption is technical interoperability. 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 has, thus, become a central issue in the development of truly global roaming. As global roaming becomes a practical reality, its contribution to international mobile traffic could increase substantially.

Regulatory Issues

In its early days, mobile telephony didn't attract much attention from national regulatory agencies (NRAs). As the number of mobile users has exploded, however, mobile telecommunications services have shifted from an area of scant regulatory interest and intervention to a growing area of concern and activity for NRAs. Between 1997 and 1999, international refile of domestic mobile traffic (so-called "tromboning"), motivated by the disparity between domestic and international mobile termination rates, garnered a fair deal of attention. Tromboning has declined appreciably since 1999, primarily due to action from long-haul carriers and mobile operators. Within the context of international voice traffic, two current regulatory issues are of particular interest: roaming charges and fixed-mobile termination.

As discussed previously, roaming contributes significantly to international traffic flows, as seemingly domestic calls (that is, between two national numbers) may in fact be routed as international calls. For mobile operators, roaming also represents a terrific source of revenue (see Figure 7. Roaming Between Denmark and Ireland, for examples of roaming charges). According to the European Union, roaming accounts for 20 to 35 percent of mobile operators' revenues (Vodafone UK, for example, reported 20 percent of its average revenue per user came from roaming charges). While telecommunica-

tions costs have generally declined over the past few years, international roaming charges have actually increased in some countries. That trend has spawned a great deal of consumer discontent which, in turn, has piqued the interest of NRAs.

Following complaints from the International Telecommunications Users Group (INTUG), the Competition Directorate-General of the European Commission launched an investigation of the telecommunications industry in late 1999, including international roaming as one of its focus areas. The agency was particularly concerned with collective price fixing in the United Kingdom and Germany, prompting unannounced inspections on nine mobile operators in the two countries. The final results of the investigation, as well as any regulatory action, are not expected until the end of 2001 or early 2002.

As discussed earlier, another significant source of revenue for mobile operators, at least in some developed economies, is call termination on their networks. Fixed-mobile interconnection rates vary dramatically across countries, in some cases reaching up to sixteen times the price of mobile-fixed interconnection. The specific dynamics which account for these differences, however complex, tend to hinge on two general issues: the payment structure of mobile service and the regulatory environment of the country in question.

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 service 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.

Figure 7. Roaming Between Denmark and Ireland

Calls to Denmark from Ireland	On EirCell Network		On Esat Digifone Network	
	1999	2000	1999	2000
Sonofon Customers	1.85	2.14	2.11	2.21
TeleDanmark Mobil Customers	2.05	2.14	2.12	2.21
Non-roaming Customers	1.74	1.25	1.57	1.24
Calls to Ireland from Denmark	**On Sonofon Network**		**On TeleDanmark Mobil**	
	1999	2000	1999	2000
EirCell Customers	2.80	1.95	2.90	1.36
Esat Digifone Customers	2.20	1.02	1.96	0.87
Non-roaming Customers	1.42	n.a.	1.37	0.93

Notes: The data above show sample roaming prices for Ireland and Denmark. The charges in Ireland are rather uniform and include significant mark-up for roaming services. The Danish charges, on the other hand, declined sharply from 1999 to 2000 and include lesser mark-ups for roaming charges. Charges listed in euros (1 euro = $1.07 for 1999 and $0.92 for 2000)

Source: INTUG Europe data

Figure 8. RPP versus CPP

Proponents of calling party pays (CPP) argue that it increases mobile penetration, especially by facilitating pre-paid mobile services. Receiving party pays (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: subscribership 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 subscribership in Mexico grew dramatically, more than doubling the previous year's growth, and the effective fixed-mobile interconnection tariff increased by approximately 250 percent. Despite the higher tariff, there was a considerable increase in incoming mobile traffic.

Source: TeleGeography research and ITU

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 few years.

As the Mexican example in Figure 8 illustrates, regulatory intervention can greatly shape the dynamics of the mobile industry in a particular country. The role of NRAs is particularly influential during the introduction of mobile telecommunications services. Where NRAs have been reluctant (or unable) to intervene on behalf of new mobile service providers, incumbent fixed-line operators have been able to impose undesirable terms for interconnection on mobile operators. Such cases, largely specific to developing countries, have not had as great an effect on international carriers, however, as those in which regulatory intervention on behalf of mobile operators has been more pronounced.

Regulators in more developed economies, particularly Europe, have focused more on the market power of fixed line operators, requiring those with significant market power (SMP) to offer mobile operators access to their networks at cost-based prices. Unsaddled by regulatory constraints, mobile operators have, in turn, been able to charge fixed-line operators access fees well above the fixed-mobile interconnection rate. As the number of mobile subscribers has exploded, so has the number of calls terminated on mobile networks and, consequently, the amount paid to mobile operators for termination on their networks (see Figure 9. Interconnection Rates for Selected Countries, 2001, for examples of fixed-mobile and mobile-fixed interconnection charges for selected countries).

Figure 9. Interconnection Rates for Selected Countries, 2001

Country	National Fixed	Mobile	% Difference
Hungary	7.97	13.04	63.6%
Norway	0.70	7.55	1,014.3%
Sweden	0.82	9.56	1,101.5%
France	1.43	10.30	686.5%
Israel	1.53	12.00	684.3%
Austria	2.01	12.34	572.6%
Denmark	2.52	15.78	525.0%
Ireland	1.18	15.89	1,296.6%
U.K.	1.69	18.73	1,073.6%
Portugal	1.34	21.19	1,541.6%

Notes: Rates are given in US cents per minute.
Source: TeleGeography research

Fixed-line operators have begun to contest the disparity in interconnection charges (between fixed-mobile, mobile-fixed, and mobile-mobile) and the logic underpinning regulatory intervention heretofore. Such complaints have recently yielded significant regulatory attention, particularly from the European Competitive Telecommunications Association. As of yet, though, regulatory action in fixed-mobile interconnection rates has been limited to formal inquiry, spawning much uncertainty as to what direction NRAs and, consequently, interconnection rates will take. One possible solution would be the establishment of benchmarks for pricing, but how those benchmarks would be determined is still a matter of considerable debate—especially as mobile operators are counting on interconnection revenues to finance their roll-out of "3G" networks. The ITU has made fixed-mobile interconnection an area of particular interest and investigation, which is available at http://www.itu.int/interconnect.

For the time being, fixed-mobile interconnection rates remain an issue of hot debate and an item of serious consideration for international carriers—and their customers. In what may be considered a de facto shift to CPP in the U.S., AT&T has recently amended its One Rate International Value Plan to reflect the disparity between fixed-fixed and fixed-mobile interconnection. Where customers were once charged a single rate for all calls to a foreign country, they will now pay different rates for calls to fixed and mobile phones within that country.

International Call Quality Metrics

Minutes, revenues, bandwidth—all are vital statistics for tracking changes in the telecom industry. In fact, much of what we know about international telecommunications traffic reflects such volumetric data. Yet statistics that describe call quantity paint only a partial picture—call quality is also a critical component. While collecting volumetric data is relatively straightforward, quality, on the other hand, is subjective. So how can quality be quantified?

Measuring the Subjective

Monnet UK Ltd., an independent Quality of Service (QoS) arbiter, has implemented one approach. In addition to monitoring call quality on its clients' networks, Monnet also constructs industry benchmarks, pooled from data provided by participating carriers. Figure 1, which shows survey results for 45 destination countries, is based on a sample of 30 million international calls from German and U.K. carriers between June 1 and August 31, 2001.

Monnet employs three indicators to measure call quality:

- Answer Seizure Ratio (ASR). ASR measures the percentage of successful call attempts between a switch and a given destination. A 50 percent ASR means that only one-half of all call attempts were answered by a person or device; an unanswered call or busy signal counts as an unsuccessful call. Thus, ASR is affected not only by performance factors—availability of dial tone and the network's ability to establish a transmission path or switch a call—but also by phenomena ranging from a changed dialing code to a holiday season, leading to more unanswered calls due to wrong numbers or busy signals. ASR standards vary significantly by region. For example, the range of acceptable ASR for calls to developed countries generally is 60 to 75 percent.

- Post Dial Delay (PDD). PDD measures the time it takes a network to establish a connection once the caller has finished dialing. Hence, a PDD of 7.3 means that an average of 7.3 seconds elapse between the dial and the ring at the other end.

- Call Quality Index (CQI). CQI, expressed on a scale of 0 to 100, consists of a basket of five qualitative factors: signal level, noise, echo path loss, echo path delay, and speech activity. All five factors are based on a technical model provided in ITU-T Recommendation G.107 (www.itu.int/itu-doc/itu-t/rec/g/g100-699/s_g107.htm). To earn a "best" ranking, a call must post a CQI score between 80-100; on the other end of the scale, a CQI of less than 60 is characterized as "poor." Many factors affect CQI scores, including basic infrastructure problems, packet loss in IP networks, the excessive use of compression, and switching calls between many service providers.

Figure 1. Call Quality Metrics from Germany and the U.K., June-August 2001

Destination	Answer Seizure Ratio		Post Dial Delay (seconds)		Call Quality Index	
	from Germany	from U.K.	from Germany	from U.K.	from Germany	from U.K.
Australia	14%	56%	7.3	3.7	52.9	64.0
Austria	39%	25%	5.1	4.6	68.1	67.4
Belgium	6%	65%	4.6	2.7	43.3	70.1
Brazil	19%	45%	5.4	4.1	58.9	50.0
Canada	46%	68%	2.8	2.8	61.7	62.7
Chile	8%	14%	5.2	3.9	59.5	67.3
China	23%	45%	6.0	5.8	52.2	53.4
Colombia	30%	41%	7.1	3.9	64.1	59.9
Denmark	22%	22%	7.1	4.9	51.8	61.9
Ecuador	11%	17%	4.9	4.9	53.0	66.0
Finland	1%	21%	6.8	5.1	70.5	61.5
France	25%	53%	2.1	2.7	46.7	59.5
Germany	35%	61%	3.1	2.4	59.4	71.6
Ghana	13%	22%	9.5	5.5	57.1	73.3
Greece	34%	35%	5.8	4.2	55.9	64.9
Hong Kong	39%	30%	5.8	6.4	61.0	73.1
India	25%	30%	4.8	5.5	61.7	61.7
Ireland	40%	67%	6.9	3.1	35.3	71.0
Israel	39%	57%	5.7	3.8	65.3	65.1
Italy	30%	49%	5.0	2.9	53.1	54.6
Japan	43%	61%	7.3	3.8	51.0	85.1
Korea, Rep.	7%	45%	6.6	6.0	63.2	72.5
Kuwait	2%	15%	10.5	2.8	47.2	58.6
Macedonia	7%	16%	5.0	4.7	58.1	62.0
Malaysia	45%	53%	5.4	4.0	63.9	67.0
Mexico	13%	27%	6.9	3.8	61.7	70.8
Netherlands	39%	67%	4.8	1.9	42.7	70.3
Norway	45%	46%	4.6	3.1	55.3	51.2
Pakistan	7%	21%	2.4	4.6	50.1	56.1
Peru	11%	14%	4.4	3.8	50.1	59.6
Philippines	9%	48%	3.1	3.6	59.6	65.3
Poland	17%	34%	6.0	6.0	62.4	59.7
Romania	13%	43%	1.1	2.8	48.3	51.3
Russia	23%	43%	6.2	3.4	52.4	44.7
Saudi Arabia	6%	31%	9.2	6.0	58.5	58.2
Singapore	33%	59%	7.5	5.0	62.0	82.4
South Africa	42%	57%	4.5	4.5	72.8	68.6
Spain	13%	56%	6.9	2.5	59.5	62.1
Sweden	10%	59%	5.9	4.2	59.2	67.7
Switzerland	24%	40%	4.1	2.7	65.0	58.4
Taiwan	41%	36%	7.7	6.0	49.2	73.8
Turkey	25%	21%	5.1	3.5	66.4	61.7
UAE	11%	6%	9.3	7.6	71.1	62.5
United Kingdom	44%	76%	6.2	3.9	58.6	62.6
United States	18%	74%	3.6	2.8	43.2	68.3
Average (Summer 2001)	**16%**	**43%**	**6.0**	**3.7**	**56.5**	**64.5**
Average (Summer 2000)	**42%**	**39%**	**3.7**	**4.7**	**68.6**	**58.5**

Source: Monnet UK Ltd., 2 Honey Lane, Cheapside, London EC2V 8BT, U.K.
Tel. +44 20 7367 5350 • Fax +44 20 7367 5360 • Email: info@monnet.uk.com • http://www.monnet.uk.com

Window on Industry Change

For carriers that subscribe to quality testing services such as Monnet's, industry-wide benchmarks provide an essential tool for pinpointing those network links that are not up to par with the competition. Beyond the immediate commercial benefit to subscribers, benchmarks also identify wider industry trends, such as the predictable gap between call quality to developing and developed countries due largely to weaker telecom infrastructure.

Quality data vary not only by destination but also by the country of origination and time period studied. For example, calls measured by Monnet during the June-August 2001 period from the U.K. scored markedly higher than those from Germany; the opposite was true for the previous two summers. In fact, the average ASR declined from 58 percent in 1999 to just 16 in the summer of 2001. Possible explanations for this convergence point to wider implications for the industry:

- Mobile Traffic. When a call transits a mobile network, a number of characteristics appear that tend to drive down Call Quality Index scores—noise, echo, and delay. The economics of sending calls to mobiles further complicate the metric; high interconnect fees to mobile networks induce terminating carriers in some countries to answer those incoming calls destined for mobile phones with a busy signal. This practice may partially explain the sliding German call quality discussed earlier, given the high growth rate of traffic to mobile terminals from Germany.

- Rapidly expanding call volumes. Especially in newly opened markets such as Germany, emerging carriers sometimes attract more traffic than originally anticipated by network planners. Some network links simply cannot handle these unexpectedly heavy traffic loads, and the network upgrades necessary to accommodate such traffic volumes require investment over a long time period. In order to continue offering service while networks are overloaded, some carriers have resorted to "call gapping." Using this practice, a carrier accepts only a limited portion of total placed calls at any one time; individuals whose calls are blocked generally hear a recorded message stating that "all circuits are busy."

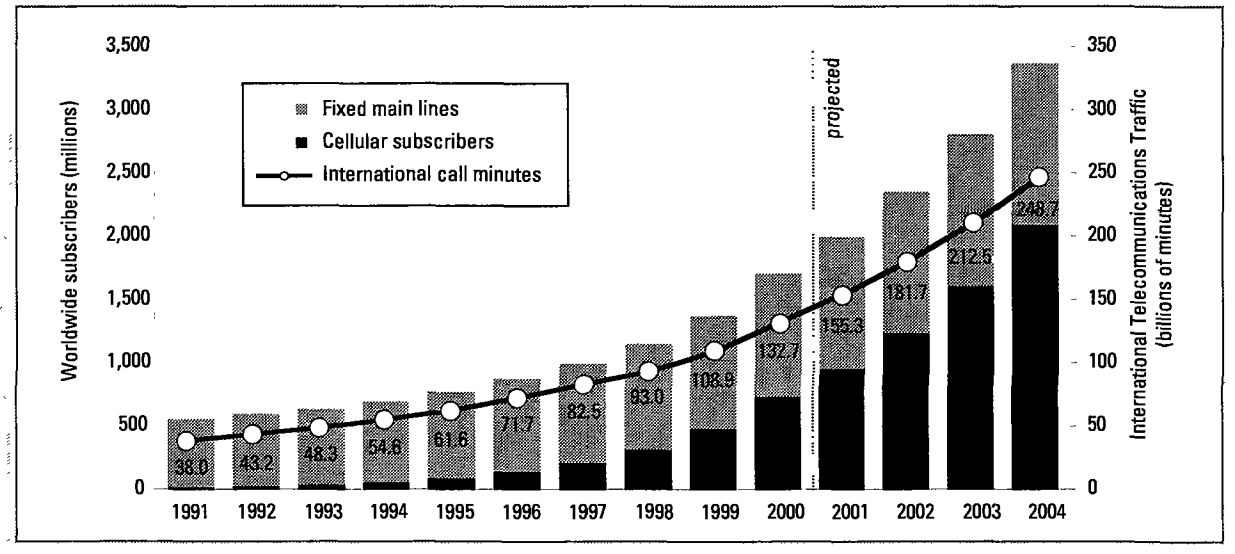
- Price/Quality Tradeoff. In Germany, call prices on some international routes have plummeted 90 percent over the last three years, squeezing profit margins. In response, more service providers are willing to purchase minutes from wholesale carriers at mediocre quality—as long as they deliver the minutes at rock bottom prices. Many of these wholesale carriers operate in the gray market of international telecommunications, using alternative routing technologies such as Voice-over-Internet Protocol (VoIP) to evade costly PSTN settlement charges. While these mechanisms enable cost-cutting by carriers, they can also frustrate call quality guarantees.

Call quality metrics are a critical part of the movement toward a more robust standard of international service. First and foremost, specific call quality metrics enable carriers to monitor flow and to diagnose their networks for maintenance and upgrades. However, industry benchmarks also illuminate technological and regional trends that impact wider business development decisions.

Traffic Summary

Global Traffic Review

Figure 1. International Traffic and Main Line Growth



Note: Data include outbound international traffic on public networks only. Projections assume 15% traffic growth, 5% main line growth, and 30% mobile subscriber growth annually.

Source: TeleGeography research and ITU

Figure 2. International Traffic, Revenue, and Subscriber Growth

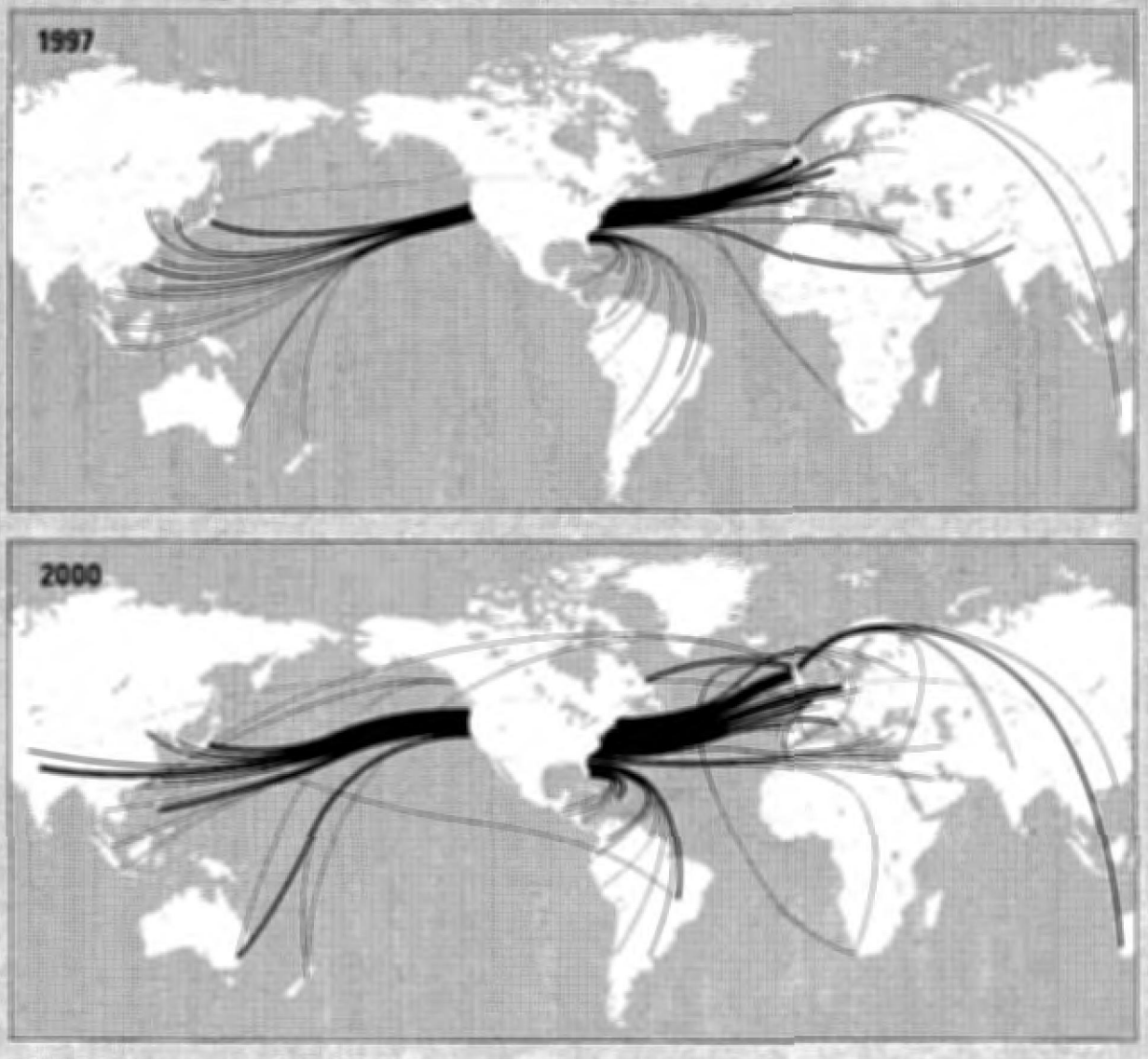
		Historical trend		*Slow growth*		*Same growth*		*Fast growth*	
			CAGR		**CAGR**		**CAGR**		**CAGR**
Indicator	**1996**	**2000**	**1996-2000**	**2004**	**2000-2004**	**2004**	**2000-2004**	**2004**	**2000-2004**
Calls (bn)	21.1	44.2	20.3%	89.7	19.3%	99.5	22.5%	110.1	25.6%
Minutes (bn)	71.7	132.7	16.6%	224.1	14.0%	248.7	17.0%	275.2	20.0%
per main line subscriber	96.8	134.7	8.6%	183.7	8.1%	192.6	9.3%	201.6	10.6%
per main line plus mobile	81.0	76.9	-1.3%	74.0	-1.0%	73.0	-1.3%	53.8	-8.5%
Revenue (US$ bn)	53.0	70.3	7.3%	81.5	3.7%	79.0	3.0%	76.1	2.0%
Assumptions									
Call length (mins)	3.4	3.0	-3.1%	2.5	-4.5%	2.5	-4.5%	2.5	-4.5%
Price per minute (US$)	0.74	0.53	-8.0%	0.36	-9.0%	0.32	-12.0%	0.28	-15.0%
Main lines (bn)	0.7	1.0	7.4%	1.2	5.5%	1.3	7.0%	1.4	8.5%
Mobile subscribers (bn)	0.1	0.7	50.6%	1.8	25.0%	2.1	30.0%	3.7	50.0%
Total subscribers (bn)	0.9	1.7	18.2%	3.0	15.1%	3.4	18.5%	5.1	31.2%

Notes: 1996-2000 based on reported data. 2001-2004 based on ITU and TeleGeography forecasts. Scenarios are as follows:

1. Slow Growth: Traffic growth slows as minutes move off the public switched network (PSTN) and large markets mature.
2. Same Growth: Traffic growth continues at similar rate to that of the last five years assuming that faster rates of price cutting keep traffic on the PSTN.
3. Fast Growth: Traffic growth increases, assuming a faster growth rate of network subscribers and faster rates of price cutting, plus a significant component of new demand created by international traffic generated by mobiles.

Source: TeleGeography research, ITU World Telecommunication Indicators Database, and ITU estimates

Figure 3. Intercontinental Traffic Flows, 1997 and 2000

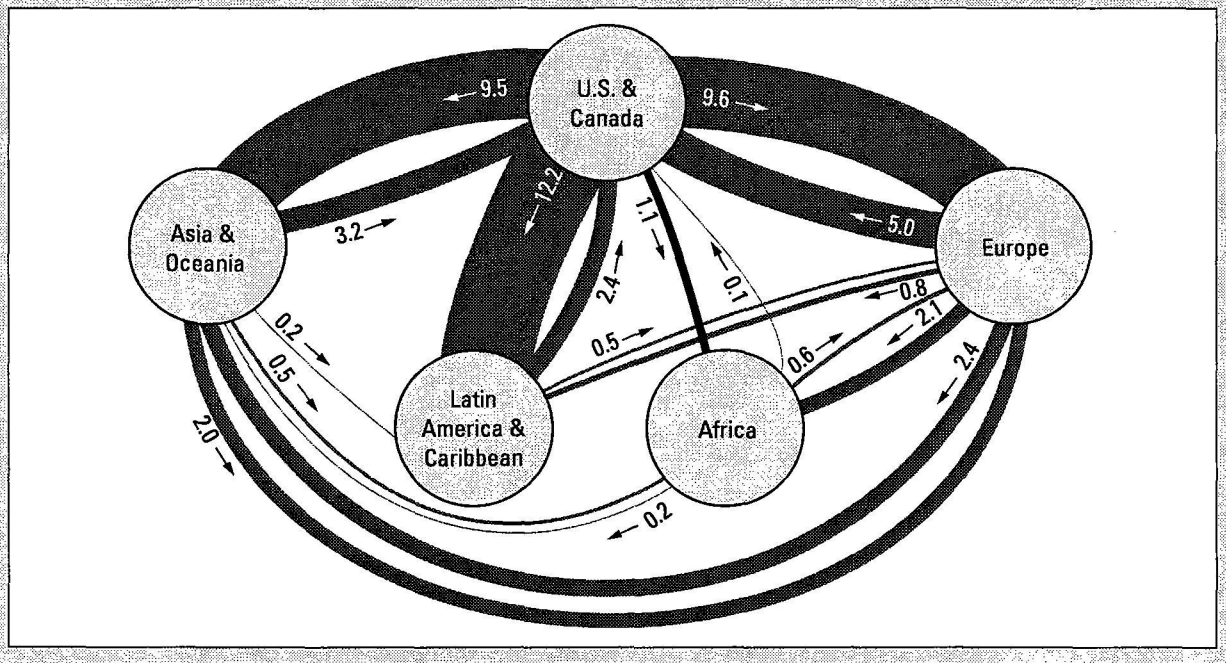


Notes: Each band is proportional to the total annual traffic on the public network in both directions between each pair of countries. These maps show all intercontinental routes with an annual volume of more than 100 million minutes. The total volume of these routes in 2000 was 34.8 billion minutes, approximately 28 percent of global international traffic.

