International Institute of Communications (IIC)

THE GLOBAL TELECOMMUNICATIONS TRAFFIC REPORT - 1991

Gregory C. Staple - Editor

Principal International Telecom Flows

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Cover Illustration - *The cover maps the largest streams of switched international telecommunications traffic onto a circular projection. Routes shown generally had a two-way flow in 1990 exceeding 80 million Minutes of Telecommunication Traffic (MiTT). Some routes have been omitted for presentation purposes. Shaded map areas show major points of origin and destination. Concept: Gregory C. Staple. Illustration: Maryland CartoGraphics.*

ACKNOWLEDGMENTS

This report could not have been compiled without assistance. Carriers, government departments and regulatory organizations from around the world responded to our informational requests. We are grateful for their cooperation. Special thanks also are due to the many professionals within these organizations who encouraged our work and set aside the time necessary to ensure that the data reported here is as up-to-date and comprehensive as is reasonably possible.

We also wish to thank the Commission of the European Communities (CEC), Directorate General XIII, for underwriting our research on European telecommunications and for permitting the IIC to publish certain Commission data on traffic to and from member states. The CEC's independent effort to improve the scope of statistics on international telecommunications flows is most welcome.

The "new look" of the 1991 report and expanded national coverage were also supported, in part, by a special publication grant from MCI Communications Corporation. The grant came without any editorial pre-conditions; the IIC remains responsible for the contents of *The Global Telecommunications Traffic Report - 1991.*

This report reflects a team effort. Deanna Nichols and Ron Sasine led the statistical research. Word processing and desk-top publishing assistance were provided by Barbara Frank and Michelle McDermid. Bennett Moe at Maryland CartoGraphics (Columbia, MD) contributed his computer graphic skills to the illustrations.

We have tried to ensure the accuracy of the statistics presented here by relying upon primary sources whenever possible. Nevertheless, in a project of this magnitude, some errors are bound to occur. We would be grateful if our readers would bring them to our attention so that they are not carried forward to future editions.

Gregory C. Staple
Editor

PREFACE

Toward the end of the 1980s, computing power, electronic databases and global telecommunications networks had succeeded in eroding once formidable barriers to commerce and communications. Geography, political divisions and time ceased to be effective hindrances to business operations or personal interactions. For the first time in history, virtually every corner of the globe could tap instantaneously into an expanding, increasingly intelligent global information network.

You could say the information age truly came of age -- on a global scale -- by the end of the 1980s. Appropriately enough, in 1989 the IIC issued its first Global Telecommunications Traffic Report. Measuring global telecommunications traffic is a very useful way to understand the forces at work in transforming our world. That's the reason this report is such a welcome addition to the wealth of information available about the telecommunications industry. It helps us put key industry trends into proper perspective -- which is increasingly a global perspective. Important trends in business, politics and society at large can be understood, at least in part, by measuring telecommunications traffic and analyzing trends in telecommunications technologies and usage rates.

As this report underscores, the forces of technological innovation, customer demand and the growing acceptance of competition in key markets will continue to transform the global telecommunications industry. And telecommunications, in turn, will continue to be a fast-growing, dynamic, strategically-important industry for any country that wants to sustain or initiate solid economic growth. There is no alternative. A nation's economic and political health today depend upon a thriving telecommunications sector.

This third edition of The Global Telecommunications Traffic Report emphasizes three key trends. It makes clear that, despite recession and war, the global traffic boom is continuing, that national and global markets are converging and that a new era of innovative, increasingly-multimedia information services are creating a platform for an ongoing revolution throughout the 1990s.

The transformational power of information, widely dispersed and instantly available, should not be underestimated. Information tends to undermine rigid political and corporate hierarchies and artificial boundaries. It is, therefore, no coincidence that the 1980s ended with a flourish of democratic revolutions and with the globalization of business organizations.