Source: TeleGeography research

International Traffic by Region

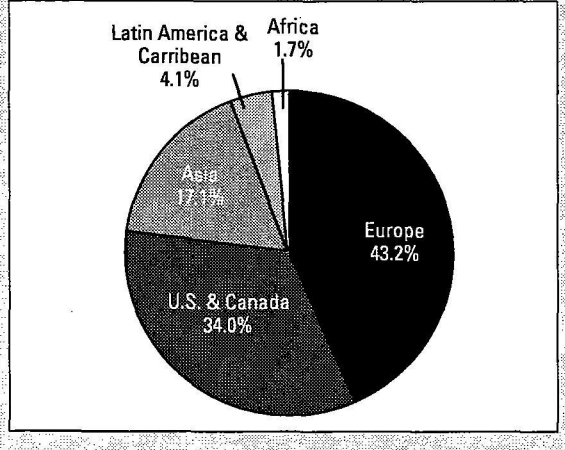
Figure 1. Interregional Traffic Flows, 2000



Notes: These interregional traffic flows total 52.4 billion minutes. That sum does not equal global total of 132.7 billion minutes because (1) data set based on top 20 outgoing routes for 130 largest countries only; (2) traffic within regions account for a further 62.9 billion minutes based on data set; (3) interregional routes below 100 million minutes are not shown.

Source: TeleGeography research

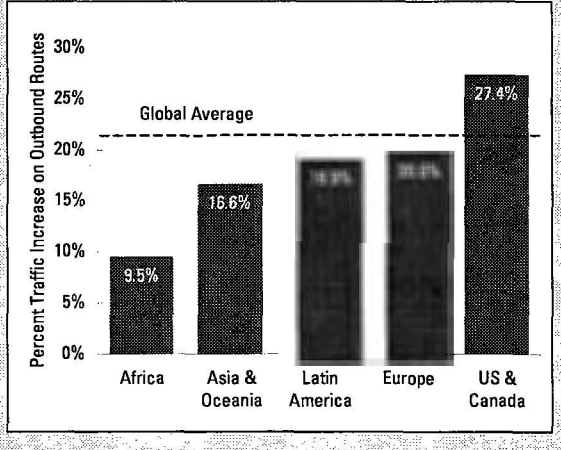
Figure 2. International Traffic by Origin, 2000



Note: Global traffic was 132.7 billion minutes in 2000.

Source: TeleGeography research

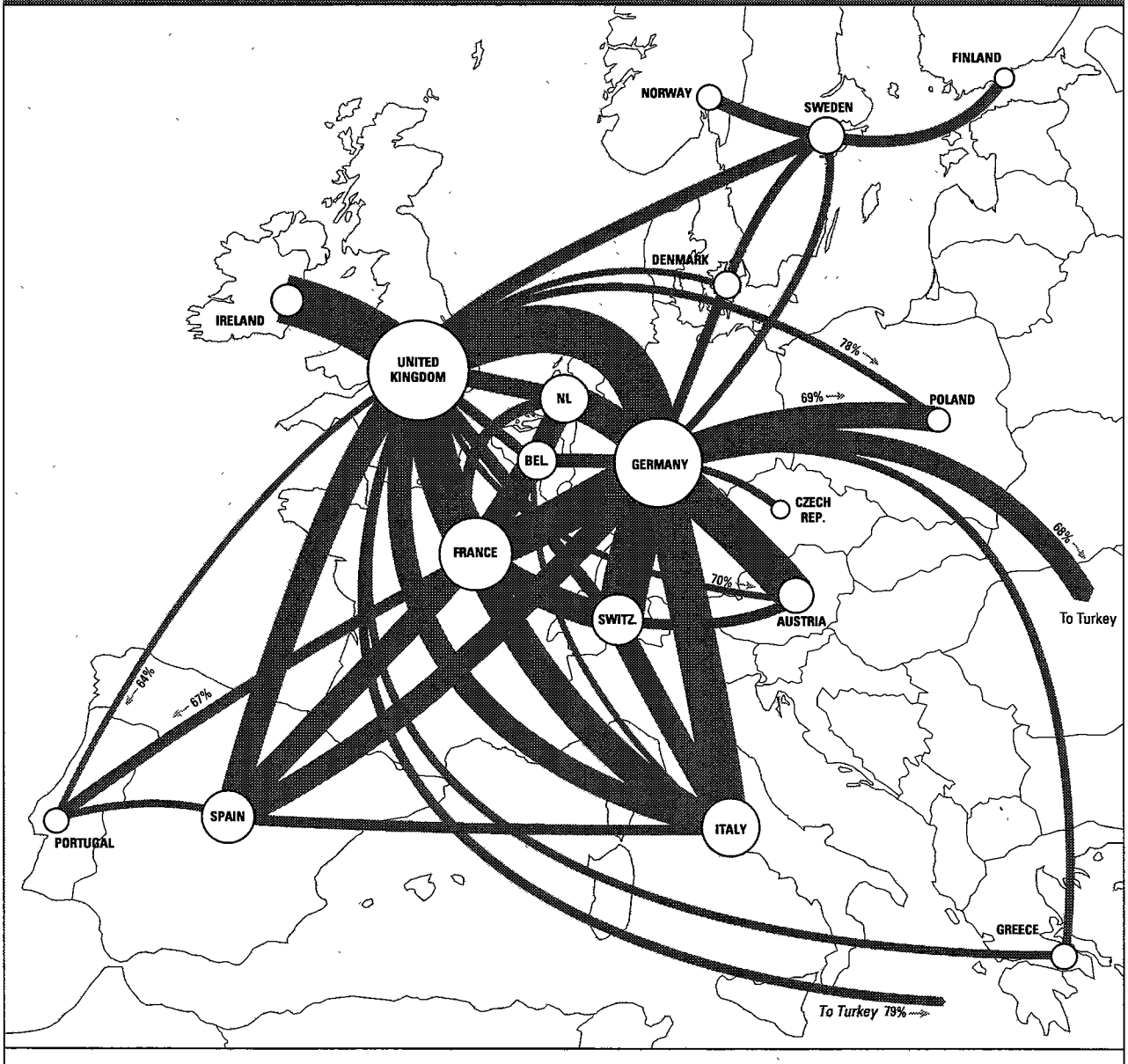
Figure 3. Traffic Growth by Region, 1999-2000



Notes: Global traffic was 132.7 billion minutes in 2000.

Source: TeleGeography research

Figure 4. European Telecommunications Traffic Flows, 2000



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 2000 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

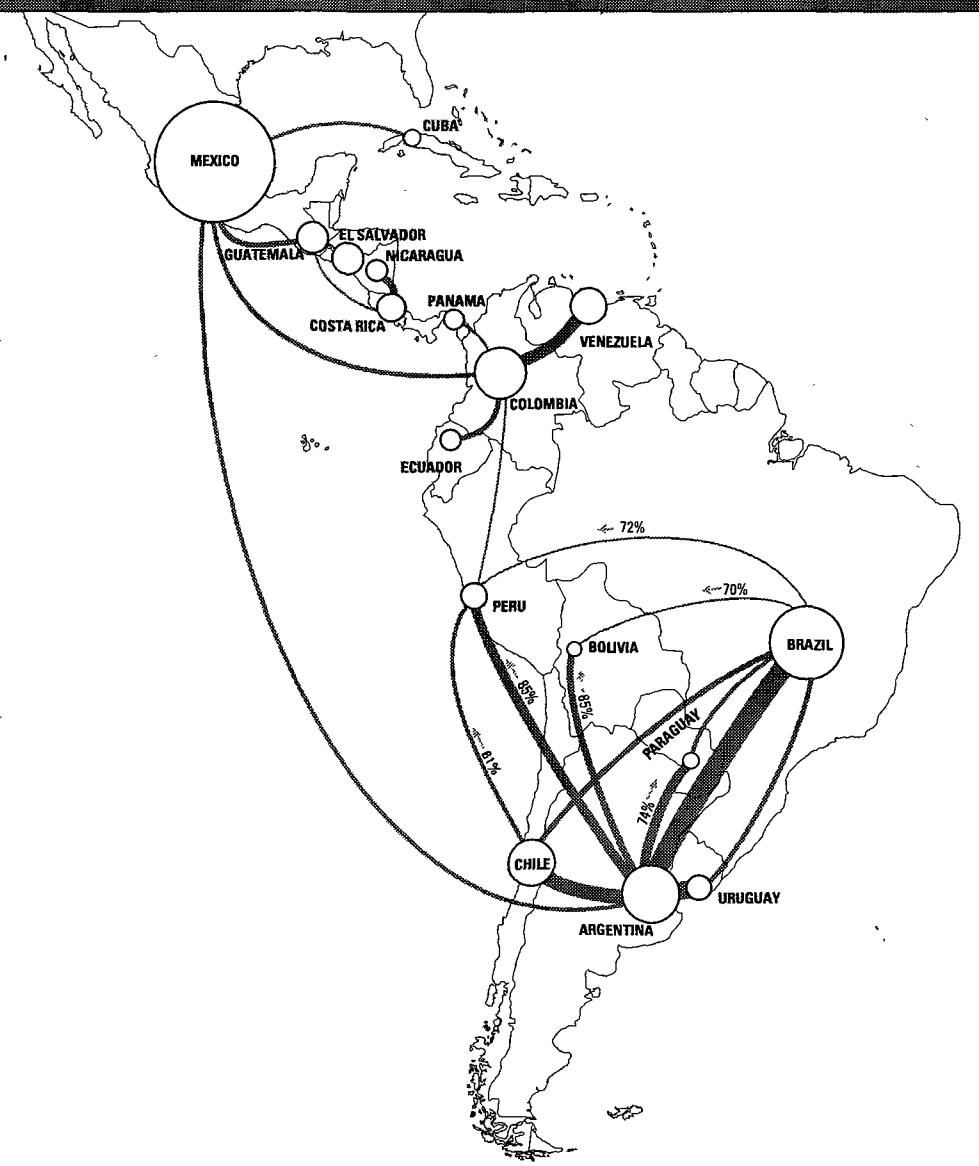
The area of each circle is proportional to the volume of the total annual outgoing traffic from each country.

Balance of Traffic

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

Source: TeleGeography research

Figure 5. Latin American Telecommunications Traffic Flows, 2000



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 2000 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

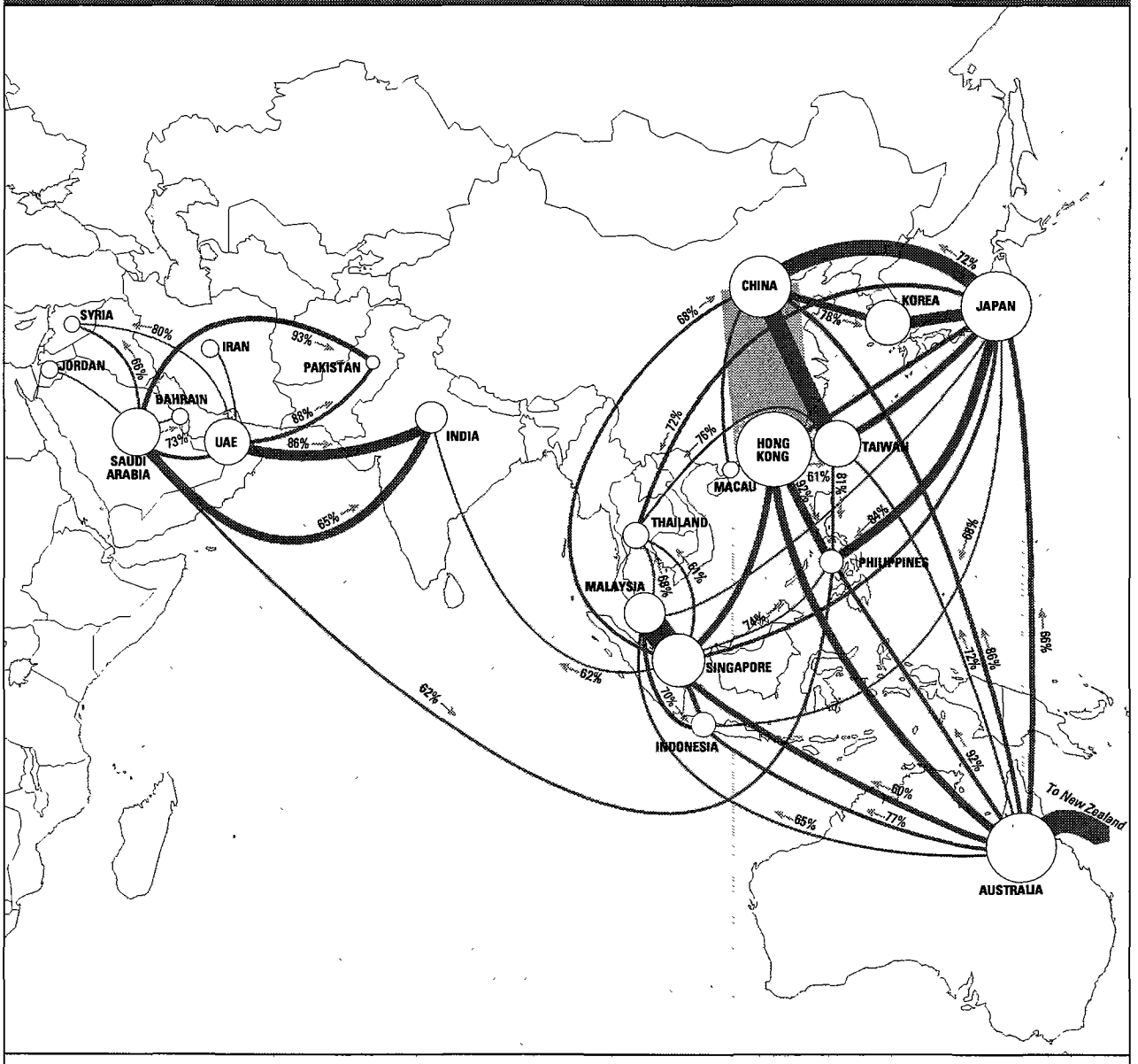
The area of each circle is proportional to the volume of the total annual outgoing traffic from each country.

Balance of Traffic

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

Source: TeleGeography research

Figure 6. Asian Telecommunications Traffic Flows, 2000



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 2000 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.

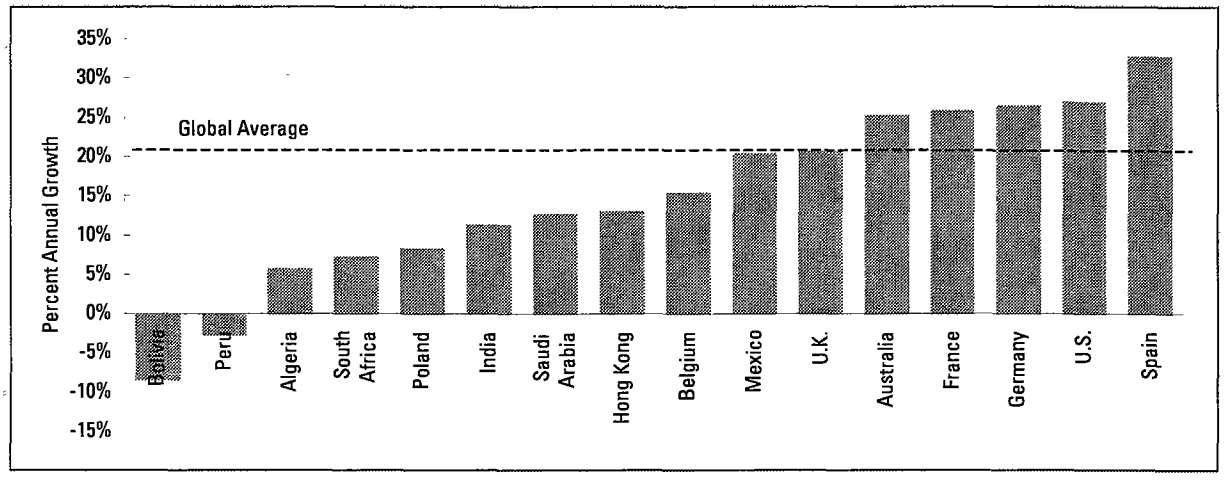
Balance of Traffic

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

Source: TeleGeography research

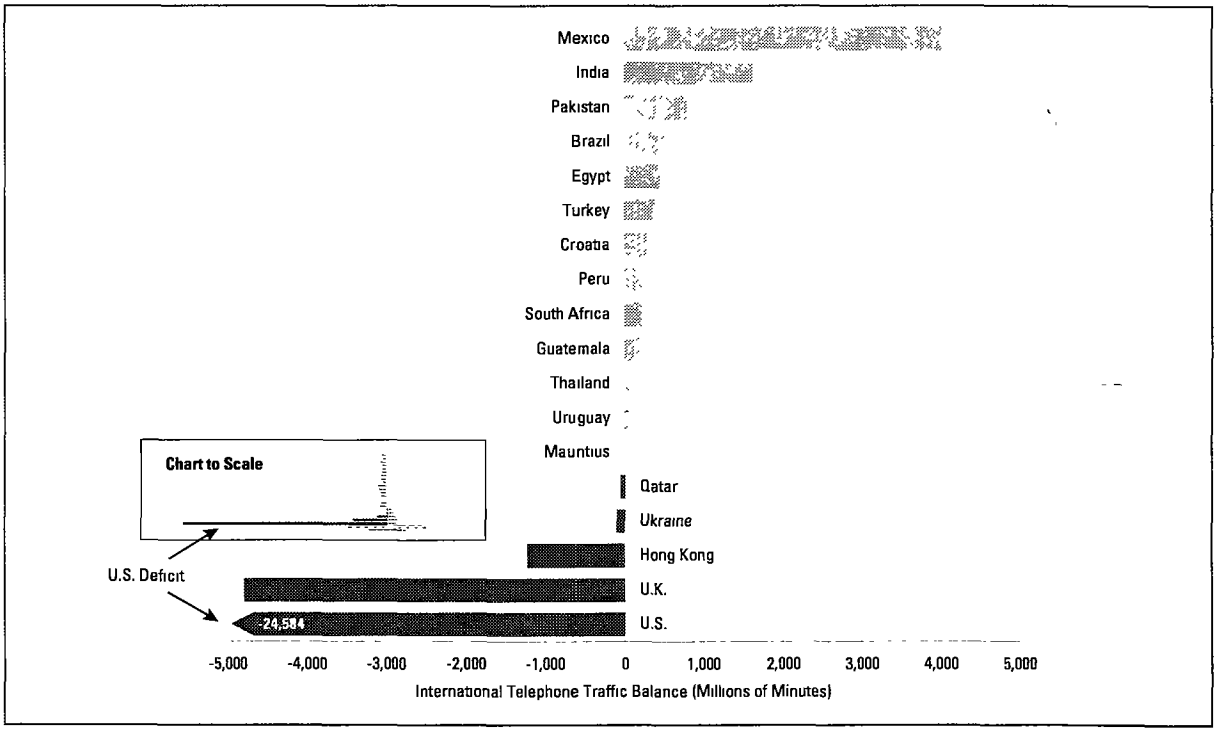
International Traffic by Country

Figure 1. Outgoing International Telephone Traffic Growth for Selected Countries, 1999-2000



Source: TeleGeography research

Figure 2. Telephone Traffic Balances for Selected Countries, 2000



Source: TeleGeography research

Figure 3. International Traffic Indicators, 2000

	Outgoing (m minutes)	Incoming (m minutes)	Balance (m minutes)	Population (m)	Minutes (Out) per Capita	Main Lines (thous.)	Minutes (Out) per Main Line
Algeria	151.8	n.a.	n.a.	30.4	5.0	1,761	86.0
Angola	35.4	n.a.	n.a.	12.7	2.8	70	507.0
Argentina	432.1	479.3	47.2	37.0	11.7	7,894	55.0
Armenia (b)	31.4	n.a.	n.a.	3.8	8.2	n.a.	n.a.
Australia (a)	2,650.0	n.a.	n.a.	19.2	138.1	10,040	264.0
Austria	1,510.0	n.a.	n.a.	8.1	186.5	3,889	388.0
Azerbaijan (b)	28.1	59.7	31.6	8.1	3.5	801	35.0
Bahamas	69.4	n.a.	n.a.	0.3	229.8	114	607.0
Bahrain (b)	139.5	125.6	-13.9	0.7	202.3	171	816.0
Belarus (b)	178.5	n.a.	n.a.	10.0	17.8	2,752	65.0
Belgium	1,835.0	n.a.	n.a.	10.3	179.0	5,074	362.0
Benin	11.7	24.3	12.6	6.3	1.9	n.a.	n.a.
Bolivia	27.2	80.8	53.6	8.3	3.3	n.a.	n.a.
Brazil	692.7	1,212.4	519.8	170.1	4.1	30,926	22.0
Brunei	24.3	23.3	-1.0	0.3	74.1	81	302.0
Bulgaria	110.0	211.0	101.0	8.2	13.5	2,882	38.0
Canada	7,224.0	n.a.	n.a.	30.7	235.0	20,803	347.0
Chile	278.0	n.a.	n.a.	15.2	18.3	3,365	83.0
China	2,050.0	n.a.	n.a.	1,261.1	1.6	144,000	14.0
Colombia	341.8	n.a.	n.a.	42.3	8.1	7,159	48.0
Costa Rica	99.6	137.8	38.2	3.7	27.3	1,003	99.0
Côte d'Ivoire	72.0	n.a.	n.a.	16.0	n.a.	267	n.a.
Croatia (b)	222.3	512.0	289.6	4.5	49.9	n.a.	n.a.
Cuba	36.2	n.a.	n.a.	11.2	3.2	489	74.0
Cyprus	192.5	n.a.	n.a.	0.8	251.3	440	437.0
Czech Republic	400.0	n.a.	n.a.	10.3	38.9	3,872	103.0
Denmark	905.0	n.a.	n.a.	5.3	169.5	4,011	226.0
Dominican Republic	211.7	1,340.0	1,128.3	8.6	24.7	870	243.0
Ecuador	55.5	n.a.	n.a.	12.6	4.4	1,265	44.0
Egypt	183.1	620.6	437.5	63.8	2.9	5,484	33.0
El Salvador	128.0	n.a.	n.a.	6.3	20.4	570	225.0
Estonia	75.5	n.a.	n.a.	1.4	52.6	523	144.0
Finland	468.0	n.a.	n.a.	5.2	90.3	2,831	165.0
France	6,500.0	n.a.	n.a.	58.9	110.5	34,114	191.0
Georgia (b)	45.6	37.6	-8.0	5.5	8.4	n.a.	n.a.
Germany	9,570.0	n.a.	n.a.	82.2	116.5	49,400	194.0
Ghana	42.1	n.a.	n.a.	19.2	2.2	237	177.0
Greece	793.2	889.8	96.6	10.6	75.1	5,659	140.0
Guatemala	125.3	295.9	170.5	11.4	11.0	650	193.0
Guyana	18.0	n.a.	n.a.	0.9	n.a.	68	n.a.
Hong Kong (a)	3,074.9	1,858.0	-1,216.8	6.8	452.3	3,926	783.0
Hungary	349.2	n.a.	n.a.	10.0	34.8	n.a.	n.a.
India (a, b)	527.1	2,161.4	1,634.3	1,015.9	0.5	32,436	16.0
Indonesia	315.5	345.8	30.3	210.4	1.5	6,663	47.0
Iran	176.8	216.8	40.0	64.0	2.8	9,486	19.0
Ireland (a, b)	1,250.0	n.a.	n.a.	3.8	329.5	1,590	786.0
Israel	965.0	n.a.	n.a.	6.2	154.8	3,021	319.0
Italy	4,140.0	n.a.	n.a.	57.7	71.8	27,153	152.0
Jamaica	73.9	328.5	254.6	2.6	28.2	512	144.0
Japan (a)	2,575.0	n.a.	n.a.	126.8	20.3	74,220	35.0
Jordan	170.6	214.1	43.5	4.9	34.9	620	275.0
Kazakhstan	105.4	183.1	77.8	14.9	7.1	n.a.	n.a.
Kenya	21.0	n.a.	n.a.	30.1	0.7	310	68.0
Korea, Rep.	1,063.0	n.a.	n.a.	47.3	22.5	21,932	48.0
Kuwait	158.7	n.a.	n.a.	2.0	80.0	467	340.0

Notes: Data are in millions of minutes of public switched traffic.
a. International traffic for year ending March 31, 2001 . Australia, Mauritius, New Zealand, and Pakistan ends June 30, 2001.
b. Traffic data exclude some carriers or routes. (See country table for details.)

Source: TeleGeography research

Figure 3. International Traffic Indicators, 2000 (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	23.2	28.6	5.4	4.9	4.7	376	62.0
Latvia	54.8	90.1	35.3	2.4	22.7	742	74.0
Luxembourg	381.0	n.a.	n.a.	0.4	869.9	331	1,151.0
Macau	152.1	103.2	-48.9	0.4	344.0	177	860.0
Macedonia	73.2	166.4	93.2	2.0	36.0	516	142.0
Malaysia (a)	895.0	n.a.	n.a.	23.3	38.5	4,637	193.0
Malta	43.0	n.a.	n.a.	0.4	112.7	204	211.0
Mauritius (a)	35.1	49.0	13.9	1.2	29.6	281	125.0
Mexico	1,883.0	5,896.0	4,013.0	98.0	19.2	12,333	153.0
Moldova	50.8	120.8	70.1	4.3	11.9	584	87.0
Morocco	245.0	n.a.	n.a.	28.7	8.5	1,425	172.0
Mozambique	22.4	n.a.	n.a.	17.6	1.3	86	262.0
Namibia	60.2	50.7	-9.5	1.7	34.6	104	576.0
Netherlands	2,830.0	n.a.	n.a.	15.9	177.8	9,879	286.0
New Zealand (a)	950.0	n.a.	n.a.	3.8	248.0	1,915	496.0
Nicaragua	58.2	n.a.	n.a.	5.0	0.0	n.a.	n.a.
Norway	770.0	n.a.	n.a.	4.5	171.4	3,270	235.0
Oman (b)	116.8	n.a.	n.a.	2.4	48.8	225	518.0
Pakistan (a, b)	98.6	896.1	797.4	138.1	0.7	3,200	31.0
Palestinian Authority (b)	45.6	37.2	-8.4	0.0	n.a.	n.a.	n.a.
Panama	51.9	111.7	59.7	2.9	18.2	n.a.	n.a.
Paraguay	33.3	71.6	38.4	5.5	6.1	n.a.	n.a.
Peru	86.5	317.7	231.3	25.7	3.4	1,636	53.0
Philippines (a)	273.0	n.a.	n.a.	75.6	3.6	3,000	91.0
Poland	675.8	n.a.	n.a.	38.7	17.5	10,946	62.0
Portugal	720.0	n.a.	n.a.	10.0	71.9	4,314	167.0
Qatar	143.0	95.5	-47.5	0.6	244.5	160	893.0
Russia (b)	944.0	n.a.	n.a.	145.5	6.5	32,070	29.0
Saudi Arabia	1,194.9	n.a.	n.a.	20.7	57.7	2,965	403.0
Senegal	50.0	n.a.	n.a.	9.5	5.3	206	243.0
Singapore (a)	1,515.0	n.a.	n.a.	4.0	377.1	1,947	778.0
Slovak Republic	162.7	233.1	70.4	5.4	30.1	1,698	96.0
South Africa	494.6	700.0	205.4	42.8	11.6	4,962	100.0
Spain	2,570.0	n.a.	n.a.	39.4	65.1	17,102	150.0
Sri Lanka	42.0	n.a.	n.a.	19.4	2.2	767	55.0
Sudan (b)	31.8	155.7	123.9	29.7	1.1	387	82.0
Swaziland (a)	25.1	n.a.	n.a.	1.0	24.0	32	779.0
Sweden	1,640.0	n.a.	n.a.	8.9	184.9	6,057	271.0
Switzerland	3,195.0	n.a.	n.a.	7.2	445.0	5,158	619.0
Syria	140.0	286.0	146.0	16.1	8.7	1,675	84.0
Taiwan	1,160.0	n.a.	n.a.	0.0	n.a.	12,642	92.0
Tajikistan (b)	6.8	18.5	11.7	6.3	1.1	219	31.0
Thailand	355.2	426.6	71.4	60.7	5.8	5,252	68.0
Trinidad & Tobago (a)	70.2	163.4	93.3	1.3	53.9	299	235.0
Turkey	850.0	1,240.0	390.0	65.3	13.0	18,395	46.0
Turkmenistan (b)	15.7	11.3	-4.5	4.8	3.3	n.a.	n.a.
Ukraine	363.0	269.5	-93.4	49.6	7.3	n.a.	n.a.
United Arab Emirates	1,123.6	n.a.	n.a.	2.9	386.8	1,020	1,101.0
United Kingdom (a)	12,242.7	7,463.2	-4,779.5	59.7	204.9	34,807	352.0
United States	37,594.8	13,010.7	-24,584.1	281.6	133.5	192,519	195.0
Uruguay	78.0	110.9	33.0	3.3	23.4	929	84.0
Uzbekistan (b)	71.4	54.3	-17.0	24.7	2.9	n.a.	n.a.
Venezuela	168.0	n.a.	n.a.	24.2	n.a.	2,606	n.a.
Yugoslavia	286.9	n.a.	n.a.	10.6	27.0	2,406	119.0
Zimbabwe	71.3	n.a.	n.a.	12.1	5.9	241	295.0

Notes: Data are in millions of minutes of public switched traffic.
a. International traffic for year ending March 31, 2001 . Australia, Mauritius, New Zealand, and Pakistan ends June 30, 2001.
b. Traffic data exclude some carriers or routes. (See country table for details.)

Source: TeleGeography research

International Traffic by Route

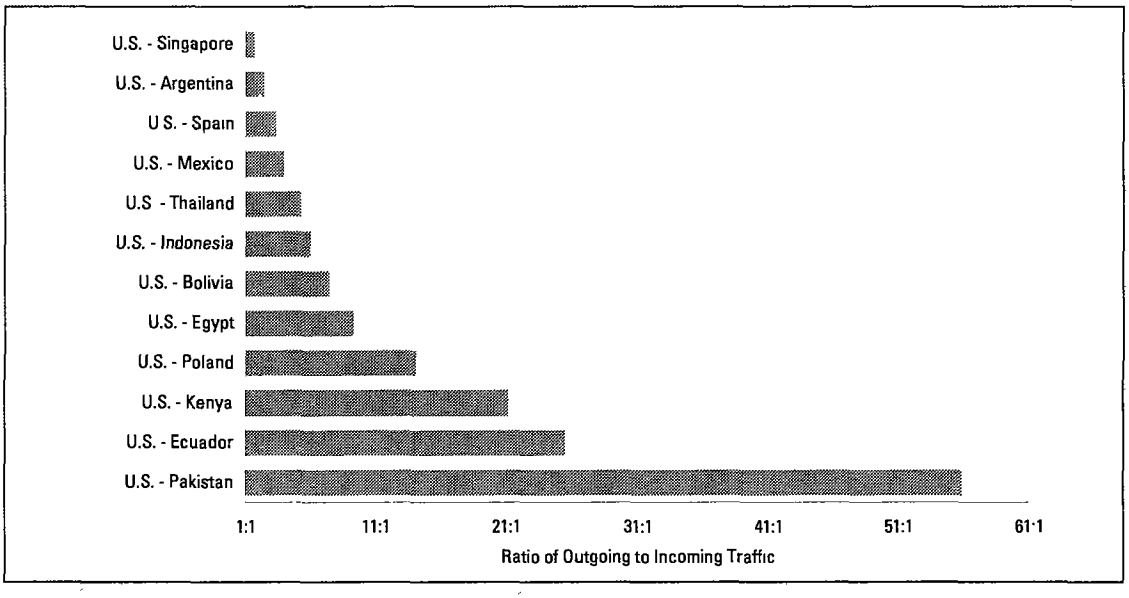
Figure 1. Top 50 International Routes, 2000

Rank	Countries	Minutes each Way	Total Minutes
1.	Canada - U.S.	5,480.0 — 4,906.1	10,386.1
2.	U.S. - Mexico	6,129.0 — 1,569.0	7,698.0
3.	U.K. - U.S.	2,009.5 — 1,908.3	3,917.8
4.	Hong Kong - China	1,404.9 — 1,050.0	2,454.9
5.	U.S. - Germany	1,600.1 — 550.0	2,150.1
6.	U.S. - India	1,577.4 — 75.3	1,652.6
7.	Ireland - U.K.	775.0 — 773.3	1,548.3
8.	U.K. - Germany	848.4 — 685.0	1,533.4
9.	Germany - Switzerland	750.0 — 720.0	1,470.0
10.	U.S. - Japan	925.5 — 520.0	1,445.5
11.	U.S. - Philippines	1,361.0 — 65.0	1,426.0
12.	U.K. - France	792.8 — 580.0	1,372.8
13.	Germany - Italy	700.0 — 620.0	1,320.0
14.	Germany - Austria	650.0 — 630.0	1,280.0
15.	Germany - France	680.0 — 565.0	1,245.0
16.	U.S. - France	800.6 — 420.0	1,220.6
17.	U.S. - Dominican Republic	939.0 — 157.4	1,096.4
18.	U.S. - Australia	569.7 — 525.0	1,094.7
19.	Germany - Netherlands	550.0 — 500.0	1,050.0
20.	Italy - France	495.0 — 490.0	985.0
21.	U.S. - Brazil	754.3 — 207.5	961.8
22.	France - Belgium	495.0 — 400.0	895.0
23.	Switzerland - France	490.0 — 405.0	895.0
24.	U.S. - Italy	607.9 — 280.0	887.9
25.	Malaysia - Singapore	440.0 — 430.0	870.0
26.	U.K. - Spain	443.6 — 420.0	863.6
27.	Germany - Poland	570.0 — 260.0	830.0
28.	U.K. - Australia	410.8 — 410.0	820.8
29.	Spain - France	400.0 — 385.0	785.0
30.	Spain - Germany	425.0 — 350.0	775.0
31.	Netherlands - Belgium	400.0 — 375.0	775.0
32.	Switzerland - Italy	400.0 — 360.0	760.0
33.	U.K. - Italy	418.9 — 330.0	748.9
34.	U.S. - China	685.2 — 55.0	740.2
35.	Germany - Turkey	500.0 — 230.0	730.0
36.	New Zealand - Australia	425.0 — 300.0	725.0
37.	Canada - U.K.	370.0 — 293.5	663.5
38.	U.S. - Israel	376.3 — 245.0	621.3
39.	U.S. - Colombia	451.5 — 165.0	616.5
40.	U.S. - Pakistan	594.8 — 10.7	605.4
41.	Taiwan - China	350.0 — 245.0	595.0
42.	U.S. - Korea, Rep.	360.0 — 235.0	595.0
43.	Netherlands - U.K.	300.0 — 279.3	579.3
44.	U.S. - Taiwan	399.7 — 176.0	575.7
45.	U.S. - Spain	391.5 — 120.0	511.5
46.	France - Morocco	400.0 — 100.0	500.0
47.	Japan - China	360.0 — 140.0	500.0
48.	Hong Kong - U.S.	277.2 — 196.7	473.9
49.	U.S. - Netherlands	298.2 — 160.0	458.2
50.	Russia - Ukraine	242.0 — 215.5	457.5

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 67.2 billion minutes, equal to 51 percent of all international traffic. Data for Australia, Hong Kong, Ireland, Japan, Malaysia, New Zealand, Singapore, and the U.K. are for fiscal year 2000/2001. The sum of minutes each way may not equal the total minutes due to rounding.

Source: TeleGeography research

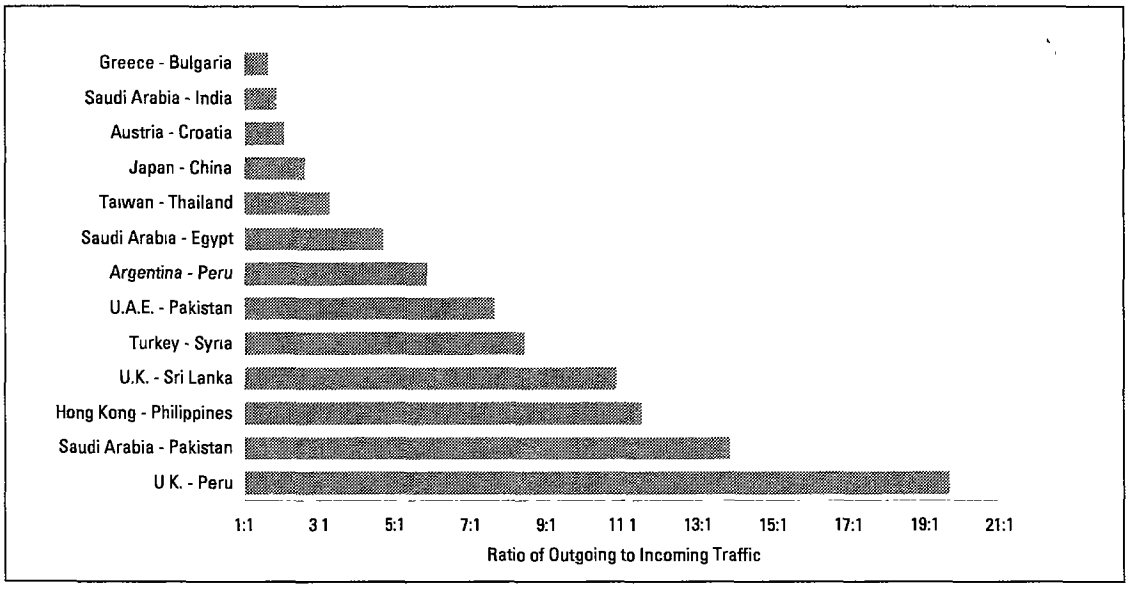
Figure 2. Traffic Imbalances on Selected U.S. Routes, 2000



Notes: Country with traffic deficit on route listed first. A ratio of 1:1 would indicate a perfect balance on a route. U.S. data is based on billing point of call and may not reflect actual call ratios due to refile and call-back.

Source: TeleGeography research

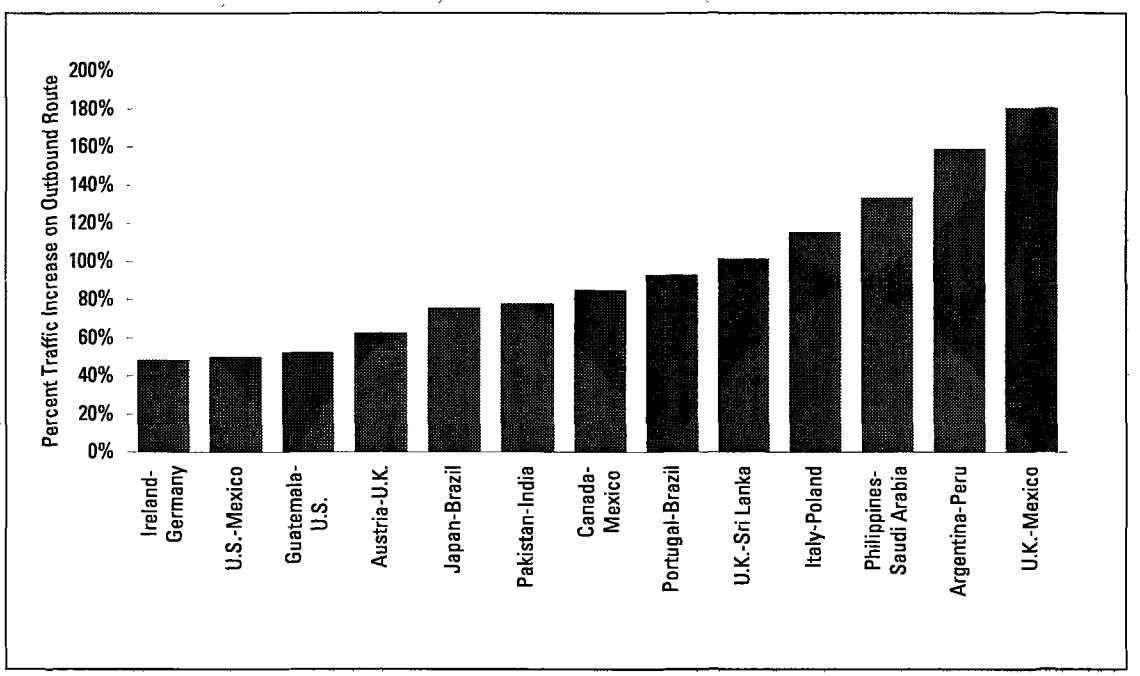
Figure 3. Traffic Imbalances on Selected Non-U.S. Routes, 2000



Notes: Country with traffic deficit on route listed first. A ratio of 1:1 would indicate a perfect balance on a route. Data for some countries is based on billing point of call and may not reflect actual call ratios due to refile and call-back.

Source: TeleGeography research

Figure 4. International Outbound Routes with Rapidly Growing Traffic, 1999-2000



Notes: Country originating traffic listed first; country terminating traffic listed second. Some data is based on billing point of call and may not reflect actual route growth rates due to refile and call-back.

Source: TeleGeography research

Country Traffic Statistics

Algeria

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	France	69.9	46.0%
2.	United Kingdom	10.2	6.7%
3.	Italy	7.3	4.8%
4.	Spain	6.7	4.4%
5.	Morocco	6.2	4.1%
6.	Germany	5.3	3.5%
7.	Belgium	3.9	2.6%
8.	Switzerland	3.0	2.0%
9.	Libya	2.9	1.9%
10.	Canada	2.8	1.8%
11.	United States	2.3	1.5%
12.	United Arab Emirates	2.0	1.3%
13.	Saudi Arabia	2.0	1.3%
14.	Egypt	1.8	1.2%
15.	Netherlands	1.6	1.1%
16.	Syria	1.5	1.0%
17.	Denmark	0.3	0.2%
18.	Greece	0.2	0.1%
19.	Australia	0.2	0.1%
20.	Sweden	0.2	0.1%
	Others	21.5	14.2%
	TOTAL	**151.8**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	n.a.	n.a.	n.a.
Outgoing	121.3	143.5	151.8
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

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

Angola

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Portugal	10.8	30.4%
2.	South Africa	5.0	14.2%
3.	France	1.6	4.6%
4.	United Kingdom	1.5	4.3%
5.	Namibia	1.2	3.4%
6.	United States	1.2	3.4%
7.	Brazil	1.0	2.8%
8.	Spain	0.4	1.2%
9.	Netherlands	0.4	1.1%
10.	Germany	0.4	1.1%
11.	Zimbabwe	0.3	0.9%
12.	Switzerland	0.3	0.8%
13.	Italy	0.3	0.8%
14.	Cuba	0.2	0.7%
15.	Gambia	0.2	0.6%
16.	Belgium	0.2	0.4%
17.	Mali	0.1	0.4%
18.	Mozambique	0.1	0.3%
19.	Côte d'Ivoire	0.1	0.3%
20.	Canada	0.1	0.3%
	Others	9.8	27.7%
	TOTAL	**35.4**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	22.3	33.1	n.a.
Outgoing	27.3	35.0	35.4
Surplus (Deficit)	(5.0)	(1.9)	n.a.
Total Volume	49.6	68.0	n.a.

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

Argentina

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United States	75.5	17.5%
2.	Brazil	45.9	10.6%
3.	Uruguay	45.2	10.5%
4.	Peru	38.0	8.8%
5.	Paraguay	33.7	7.8%
6.	Chile	33.1	7.7%
7.	Spain	32.2	7.4%
8.	Bolivia	27.7	6.4%
9.	Italy	18.7	4.3%
10.	Mexico	9.7	2.2%
11.	France	7.8	1.8%
12.	United Kingdom	6.5	1.5%
13.	Colombia	4.8	1.1%
14.	Germany	4.4	1.0%
15.	Venezuela	4.3	1.0%
16.	Canada	4.2	1.0%
17.	Israel	2.8	0.6%
18.	Switzerland	2.5	0.6%
19.	China	2.2	0.5%
20.	Cuba	1.3	0.3%
	Others	31.5	7.3%
	TOTAL	**432.1**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	n.a.	n.a.	479.3
Outgoing	358.7	377.6	432.1
Surplus (Deficit)	n.a.	n.a.	47.2
Total Volume	n.a.	n.a.	911.4

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

Armenia

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (thousands)	Percent of Outgoing Traffic
1.	Russia	22,715.0	72.2%
2.	Ukraine	1,936.0	6.2%
3.	Georgia	1,332.8	4.2%
4.	Belarus	307.2	1.0%
5.	Kazakhstan	269.6	0.9%
6.	Turkmenistan	144.9	0.5%
7.	Uzbekistan	139.0	0.4%
8.	Moldova	69.0	0.2%
9.	Azerbaijan	19.8	0.1%
10.	Kyrgyzstan	16.4	0.1%
11.	Tajikistan	9.5	<0.1%
	Others	4,484.0	14.3%
	TOTAL	**31,443.2**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	94.0	89.8	n.a.
Outgoing	56.6	33.7	31.4
Surplus (Deficit)	37.4	56.0	n.a.
Total Volume	150.7	123.5	n.a.

Note: National traffic data are in millions of minutes of outgoing public switched telecommunications traffic; route data are in thousands of minutes of outgoing public switched telecommunications traffic. The "Other" category may include routes to non-members

Australia

LARGEST TELECOMMUNICATIONS ROUTES, FY 2000/01

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United States	525.0	19.8%
2.	United Kingdom	410.0	15.5%
3.	New Zealand	300.0	11.3%
4.	China	125.0	4.7%
5.	Philippines	125.0	4.7%
6.	Japan	110.0	4.2%
7.	Singapore	110.0	4.2%
8.	Canada	105.0	4.0%
9.	Hong Kong	100.0	3.8%
10.	Germany	95.0	3.6%
11.	Italy	95.0	3.6%
12.	Indonesia	90.0	3.4%
13.	Taiwan	55.0	2.1%
14.	Malaysia	50.0	1.9%
	Others	355.0	13.4%
	TOTAL	**2,650.0**	

NATIONAL TRAFFIC BALANCE

Minutes	FY 1998/99	FY 1999/00	FY 2000/01
Incoming	n.a.	n.a.	n.a.
Outgoing	1,690.0	2,115.0	2,650.0
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

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

Austria

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Germany	630.0	41.7%
2.	Switzerland	200.0	13.2%
3.	Italy	85.0	5.6%
4.	United Kingdom	65.0	4.3%
5.	Hungary	60.0	4.0%
6.	Yugoslavia	60.0	4.0%
7.	Croatia	55.0	3.6%
8.	Poland	40.0	2.6%
9.	France	35.0	2.3%
10.	Czech Republic	35.0	2.3%
11.	Netherlands	34.0	2.3%
12.	Turkey	30.0	2.0%
13.	United States	23.0	1.5%
14.	Romania	22.0	1.5%
15.	Slovenia	22.0	1.5%
	Others	114.0	7.5%
	TOTAL	**1,510.0**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	n.a.	n.a.	n.a.
Outgoing	1,160.0	1,305.0	1,510.0
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

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

Azerbaijan

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (thousands)	Percent of Outgoing Traffic
1.	Russia	13,546.0	48.2%
2.	Ukraine	1,323.9	4.7%
3.	Georgia	1,127.9	4.0%
4.	Kazakhstan	729.4	2.6%
5.	Uzbekistan	338.9	1.2%
6.	Turkmenistan	319.4	1.1%
7.	Belarus	298.8	1.1%
8.	Kyrgyzstan	68.0	0.2%
9.	Moldova	59.8	0.2%
10.	Tajikistan	17.3	0.1%
	Others	10,263.5	36.5%
	TOTAL	**28,092.9**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	46.0	68.6	59.7
Outgoing	42.9	32.2	28.1
Surplus (Deficit)	3.2	36.4	31.6
Total Volume	88.9	100.8	87.8

Note: National traffic data are in millions of minutes of outgoing public switched telecommunications traffic; route data are in thousands of minutes of outgoing public switched telecommunications traffic. The "Other" category may include routes to non-members

Bahrain

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	India	24.1	17.3%
2.	Saudi Arabia	15.8	11.3%
3.	United Arab Emirates	13.3	9.5%
4.	United Kingdom	7.2	5.2%
5.	Pakistan	5.5	3.9%
6.	Kuwait	5.0	3.6%
7.	United States	4.4	3.1%
8.	Qatar	4.2	3.0%
9.	Egypt	4.0	2.9%
10.	Philippines	2.6	1.9%
11.	Bangladesh	2.2	1.6%
12.	Morocco	1.9	1.4%
13.	Jordan	1.8	1.3%
14.	Oman	1.8	1.3%
15.	Sri Lanka	1.3	0.9%
16.	Lebanon	1.1	0.8%
17.	France	1.0	0.7%
18.	Syria	0.9	0.6%
19.	Iran	0.8	0.6%
20.	Germany	0.8	0.6%
	Others	40.3	28.9%
	TOTAL	**139.5**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	102.1	106.5	125.6
Outgoing	124.4	134.1	139.5
Surplus (Deficit)	(22.3)	(27.5)	(13.9)
Total Volume	226.5	240.6	265.2

Note: Data are in millions of minutes of outgoing public switched telecommunications traffic. 2000 data exclude 28.2 million minutes of prepaid calling card traffic for which route data is not available.

Belarus

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Russia	95.0	53.2%
2.	Ukraine	24.0	13.4%
3.	Moldova	6.8	3.8%
4.	Kazakhstan	2.8	1.6%
5.	Azerbaijan	1.0	0.6%
6.	Armenia	1.0	0.6%
7.	Uzbekistan	0.8	0.4%
8.	Georgia	0.6	0.3%
9.	Tajikistan	0.2	0.1%
10.	Turkmenistan	0.2	0.1%
	Others	46.1	25.8%
	TOTAL	**178.5**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	193.5	195.6	n.a.
Outgoing	176.1	161.2	178.5
Surplus (Deficit)	17.3	34.4	n.a.
Total Volume	369.6	356.8	n.a.