Both in politics and in business we are now in the midst of a new, transnational era. We have moved abruptly from a bi-polar world, dominated by two

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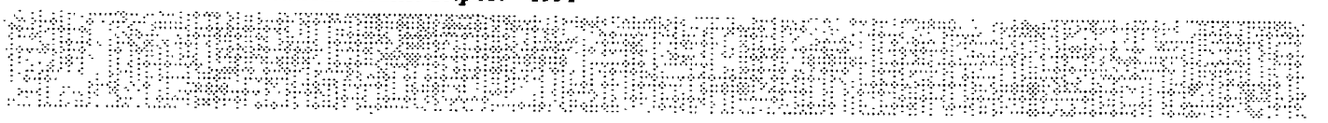
superpowers locked in a Cold War standoff, to an increasingly multipolar world order. World politics have become more decentralized and democratic. In global business, we're seeing a similar trend toward a decentralized world in which advanced global telecommunications networks enable companies to respond quickly to market opportunities anywhere, anytime.

Because this report is so helpful to so many audiences, MCI is proud to be associated with the third edition of The Global Telecommunications Traffic Report. We recommend it wholeheartedly as a valuable resource for telecommunications users, for service providers, for regulators and for students of the industry.

William G. McGowan
Chairman and CEO
MCI Communications Corporation



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Introduction

Since the 1970s, international telecommunications has remapped the globe. Today telegeography is reorienting our lives and our work. Traditional boundaries, based upon politics and nature, have been replaced by network boundaries. Increasingly, what matters -- for the telecommunication industry itself as well as in finance and manufacturing, in politics and the arts -- is what can be connected and how, not what is close or established.

Chronicling the connections and forecasting their evolution has motivated this report since it was founded. This year's edition, the third since 1988, provides expanded coverage of these themes. A new two-part format also has been adopted to make the report more accessible to readers.

Part one contains review articles on business and regulatory activities shaping the market for international telecom services in the early 1990s. We are fortunate to have major contributions from Denis Gilhooly, Editorial Director of the Paris based Communications Week International, and Kiyoto Uehara, Managing Director of InfoCom Research in Tokyo.

Part two provides country-by-country and carrier-by-carrier statistics on the demand for international telecoms services. The focus is on the volume of switched voice traffic in approximately 35 countries. 1990 statistics are given for more than 475 routes totaling over 27 billion Minutes of Telecommunications Traffic (MiTT) -- almost 90% of the world market. By compiling and analyzing standard statistics on telecom traffic, this part of the report seeks to fill a gap in industry analysis, still heavily dependent on revenue and facilities data.

Major Themes

Three significant market trends, first raised in the IIC's 1989 and 1990 reports, provide a point of departure for this year's publication.

The Global Traffic Boom. During 1990, economic output in most English speaking countries began a decline which continued well into 1991. The collapse of international travel during the Gulf War also reduced calling volumes. And yet, for carrier after carrier, year-on-year international traffic for switched telephone services continued to rise.

Outbound traffic from the U.S. in 1990 was up approximately 18% from 1989 (excluding Canada and Mexico) -- the same rate of growth as from 1988 to 1989; Japan saw approximately 23% growth in telephone circuit traffic for the year ending March 1991. Traffic volumes from the U.K., Germany, Switzerland and the Netherlands also grew 12%-15% in 1990. Singapore, Taiwan, Hong Kong and Thailand all experienced growth rates for outgoing switched telephone services of over 20% in their last reporting period.

Yes, lower tariffs did stimulate demand and these price cuts likely will continue through 1995 at about 10% annually on major intercontinental routes. Indeed, since last year's report (June 1990), a surprisingly broad consensus has emerged among carriers that cross-border tariffs and accounting rates (what carriers charge each other for interconnecting traffic) should and will be brought more into line with costs.

The new outlook on international telecom pricing practices (accounting rates, tariffs) marks a departure from that prevailing in the 1980s. By mid-decade it could have far-reaching implications for service choice and demand. Several factors

appear to have encouraged a break with the past.

The first is the likelihood of growing "by-pass" of the switched network. Market liberalization and new technologies have given major users more and more options for avoiding high-price carriers by routing traffic via least-cost national hubs, private networks and alternative (value added) carriers. Smart terminals and digital networks will soon enable other groups of users to convert their basic international telephone traffic into enhanced "off-net" services (e.g. via store and forward technology), and often to save money in doing so.

Second, during the 1990s, the rate of growth in the supply of international telephone pathways, especially on trans-continental routes, is likely to exceed the growth in demand by a factor of two or more. For example, available voicepaths on trans-Atlantic fiber optic cables alone will grow almost 400% by 1996 and by approximately 600% on trans-Pacific cables during the same timeframe. (See Table 6 of this report.) International satellite capacity in each region also is likely to double by 1996. In this environment, further cuts in inter-continental call prices are inevitable.

The projected gap between supply and demand also suggests that carriers will soon begin to devote more attention to building a market for band-width intensive services (e.g. dial-up video) so as to maximize their return on new cable and satellite investments. Which brings us to a third factor affecting the industry's future pricing plans: international Integrated Digital Services Networks (ISDNs) -- the industry's multimedia platform.

Multimedia, like ISDN before it, has become a ballyhooed buzzword with a multiplicity of meanings (more on this below). But the implications for telecom tariffs are reasonably clear. This is a matter of economics.

To be attractive to a mass market, tariffs for the ISDN must not be priced at too high a multiple of that for voice services. But nor can they be priced too low vis-a-vis the comparable price for an equivalent number of voice channels; that would be an open invitation to arbitrage. Thus, the lower the price for international telephony, the more flexibility carriers are likely to have to introduce wider bandwidth services in the 1990s.

We shall return to the potential market for multimedia communications below.

Market Convergence. The boundaries between international and domestic telecom markets continue to erode. In countries as different as Hungary and Argentina, privatization has become synonymous with internationalization. With each new PTT share offering, foreign carriers are buying into national markets from which they were once barred.

At the same time, from Sweden to Japan, market liberalization is sharpening the head-to-head battle between national carriers for cross-border traffic. Where new facilities licenses are limited, competitors seek to enter the market by negotiating network management contracts with large business users. (BT's Pathfinder Project is one of the more publicized examples.) Similarly, where basic services remain the monopoly of national carriers, value added networks and mobile facilities provide an opportunity to build a market presence for the future.

The same question is now asked in almost every country: "Whose traffic is it anyway?" It belongs to the customer, of course. Or does it? We explore this question further in two review articles. The first one focuses on the North America market and the impact of national ownership rules on inward investment by trans-national carriers. Privatization

has led many countries to see the merits of accepting more foreign investment in national carriers; the article argues that the U.S. and Canada also would do well to reconsider their positions on this issue.

The second article focuses on Europe, where the challenge presented by competing trans-European networks is just beginning. "[T]he development of real European services and networks which are not the sum of national services or networks -- needs to be focused through a European body with a truly commercial stance," argues the author. The solution might come from a joint effort by existing operators or the private sector. But, the overriding need today "is for a new brand of politics which will create the conditions for this new brand of networks."

New Media. "The telephone is going through a metamorphosis," we wrote last year. "The black bakelite chrysalis is becoming an electronic butterfly. But what kind of a butterfly will it be? And how will it affect network traffic....Could it be that [the] fax [machine] has given us a glimpse of what lies ahead?"

We continue this inquiry here. In mid-1991, the worldwide base of fax machines was still only approximately 16 to 17 million, less than 3% of the global base of telephone lines. The number of modems was even smaller. But, these few million terminals have transformed the market for international communications.