Note: Data are in millions of minutes of outgoing 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, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	France	400.0	21.8%
2.	Netherlands	375.0	20.4%
3.	Germany	220.0	12.0%
4.	United Kingdom	160.0	8.7%
5.	Italy	95.0	5.2%
6.	Luxembourg	65.0	3.5%
7.	United States	65.0	3.5%
8.	Spain	60.0	3.3%
9.	Switzerland	35.0	1.9%
10.	Sweden	18.0	1.0%
	Others	342.0	18.6%
	TOTAL	**1,835.0**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	n.a.	n.a.	n.a.
Outgoing	1,460.0	1,590.0	1,835.0
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

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

Benin

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (thousands)	Percent of Outgoing Traffic
1.	France	3,248.0	27.8%
2.	Togo	1,470.0	12.6%
3.	Côte d'Ivoire	989.0	8.5%
4.	United States	565.0	4.8%
5.	Senegal	547.0	4.7%
6.	Niger	508.0	4.4%
7.	Burkina Faso	471.0	4.0%
8.	Gabon	469.0	4.0%
9.	Cameroon	338.0	2.9%
10.	Germany	289.0	2.5%
11.	Belgium	222.0	1.9%
12.	United Kingdom	189.0	1.6%
13.	Mali	172.0	1.5%
14.	Nigeria	167.0	1.4%
15.	Italy	144.0	1.2%
16.	Congo, Rep.	138.0	1.2%
17.	Canada	132.0	1.1%
18.	Ghana	119.0	1.0%
19.	Switzerland	119.0	1.0%
20.	Lebanon	110.0	0.9%
	Others	1,240.0	10.6%
	TOTAL	**11,665.0**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	16.4	15.1	24.3
Outgoing	11.4	10.5	11.7
Surplus (Deficit)	5.0	4.6	12.6
Total Volume	27.8	25.6	35.9

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

Bolivia

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United States	7.1	26.0%
2.	Argentina	5.1	18.7%
3.	Brazil	3.2	11.8%
4.	Chile	3.0	11.1%
5.	Peru	1.8	6.6%
6.	Italy	0.6	2.1%
7.	Spain	0.6	2.1%
8.	Germany	0.5	1.7%
9.	Canada	0.5	1.7%
10.	Ecuador	0.4	1.6%
11.	Paraguay	0.4	1.6%
12.	Colombia	0.4	1.5%
13.	Mexico	0.4	1.5%
14.	Uruguay	0.3	1.2%
15.	United Kingdom	0.3	1.2%
16.	San Marino	0.3	1.0%
17.	Venezuela	0.3	1.0%
18.	Cuba	0.2	0.9%
19.	France	0.2	0.7%
20.	Japan	0.2	0.6%
	Others	1.4	5.2%
	TOTAL	**27.2**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	76.4	82.2	80.8
Outgoing	31.6	29.7	27.2
Surplus (Deficit)	44.8	52.5	53.6
Total Volume	108.0	111.9	107.9

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

Brazil

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United States	207.5	30.0%
2.	Argentina	50.4	7.3%
3.	Portugal	41.6	6.0%
4.	Italy	32.5	4.7%
5.	Spain	24.5	3.5%
6.	United Kingdom	21.6	3.1%
7.	Germany	19.1	2.8%
8.	Japan	17.7	2.5%
9.	France	16.6	2.4%
10.	Chile	13.2	1.9%
11.	Uruguay	12.7	1.8%
12.	Paraguay	11.4	1.6%
13.	Switzerland	10.1	1.5%
14.	Canada	9.6	1.4%
15.	Lebanon	8.6	1.2%
16.	Peru	8.0	1.2%
17.	Bolivia	7.6	1.1%
18.	Israel	6.4	0.9%
19.	Netherlands	6.3	0.9%
20.	Mexico	6.3	0.9%
	Others	161.2	23.3%
	TOTAL	**692.7**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	806.9	838.5	1,212.4
Outgoing	545.8	574.8	692.7
Surplus (Deficit)	261.1	263.7	519.8
Total Volume	1,352.7	1,413.3	1,905.1

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

Brunei

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Singapore	4.1	16.9%
2.	Malaysia	3.2	13.2%
3.	Indonesia	2.7	11.1%
4.	Philippines	2.7	11.1%
5.	United Kingdom	1.6	6.6%
6.	Australia	1.0	4.1%
7.	India	0.6	2.5%
8.	Thailand	0.6	2.5%
9.	United States	0.4	1.6%
10.	Japan	0.3	1.2%
	Others	7.1	29.2%
	TOTAL	**24.3**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	25.5	21.7	23.3
Outgoing	23.4	23.4	24.3
Surplus (Deficit)	2.1	(1.7)	(1.0)
Total Volume	48.9	45.1	47.6

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

Bulgaria

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Greece	17.0	15.5%
2.	Germany	14.0	12.7%
3.	Turkey	12.0	10.9%
4.	Italy	6.0	5.5%
5.	United Kingdom	4.0	3.6%
6.	Russia	4.0	3.6%
7.	France	4.0	3.6%
8.	Austria	4.0	3.6%
9.	Spain	3.0	2.7%
10.	Macedonia	3.0	2.7%
11.	United States	2.0	1.8%
12.	Ukraine	2.0	1.8%
13.	Yugoslavia	2.0	1.8%
14.	Netherlands	2.0	1.8%
15.	Switzerland	1.0	0.9%
16.	Belgium	1.0	0.9%
17.	Czech Republic	1.0	0.9%
18.	Cyprus	1.0	0.9%
19.	Poland	1.0	0.9%
20.	Hungary	1.0	0.9%
	Others	25.0	22.7%
	TOTAL	**110.0**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	201.0	n.a.	211.0
Outgoing	96.0	98.9	110.0
Surplus (Deficit)	105.0	n.a.	101.0
Total Volume	297.0	n.a.	321.0

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

Burundi

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (thousands)	Percent of Outgoing Traffic
1.	Belgium	680.0	23.5%
2.	France	317.0	11.0%
3.	Kenya	237.0	8.2%
4.	United States	147.0	5.1%
5.	United Kingdom	127.0	4.4%
6.	Canada	123.0	4.3%
7.	Italy	117.0	4.0%
8.	Switzerland	99.0	3.4%
9.	South Africa	95.0	3.3%
10.	Tanzania	91.0	3.1%
11.	Netherlands	77.0	2.7%
12.	Germany	63.0	2.2%
13.	Greece	46.0	1.6%
14.	Uganda	40.0	1.4%
15.	Rwanda	35.0	1.2%
16.	Senegal	34.0	1.2%
17.	China	27.0	0.9%
18.	Ethiopia	22.0	0.8%
19.	Egypt	17.0	0.6%
20.	Cameroon	16.0	0.6%
	Others	484.0	16.7%
	TOTAL	**2,893.0**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	3.6	3.4	4.4
Outgoing	2.4	2.5	2.9
Surplus (Deficit)	1.1	1.0	1.5
Total Volume	6.0	5.9	7.3

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

Canada

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United States	5,480.0	75.9%
2.	United Kingdom	370.0	5.1%
3.	France	105.0	1.5%
4.	Hong Kong	100.0	1.4%
5.	Italy	100.0	1.4%
6.	Germany	95.0	1.3%
7.	Philippines	95.0	1.3%
8.	India	90.0	1.2%
9.	Australia	55.0	0.8%
10.	Japan	52.0	0.7%
	Others	682.0	9.4%
	TOTAL	**7,224.0**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	n.a.	n.a.	n.a.
Outgoing	4,805.0	5,830.0	7,224.0
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

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

Chile

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United States	105.0	37.8%
2.	Argentina	36.0	12.9%
3.	Spain	15.0	5.4%
4.	Brazil	14.5	5.2%
5.	Peru	11.5	4.1%
6.	Germany	7.0	2.5%
7.	Canada	6.5	2.3%
8.	Bolivia	6.0	2.2%
9.	Japan	6.0	2.2%
10.	France	5.0	1.8%
	Others	65.5	23.6%
	TOTAL	**278.0**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	n.a.	n.a.	n.a.
Outgoing	259.4	270.0	278.0
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

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

China

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Hong Kong	1,050.0	51.2%
2.	Taiwan	245.0	12.0%
3.	Japan	140.0	6.8%
4.	United States	55.0	2.7%
5.	Korea, Rep.	48.0	2.3%
6.	Macau	40.0	2.0%
7.	Singapore	35.0	1.7%
8.	United Kingdom	25.0	1.2%
9.	Australia	20.0	1.0%
10.	Canada	20.0	1.0%
11.	Germany	20.0	1.0%
12.	France	14.0	0.7%
13.	Italy	11.0	0.5%
14.	Malaysia	10.0	0.5%
15.	Russia	10.0	0.5%
	Others	307.0	15.0%
	TOTAL	**2,050.0**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	n.a.	n.a.	n.a.
Outgoing	1,711.5	1,950.0	2,050.0
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

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

Colombia

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United States	165.0	48.3%
2.	Venezuela	30.0	8.8%
3.	Spain	26.0	7.6%
4.	Ecuador	11.0	3.2%
5.	Mexico	9.0	2.6%
6.	United Kingdom	8.0	2.3%
7.	Panama	7.0	2.0%
8.	Canada	6.0	1.8%
9.	Italy	6.0	1.8%
10.	France	5.5	1.6%
11.	Brazil	4.5	1.3%
12.	Peru	4.5	1.3%
13.	Costa Rica	4.0	1.2%
14.	Chile	3.7	1.1%
15.	Germany	3.7	1.1%
	Others	47.9	14.0%
	TOTAL	**341.8**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	454.6	n.a.	n.a.
Outgoing	204.2	212.2	341.8
Surplus (Deficit)	250.4	n.a.	n.a.
Total Volume	658.8	n.a.	n.a.

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

Costa Rica

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United States	40.4	40.6%
2.	Nicaragua	19.2	19.2%
3.	Mexico	5.8	5.8%
4.	Panama	5.5	5.5%
5.	Guatemala	5.1	5.1%
6.	El Salvador	4.2	4.2%
7.	Colombia	3.6	3.6%
8.	Honduras	2.9	2.9%
9.	Canada	1.9	2.0%
10.	Cuba	1.3	1.3%
11.	Spain	1.2	1.2%
12.	Italy	1.0	1.0%
13.	Dominican Republic	0.8	0.8%
14.	Germany	0.8	0.8%
15.	Argentina	0.7	0.7%
16.	Chile	0.7	0.7%
17.	Venezuela	0.7	0.7%
18.	Peru	0.7	0.7%
19.	Brazil	0.5	0.5%
20.	France	0.5	0.5%
	Others	1.6	1.6%
	TOTAL	**99.6**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	112.9	109.0	137.8
Outgoing	82.7	94.1	99.6
Surplus (Deficit)	30.2	14.9	38.2
Total Volume	195.6	203.1	237.4

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

Croatia

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Germany	44.9	20.2%
2.	Austria	27.1	12.2%
3.	Switzerland	23.8	10.7%
4.	Italy	20.5	9.2%
5.	Macedonia	14.6	6.6%
6.	France	12.3	5.5%
7.	Greece	10.3	4.6%
8.	Hungary	10.2	4.6%
9.	United Kingdom	8.2	3.7%
10.	Russia	7.1	3.2%
11.	United States	6.2	2.8%
12.	Sweden	6.0	2.7%
13.	Netherlands	4.5	2.0%
14.	Romania	4.0	1.8%
15.	Belgium	2.9	1.3%
16.	Turkey	2.7	1.2%
17.	Spain	2.4	1.1%
18.	Bulgaria	2.3	1.0%
19.	Australia	1.7	0.8%
20.	Denmark	1.7	0.8%
	Others	8.8	4.0%
	TOTAL	**222.3**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	n.a.	n.a.	512.0
Outgoing	274.4	n.a.	222.3
Surplus (Deficit)	n.a.	n.a.	289.6
Total Volume	n.a.	n.a.	734.3

Note: Data are in millions of minutes of outgoing public switched telecommunications traffic. Data exclude traffic to Slovenia, Serbia, and Bosnia.

Cyprus

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Greece	56.3	29.3%
2.	United Kingdom	44.6	23.2%
3.	Egypt	9.2	4.8%
4.	Lebanon	9.1	4.7%
5.	Russia	8.8	4.6%
6.	United States	6.4	3.3%
7.	Germany	5.6	2.9%
8.	Romania	4.2	2.2%
9.	Bulgaria	4.0	2.1%
10.	Ukraine	3.2	1.7%
11.	Italy	2.9	1.5%
12.	Yugoslavia	2.6	1.4%
13.	Syria	2.2	1.2%
14.	France	2.2	1.2%
15.	Switzerland	2.2	1.1%
16.	Netherlands	1.9	1.0%
17.	Sweden	1.8	0.9%
18.	Israel	1.7	0.9%
19.	Australia	1.2	0.6%
20.	Austria	1.2	0.6%
	Others	21.1	10.9%
	TOTAL	**192.5**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	120.6	134.1	n.a.
Outgoing	182.0	168.2	192.5
Surplus (Deficit)	(61.4)	(34.0)	n.a.
Total Volume	302.7	302.3	n.a.

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

Czech Republic

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Germany	100.0	25.0%
2.	Slovak Republic	82.0	20.5%
3.	Austria	29.0	7.2%
4.	United Kingdom	22.0	5.5%
5.	Poland	17.0	4.2%
6.	Italy	14.0	3.5%
7.	France	13.0	3.2%
8.	United States	12.0	3.0%
9.	Netherlands	11.0	2.8%
10.	Ukraine	11.0	2.8%
	Others	89.0	22.2%
	TOTAL	**400.0**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	406.9	452.2	n.a.
Outgoing	317.4	364.0	400.0
Surplus (Deficit)	89.5	88.2	n.a.
Total Volume	724.4	816.2	n.a.

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

Denmark

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Germany	155.0	17.1%
2.	Sweden	140.0	15.5%
3.	United Kingdom	110.0	12.2%
4.	Norway	85.0	9.4%
5.	United States	41.0	4.5%
6.	Netherlands	38.0	4.2%
7.	France	34.0	3.8%
8.	Italy	27.0	3.0%
9.	Spain	19.0	2.1%
10.	Switzerland	19.0	2.1%
	Others	237.0	26.2%
	TOTAL	**905.0**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	n.a.	n.a.	n.a.
Outgoing	710.0	800.0	905.0
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

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

Dominican Republic

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United States	157.4	74.4%
2.	Spain	9.5	4.5%
3.	Italy	4.8	2.3%
4.	Canada	3.1	1.5%
5.	Germany	3.0	1.4%
6.	Mexico	2.4	1.1%
7.	Venezuela	2.4	1.1%
8.	Cuba	2.0	0.9%
9.	Argentina	1.8	0.9%
10.	France	1.8	0.9%
11.	Colombia	1.7	0.8%
12.	Haiti	1.6	0.8%
13.	Switzerland	1.4	0.7%
14.	Netherlands Antilles	1.3	0.6%
15.	Panama	1.3	0.6%
16.	United Kingdom	1.0	0.5%
17.	Netherlands	1.0	0.5%
18.	Chile	0.7	0.3%
19.	Costa Rica	0.7	0.3%
20.	Brazil	0.3	0.1%
	Others	12.5	5.9%
	TOTAL	**211.7**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	730.5	920.0	1,340.0
Outgoing	157.5	185.7	211.7
Surplus (Deficit)	573.0	734.3	1,128.3
Total Volume	888.0	1,105.7	1,551.7

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

Ecuador

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United States	15.0	27.0%
2.	Colombia	14.0	25.2%
3.	United Kingdom	3.5	6.3%
4.	Peru	3.0	5.4%
5.	Spain	3.0	5.4%
6.	Venezuela	2.0	3.6%
7.	Brazil	1.9	3.4%
8.	Chile	1.8	3.2%
9.	Argentina	1.6	2.9%
10.	Mexico	1.6	2.9%
	Others	8.1	14.6%
	TOTAL	**55.5**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	n.a.	n.a.	n.a.
Outgoing	62.0	57.4	55.5
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

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

Egypt

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Saudi Arabia	40.2	22.0%
2.	United States	14.1	7.7%
3.	United Arab Emirates	13.9	7.6%
4.	Italy	11.3	6.2%
5.	United Kingdom	11.1	6.0%
6.	Kuwait	10.3	5.6%
7.	Germany	9.8	5.4%
8.	France	7.3	4.0%
9.	Yemen	6.8	3.7%
10.	Lebanon	5.5	3.0%
11.	Jordan	4.2	2.3%
12.	Syria	3.2	1.7%
13.	Switzerland	3.1	1.7%
14.	Netherlands	2.6	1.4%
15.	Spain	2.5	1.4%
16.	Qatar	2.4	1.3%
17.	Libya	2.3	1.2%
18.	Morocco	2.1	1.1%
19.	Greece	2.0	1.1%
20.	Canada	1.9	1.1%
	Others	26.9	14.7%
	TOTAL	**183.1**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	475.3	554.6	620.6
Outgoing	127.3	171.0	183.1
Surplus (Deficit)	348.0	383.6	437.5
Total Volume	602.6	725.6	803.7

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

Eritrea

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (thousands)	Percent of Outgoing Traffic
1.	Italy	424.6	14.8%
2.	United States	364.7	12.7%
3.	Saudi Arabia	345.7	12.0%
4.	Sudan	172.5	6.0%
5.	United Kingdom	167.1	5.8%
6.	Germany	137.7	4.8%
7.	Kenya	99.6	3.5%
8.	Egypt	89.5	3.1%
9.	Korea, Rep.	83.4	2.9%
10.	Netherlands	58.5	2.0%
11.	Sweden	52.4	1.8%
12.	Switzerland	48.1	1.7%
13.	Canada	41.4	1.4%
14.	India	41.1	1.4%
15.	Libya	33.0	1.1%
16.	France	32.6	1.1%
17.	Norway	31.1	1.1%
18.	South Africa	30.0	1.0%
19.	Denmark	25.1	0.9%
20.	Belgium	20.4	0.7%
	Others	600.0	20.9%
	TOTAL	**2,876.0**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	12.6	13.8	n.a.
Outgoing	3.1	2.5	2.9
Surplus (Deficit)	9.5	11.3	n.a.
Total Volume	15.7	16.3	n.a.

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

Estonia

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Finland	22.0	29.2%
2.	Russia	15.0	19.9%
3.	Sweden	6.0	8.0%
4.	Latvia	5.5	7.3%
5.	Germany	4.6	6.1%
6.	Ukraine	3.1	4.1%
7.	Lithuania	2.9	3.8%
8.	United Kingdom	2.2	2.9%
9.	Denmark	1.8	2.4%
10.	United States	1.4	1.9%
11.	Norway	1.2	1.6%
12.	Belarus	1.1	1.5%
13.	Italy	1.0	1.3%
14.	Netherlands	0.9	1.2%
15.	Poland	0.9	1.2%
	Others	5.9	7.8%
	TOTAL	**75.5**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	79.2	84.8	n.a.
Outgoing	75.1	74.6	75.5
Surplus (Deficit)	4.1	10.2	n.a.
Total Volume	154.3	159.4	n.a.

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

Finland

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Sweden	150.0	32.1%
2.	Germany	42.0	9.0%
3.	United Kingdom	40.0	8.5%
4.	Estonia	30.0	6.4%
5.	Russia	28.0	6.0%
6.	Norway	20.0	4.3%
7.	United States	18.0	3.8%
8.	Denmark	13.0	2.8%
9.	France	13.0	2.8%
10.	Netherlands	9.0	1.9%
	Others	105.0	22.4%
	TOTAL	**468.0**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	n.a.	n.a.	n.a.
Outgoing	410.8	423.9	468.0
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

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

France

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United Kingdom	580.0	8.9%
2.	Germany	565.0	8.7%
3.	Belgium	495.0	7.6%
4.	Italy	490.0	7.5%
5.	United States	420.0	6.5%
6.	Switzerland	405.0	6.2%
7.	Morocco	400.0	6.2%
8.	Spain	385.0	5.9%
9.	Portugal	255.0	3.9%
10.	Algeria	250.0	3.8%
11.	Tunisia	215.0	3.3%
12.	Netherlands	200.0	3.1%
13.	Canada	145.0	2.2%
14.	Poland	90.0	1.4%
15.	Turkey	90.0	1.4%
16.	Monaco	80.0	1.2%
17.	Luxembourg	75.0	1.2%
18.	Sweden	60.0	0.9%
19.	Senegal	55.0	0.8%
20.	Yugoslavia	45.0	0.7%
	Others	1,200.0	18.5%
	TOTAL	**6,500.0**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	n.a.	n.a.	n.a.
Outgoing	4,115.0	5,165.0	6,500.0
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

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

Georgia

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (thousands)	Percent of Outgoing Traffic
1.	Russia	26,233.6	57.5%
2.	Ukraine	3,467.8	7.6%
3.	Azerbaijan	2,718.7	6.0%
4.	Armenia	2,220.1	4.9%
5.	Kazakhstan	507.1	1.1%
6.	Belarus	440.6	1.0%
7.	Uzbekistan	220.9	0.5%
8.	Turkmenistan	169.4	0.4%
9.	Moldova	114.5	0.3%
10.	Kyrgyzstan	44.3	0.1%
	Others	9,437.3	20.7%
	TOTAL	**45,594.9**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	n.a.	65.7	37.6
Outgoing	n.a.	46.7	45.6
Surplus (Deficit)	n.a.	19.0	(8.0)
Total Volume	n.a.	112.4	83.2

Note: National traffic data are in millions of minutes of outgoing public switched telecommunications traffic; route data are in thousands of minutes of outgoing public switched telecommunications traffic. The "Other" category may include routes to non-members

Germany

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Switzerland	750.0	7.8%
2.	Italy	700.0	7.3%
3.	United Kingdom	685.0	7.2%
4.	France	680.0	7.1%
5.	Austria	650.0	6.8%
6.	Poland	570.0	6.0%
7.	Netherlands	550.0	5.7%
8.	United States	550.0	5.7%
9.	Turkey	500.0	5.2%
10.	Spain	350.0	3.7%
11.	Belgium	225.0	2.4%
12.	Denmark	175.0	1.8%
13.	Greece	160.0	1.7%
14.	Croatia	150.0	1.6%
15.	Czech Republic	145.0	1.5%
16.	Sweden	120.0	1.3%
17.	Hungary	105.0	1.1%
18.	Yugoslavia	105.0	1.1%
19.	Canada	95.0	1.0%
20.	Portugal	90.0	0.9%
	Others	2,215.0	23.1%
	TOTAL	**9,570.0**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	n.a.	n.a.	n.a.
Outgoing	5,870.0	7,565.0	9,570.0
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

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

Ghana

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (thousands)	Percent of Outgoing Traffic
1.	United Kingdom	15,350.3	36.5%
2.	United States	11,836.9	28.1%
3.	Germany	4,394.5	10.4%
4.	Canada	2,222.6	5.3%
5.	France	1,698.3	4.0%
6.	Nigeria	1,367.1	3.2%
7.	Italy	1,013.1	2.4%
8.	Togo	761.2	1.8%
9.	South Africa	746.6	1.8%
10.	Burkina Faso	361.4	0.9%
11.	Benin	175.2	0.4%
12.	Korea, Rep.	139.9	0.3%
13.	Denmark	96.1	0.2%
14.	Netherlands	93.3	0.2%
15.	Japan	84.7	0.2%
16.	Senegal	82.7	0.2%
17.	Cameroon	57.6	0.1%
18.	Guinea	54.0	0.1%
19.	Belgium	30.7	0.1%
20.	Côte d'Ivoire	1.3	<0.1%
	Others	1,500.0	3.6%
	TOTAL	**42,067.5**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	100.8	118.4	n.a.
Outgoing	28.9	30.1	42.1
Surplus (Deficit)	72.0	88.2	n.a.
Total Volume	129.7	148.5	n.a.

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

Greece

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United Kingdom	117.7	14.8%
2.	Germany	111.4	14.0%
3.	Italy	65.2	8.2%
4.	United States	44.6	5.6%
5.	Albania	40.7	5.1%
6.	Cyprus	31.7	4.0%
7.	France	31.1	3.9%
8.	Bulgaria	27.3	3.4%
9.	Romania	25.3	3.2%
10.	Netherlands	19.1	2.4%
11.	Belgium	14.3	1.8%
12.	Switzerland	13.2	1.7%
13.	Ukraine	13.0	1.6%
14.	Australia	12.7	1.6%
15.	Turkey	12.0	1.5%
16.	Russia	11.9	1.5%
17.	Sweden	11.1	1.4%
18.	Canada	10.5	1.3%
19.	Yugoslavia	9.7	1.2%
20.	Austria	9.4	1.2%
	Others	161.3	20.3%
	TOTAL	**793.2**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	710.1	794.2	889.8
Outgoing	681.3	725.7	793.2
Surplus (Deficit)	28.8	68.5	96.6
Total Volume	1,391.4	1,519.9	1,683.0

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

Guatemala

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United States	59.1	47.2%
2.	El Salvador	13.4	10.7%
3.	Mexico	12.8	10.2%
4.	Costa Rica	5.7	4.5%
5.	Nicaragua	3.7	3.0%
6.	Colombia	3.4	2.8%
7.	Spain	1.7	1.3%
8.	Panama	1.7	1.3%
9.	Korea, Rep.	1.6	1.3%
10.	Lebanon	1.3	1.0%
11.	Canada	1.3	1.0%
12.	Peru	1.3	1.0%
13.	Vietnam	1.0	0.8%
14.	Chile	0.7	0.6%
15.	Germany	0.7	0.5%
16.	Eritrea	0.6	0.5%
17.	Israel	0.6	0.5%
18.	Italy	0.6	0.5%
	Others	14.3	11.4%
	TOTAL	**125.3**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	n.a.	208.6	295.9
Outgoing	60.0	83.3	125.3
Surplus (Deficit)	n.a.	125.3	170.5
Total Volume	n.a.	291.9	421.2

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

Hong Kong

LARGEST TELECOMMUNICATIONS ROUTES, FY 2000/01

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	China	1,404.9	45.7%
2.	United States	277.2	9.0%
3.	Philippines	229.2	7.5%
4.	Canada	202.0	6.6%
5.	United Kingdom	143.1	4.7%
6.	Australia	139.4	4.5%
7.	Taiwan	125.2	4.1%
8.	Japan	83.2	2.7%
9.	Singapore	81.2	2.6%
10.	Macau	47.8	1.6%
	Others	341.6	11.1%
	TOTAL	**3,074.9**	

NATIONAL TRAFFIC BALANCE

Minutes	FY 1998/99	FY 1999/00	FY 2000/01
Incoming	1,833.0	1,747.2	1,858.0
Outgoing	1,879.8	2,720.3	3,074.9
Surplus (Deficit)	(46.8)	(973.1)	(1,216.8)
Total Volume	3,712.8	4,467.5	4,932.9

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

Hungary

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Germany	84.4	24.2%
2.	Austria	37.0	10.6%
3.	Romania	35.8	10.3%
4.	Yugoslavia	23.4	6.7%
5.	United Kingdom	17.1	4.9%
6.	Italy	16.3	4.7%
7.	United States	13.9	4.0%
8.	France	12.0	3.4%
9.	Netherlands	7.6	2.2%
10.	Switzerland	7.3	2.1%
	Others	44.2	12.7%
	TOTAL	**349.2**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	374.5	n.a.	n.a.
Outgoing	296.3	343.9	349.2
Surplus (Deficit)	78.2	n.a.	n.a.
Total Volume	670.8	n.a.	n.a.

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

India

LARGEST TELECOMMUNICATIONS ROUTES, FY 2000/01

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Saudi Arabia	90.2	17.1%
2.	United States	75.3	14.3%
3.	United Kingdom	48.3	9.2%
4.	United Arab Emirates	48.0	9.1%
5.	Singapore	24.1	4.6%
6.	Kuwait	17.2	3.3%
7.	Oman	16.7	3.2%
8.	Germany	14.0	2.6%
9.	Canada	10.9	2.1%
10.	Hong Kong	10.4	2.0%
11.	Australia	9.9	1.9%
12.	Sri Lanka	9.6	1.8%
13.	Malaysia	8.6	1.6%
14.	France	8.4	1.6%
15.	Japan	8.2	1.6%
16.	Qatar	7.2	1.4%
17.	Bahrain	6.2	1.2%
18.	Thailand	4.8	0.9%
19.	Philippines	4.4	0.8%
20.	Spain	2.6	0.5%
	Others	102.0	19.4%
	TOTAL	**527.1**	

NATIONAL TRAFFIC BALANCE

Minutes	FY 1998/99	FY 1999/00	FY 2000/01
Incoming	1,498.8	1,772.5	2,161.4
Outgoing	436.2	473.3	527.1
Surplus (Deficit)	1,062.6	1,299.2	1,634.3
Total Volume	1,935.0	2,245.8	2,688.5

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

Indonesia

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Singapore	76.3	24.2%
2.	Malaysia	38.6	12.2%
3.	Australia	26.5	8.4%
4.	United States	24.0	7.6%
5.	Japan	21.2	6.7%
6.	Taiwan	13.4	4.3%
7.	Hong Kong	12.1	3.8%
8.	Korea, Rep.	8.8	2.8%
9.	United Kingdom	8.4	2.7%
10.	China	7.7	2.4%
11.	Philippines	6.1	1.9%
12.	Thailand	5.6	1.8%
13.	Germany	5.6	1.8%
14.	India	5.4	1.7%
15.	Netherlands	5.3	1.7%
16.	Canada	5.3	1.7%
17.	France	4.9	1.6%
18.	Brunei	3.3	1.0%
19.	Italy	2.4	0.8%
20.	New Zealand	1.5	0.5%
	Others	33.1	10.5%
	TOTAL	**315.5**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	434.2	n.a.	345.8
Outgoing	324.5	269.6	315.5
Surplus (Deficit)	109.7	n.a.	30.3
Total Volume	758.7	n.a.	661.3

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

Iran

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United Arab Emirates	30.1	17.0%
2.	United States	22.9	12.9%
3.	Pakistan	15.7	8.9%
4.	Germany	13.0	7.4%
5.	United Kingdom	12.8	7.2%
6.	Turkey	9.4	5.3%
7.	Kuwait	7.1	4.0%
8.	Sweden	6.7	3.8%
9.	Azerbaijan	4.5	2.5%
10.	Italy	4.1	2.3%
11.	Japan	3.8	2.1%
12.	Austria	3.5	2.0%
13.	France	3.3	1.9%
14.	Canada	2.7	1.5%
15.	Qatar	2.6	1.5%
16.	Netherlands	2.6	1.5%
17.	India	2.4	1.4%
18.	Saudi Arabia	2.3	1.3%
19.	Switzerland	2.3	1.3%
20.	Bahrain	1.7	1.0%
	Others	23.2	13.1%
	TOTAL	**176.8**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	185.7	191.5	216.8
Outgoing	177.0	156.1	176.8
Surplus (Deficit)	8.8	35.4	40.0
Total Volume	362.7	347.6	393.6

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

Ireland

LARGEST TELECOMMUNICATIONS ROUTES, FY 2000/01

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United Kingdom	775.0	62.0%
2.	United States	130.0	10.4%
3.	Germany	43.0	3.4%
4.	France	41.0	3.3%
5.	Netherlands	28.0	2.2%
6.	Spain	23.0	1.8%
7.	Australia	18.0	1.4%
8.	Canada	17.0	1.4%
9.	Italy	15.0	1.2%
10.	Belgium	10.0	0.8%
11.	Sweden	9.0	0.7%
12.	Switzerland	8.0	0.6%
13.	Denmark	6.0	0.5%
14.	Finland	5.0	0.4%
15.	Poland	4.0	0.3%
	Others	118.0	9.4%
	TOTAL	**1,250.0**	

NATIONAL TRAFFIC BALANCE

Minutes	FY 1998/99	FY 1999/00	FY 2000/01
Incoming	n.a.	n.a.	n.a.
Outgoing	885.0	1,015.0	1,250.0
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

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

Israel

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United States	245.0	25.4%
2.	United Kingdom	65.0	6.7%
3.	Canada	60.0	6.2%
4.	France	50.0	5.2%
5.	Germany	50.0	5.2%
6.	Italy	35.0	3.6%
7.	Russia	30.0	3.1%
8.	Ukraine	25.0	2.6%
9.	Netherlands	20.0	2.1%
	Others	385.0	39.9%
	TOTAL	**965.0**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	424.0	n.a.	n.a.
Outgoing	661.0	804.0	965.0
Surplus (Deficit)	(237.0)	n.a.	n.a.
Total Volume	1,085.0	n.a.	n.a.

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

Italy

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Germany	620.0	15.0%
2.	France	495.0	12.0%
3.	Switzerland	360.0	8.7%
4.	United Kingdom	330.0	8.0%
5.	United States	280.0	6.8%
6.	Romania	170.0	4.1%
7.	Spain	170.0	4.1%
8.	Poland	140.0	3.4%
9.	Belgium	105.0	2.5%
10.	Austria	100.0	2.4%
11.	Morocco	90.0	2.2%
12.	Netherlands	85.0	2.1%
13.	Croatia	75.0	1.8%
14.	Yugoslavia	68.0	1.6%
15.	Greece	66.0	1.6%
16.	Albania	65.0	1.6%
17.	Canada	60.0	1.4%
18.	Tunisia	55.0	1.3%
19.	Macedonia	45.0	1.1%
20.	Chile	40.0	1.0%
	Others	721.0	17.4%
	TOTAL	**4,140.0**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	n.a.	n.a.	n.a.
Outgoing	2,640.0	3,100.0	4,140.0
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

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

Jamaica

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United States	51.4	69.7%
2.	United Kingdom	7.8	10.6%
3.	Canada	2.3	3.2%
4.	Cayman Islands	2.3	3.1%
5.	Bahamas	1.7	2.3%
6.	Trinidad & Tobago	1.6	2.2%
7.	Barbados	1.1	1.4%
8.	Cuba	0.8	1.1%
9.	Germany	0.5	0.7%
10.	Antigua & Barbuda	0.4	0.5%
11.	Guyana	0.3	0.5%
12.	Turks & Caicos Islands	0.3	0.4%
13.	Saint Lucia	0.3	0.4%
14.	Dominican Republic	0.3	0.4%
15.	India	0.3	0.4%
16.	Colombia	0.2	0.3%
17.	Bermuda	0.2	0.3%
18.	Panama	0.2	0.3%
19.	Saint Vincent & The Grenadines	0.2	0.3%
20.	China	0.2	0.2%
	Others	1.5	2.0%
	TOTAL	**73.8**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	349.8	347.4	328.5
Outgoing	60.1	64.4	73.8
Surplus (Deficit)	289.7	283.0	254.6
Total Volume	409.9	411.8	402.3

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

Japan

LARGEST TELECOMMUNICATIONS ROUTES, FY 2000/01

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United States	520.0	20.2%
2.	China	360.0	14.0%
3.	Philippines	245.0	9.5%
4.	Korea, Rep.	210.0	8.2%
5.	Brazil	140.0	5.4%
6.	Taiwan	130.0	5.0%
7.	Thailand	100.0	3.9%
8.	United Kingdom	80.0	3.1%
9.	Hong Kong	75.0	2.9%
10.	Singapore	60.0	2.3%
11.	Australia	56.0	2.2%
12.	Indonesia	45.0	1.7%
13.	Seychelles	45.0	1.7%
14.	Germany	40.0	1.6%
15.	France	36.0	1.4%
16.	Malaysia	35.0	1.4%
17.	Canada	33.0	1.3%
18.	Russia	20.0	0.8%
19.	Vietnam	20.0	0.8%
20.	India	19.0	0.7%
	Others	306.0	11.9%
	TOTAL	**2,575.0**	

NATIONAL TRAFFIC BALANCE

Minutes	FY 1998/99	FY 1999/00	FY 2000/01
Incoming	1,575.0	1,929.6	n.a.
Outgoing	1,895.0	2,050.0	2,575.0
Surplus (Deficit)	(320.0)	(120.4)	n.a.
Total Volume	3,470.0	3,979.6	n.a.

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

Jordan

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Saudi Arabia	24.2	14.2%
2.	Egypt	18.3	10.7%
3.	Palestinian Authority	15.5	9.1%
4.	United Arab Emirates	13.4	7.9%
5.	Syria	11.4	6.7%
6.	Iraq	10.7	6.3%
7.	Israel	10.0	5.9%
8.	United States	9.6	5.6%
9.	Kuwait	6.5	3.8%
10.	Lebanon	5.5	3.2%
11.	*United Kingdom*	5.2	3.1%
12.	Qatar	3.5	2.0%
13.	Germany	3.4	2.0%
14.	France	2.3	1.3%
15.	Italy	1.9	1.1%
16.	Oman	1.6	1.0%
17.	Bahrain	1.6	0.9%
18.	Yemen	1.6	0.9%
19.	Canada	1.4	0.8%
20.	Turkey	1.2	0.7%
	Others	21.6	12.7%
	TOTAL	**170.6**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	176.9	191.5	214.1
Outgoing	122.6	145.6	170.6
Surplus (Deficit)	54.4	45.9	43.5
Total Volume	299.5	337.2	384.7

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

Kazakhstan

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (thousands)	Percent of Outgoing Traffic
1.	Russia	48,200.0	45.7%
2.	Uzbekistan	13,300.0	12.6%
3.	Kyrgyzstan	8,100.0	7.7%
4.	Ukraine	3,700.0	3.5%
5.	Germany	3,041.0	2.9%
6.	Turkmenistan	2,300.0	2.2%
7.	Tajikistan	2,100.0	2.0%
8.	Azerbaijan	1,631.0	1.5%
9.	Belarus	1,544.0	1.5%
10.	Armenia	700.0	0.7%
11.	Georgia	600.0	0.6%
12.	China	598.0	0.6%
13.	Moldova	300.0	0.3%
14.	France	294.0	0.3%
15.	India	227.0	0.2%
16.	Canada	198.0	0.2%
17.	Australia	58.0	0.1%
18.	Egypt	34.0	<0.1%
19.	Hong Kong	21.0	<0.1%
20.	Bahrain	3.0	<0.1%
	Others	18,416.0	17.5%
	TOTAL	**105,365.0**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	137.5	149.8	183.1
Outgoing	118.9	104.5	105.4
Surplus (Deficit)	18.6	45.3	77.8
Total Volume	256.4	254.3	288.5

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

Kenya

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United Kingdom	4.6	22.1%
2.	United States	3.4	16.1%
3.	India	1.9	9.2%
4.	South Africa	1.6	7.6%
5.	Germany	0.9	4.5%
6.	Italy	0.9	4.1%
7.	France	0.8	3.8%
8.	United Arab Emirates	0.7	3.3%
9.	Netherlands	0.6	3.1%
10.	Canada	0.5	2.6%
11.	Switzerland	0.5	2.4%
12.	Ethiopia	0.5	2.2%
13.	Japan	0.3	1.6%
14.	Pakistan	0.3	1.5%
15.	Zimbabwe	0.3	1.4%
16.	Australia	0.3	1.4%
17.	Belgium	0.3	1.4%
18.	Somalia	0.3	1.3%
19.	Nigeria	0.2	1.1%
20.	Sweden	0.2	1.0%
	Others	1.8	8.5%
	TOTAL	**21.0**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	72.5	n.a.	n.a.
Outgoing	29.2	n.a.	21.0
Surplus (Deficit)	43.3	n.a.	n.a.
Total Volume	101.7	n.a.	n.a.

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

Korea, Rep.

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United States	235.0	22.1%
2.	China	175.0	16.5%
3.	Japan	165.0	15.5%
4.	Hong Kong	27.6	2.6%
5.	Canada	27.0	2.5%
6.	Philippines	27.0	2.5%
7.	Australia	24.0	2.3%
8.	Indonesia	20.0	1.9%
9.	Vietnam	19.0	1.8%
10.	Germany	18.5	1.7%
11.	Taiwan	15.0	1.4%
12.	United Kingdom	15.0	1.4%
13.	Pakistan	14.0	1.3%
14.	Singapore	14.0	1.3%
15.	Thailand	11.0	1.0%
	Others	255.9	24.1%
	TOTAL	**1,063.0**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	719.4	n.a.	n.a.
Outgoing	907.7	898.0	1,063.0
Surplus (Deficit)	(188.3)	n.a.	n.a.
Total Volume	1,627.1	n.a.	n.a.

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

Kuwait

LARGEST TELECOMMUNICATIONS ROUTES, 1999

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Egypt	35.0	22.1%
2.	Saudi Arabia	18.6	11.8%
3.	India	18.2	11.5%
4.	Syria	11.9	7.5%
5.	United Arab Emirates	11.2	7.1%
6.	United States	9.3	5.9%
7.	Iran	7.0	4.4%
8.	Pakistan	6.9	4.4%
9.	United Kingdom	6.5	4.1%
10.	Jordan	5.8	3.6%
11.	Lebanon	5.2	3.3%
12.	Bahrain	4.2	2.7%
13.	Qatar	1.8	1.2%
14.	Philippines	1.7	1.1%
15.	Canada	1.7	1.1%
16.	Bangladesh	1.7	1.0%
17.	Sri Lanka	1.3	0.8%
18.	Oman	1.2	0.8%
19.	France	1.2	0.8%
20.	Germany	1.1	0.7%
	Others	18.2	11.5%
	TOTAL	**170.0**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	135.0	120.0	n.a.
Outgoing	173.1	170.0	158.7
Surplus (Deficit)	(38.1)	(50.0)	n.a.
Total Volume	308.1	290.0	n.a.

Note: Data are in millions of minutes of outgoing public switched telecommunications traffic. 2000 route data are not available.

Kyrgyzstan

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (thousands)	Percent of Outgoing Traffic
1.	Russia	10,600.0	45.7%
2.	Kazakhstan	6,066.0	26.2%
3.	Uzbekistan	2,521.0	10.9%
4.	Turkey	624.0	2.7%
5.	Tajikistan	591.0	2.6%
6.	Ukraine	464.0	2.0%
7.	Germany	311.0	1.3%
8.	China	221.0	1.0%
9.	Belarus	194.0	0.8%
10.	Azerbaijan	166.0	0.7%
11.	Turkmenistan	157.0	0.7%
12.	United Kingdom	133.0	0.6%
13.	United Arab Emirates	70.0	0.3%
14.	Iran	47.0	0.2%
15.	India	46.0	0.2%
16.	France	35.0	0.2%
17.	Belgium	30.0	0.1%
18.	Pakistan	25.0	0.1%
19.	Korea, Rep.	24.0	0.1%
20.	Japan	23.0	0.1%
	Others	800.0	3.5%
	TOTAL	**23,174.8**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	30.1	n.a.	28.6
Outgoing	30.4	23.5	23.2
Surplus (Deficit)	(0.3)	n.a.	5.4
Total Volume	60.5	n.a.	51.8

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

Latvia

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Russia	13.5	24.7%
2.	Lithuania	6.5	11.8%
3.	Estonia	5.3	9.6%
4.	Germany	3.9	7.1%
5.	Belarus	3.7	6.8%
6.	Ukraine	3.5	6.3%
7.	United Kingdom	2.1	3.8%
8.	Finland	1.8	3.4%
9.	Denmark	1.4	2.6%
10.	Sweden	1.4	2.5%
11.	Poland	1.4	2.5%
12.	Norway	0.8	1.4%
13.	Netherlands	0.7	1.4%
14.	France	0.7	1.3%
15.	Italy	0.7	1.2%
16.	United States	0.6	1.1%
17.	Switzerland	0.6	1.1%
18.	Belgium	0.5	1.0%
19.	Austria	0.4	0.8%
20.	Israel	0.3	0.6%
	Others	5.0	9.1%
	TOTAL	**54.8**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	87.2	90.0	90.1
Outgoing	55.4	55.6	54.8
Surplus (Deficit)	31.8	34.4	35.3
Total Volume	142.5	145.6	144.9

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

Luxembourg

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	France	90.0	23.6%
2.	Belgium	85.0	22.3%
3.	Germany	85.0	22.3%
4.	Portugal	23.0	6.0%
5.	United Kingdom	19.0	5.0%
6.	Italy	18.0	4.7%
7.	Netherlands	13.0	3.4%
8.	Switzerland	11.0	2.9%
9.	United States	7.0	1.8%
10.	Spain	6.0	1.6%
	Others	24.0	6.3%
	TOTAL	**381.0**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	242.6	n.a.	n.a.
Outgoing	293.8	319.1	381.0
Surplus (Deficit)	(51.2)	n.a.	n.a.
Total Volume	536.4	n.a.	n.a.

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

Macau

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	China	58.7	38.6%
2.	Hong Kong	57.4	37.7%
3.	Taiwan	9.9	6.5%
4.	United States	6.1	4.0%
5.	Canada	3.3	2.1%
6.	Portugal	3.0	2.0%
7.	United Kingdom	2.9	1.9%
8.	Philippines	2.5	1.7%
9.	Australia	2.4	1.6%
10.	Thailand	1.2	0.8%
11.	Singapore	0.7	0.5%
12.	Japan	0.5	0.3%
13.	Malaysia	0.4	0.3%
14.	Korea, Rep.	0.4	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.	Cambodia	0.1	0.1%
	Others	1.6	1.1%
	TOTAL	**152.1**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	95.1	97.7	103.2
Outgoing	125.2	132.8	152.1
Surplus (Deficit)	(30.2)	(35.1)	(48.9)
Total Volume	220.3	230.5	255.2

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

Macedonia

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Yugoslavia	18.8	25.7%
2.	Germany	8.4	11.4%
3.	Greece	5.0	6.9%
4.	Bulgaria	4.8	6.6%
5.	Switzerland	4.5	6.2%
6.	Italy	3.8	5.2%
7.	Turkey	3.0	4.1%
8.	Croatia	2.5	3.4%
9.	United States	2.3	3.2%
10.	Slovenia	2.3	3.2%
11.	United Kingdom	1.9	2.6%
12.	Austria	1.9	2.6%
13.	France	1.4	1.9%
14.	Albania	1.1	1.4%
15.	Bosnia-Herzegovina	0.9	1.3%
16.	Australia	0.9	1.2%
17.	Belgium	0.8	1.1%
18.	Hungary	0.6	0.8%
19.	Netherlands	0.5	0.7%
20.	Sweden	0.5	0.6%
	Others	7.5	10.2%
	TOTAL	**73.2**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	91.7	152.5	166.4
Outgoing	37.1	82.3	73.2
Surplus (Deficit)	54.6	70.3	93.2
Total Volume	128.9	234.8	239.6

Note: Data are in millions of minutes of outgoing public switched telecommunications traffic. Data for 1998 exclude an estimated 20 million minutes of traffic to Yugoslavia.

Malaysia

LARGEST TELECOMMUNICATIONS ROUTES, FY 2000/01

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Singapore	440.0	49.2%
2.	Indonesia	92.0	10.3%
3.	Thailand	50.0	5.6%
4.	Japan	31.0	3.5%
5.	India	30.0	3.4%
6.	Australia	27.0	3.0%
7.	United States	27.0	3.0%
8.	United Kingdom	26.0	2.9%
9.	Hong Kong	23.0	2.6%
10.	China	22.0	2.5%
11.	Taiwan	22.0	2.5%
12.	Philippines	14.0	1.6%
13.	Bangladesh	8.5	0.9%
14.	Germany	6.5	0.7%
15.	France	5.8	0.6%
16.	Korea, Rep.	5.3	0.6%
17.	Brunei	2.6	0.3%
18.	Canada	2.5	0.3%
19.	Saudi Arabia	1.2	0.1%
20.	Myanmar	1.1	0.1%
	Others	57.5	6.4%
	TOTAL	**895.0**	

NATIONAL TRAFFIC BALANCE

Minutes	FY 1998/99	FY 1999/00	FY 2000/01
Incoming	n.a.	n.a.	n.a.
Outgoing	685.0	690.0	895.0
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

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

Malta

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United Kingdom	13.0	30.1%
2.	Italy	6.6	15.3%
3.	Germany	3.9	9.0%
4.	France	1.9	4.4%
5.	Libya	1.7	3.9%
6.	Netherlands	1.6	3.6%
7.	United States	1.3	3.1%
8.	Australia	1.2	2.9%
9.	Switzerland	1.0	2.3%
10.	Russia	0.8	1.8%
11.	Belgium	0.8	1.8%
12.	Sweden	0.6	1.4%
13.	Austria	0.6	1.4%
14.	Spain	0.6	1.3%
15.	Ireland	0.5	1.2%
16.	Canada	0.5	1.2%
17.	Turkey	0.5	1.1%
18.	Greece	0.4	0.9%
19.	Tunisia	0.4	0.9%
20.	Norway	0.3	0.7%
	Others	5.0	11.7%
	TOTAL	**43.0**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	43.4	50.2	n.a.
Outgoing	37.3	39.0	43.0
Surplus (Deficit)	6.1	11.2	n.a.
Total Volume	80.7	89.2	n.a.

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

Mauritius

LARGEST TELECOMMUNICATIONS ROUTES, FY 2000/01

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	France	7.1	20.1%
2.	United Kingdom	5.3	15.0%
3.	Réunion	3.6	10.4%
4.	South Africa	3.0	8.5%
5.	India	2.5	7.3%
6.	Italy	1.2	3.5%
7.	Australia	1.1	3.0%
8.	Germany	1.0	2.8%
9.	Madagascar	0.9	2.7%
10.	China	0.9	2.5%
11.	Switzerland	0.7	2.0%
12.	United States	0.5	1.6%
13.	Hong Kong	0.5	1.5%
14.	Seychelles	0.5	1.5%
15.	Singapore	0.5	1.5%
16.	Belgium	0.5	1.4%
17.	Canada	0.3	0.9%
18.	Spain	0.3	0.7%
19.	Taiwan	0.2	0.6%
20.	Malaysia	0.2	0.6%
	Others	4.1	11.7%
	TOTAL	**35.1**	

NATIONAL TRAFFIC BALANCE

Minutes	FY 1998/99	FY 1999/00	FY 2000/01
Incoming	39.5	43.3	49.0
Outgoing	29.7	31.4	35.1
Surplus (Deficit)	9.8	11.9	13.9
Total Volume	69.2	74.7	84.0

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

Mexico

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United States	1,569.0	83.3%
2.	Canada	23.0	1.2%
3.	Spain	19.0	1.0%
4.	Cuba	13.0	0.7%
5.	Guatemala	13.0	0.7%
6.	Colombia	12.0	0.6%
7.	France	11.0	0.6%
8.	Argentina	10.0	0.5%
9.	Germany	9.0	0.5%
10.	United Kingdom	9.0	0.5%
	Others	195.0	10.4%
	TOTAL	**1,883.0**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	3,060.0	4,007.5	5,896.0
Outgoing	1,310.0	1,563.0	1,883.0
Surplus (Deficit)	1,750.0	2,444.5	4,013.0
Total Volume	4,370.0	5,570.5	7,779.0

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

Moldova

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Russia	14.7	29.0%
2.	Ukraine	12.7	25.0%
3.	Romania	7.2	14.1%
4.	Italy	2.6	5.2%
5.	Turkey	2.0	3.9%
6.	Germany	1.9	3.6%
7.	Belarus	1.4	2.7%
8.	Greece	0.9	1.8%
9.	Portugal	0.9	1.7%
10.	France	0.5	1.0%
11.	United States	0.5	1.0%
12.	Bulgaria	0.5	0.9%
13.	Israel	0.4	0.9%
14.	Poland	0.4	0.8%
15.	Spain	0.4	0.7%
16.	Czech Republic	0.4	0.7%
17.	Hungary	0.3	0.7%
18.	United Kingdom	0.3	0.6%
19.	Cyprus	0.2	0.5%
20.	Belgium	0.2	0.4%
	Others	2.5	4.8%
	TOTAL	**50.8**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	90.3	101.1	120.8
Outgoing	55.8	49.0	50.8
Surplus (Deficit)	34.4	52.1	70.1
Total Volume	146.1	150.1	171.6

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

Morocco

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	France	100.0	40.8%
2.	Spain	22.0	9.0%
3.	United Kingdom	19.0	7.8%
4.	Italy	18.0	7.3%
5.	Germany	10.0	4.1%
6.	United States	10.0	4.1%
7.	Belgium	10.0	4.1%
8.	Netherlands	9.0	3.7%
9.	Saudi Arabia	9.0	3.7%
10.	Canada	5.0	2.0%
	Others	33.0	13.5%
	TOTAL	**245.0**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	460.0	n.a.	n.a.
Outgoing	181.0	219.5	245.0
Surplus (Deficit)	279.0	n.a.	n.a.
Total Volume	641.0	n.a.	n.a.

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

Namibia

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	South Africa	49.6	82.4%
2.	Germany	2.0	3.4%
3.	United Kingdom	0.9	1.5%
4.	Botswana	0.8	1.4%
5.	Zimbabwe	0.8	1.3%
6.	United States	0.6	1.0%
7.	Angola	0.6	0.9%
8.	Zambia	0.5	0.8%
9.	Spain	0.4	0.7%
10.	Ghana	0.4	0.6%
11.	France	0.2	0.4%
12.	Portugal	0.2	0.3%
13.	China	0.2	0.3%
14.	Russia	0.2	0.3%
15.	Italy	0.2	0.3%
16.	Netherlands	0.2	0.3%
17.	Switzerland	0.2	0.3%
18.	Austria	0.1	0.2%
19.	Australia	0.1	0.2%
20.	Nigeria	0.1	0.2%
	Others	0.6	1.0%
	TOTAL	**60.2**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	45.3	51.2	50.7
Outgoing	61.9	61.2	60.2
Surplus (Deficit)	(16.6)	(10.0)	(9.5)
Total Volume	107.2	112.4	110.8

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

Netherlands

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Germany	500.0	17.7%
2.	Belgium	400.0	14.1%
3.	United Kingdom	300.0	10.6%
4.	France	180.0	6.4%
5.	United States	160.0	5.7%
6.	Italy	80.0	2.8%
7.	Spain	76.0	2.7%
8.	Switzerland	75.0	2.7%
9.	Turkey	62.0	2.2%
10.	Canada	60.0	2.1%
11.	Sweden	40.0	1.4%
12.	Morocco	36.0	1.3%
13.	Poland	35.0	1.2%
14.	Austria	30.0	1.1%
15.	Denmark	30.0	1.1%
16.	Greece	30.0	1.1%
17.	Portugal	27.0	1.0%
18.	Australia	22.0	0.8%
19.	Ireland	19.0	0.7%
20.	Norway	18.0	0.6%
	Others	650.0	23.0%
	TOTAL	**2,830.0**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	n.a.	n.a.	n.a.
Outgoing	1,885.0	2,380.0	2,830.0
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

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

New Zealand

LARGEST TELECOMMUNICATIONS ROUTES, FY 2000/01

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Australia	425.0	44.7%
2.	United States	115.0	12.1%
3.	United Kingdom	110.0	11.6%
4.	Canada	45.0	4.7%
5.	Philippines	25.0	2.6%
6.	Hong Kong	16.0	1.7%
7.	Japan	16.0	1.7%
8.	Fiji	15.0	1.6%
9.	Malaysia	12.0	1.3%
10.	Singapore	12.0	1.3%
	Others	159.0	16.7%
	TOTAL	**950.0**	

NATIONAL TRAFFIC BALANCE

Minutes	FY 1998/99	FY 1999/00	FY 2000/01
Incoming	n.a.	n.a.	n.a.
Outgoing	610.0	815.0	950.0
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

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

Norway

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Sweden	200.0	26.0%
2.	Denmark	105.0	13.6%
3.	United Kingdom	95.0	12.3%
4.	United States	55.0	7.1%
5.	Germany	50.0	6.5%
6.	Spain	34.0	4.4%
7.	Netherlands	23.0	3.0%
8.	Finland	22.0	2.9%
9.	France	22.0	2.9%
10.	Italy	21.0	2.7%
	Others	143.0	18.6%
	TOTAL	**770.0**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	n.a.	n.a.	n.a.
Outgoing	540.0	694.0	770.0
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

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

Oman

LARGEST TELECOMMUNICATIONS ROUTES, 1999

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	India	30.3	25.9%
2.	United Arab Emirates	27.4	23.5%
3.	Pakistan	6.5	5.6%
4.	United Kingdom	5.8	5.0%
5.	Egypt	4.1	3.5%
6.	Saudi Arabia	2.8	2.4%
7.	Bangladesh	2.7	2.3%
8.	Bahrain	2.4	2.1%
9.	United States	2.2	1.9%
10.	Jordan	1.7	1.4%
11.	Sri Lanka	1.5	1.3%
12.	Kuwait	1.5	1.3%
13.	Philippines	1.4	1.2%
14.	Qatar	1.4	1.2%
15.	Tanzania	1.1	1.0%
16.	South Africa	1.0	0.9%
17.	Sudan	0.9	0.8%
18.	Germany	0.8	0.7%
19.	France	0.8	0.7%
20.	Netherlands	0.6	0.5%
	Others	4.3	3.7%
	TOTAL	**101.3**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	71.7	83.4	n.a.
Outgoing	90.0	101.3	116.8
Surplus (Deficit)	(18.3)	(17.9)	n.a.
Total Volume	161.8	184.7	n.a.

Note: Data are in millions of minutes of outgoing public switched telecommunications traffic. 2000 route data are not available. Data exclude some cross-border traffic to the United Arab Emirates.

Pakistan

LARGEST TELECOMMUNICATIONS ROUTES, FY 2000/01

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United Kingdom	19.1	19.3%
2.	United Arab Emirates	14.4	14.6%
3.	Saudi Arabia	11.2	11.4%
4.	United States	10.7	10.8%
5.	Canada	7.7	7.8%
6.	Italy	3.5	3.5%
7.	Iran	3.4	3.5%
8.	Germany	2.5	2.5%
9.	Kuwait	2.1	2.1%
10.	France	1.9	1.9%
11.	Singapore	1.9	1.9%
12.	India	1.8	1.8%
13.	Japan	1.6	1.6%
14.	Bangladesh	1.5	1.6%
15.	Oman	1.3	1.3%
16.	China	1.2	1.2%
17.	Hong Kong	1.2	1.2%
18.	Australia	1.2	1.2%
19.	Turkey	1.1	1.1%
20.	Qatar	1.1	1.1%
	Others	8.4	8.5%
	TOTAL	**98.6**	

NATIONAL TRAFFIC BALANCE

Minutes	FY 1998/99	FY 1999/00	FY 2000/01
Incoming	640.4	644.9	896.1
Outgoing	87.5	75.1	98.6
Surplus (Deficit)	552.9	569.8	797.4
Total Volume	727.9	720.0	994.7

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

Palestinian Authority

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Jordan	19.5	42.9%
2.	United States	5.1	11.1%
3.	Egypt	3.5	7.8%
4.	Saudi Arabia	2.8	6.0%
5.	United Arab Emirates	1.8	4.0%
6.	Germany	1.2	2.6%
7.	United Kingdom	1.0	2.2%
8.	Italy	0.7	1.5%
9.	Syria	0.6	1.3%
10.	France	0.6	1.2%
11.	Ukraine	0.5	1.1%
12.	Turkey	0.5	1.0%
13.	Lebanon	0.4	0.9%
14.	Canada	0.4	0.9%
15.	Kuwait	0.4	0.9%
16.	Qatar	0.4	0.8%
17.	Russia	0.3	0.7%
18.	Spain	0.3	0.7%
19.	Morocco	0.3	0.7%
20.	Iraq	0.3	0.6%
	Others	5.1	11.1%
	TOTAL	**45.6**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	16.6	n.a.	37.2
Outgoing	27.6	34.9	45.6
Surplus (Deficit)	(11.0)	n.a.	(8.4)
Total Volume	44.3	n.a.	82.8

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

Panama

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United States	15.6	30.0%
2.	Colombia	6.0	11.5%
3.	Costa Rica	4.0	7.8%
4.	Mexico	2.5	4.7%
5.	Guatemala	1.3	2.5%
6.	Dominican Republic	1.3	2.5%
7.	Venezuela	1.2	2.4%
8.	Spain	1.1	2.1%
9.	Nicaragua	1.1	2.1%
10.	El Salvador	0.9	1.7%
11.	Peru	0.8	1.5%
12.	Cuba	0.7	1.4%
13.	Brazil	0.7	1.4%
14.	Honduras	0.7	1.3%
15.	Chile	0.6	1.2%
16.	Canada	0.6	1.1%
17.	Ecuador	0.5	1.0%
18.	United Kingdom	0.5	1.0%
19.	France	0.3	0.6%
20.	Japan	0.2	0.4%
	Others	11.4	21.9%
	TOTAL	**51.9**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	95.5	96.2	111.7
Outgoing	50.0	53.6	51.9
Surplus (Deficit)	45.5	42.6	59.7
Total Volume	145.5	149.8	163.6

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

Paraguay

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Argentina	12.0	36.2%
2.	Brazil	9.2	27.6%
3.	United States	3.4	10.2%
4.	Uruguay	1.4	4.3%
5.	Chile	1.2	3.5%
6.	Spain	0.6	1.8%
7.	Germany	0.5	1.6%
8.	Bolivia	0.5	1.4%
9.	Taiwan	0.4	1.2%
10.	Peru	0.4	1.1%
11.	Italy	0.3	0.9%
12.	Mexico	0.3	0.8%
13.	China	0.2	0.7%
14.	Japan	0.2	0.7%
15.	France	0.2	0.7%
16.	Korea, Rep.	0.2	0.6%
17.	Canada	0.2	0.6%
18.	Colombia	0.2	0.5%
19.	Switzerland	0.1	0.4%
20.	Lebanon	0.0	<0.1%
	Others	1.7	5.2%
	TOTAL	**33.3**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	57.4	54.8	71.6
Outgoing	37.8	34.7	33.3
Surplus (Deficit)	19.6	20.1	38.4
Total Volume	95.2	89.5	104.9

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

Peru

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United States	32.0	37.0%
2.	Chile	7.3	8.4%
3.	Argentina	6.6	7.6%
4.	Spain	6.3	7.3%
5.	Colombia	5.7	6.6%
6.	Brazil	3.1	3.6%
7.	Mexico	3.0	3.5%
8.	Venezuela	2.6	3.0%
9.	Italy	2.5	2.9%
10.	Japan	2.3	2.6%
11.	Ecuador	2.3	2.6%
12.	Bolivia	2.2	2.5%
13.	Canada	1.5	1.8%
14.	Germany	1.4	1.6%
15.	United Kingdom	1.2	1.3%
16.	France	1.0	1.2%
17.	Switzerland	0.8	0.9%
18.	China	0.8	0.9%
19.	Panama	0.7	0.8%
20.	Costa Rica	0.5	0.6%
	Others	2.8	3.3%
	TOTAL	**86.5**	

NATIONAL TRAFFIC BALANCE

Minutes	FY 1998/99	1999	2000
Incoming	272.6	299.6	317.7
Outgoing	90.3	88.9	86.5
Surplus (Deficit)	182.3	210.6	231.3
Total Volume	363.0	388.5	404.2

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

Philippines

LARGEST TELECOMMUNICATIONS ROUTES, FY 2000/01

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United States	65.0	23.8%
2.	Japan	45.0	16.5%
3.	Saudi Arabia	35.0	12.8%
4.	Hong Kong	20.0	7.3%
5.	Canada	15.0	5.5%
6.	Singapore	15.0	5.5%
7.	Taiwan	15.0	5.5%
8.	Australia	11.0	4.0%
9.	Malaysia	6.0	2.2%
10.	Korea, Rep.	5.0	1.8%
	Others	41.0	15.0%
	TOTAL	**273.0**	

NATIONAL TRAFFIC BALANCE

Minutes	FY 1998/99	FY 1999/00	FY 2000/01
Incoming	n.a.	n.a.	n.a.
Outgoing	262.0	230.8	273.0
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

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

Poland

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Germany	260.0	38.5%
2.	United Kingdom	55.0	8.1%
3.	Italy	50.0	7.4%
4.	France	40.0	5.9%
5.	United States	30.0	4.4%
6.	Austria	23.0	3.4%
7.	Netherlands	23.0	3.4%
8.	Ukraine	22.0	3.3%
9.	Sweden	19.0	2.8%
10.	Czech Republic	16.0	2.4%
	Others	138.0	20.4%
	TOTAL	**675.8**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	1,144.2	n.a.	n.a.
Outgoing	602.4	624.0	675.8
Surplus (Deficit)	541.8	n.a.	n.a.
Total Volume	1,746.6	n.a.	n.a.

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

Portugal

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	France	125.0	17.4%
2.	Spain	120.0	16.7%
3.	United Kingdom	75.0	10.4%
4.	Germany	65.0	9.0%
5.	Brazil	55.0	7.6%
6.	Switzerland	35.0	4.9%
7.	United States	28.0	3.9%
8.	Italy	24.0	3.3%
9.	Netherlands	23.0	3.2%
10.	Belgium	17.0	2.4%
11.	Angola	17.0	2.4%
12.	Canada	13.0	1.8%
13.	Cape Verde	12.0	1.7%
14.	Guinea-Bissau	8.5	1.2%
15.	Luxembourg	7.0	1.0%
16.	South Africa	6.0	0.8%
17.	Sweden	6.0	0.8%
18.	Venezuela	6.0	0.8%
19.	Mozambique	5.5	0.8%
20.	Ireland	4.0	0.6%
	Others	68.0	9.4%
	TOTAL	**720.0**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	713.8	753.3	n.a.
Outgoing	462.8	532.8	720.0
Surplus (Deficit)	250.9	220.5	n.a.
Total Volume	1,176.6	1,286.0	n.a.

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

Qatar

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United Arab Emirates	23.7	16.6%
2.	India	21.8	15.2%
3.	Saudi Arabia	12.8	9.0%
4.	Egypt	10.3	7.2%
5.	Bahrain	9.9	6.9%
6.	Pakistan	6.1	4.3%
7.	Jordan	4.3	3.0%
8.	Kuwait	3.9	2.8%
9.	Sudan	3.5	2.5%
10.	Philippines	2.2	1.6%
11.	Lebanon	2.2	1.5%
12.	Bangladesh	2.1	1.5%
13.	Iran	2.1	1.4%
14.	Oman	2.0	1.4%
15.	Sri Lanka	1.9	1.4%
16.	Syria	1.7	1.2%
17.	United Kingdom	1.5	1.0%
18.	Yemen	1.3	0.9%
19.	United States	0.9	0.6%
20.	Morocco	0.8	0.5%
	Others	28.7	20.1%
	TOTAL	**143.0**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	70.0	84.0	95.5
Outgoing	112.5	128.5	143.0
Surplus (Deficit)	(42.5)	(44.5)	(47.5)
Total Volume	182.5	212.5	238.6

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

Russia

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Ukraine	242.0	25.6%
2.	Belarus	110.7	11.7%
3.	Azerbaijan	49.5	5.2%
4.	Kazakhstan	47.4	5.0%
5.	Moldova	42.5	4.5%
6.	Germany	40.0	4.2%
7.	Uzbekistan	31.9	3.4%
8.	Georgia	20.5	2.2%
9.	Latvia	17.9	1.9%
10.	Kyrgyzstan	14.0	1.5%
11.	Lithuania	12.9	1.4%
12.	Italy	12.3	1.3%
13.	United States	12.1	1.3%
14.	Turkey	10.1	1.1%
15.	France	9.0	1.0%
16.	United Kingdom	8.6	0.9%
17.	Estonia	8.5	0.9%
18.	Poland	7.7	0.8%
19.	China	7.1	0.8%
20.	Spain	6.7	0.7%
	Others	232.6	24.6%
	TOTAL	**944.0**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	1,029.8	929.3	n.a.
Outgoing	1,038.3	928.2	944.0
Surplus (Deficit)	(8.5)	1.1	n.a.
Total Volume	2,068.1	1,857.5	n.a.

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

Rwanda

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (thousands)	Percent of Outgoing Traffic
1.	Belgium	610.0	11.6%
2.	India	537.0	10.2%
3.	Uganda	506.0	9.6%
4.	Burundi	451.0	8.6%
5.	United States	404.0	7.7%
6.	Kenya	268.0	5.1%
7.	France	243.0	4.6%
8.	South Africa	188.0	3.6%
9.	United Kingdom	144.0	2.7%
10.	Netherlands	140.0	2.7%
11.	Germany	111.0	2.1%
12.	Italy	94.0	1.8%
13.	Canada	82.0	1.6%
14.	China	28.0	0.5%
15.	Ethiopia	27.0	0.5%
16.	Senegal	26.0	0.5%
17.	Côte d'Ivoire	24.0	0.5%
18.	Cameroon	22.0	0.4%
19.	Egypt	17.0	0.3%
20.	Nigeria	9.0	0.2%
	Others	1,324.0	25.2%
	TOTAL	**5,246.0**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	n.a.	n.a.	n.a.
Outgoing	4.6	4.7	5.2
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

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

Saudi Arabia

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Egypt	187.0	15.6%
2.	India	166.0	13.9%
3.	Pakistan	155.0	13.0%
4.	Sudan	69.0	5.8%
5.	United Arab Emirates	59.0	4.9%
6.	Philippines	57.0	4.8%
7.	Syria	52.0	4.4%
8.	Yemen	46.5	3.9%
9.	Bahrain	43.0	3.6%
10.	Bangladesh	41.0	3.4%
11.	Kuwait	35.0	2.9%
12.	United States	32.0	2.7%
13.	Jordan	31.0	2.6%
14.	United Kingdom	27.8	2.3%
15.	Lebanon	24.4	2.0%
16.	Morocco	21.4	1.8%
17.	Qatar	13.0	1.1%
18.	Turkey	13.0	1.1%
19.	France	10.6	0.9%
20.	Germany	6.2	0.5%
	Others	105.0	8.8%
	TOTAL	**1,194.9**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	n.a.	n.a.	n.a.
Outgoing	932.6	1,060.0	1,194.9
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

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

Singapore

LARGEST TELECOMMUNICATIONS ROUTES, FY 2000/01

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Malaysia	430.0	28.4%
2.	Hong Kong	120.0	7.9%
3.	United States	80.0	5.3%
4.	Indonesia	79.0	5.2%
5.	Australia	73.0	4.8%
6.	China	73.0	4.8%
7.	Japan	62.0	4.1%
8.	Thailand	50.0	3.3%
9.	Philippines	43.0	2.8%
10.	India	40.0	2.6%
	Others	465.0	30.7%
	TOTAL	**1,515.0**	

NATIONAL TRAFFIC BALANCE

Minutes	FY 1998/99	FY 1999/00	FY 2000/01
Incoming	n.a.	n.a.	n.a.
Outgoing	1,235.0	1,350.0	1,515.0
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

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

Slovak Republic

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Czech Republic	65.0	39.9%
2.	Germany	20.5	12.6%
3.	Austria	14.1	8.7%
4.	Hungary	8.6	5.3%
5.	Italy	6.9	4.3%
6.	United Kingdom	6.0	3.7%
7.	Poland	5.9	3.6%
8.	France	3.4	2.1%
9.	United States	3.4	2.1%
10.	Ukraine	3.2	2.0%
11.	Switzerland	3.2	1.9%
12.	Netherlands	2.2	1.3%
13.	Russia	1.9	1.1%
14.	Spain	1.7	1.1%
15.	Belgium	1.6	1.0%
16.	Croatia	1.5	0.9%
17.	Yugoslavia	1.0	0.6%
18.	Canada	0.8	0.5%
19.	Greece	0.8	0.5%
20.	Sweden	0.8	0.5%
	Others	10.1	6.2%
	TOTAL	**162.7**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	186.4	208.7	233.1
Outgoing	151.8	162.8	162.7
Surplus (Deficit)	34.6	45.9	70.4
Total Volume	338.1	371.5	395.7

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

South Africa

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United Kingdom	100.0	20.2%
2.	Zimbabwe	38.8	7.8%
3.	United States	35.0	7.1%
4.	Namibia	35.0	7.1%
5.	Botswana	27.6	5.6%
6.	Mozambique	27.0	5.5%
7.	Germany	18.4	3.7%
8.	Swaziland	17.6	3.6%
9.	Australia	17.5	3.5%
10.	Lesotho	12.8	2.6%
11.	Zambia	9.3	1.9%
12.	Netherlands	8.9	1.8%
13.	France	8.4	1.7%
14.	Malawi	7.7	1.6%
15.	India	6.9	1.4%
16.	Canada	6.7	1.4%
17.	Portugal	6.5	1.3%
18.	Italy	5.7	1.2%
19.	Switzerland	5.4	1.1%
20.	Israel	4.4	0.9%
	Others	95.0	19.2%
	TOTAL	**494.6**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	n.a.	n.a.	700.0
Outgoing	405.0	461.1	494.6
Surplus (Deficit)	n.a.	n.a.	205.4
Total Volume	n.a.	n.a.	1,194.6

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

Spain

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Germany	425.0	16.5%
2.	United Kingdom	420.0	16.3%
3.	France	400.0	15.6%
4.	Italy	170.0	6.6%
5.	Portugal	125.0	4.9%
6.	United States	120.0	4.7%
7.	Switzerland	80.0	3.1%
8.	Belgium	75.0	2.9%
9.	Netherlands	75.0	2.9%
10.	Morocco	46.0	1.8%
	Others	634.0	24.7%
	TOTAL	**2,570.0**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	n.a.	n.a.	n.a.
Outgoing	1,675.0	1,935.0	2,570.0
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

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

Sri Lanka

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	India	8.2	19.6%
2.	United Kingdom	4.9	11.7%
3.	Singapore	2.7	6.4%
4.	United States	2.7	6.4%
5.	Japan	2.4	5.8%
6.	Australia	2.2	5.3%
7.	United Arab Emirates	1.9	4.6%
8.	Germany	1.6	3.9%
9.	Saudi Arabia	1.6	3.9%
10.	Hong Kong	1.6	3.8%
11.	Maldives	1.4	3.3%
12.	Italy	1.1	2.6%
13.	Korea, Rep.	1.1	2.5%
14.	Canada	0.9	2.1%
15.	Pakistan	0.8	2.0%
16.	France	0.8	2.0%
17.	Kuwait	0.8	1.9%
18.	Malaysia	0.8	1.8%
19.	China	0.6	1.5%
20.	Thailand	0.6	1.5%
	Others	3.1	7.5%
	TOTAL	**42.0**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	146.8	n.a.	n.a.
Outgoing	39.3	45.5	42.0
Surplus (Deficit)	107.5	n.a.	n.a.
Total Volume	186.1	n.a.	n.a.

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

Sudan

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Saudi Arabia	10.8	34.1%
2.	United Arab Emirates	3.4	10.7%
3.	Egypt	2.4	7.6%
4.	United States	1.6	5.1%
5.	United Kingdom	1.5	4.9%
6.	Qatar	0.8	2.4%
7.	Jordan	0.5	1.4%
8.	Germany	0.4	1.3%
9.	Syria	0.4	1.2%
10.	China	0.3	1.1%
11.	Eritrea	0.3	1.0%
12.	India	0.3	1.0%
13.	Canada	0.3	1.0%
14.	France	0.3	1.0%
15.	Libya	0.3	0.9%
16.	Malaysia	0.3	0.8%
17.	Italy	0.3	0.8%
18.	Netherlands	0.3	0.8%
19.	Lebanon	0.2	0.8%
20.	Switzerland	0.2	0.7%
	Others	6.8	21.3%
	TOTAL	**31.8**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	88.0	105.3	155.7
Outgoing	18.4	21.9	31.8
Surplus (Deficit)	69.6	83.3	123.9
Total Volume	106.4	127.2	187.6

Note: Data are in millions of minutes of outgoing public switched telecommunications traffic. Data exclude some cross-border traffic to Chad.

Swaziland

LARGEST TELECOMMUNICATIONS ROUTES, FY 2000/01

	Destination	Minutes (thousands)	Percent of Outgoing Traffic
1.	South Africa	22,178.0	88.5%
2.	Mozambique	770.0	3.1%
3.	United Kingdom	361.0	1.4%
4.	Botswana	168.0	0.7%
5.	United States	159.0	0.6%
6.	Zimbabwe	157.0	0.6%
7.	Lesotho	134.0	0.5%
8.	Zambia	77.0	0.3%
9.	Ghana	72.0	0.3%
10.	Namibia	52.0	0.2%
11.	Kenya	47.0	0.2%
12.	Malawi	43.0	0.2%
13.	Germany	41.0	0.2%
14.	India	39.0	0.2%
15.	China	38.0	0.2%
16.	Azerbaijan	38.0	0.2%
17.	Uganda	36.0	0.1%
18.	Australia	34.0	0.1%
19.	Canada	31.0	0.1%
	Others	510.0	2.0%
	TOTAL	**25,070.0**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	FY 1999/00	FY 2000/01
Incoming	n.a.	n.a.	n.a.
Outgoing	28.4	29.3	25.1
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

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

Sweden

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Norway	230.0	14.0%
2.	Finland	220.0	13.4%
3.	United Kingdom	215.0	13.1%
4.	United States	165.0	10.1%
5.	Denmark	160.0	9.8%
6.	Germany	145.0	8.8%
7.	Poland	70.0	4.3%
8.	France	65.0	4.0%
9.	Netherlands	55.0	3.4%
10.	Switzerland	40.0	2.4%
	Others	275.0	16.8%
	TOTAL	**1,640.0**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	n.a.	n.a.	n.a.
Outgoing	1,230.0	1,365.0	1,640.0
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

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

Switzerland

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Germany	720.0	22.5%
2.	France	490.0	15.3%
3.	Italy	400.0	12.5%
4.	United Kingdom	190.0	5.9%
5.	Austria	145.0	4.5%
6.	United States	135.0	4.2%
7.	Spain	110.0	3.4%
8.	Portugal	105.0	3.3%
9.	Netherlands	75.0	2.3%
10.	Yugoslavia	75.0	2.3%
	Others	750.0	23.5%
	TOTAL	**3,195.0**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	n.a.	n.a.	n.a.
Outgoing	2,425.0	2,730.0	3,195.0
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

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

Syria

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Lebanon	38.5	27.5%
2.	Saudi Arabia	27.3	19.5%
3.	United Arab Emirates	10.3	7.4%
4.	Jordan	8.5	6.1%
5.	Kuwait	6.6	4.7%
6.	United States	4.3	3.1%
7.	Egypt	4.0	2.9%
8.	France	3.5	2.5%
9.	Iraq	2.8	2.0%
10.	Turkey	2.7	1.9%
11.	Germany	2.3	1.6%
12.	Italy	2.0	1.4%
13.	United Kingdom	1.2	0.9%
14.	Canada	1.0	0.7%
15.	Russia	1.0	0.7%
16.	Qatar	1.0	0.7%
17.	Yemen	1.0	0.7%
18.	Greece	0.9	0.6%
19.	Sudan	0.9	0.6%
20.	Sweden	0.5	0.4%
	Others	19.7	14.1%
	TOTAL	**140.0**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	n.a.	256.7	286.0
Outgoing	103.0	125.6	140.0
Surplus (Deficit)	n.a.	131.1	146.0
Total Volume	n.a.	382.3	426.0

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

Taiwan

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	China	350.0	30.2%
2.	United States	176.0	15.2%
3.	Japan	89.0	7.7%
4.	Hong Kong	80.0	6.9%
5.	Philippines	66.0	5.7%
6.	Thailand	58.0	5.0%
7.	Vietnam	39.0	3.4%
8.	Singapore	32.0	2.8%
9.	Canada	32.0	2.8%
10.	Indonesia	31.0	2.7%
11.	Australia	21.0	1.8%
12.	Malaysia	18.0	1.6%
13.	United Kingdom	14.0	1.2%
14.	Korea, Rep.	14.0	1.2%
15.	Germany	11.0	0.9%
16.	New Zealand	7.0	0.6%
17.	France	7.0	0.6%
18.	Macau	5.0	0.4%
19.	Netherlands	4.3	0.4%
20.	Italy	4.0	0.3%
	Others	101.7	8.8%
	TOTAL	**1,160.0**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	781.8	882.0	n.a.
Outgoing	862.0	949.3	1,160.0
Surplus (Deficit)	(80.2)	(67.3)	n.a.
Total Volume	1,643.9	1,831.3	n.a.

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

Tajikistan

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (thousands)	Percent of Outgoing Traffic
1.	Russia	4,048.8	59.8%
2.	Uzbekistan	1,214.3	17.9%
3.	Kazakhstan	567.4	8.4%
4.	Kyrgyzstan	271.3	4.0%
5.	Ukraine	144.9	2.1%
6.	Turkmenistan	89.6	1.3%
7.	Belarus	71.5	1.1%
8.	Armenia	9.2	0.1%
9.	Georgia	8.1	0.1%
10.	Moldova	7.5	0.1%
11.	Azerbaijan	1.3	<0.1%
	Others	319.7	4.7%
	TOTAL	**6,765.3**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	n.a.	n.a.	18.5
Outgoing	9.9	9.0	6.8
Surplus (Deficit)	n.a.	n.a.	11.7
Total Volume	n.a.	n.a.	25.3

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

Thailand

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Japan	39.9	11.2%
2.	Singapore	32.6	9.2%
3.	United States	29.2	8.2%
4.	Malaysia	23.5	6.6%
5.	Australia	21.0	5.9%
6.	Laos	19.9	5.6%
7.	Hong Kong	18.8	5.3%
8.	Taiwan	17.9	5.0%
9.	United Kingdom	16.5	4.7%
10.	China	14.3	4.0%
11.	Germany	12.2	3.4%
12.	Myanmar	11.9	3.3%
13.	India	8.0	2.2%
14.	France	6.5	1.8%
15.	Philippines	6.3	1.8%
16.	Indonesia	5.3	1.5%
17.	Korea, Rep.	5.2	1.5%
18.	Sweden	4.5	1.3%
19.	Switzerland	4.4	1.2%
20.	Italy	4.2	1.2%
	Others	53.1	14.9%
	TOTAL	**355.2**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	358.6	327.8	426.6
Outgoing	296.4	298.7	355.2
Surplus (Deficit)	62.2	29.1	71.4
Total Volume	655.0	626.5	781.8

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

Togo

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (thousands)	Percent of Outgoing Traffic
1.	France	2,413.0	23.7%
2.	Benin	1,210.0	11.9%
3.	Côte d'Ivoire	1,200.0	11.8%
4.	Senegal	620.0	6.1%
5.	Burkina Faso	520.0	5.1%
6.	Nigeria	425.0	4.2%
7.	Germany	353.0	3.5%
8.	Ghana	329.0	3.2%
9.	Niger	285.0	2.8%
10.	United States	266.0	2.6%
11.	Gabon	233.0	2.3%
12.	Lebanon	210.0	2.1%
13.	Mali	200.0	2.0%
14.	Belgium	199.0	2.0%
15.	United Kingdom	169.0	1.7%
16.	Switzerland	107.0	1.1%
17.	Cameroon	104.0	1.0%
18.	Italy	91.0	0.9%
19.	China	82.0	0.8%
20.	Canada	74.0	0.7%
	Others	1,093.0	10.7%
	TOTAL	**10,183.0**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	17.1	21.6	12.2
Outgoing	8.4	8.5	10.2
Surplus (Deficit)	8.7	13.1	2.0
Total Volume	25.5	30.1	22.4

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

Trinidad & Tobago

LARGEST TELECOMMUNICATIONS ROUTES, FY 2000/01

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United States	32.5	46.3%
2.	Canada	6.5	9.2%
3.	United Kingdom	4.8	6.8%
4.	Barbados	4.0	5.7%
5.	Grenada	3.4	4.8%
6.	Guyana	3.0	4.3%
7.	Jamaica	2.2	3.1%
8.	Venezuela	2.0	2.9%
9.	Saint Vincent & The Grenadines	1.9	2.7%
10.	Saint Lucia	1.7	2.4%
11.	Antigua & Barbuda	1.0	1.4%
12.	Dominica	0.5	0.7%
13.	Netherlands Antilles	0.5	0.6%
14.	Saint Kitts & Nevis	0.4	0.6%
15.	British Virgin Islands	0.4	0.6%
16.	Germany	0.4	0.5%
17.	Sweden	0.3	0.5%
18.	Bahamas	0.3	0.4%
19.	Netherlands	0.3	0.4%
20.	Cayman Islands	0.3	0.4%
	Others	4.8	6.8%
	TOTAL	**70.2**	

NATIONAL TRAFFIC BALANCE

Minutes	FY 1998/99	FY 1999/00	FY 2000/01
Incoming	141.5	158.8	163.4
Outgoing	64.4	67.2	70.2
Surplus (Deficit)	77.1	91.6	93.3
Total Volume	206.0	226.0	233.6

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

Turkey

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Germany	230.0	27.1%
2.	United Kingdom	62.0	7.3%
3.	France	44.0	5.2%
4.	United States	41.0	4.8%
5.	Netherlands	30.0	3.5%
6.	Italy	23.0	2.7%
7.	Syria	22.6	2.7%
8.	Bulgaria	21.5	2.5%
9.	Austria	21.0	2.5%
10.	Russia	21.0	2.5%
11.	Switzerland	20.0	2.4%
12.	Romania	16.7	2.0%
13.	Belgium	16.5	1.9%
14.	Greece	12.4	1.5%
15.	Ukraine	11.6	1.4%
16.	Azerbaijan	11.2	1.3%
17.	Moldova	9.5	1.1%
18.	Iran	8.5	1.0%
19.	Sweden	6.5	0.8%
20.	Israel	6.0	0.7%
	Others	215.0	25.3%
	TOTAL	**850.0**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	955.9	1,122.7	1,240.0
Outgoing	644.1	698.4	850.0
Surplus (Deficit)	311.7	424.3	390.0
Total Volume	1,600.0	1,821.1	2,090.0

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

Turkmenistan

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Russia	3.5	22.0%
2.	Uzbekistan	1.3	8.0%
3.	Ukraine	1.0	6.4%
4.	Kazakhstan	0.9	6.0%
5.	Azerbaijan	0.9	5.8%
6.	Armenia	0.4	2.6%
7.	Belarus	0.3	2.1%
8.	Tajikistan	0.3	1.6%
9.	Georgia	0.2	1.3%
10.	Moldova	0.2	1.2%
11.	Kyrgyzstan	0.2	1.1%
	Others	6.6	42.0%
	TOTAL	**15.7**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	n.a.	n.a.	11.3
Outgoing	15.3	16.5	15.7
Surplus (Deficit)	n.a.	n.a.	(4.5)
Total Volume	n.a.	n.a.	27.0

Note: Data are in millions of minutes of outgoing 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, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Russia	215.5	59.4%
2.	Belarus	18.5	5.1%
3.	Moldova	14.5	4.0%
4.	Armenia	4.3	1.2%
5.	Kazakhstan	3.7	1.0%
6.	Azerbaijan	3.7	1.0%
7.	Georgia	3.0	0.8%
8.	Uzbekistan	2.5	0.7%
9.	Kyrgyzstan	1.0	0.3%
10.	Turkmenistan	0.8	0.2%
11.	Tajikistan	0.2	0.1%
	Others	95.1	26.2%
	TOTAL	**363.0**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	n.a.	n.a.	269.5
Outgoing	465.9	359.2	363.0
Surplus (Deficit)	n.a.	n.a.	(93.4)
Total Volume	n.a.	n.a.	632.5

Note: Data are in millions of minutes of outgoing 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.

United Arab Emirates

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	India	290.6	25.9%
2.	Pakistan	109.0	9.7%
3.	Egypt	66.2	5.9%
4.	Saudi Arabia	60.4	5.4%
5.	United Kingdom	53.6	4.8%
6.	Oman	42.6	3.8%
7.	Syria	42.0	3.7%
8.	United States	33.6	3.0%
9.	Iran	30.4	2.7%
10.	Jordan	29.1	2.6%
11.	Philippines	27.3	2.4%
12.	Bangladesh	26.3	2.3%
13.	Lebanon	26.1	2.3%
14.	Qatar	24.1	2.1%
15.	Bahrain	22.4	2.0%
16.	Sudan	21.9	1.9%
17.	Kuwait	20.4	1.8%
18.	Sri Lanka	14.4	1.3%
19.	Morocco	13.2	1.2%
20.	Germany	13.1	1.2%
	Others	158.7	14.1%
	TOTAL	**1,123.6**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	n.a.	n.a.	n.a.
Outgoing	874.8	963.0	1,123.6
Surplus (Deficit)	n.a.	n.a.	n.a.
Total Volume	n.a.	n.a.	n.a.

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

United Kingdom—Outgoing

LARGEST TELECOMMUNICATIONS ROUTES, FY 2000/01

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	United States	2,009.5	16.4%
2.	Germany	848.4	6.9%
3.	France	792.8	6.5%
4.	Ireland	773.3	6.3%
5.	Spain	443.6	3.6%
6.	Italy	418.9	3.4%
7.	Australia	410.8	3.4%
8.	Canada	293.4	2.4%
9.	Netherlands	279.3	2.3%
10.	India	260.0	2.1%
11.	Turkey	237.4	1.9%
12.	Switzerland	234.1	1.9%
13.	Sweden	231.1	1.9%
14.	Pakistan	206.5	1.7%
15.	Poland	194.4	1.6%
16.	South Africa	185.1	1.5%
17.	Belgium	179.5	1.5%
18.	Japan	158.3	1.3%
19.	Austria	153.2	1.3%
20.	Greece	142.6	1.2%
	Others	3,790.4	31.0%
	TOTAL	**12,242.7**	

NATIONAL TRAFFIC BALANCE

Minutes	FY 1998/99	FY 1999/00	FY 2000/01
Incoming	6,400.0	6,853.4	7,463.2
Outgoing	8,225.0	10,141.0	12,242.7
Surplus (Deficit)	(1,825.0)	(3,287.6)	(4,779.5)
Total Volume	14,625.0	16,994.4	19,705.9

Note: Data are in millions of minutes of outgoing public switched telecommunications traffic. Data include include approximately two billion minutes of traffic refiled via the U.K., thus overstating U.K.-originated volumes. Fiscal year ends March 31.

United Kingdom—Incoming

LARGEST TELECOMMUNICATIONS ROUTES, FY 2000/01

	Origin	Minutes (millions)	Percent of Incoming Traffic
1.	United States	1,547.2	20.7%
2.	Germany	663.9	8.9%
3.	Ireland	575.0	7.7%
4.	France	537.9	7.2%
5.	Spain	366.6	4.9%
6.	Australia	350.8	4.7%
7.	Canada	324.3	4.3%
8.	Italy	237.6	3.2%
9.	Sweden	209.4	2.8%
10.	Netherlands	189.4	2.5%
11.	Switzerland	160.3	2.1%
12.	Greece	125.8	1.7%
13.	Singapore	102.8	1.4%
14.	South Africa	102.5	1.4%
15.	Belgium	91.8	1.2%
16.	Hong Kong	88.4	1.2%
17.	Norway	78.5	1.1%
18.	India	68.5	0.9%
19.	Austria	65.9	0.9%
20.	New Zealand	65.6	0.9%
	Others	1,511.0	20.2%
	TOTAL	**5,183.8**	

NATIONAL TRAFFIC BALANCE

Minutes	FY 1998/99	FY 1999/00	FY 2000/01
Incoming	6,400.0	6,853.4	7,463.2
Outgoing	8,225.0	10,141.0	12,242.7
Surplus (Deficit)	(1,825.0)	(3,287.6)	(4,779.5)
Total Volume	14,625.0	16,994.4	19,705.9

Note: Data are in millions of minutes of outgoing public switched telecommunications traffic. Data include include approximately two billion minutes of traffic refiled via the U.K., thus overstating U.K.-originated volumes.

United States—Outgoing

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Mexico	6,129.0	16.3%
2.	Canada	4,906.1	13.0%
3.	United Kingdom	1,908.3	5.1%
4.	Germany	1,600.1	4.3%
5.	India	1,577.3	4.2%
6.	Philippines	1,361.0	3.6%
7.	Dominican Republic	939.0	2.5%
8.	Japan	925.5	2.5%
9.	France	800.6	2.1%
10.	Brazil	754.3	2.0%
11.	China	685.2	1.8%
12.	Italy	607.9	1.6%
13.	Pakistan	594.8	1.6%
14.	Australia	569.7	1.5%
15.	Colombia	451.5	1.2%
16.	Poland	420.8	1.1%
17.	Taiwan	399.7	1.1%
18.	Jamaica	393.9	1.0%
19.	Spain	391.4	1.0%
20.	Vietnam	385.7	1.0%
	Others	11,792.9	31.4%
	TOTAL	**37,594.8**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	10,395.3	10,640.8	13,010.7
Outgoing	25,163.8	29,358.8	37,594.8
Surplus (Deficit)	(14,768.5)	(18,718.0)	(24,584.1)
Total Volume	35,559.2	39,999.5	50,605.6

Note: Data are in millions of minutes of outgoing public switched telecommunications traffic. Data include one to two billion minutes of traffic refiled via the U.S., thus overstating traffic originating from the U.S. Carriers and traffic from points beyond the United States, Puerto Rico, and the U.S. Virgin Islands are excluded.

United States—Incoming

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Origin	Minutes (millions)	Percent of Incoming Traffic
1.	Canada	5,138.6	39.5%
2.	Mexico	1,572.8	12.1%
3.	United Kingdom	1,040.4	8.0%
4.	Australia	548.8	4.2%
5.	Germany	319.2	2.5%
6.	Japan	318.0	2.4%
7.	Korea, Rep.	277.8	2.1%
8.	France	253.3	1.9%
9.	Israel	245.3	1.9%
10.	Dominican Republic	212.3	1.6%
11.	Brazil	202.1	1.6%
12.	Taiwan	166.7	1.3%
13.	Sweden	165.2	1.3%
14.	Netherlands	141.8	1.1%
15.	Italy	117.7	0.9%
16.	Switzerland	117.4	0.9%
17.	Spain	93.9	0.7%
18.	Colombia	87.9	0.7%
19.	Hong Kong	83.7	0.6%
20.	Ireland	72.8	0.6%
	Others	1,834.7	14.1%
	TOTAL	**13,010.7**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	10,395.3	10,640.8	13,010.7
Outgoing	25,163.8	29,358.8	37,594.8
Surplus (Deficit)	(14,768.5)	(18,718.0)	(24,584.1)
Total Volume	35,559.2	39,999.5	50,605.6

Note: Data are in millions of minutes of outgoing public switched telecommunications traffic. Data include one to two billion minutes of traffic refiled via the U.S., thus overstating traffic originating from the U.S. Carriers and traffic from points beyond the United States, Puerto Rico, and the U.S. Virgin Islands are excluded.

Uruguay

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Argentina	38.9	49.9%
2.	Brazil	10.7	13.7%
3.	United States	10.4	13.3%
4.	Spain	4.7	6.0%
5.	Chile	2.0	2.6%
6.	Paraguay	1.5	1.9%
7.	Italy	1.0	1.3%
8.	Peru	0.9	1.2%
9.	Mexico	0.8	1.0%
10.	France	0.7	0.9%
11.	Canada	0.7	0.9%
12.	Germany	0.5	0.6%
13.	Venezuela	0.4	0.5%
14.	Cuba	0.4	0.5%
15.	United Kingdom	0.4	0.5%
16.	Australia	0.3	0.4%
17.	Switzerland	0.3	0.4%
18.	Colombia	0.2	0.3%
19.	Bolivia	0.2	0.3%
20.	Ecuador	0.2	0.2%
	Others	2.8	3.5%
	TOTAL	**78.0**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	97.0	98.3	110.9
Outgoing	78.3	80.1	78.0
Surplus (Deficit)	18.7	18.2	33.0
Total Volume	175.3	178.4	188.9

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

Uzbekistan

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Russia	32.7	45.8%
2.	Kazakhstan	7.5	10.5%
3.	Kyrgyzstan	4.5	6.4%
4.	Ukraine	2.7	3.8%
5.	Tajikistan	2.6	3.6%
6.	Turkmenistan	1.8	2.5%
7.	Azerbaijan	1.2	1.7%
8.	Belarus	0.8	1.1%
9.	Armenia	0.4	0.5%
10.	Georgia	0.3	0.4%
11.	Moldova	0.1	0.2%
	Others	16.8	23.5%
	TOTAL	**71.4**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	74.7	75.0	54.3
Outgoing	91.7	68.5	71.4
Surplus (Deficit)	(17.0)	6.6	(17.0)
Total Volume	166.5	143.5	125.7

Note: Data are in millions of minutes of outgoing 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.

Yugoslavia

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	Germany	48.0	16.7%
2.	Austria	26.0	9.1%
3.	Switzerland	24.0	8.4%
4.	Croatia	23.0	8.0%
5.	Italy	18.0	6.3%
6.	Hungary	15.0	5.2%
7.	Macedonia	15.0	5.2%
8.	Bosnia-Herzegovina	14.0	4.9%
9.	United States	11.0	3.8%
10.	Slovenia	11.0	3.8%
	Others	81.9	28.5%
	TOTAL	**286.9**	

NATIONAL TRAFFIC BALANCE

Minutes	1998	1999	2000
Incoming	423.3	498.8	n.a.
Outgoing	219.5	227.0	286.9
Surplus (Deficit)	203.8	271.7	n.a.
Total Volume	642.9	725.8	n.a.

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

Zimbabwe

LARGEST TELECOMMUNICATIONS ROUTES, 2000

	Destination	Minutes (millions)	Percent of Outgoing Traffic
1.	South Africa	31.4	44.1%
2.	United Kingdom	14.6	20.5%
3.	United States	3.6	5.0%
4.	Zambia	2.7	3.9%
5.	Botswana	2.6	3.6%
6.	Malawi	1.4	1.9%
7.	Mozambique	1.1	1.6%
8.	Australia	0.9	1.3%
9.	Kenya	0.9	1.2%
10.	India	0.8	1.2%
11.	Germany	0.8	1.1%
12.	Kuwait	0.7	0.9%
13.	France	0.6	0.8%
14.	Canada	0.6	0.8%
15.	Netherlands	0.6	0.8%
16.	Namibia	0.5	0.7%
17.	Switzerland	0.4	0.6%
18.	Angola	0.4	0.5%
19.	Belgium	0.4	0.5%
20.	China	0.4	0.5%
	Others	6.0	8.4%
	TOTAL	**71.3**	

NATIONAL TRAFFIC BALANCE

Minutes	FY 1998/99	FY 1999/00	2000
Incoming	53.2	59.0	n.a.
Outgoing	52.8	65.6	71.3
Surplus (Deficit)	0.4	(6.6)	n.a.
Total Volume	106.0	124.6	n.a.

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

Methodology

The traffic statistics in *TeleGeography 2002* 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 2002,* however, readers should keep in mind the following issues.

Public Switched Network vs. Private Line Traffic

Traffic volumes in *TeleGeography 2002* 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 2002* 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 2002* and data published in prior TeleGeography reports or Direction of Traffic. The variations reflect corrections and/or revised data subsequently provided to TeleGeography.

Reference

National Telecommunications Indicators (A-K)

Countries	GDP 2000 (US$ billions)	Population 2000 (millions)	Main Lines 2000 (thous.)	Lines Per 100 people	Cellular Users 2000 (thous.)	International Carriers 2000	Internet Hosts 2000 (thous.)
Algeria	53.8	30.4	1,761	5.8	86	1	<1
Angola	8.7	12.7	70	0.5	26	1	<1
Argentina	285.5	37	7,894	21.3	6,050	4	270
Armenia (b)	1.9	3.8	n.a.	n.a.	n.a.	1	3
Australia (a)	394.0	19.2	10,040	52.3	8,550	40	1,616
Austria	191.0	8.1	3,889	48.0	6,450	40	483
Azerbaijan (b)	4.9	8.1	801	9.9	430	1	2
Bahamas	4.8	0.3	114	37.9	32	1	<1
Bahrain (b)	n.a.	0.7	171	24.8	206	1	<1
Belarus (b)	35.9	10	2,752	27.5	49	1	2
Belgium	231.0	10.3	5,074	49.5	5,577	21	300
Benin	2.3	6.3	n.a.	n.a.	n.a.	1	n.a.
Bolivia	8.5	8.3	n.a.	n.a.	n.a.	1	1
Brazil	587.6	170.1	30,926	18.2	23,188	2	877
Brunei	n.a.	0.3	81	24.5	95	2	5
Bulgaria	12.1	8.2	2,882	35.3	738	1	18
Canada	689.5	30.7	20,803	67.7	8,751	75	2,364
Chile	70.7	15.2	3,365	22.1	3,402	10	75
China	1,080.0	1,261.10	144,000	11.4	85,260	2	70
Colombia	82.8	42.3	7,159	16.9	2,257	3	47
Costa Rica	15.8	3.7	1,003	27.5	209	1	7
Côte d'Ivoire	9.3	16	267	1.7	n.a.	1	<1
Croatia (b,c)	19.0	4.5	n.a.	n.a.	1,033	1	17
Cuba	n.a.	11.2	489	4.3	7	1	<1
Cyprus	n.a.	0.8	440	57.5	218	1	8
Czech Republic	49.5	10.3	3,872	37.7	4,346	1	159
Denmark	160.8	5.3	4,011	75.1	3,251	45	334
Dominican Republic	19.9	8.6	870	10.2	648	3	8
Ecuador	13.6	12.6	1,265	10.0	482	3	<1
Egypt	98.3	63.8	5,484	8.6	1,360	1	2
El Salvador	13.2	6.3	570	9.1	n.a.	10	<1
Estonia	5.0	1.4	523	36.4	557	1	41
Finland	119.8	5.2	2,831	54.7	3,760	21	529
France	1,286.3	58.9	34,114	58.0	29,052	89	1,122
Georgia (b)	3.0	5.5	n.a.	n.a.	n.a.	2	2
Germany	1,870.1	82.2	49,400	60.1	48,145	90	2,040
Ghana	5.4	19.2	237	1.2	130	1	<1
Greece	112.0	10.6	5,659	53.6	5,951	1	111
Guatemala	19.0	11.4	650	5.7	n.a.	2	6
Guyana	0.7	0.9	68	7.9	n.a.	1	<1
Hong Kong (a)	163.3	6.8	3,926	57.8	5,447	150	229
Hungary	45.7	10	n.a.	n.a.	3,000	1	104
India (a,b)	479.4	1,015.90	32,436	3.2	3,577	1	36
Indonesia	153.3	210.4	6,663	3.2	3,669	2	27
Iran	99.0	64	9,486	14.8	963	1	2
Ireland (a,b)	94.4	3.8	1,590	41.9	2,490	40	111
Israel	110.3	6.2	3,021	48.5	4,400	3	180
Italy	1,068.5	57.7	27,153	47.1	42,243	90	1,020
Jamaica	6.9	2.6	512	19.5	367	1	1
Japan (a)	4,677.1	126.8	74,220	58.5	66,784	115	4,641
Jordan	8.3	4.9	620	12.7	389	1	<1
Kazakhstan	18.3	14.9	n.a.	n.a.	n.a.	3	7
Kenya	10.4	30.1	310	1.0	35	1	5
Korea, Rep.	457.2	47.3	21,932	46.4	26,816	40	398
Kuwait	n.a.	2	467	23.5	476	1	3

Source: TeleGeography research; ITU; and *World Development Report 2000/2001*, World Bank, September 2001

International Telephone Traffic (A-K)

Outgoing MiTT (millions)			Incoming MiTT (millions)			Traffic Balance		
1999	2000	% Change	1999	2000	% Change	1999	2000	Countries
143.5	151.8	5.8%	n.a.	n.a.	n.a.	n.a.	n.a.	Algeria
35.0	35.4	1.1%	33.1	n.a.	n.a.	-1.9	n.a.	Angola
377.6	432.1	14.4%	n.a.	479.3	n.a.	n.a.	47.2.	Argentina
33.7	31.4	-6.8%	89.8	n.a.	n.a.	56.0	n.a.	Armenia (b)
2,115.0	2,650.0	25.3%	n.a.	n.a.	n.a.	n.a.	n.a.	Australia (a)
1,305.0	1,510.0	15.7%	n.a.	n.a.	n.a.	n.a.	n.a.	Austria
32.2	28.1	-12.8%	68.6	59.7	-13.0%	36.4	31.6	Azerbaijan (b)
n.a.	69.4	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	Bahamas
134.1	139.5	4.1%	106.5	125.6	17.9%	-27.5	-13.9	Bahrain (b)
161.2	178.5	10.7%	195.6	n.a.	n.a.	34.4	n.a.	Belarus (b)
1,590.0	1,835.0	15.4%	n.a.	n.a.	n.a.	n.a.	n.a.	Belgium
10.5	11.7	11.1%	15.1	24.3	60.9%	4.6	12.6	Benin
29.7	27.2	-8.5%	82.2	80.8	-1.8%	52.5	53.6	Bolivia
574.8	692.7	20.5%	838.5	1,212.4	44.6%	263.7	519.8	Brazil
23.4	24.3	3.8%	21.7	23.3	7.6%	-1.7	-1.0	Brunei
98.9	110.0	11.2%	n.a.	211.0	n.a.	n.a.	101.0	Bulgaria
5,830.0	7,224.0	23.9%	n.a.	n.a.	n.a.	n.a.	n.a.	Canada
270.0	278.0	3.0%	n.a.	n.a.	n.a.	n.a.	n.a.	Chile
1,950.0	2,050.0	5.1%	n.a.	n.a.	n.a.	n.a.	n.a.	China
212.2	341.8	61.1%	n.a.	n.a.	n.a.	n.a.	n.a.	Colombia
94.1	99.6	5.8%	109.0	137.8	26.4%	14.9	38.2	Costa Rica
71.3	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	Côte d'Ivoire (b,c)
n.a.	222.3	n.a.	n.a.	512.0	n.a.	n.a.	289.6	Croatia
32.6	36.2	11.1%	225.3	n.a.	n.a.	192.7	n.a.	Cuba
168.2	192.5	14.5%	134.1	n.a.	n.a.	-34.0	n.a.	Cyprus
364.0	400.0	9.9%	452.2	n.a.	n.a.	88.2	n.a.	Czech Republic
800.0	905.0	13.1%	n.a.	n.a.	n.a.	n.a.	n.a.	Denmark
185.7	211.7	14.0%	920.0	1,340.0	45.7%	734.3	1,128.3	Dominican Republic
57.4	55.5	-3.3%	n.a.	n.a.	n.a.	n.a.	n.a.	Ecuador
171.0	183.1	7.1%	554.6	620.6	11.9%	383.6	437.5	Egypt
68.1	128.0	88.1%	n.a.	n.a.	n.a.	n.a.	n.a.	El Salvador
74.6	75.5	1.2%	84.8	n.a.	n.a.	10.2	n.a.	Estonia
423.9	468.0	10.4%	n.a.	n.a.	n.a.	n.a.	n.a.	Finland
5,165.0	6,500.0	25.8%	n.a.	n.a.	n.a.	n.a.	n.a.	France
46.7	45.6	-2.4%	65.7	37.6	-42.7%	19.0	-8.0	Georgia (b)
7,565.0	9,570.0	26.5%	n.a.	n.a.	n.a.	n.a.	n.a.	Germany
30.1	42.1	39.7%	118.4	n.a.	n.a.	88.2	n.a.	Ghana
725.7	793.2	9.3%	794.2	889.8	12.0%	68.5	96.6	Greece
83.3	125.3	50.4%	208.6	295.9	41.8%	125.3	170.5	Guatemala
16.1	n.a.	n.a.	101.0	n.a.	n.a.	84.9	n.a.	Guyana
2,720.3	3,074.9	13.0%	1,747.2	1,858.0	6.3%	-973.1	-1,216.8	Hong Kong (a)
343.9	349.2	1.5%	n.a.	n.a.	n.a.	n.a.	n.a.	Hungary
473.3	527.1	11.4%	1,772.5	2,161.4	21.9%	1,299.2	1,634.3	India (a,b)
269.6	315.5	17.0%	n.a.	345.8	n.a.	n.a.	30.3	Indonesia
156.1	176.8	13.3%	191.5	216.8	13.2%	35.4	40.0	Iran
1,015.0	1,250.0	23.2%	n.a.	n.a.	n.a.	n.a.	n.a.	Ireland (a,b)
804.0	965.0	20.0%	n.a.	n.a.	n.a.	n.a.	n.a.	Israel
3,100.0	4,140.0	33.5%	n.a.	n.a.	n.a.	n.a.	n.a.	Italy
64.4	73.8	14.7%	347.4	328.5	-5.4%	283.0	254.6	Jamaica
2,050.0	2,575.0	25.6%	1,929.6	n.a.	n.a.	-120.4	n.a.	Japan (a)
145.6	170.6	17.1%	191.5	214.1	11.8%	45.9	43.5	Jordan
104.5	105.4	0.8%	149.8	183.1	22.2%	45.3	77.8	Kazakhstan
n.a.	21.0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	Kenya
898.0	1,063.0	18.4%	n.a.	n.a.	n.a.	n.a.	n.a.	Korea, Rep.
170.0	158.7	-6.7%	120.0	n.a.	n.a.	-50.0	n.a.	Kuwait

Notes: Data are in millions of minutes of public switched traffic.
a. International traffic for year ending March 31. Australia, New Zealand, and Pakistan ends June 30.
b. Traffic data exclude some carriers or routes. (See country table for details.)
c. 1999 and 2000 traffic data not directly comparable. (See country table for details.)

National Telecommunications Indicators (K-Z)

Countries	GDP 2000 (US$ billions)	Population 2000 (millions)	Main Lines 2000 (thous.)	Lines Per 100 people	Cellular Users 2000 (thous.)	International Carriers 2000	Internet Hosts 2000 (thous.)
Kyrgyzstan	1.3	4.9	376	7.6	9	1	4
Latvia	7.1	2.4	742	30.7	401	1	20
Luxembourg	18.6	0.4	331	75.6	380	10	12
Macau	n.a.	0.4	177	40.0	118	1	<1
Macedonia	3.3	2	516	25.4	116	1	2
Malaysia (a)	89.3	23.3	4,637	19.9	4,961	5	68
Malta	n.a.	0.4	204	53.5	114	1	7
Mauritius (a)	4.5	1.2	281	23.7	124	1	3
Mexico	574.5	98	12,333	12.6	14,074	16	559
Moldova	1.3	4.3	584	13.7	132	1	2
Morocco	33.4	28.7	1,425	5.0	2,342	1	2
Mozambique	3.8	17.6	86	0.5	22	1	<1
Namibia	3.5	1.7	104	6.0	82	1	3
Netherlands	364.9	15.9	9,879	62.1	10,710	60	1,624
New Zealand (a)	50.0	3.8	1,915	50.0	2,158	21	345
Nicaragua	2.4	5	n.a.	n.a.	n.a.	1	1
Norway	149.3	4.5	3,270	72.8	3,151	35	453
Oman (b)	n.a.	2.4	225	9.4	164	1	3
Pakistan (a,b)	61.7	138.1	3,200	2.3	349	1	6
Palestinian Authority (b)	n.a.	n.a.	n.a.	n.a.	n.a.	1	n.a.
Panama	9.9	2.9	n.a.	n.a.	n.a.	1	15
Paraguay	7.7	5.5	n.a.	n.a.	n.a.	1	1
Peru	53.9	25.7	1,636	6.4	n.a.	22	11
Philippines (a)	75.2	75.6	3,000	4.0	6,300	12	19
Poland	158.8	38.7	10,946	28.3	6,747	1	340
Portugal (c)	103.9	10	4,314	43.1	6,665	15	62
Qatar	n.a.	0.6	160	27.4	119	1	2
Russia (b)	251.1	145.5	32,070	22.0	3,263	30	327
Saudi Arabia	n.a.	20.7	2,965	14.3	1,376	1	4
Senegal	4.4	9.5	206	2.2	196	1	2
Singapore (a)	92.3	4	1,947	48.4	2,747	40	176
Slovak Republic	19.1	5.4	1,698	31.4	1,294	1	38
South Africa	125.9	42.8	4,962	11.6	8,608	1	188
Spain	555.0	39.4	17,102	43.4	24,736	30	455
Sri Lanka	16.4	19.4	767	4.0	451	1	2
Sudan (b)	11.2	29.7	387	1.3	23	1	n.a.
Swaziland (a)	1.3	1	32	3.1	23	1	<1
Sweden	227.4	8.9	6,057	68.3	6,338	26	596
Switzerland	240.3	7.2	5,158	71.8	4,618	50	263
Syria	16.5	16.1	1,675	10.4	27	1	<1
Taiwan	n.a.	n.a.	12,642	n.a.	17,874	4	1,096
Tajikistan (b)	1.0	6.3	219	3.4	1	1	<1
Thailand (c)	121.9	60.7	5,252	8.6	3,056	1	63
Trinidad & Tobago (a)	7.1	1.3	299	23.0	133	1	7
Turkey	199.9	65.3	18,395	28.2	16,133	1	70
Turkmenistan (b)	4.4	4.8	n.a.	n.a.	10	1	1
Ukraine	32.2	49.6	n.a.	n.a.	819	2	36
United Arab Emirates	n.a.	2.9	1,020	35.1	1,428	1	43
United Kingdom (a)	1,413.4	59.7	34,807	58.3	40,017	306	1,678
United States	9,882.8	281.6	192,519	68.4	109,478	1,100	80,567
Uruguay	20.2	3.3	929	27.8	440	1	54
Uzbekistan (b)	13.5	24.7	n.a.	n.a.	53	1	<1
Venezuela	120.5	24.2	2,606	10.8	5,256	1	16
Yugoslavia	n.a.	10.6	2,406	22.7	1,304	1	15
Zimbabwe	7.4	12.1	241	2.0	309	1	3

Source: TeleGeography research; ITU; and *World Development Report 2000/2001*, World Bank, September 2001

International Telephone Traffic (K-Z)

Outgoing MiTT (millions)			Incoming MiTT (millions)			Traffic Balance		
1999	2000	% Change	1999	2000	% Change	1999	2000	Countries
23.5	23.2	-1.4%	n.a.	28.6	n.a.	n.a.	5.4	Kyrgyzstan
55.6	54.8	-1.4%	90.0	90.1	0.1%	34.4	35.3	Latvia
319.1	381.0	19.4%	n.a.	n.a.	n.a.	n.a.	n.a.	Luxembourg
132.8	152.1	14.5%	97.7	103.2	5.6%	-35.1	-48.9	Macau
82.3	73.2	-11.0%	152.5	166.4	9.1%	70.3	93.2	Macedonia
690.0	895.0	29.7%	n.a.	n.a.	n.a.	n.a.	n.a.	Malaysia (a)
39.0	43.0	10.2%	50.2	n.a.	n.a.	11.2	n.a.	Malta
31.4	35.1	11.6%	43.3	49.0	13.1%	11.9	13.9	Mauritius (a)
1,563.0	1,883.0	20.5%	4,007.5	5,896.0	47.1%	2,444.5	4,013.0	Mexico
49.0	50.8	3.6%	101.1	120.8	19.6%	52.1	70.1	Moldova
219.5	245.0	11.6%	n.a.	n.a.	n.a.	n.a.	n.a.	Morocco
20.3	22.4	10.3%	38.8	n.a.	n.a.	18.5	n.a.	Mozambique
61.2	60.2	-1.7%	51.2	50.7	-1.0%	-10.0	-9.5	Namibia
2,380.0	2,830.0	18.9%	n.a.	n.a.	n.a.	n.a.	n.a.	Netherlands
815.0	950.0	16.6%	n.a.	n.a.	n.a.	n.a.	n.a.	New Zealand (a)
52.0	n.a.	n.a.	72.7	n.a.	n.a.	20.7	n.a.	Nicaragua
694.0	770.0	11.0%	n.a.	n.a.	n.a.	n.a.	n.a.	Norway
101.3	116.8	15.3%	83.4	n.a.	n.a.	-17.9	n.a.	Oman (b)
75.1	98.6	31.3%	644.9	896.1	38.9%	569.8	797.4	Pakistan (a,b)
34.9	45.6	30.7%	n.a.	37.2	n.a.	n.a.	-8.4	Palestinian Territory (b)
53.6	51.9	-3.1%	96.2	111.7	16.1%	42.6	59.7	Panama
34.7	33.3	-4.1%	54.8	71.6	30.7%	20.1	38.4	Paraguay
88.9	86.5	-2.8%	299.6	317.7	6.1%	210.6	231.3	Peru
230.8	273.0	18.3%	n.a.	n.a.	n.a.	n.a.	n.a.	Philippines (a)
624.0	675.8	8.3%	n.a.	n.a.	n.a.	n.a.	n.a.	Poland
532.8	720.0	35.1%	753.3	n.a.	n.a.	220.5	n.a.	Portugal (c)
128.5	143.0	11.3%	84.0	95.5	13.7%	-44.5	-47.5	Qatar
928.2	944.0	1.7%	929.3	n.a.	n.a.	1.1	n.a.	Russia (b)
1,060.0	1,194.9	12.7%	n.a.	n.a.	n.a.	n.a.	n.a.	Saudi Arabia
36.5	50.0	37.2%	111.1	n.a.	n.a.	74.7	n.a.	Senegal
1,350.0	1,515.0	12.2%	n.a.	n.a.	n.a.	n.a.	n.a.	Singapore (a)
162.8	162.7	-0.1%	208.7	233.1	11.7%	45.9	70.4	Slovak Republic
461.1	494.6	7.3%	n.a.	700.0	n.a.	n.a.	205.4	South Africa
1,935.0	2,570.0	32.8%	n.a.	n.a.	n.a.	n.a.	n.a.	Spain
45.5	42.0	-7.6%	n.a.	n.a.	n.a.	n.a.	n.a.	Sri Lanka
21.9	31.8	45.1%	105.3	155.7	47.9%	83.3	123.9	Sudan (b)
29.3	25.1	-14.6%	n.a.	n.a.	n.a.	n.a.	n.a.	Swaziland (a)
1,365.0	1,640.0	20.1%	n.a.	n.a.	n.a.	n.a.	n.a.	Sweden
2,730.0	3,195.0	17.0%	n.a.	n.a.	n.a.	n.a.	n.a.	Switzerland
125.6	140.0	11.5%	256.7	286.0	11.4%	131.1	146.0	Syria
949.3	1,160.0	22.2%	882.0	n.a.	n.a.	-67.3	n.a.	Taiwan
9.0	6.8	-24.8%	n.a.	18.5	n.a.	n.a.	11.7	Tajikistan (b)
298.7	355.2	18.9%	327.8	426.6	30.1%	29.1	71.4	Thailand (c)
67.2	70.2	4.4%	158.8	163.4	2.9%	91.6	93.3	Trinidad & Tobago (a)
698.4	850.0	21.7%	1,122.7	1,240.0	10.4%	424.3	390.0	Turkey
16.5	15.7	-4.6%	n.a.	11.3	n.a.	n.a.	-4.5	Turkmenistan (b)
359.2	363.0	1.1%	n.a.	269.5	n.a.	n.a.	-93.4	Ukraine
963.0	1,123.6	16.7%	n.a.	n.a.	n.a.	n.a.	n.a.	United Arab Emirates
10,141.0	12,242.7	20.7%	6,853.4	7,463.2	8.9%	-3,287.6	-4,779.5	United Kingdom (a)
29,358.8	37,594.8	28.1%	10,640.8	13,010.7	22.3%	-18,718.0	-24,584.1	United States
80.1	78.0	-2.7%	98.3	110.9	12.8%	18.2	33.0	Uruguay
68.5	71.4	4.3%	75.0	54.3	-27.6%	6.6	-17.0	Uzbekistan (b)
160.2	n.a.	n.a.	315.3	n.a.	n.a.	155.2	n.a.	Venezuela
227.0	286.9	26.4%	498.8	n.a.	n.a.	271.7	n.a.	Yugoslavia
65.6	71.3	8.7%	59.0	n.a.	n.a.	-6.6	n.a.	Zimbabwe

Notes: Data are in millions of minutes of public switched traffic.
a. International traffic for year ending March 31. Australia, New Zealand, and Pakistan ends June 30.
b. Traffic data exclude some carriers or routes. (See country table for details.)
c. 1999 and 2000 traffic data not directly comparable. (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 71
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
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 672-9
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
Riga 2
Lebanon 961
Beirut 1
Lesotho 266

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	Yugoslavia
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
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 Authority
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
227	Maryland
228	Mississippi
229	Georgia
231	Michigan
234	Ohio
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
270	Kentucky
276	Virginia
278	Michigan
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
330	Ohio
331	Illinois
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
424	California
425	Washington
434	Virginia
435	Utah
440	Ohio
441	Bermuda
443	Maryland
445	Pennsylvania
450	Quebec
464	Illinois
469	Texas
470	Georgia
473	Grenada
475	Connecticut
478	Georgia
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
564	Washington
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
659	Alabama
660	Missouri
661	California
662	Mississippi
664	Montserrat
667	Maryland
670	Northern Marianas
671	Guam
678	Georgia
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
737	Texas
740	Ohio
754	Florida
757	Virginia
758	St. Lucia
760	California
763	Minnesota
764	California
765	Indiana
767	Dominica
770	Georgia
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
835	Pennsylvania
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
872	Illinois
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
940	Texas
941	Florida
947	Michigan
949	California
952	Minnesota
954	Florida
956	Texas
959	Connecticut
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 205/659
- 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
- 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 310/424
- 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 203/475
- Hartford, Bristol, and northeastern Connecticut 860/959

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
- 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 941
- Fort Lauderdale 754/954

Georgia
- Albany, Valdosta, and south-central Georgia 229
- Atlanta 404/470/678/770
- 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 312/872
- Southern Chicago suburbs 464/708
- Alton, Mount Vernon, and southern Illinois 618
- Central Chicago suburbs 630/331
- Chicago/outside downtown 773/872
- 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

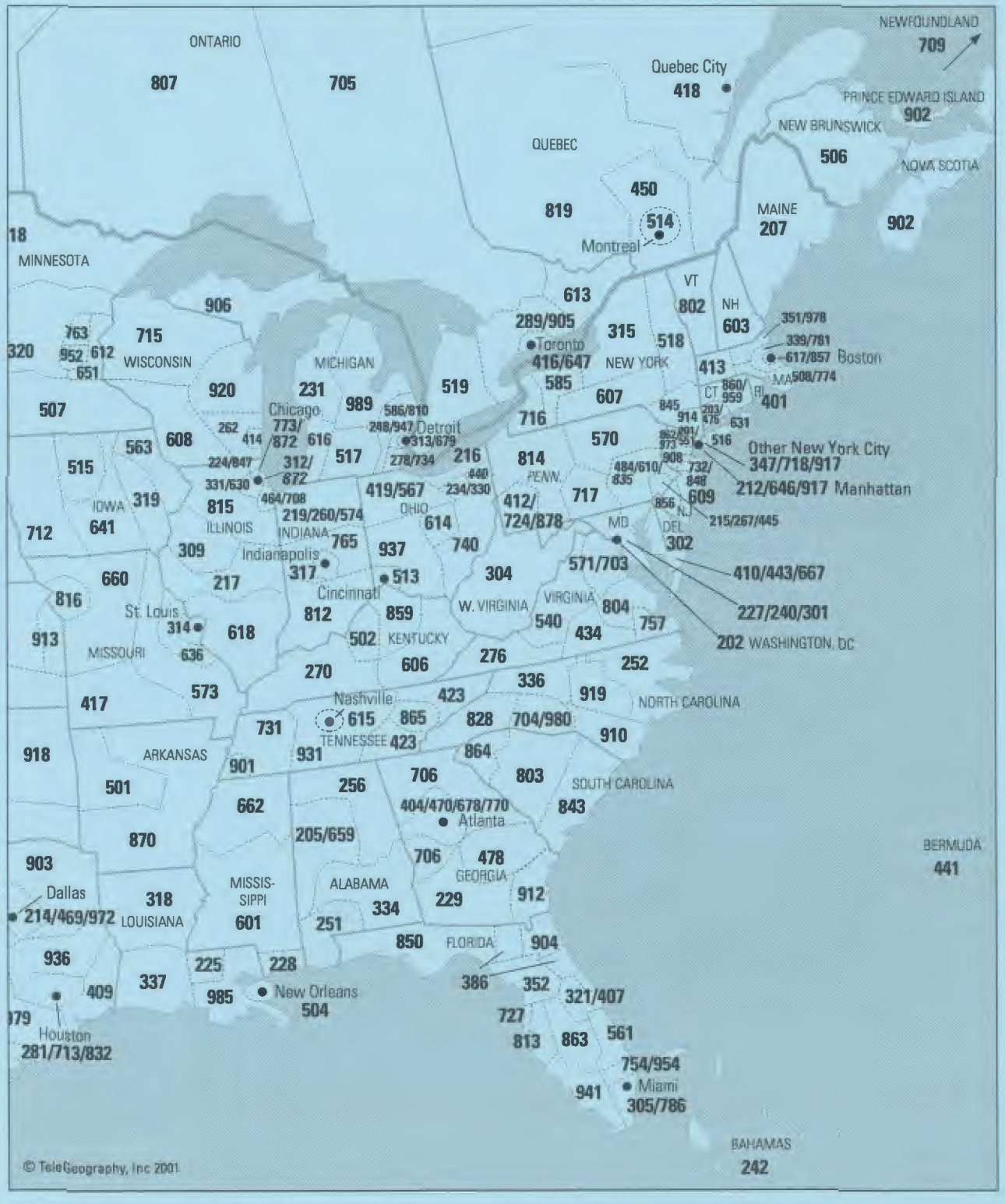
Manitoba 204

Maryland
- Rockville, Hagerstown, and western Maryland 227/240/301
- Baltimore, Annapolis, and eastern Maryland 410/443/667

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

North American Area Codes



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	810
OC-3/STM-1	155.520	Exactly three times the capacity of OC-1**	2,430
OC-12/STM-4	622.080	12 times the capacity of OC-1	9,720
OC-24	1,244.160	24 times the capacity of OC-1	19,440
OC-48/STM-16	2,488.320	48 times the capacity of OC-1	38,880
OC-192/STM-64	9,953.280	192 times the capacity of OC-1	155,520

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*

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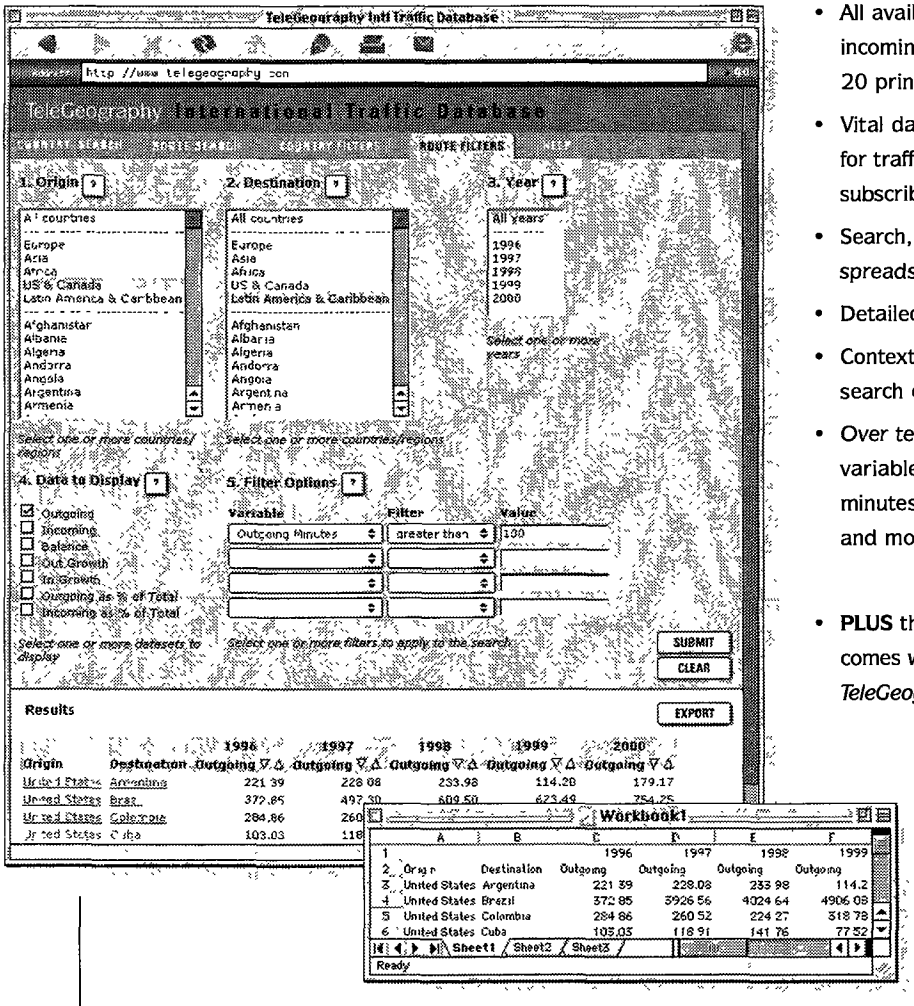

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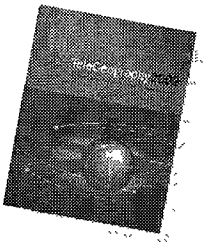

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About TeleGeography, Inc.

telegeography \tĕl´ə-jĕ-ŏg´rə-fē \ *n* (1990) abbrv. of telecommunications geography [fr. Gk *tele,* far off, at a distance and L. *communicatus,* pp. of communicare to impart + fr. Gk *geo* (earth) + *graphein,* (to write)] 1. a new branch of geography that maps the pattern of telephone traffic and other electronic communication flows; 2. places created by or perceived solely via telecommunications (e.g., a computer network address); 3. the telecommunications artifacts (radio antennae, terminals, signs) on a site; 4. the balance of telecommunications power in one country or region vis-à-vis another (cf. geopolitics, *archaic*).

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TeleGeography also authors a series of related reports and maps on global telecom infrastructure and network topology, including: *International Bandwidth 2001*, a guide to supply and demand on long-haul networks; *Packet Geography 2002*, global Internet statistics and commentary; *Colocation 2002*, a guide to the industry of power and space; *Direction of Traffic 1999*, an historical traffic atlas compiled with the International Telecommunication Union (ITU); *Global Internet Map,* a wall map of intercontinental Internet bandwidth; *Global Communications Cable and Satellite Map*, a poster-sized map of telecom infrastructure; and *Global Communications Traffic Map*, a wall map of international traffic flows.

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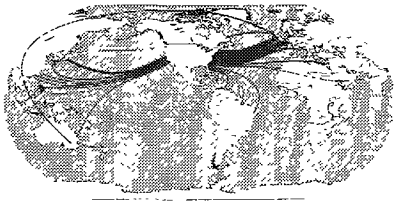

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