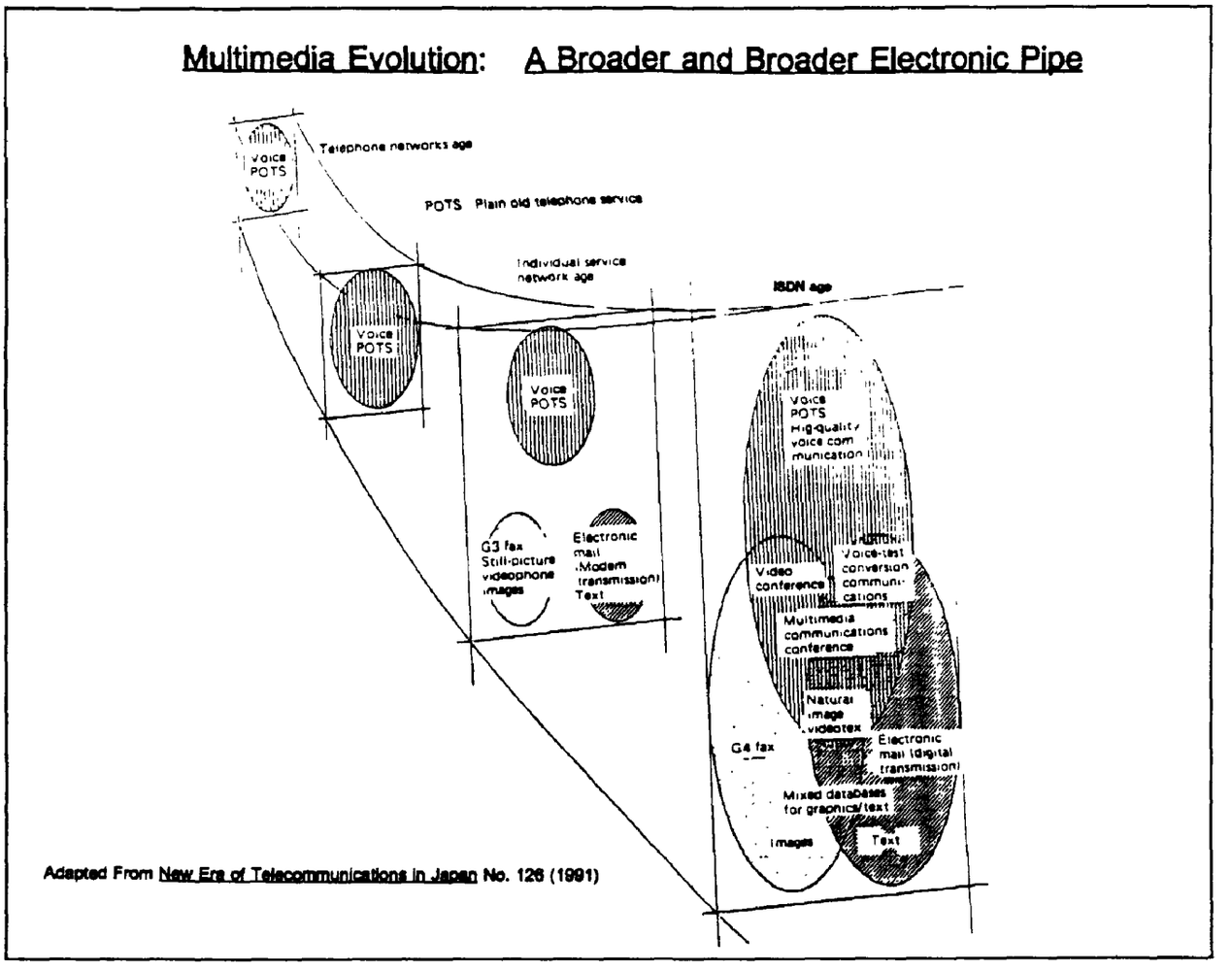
Fax is now the medium of choice on most trans-Pacific routes; about 15 - 20 % of the traffic across the Atlantic is fax. And on international private lines, it is estimated that data traffic is growing at 30 - 40% annually. This anecdotal evidence suggests that it is international users -- and especially on the Asia- Europe, Asia-North America routes -- which will be the most avid customers for the next generation of multimedia or ISDN services.

How quickly will such multimedia services be available on cross-border routes? That depends on what is meant by multimedia. On this subject there seems to be a growing divide.

On one side is the computer industry which now appears to see multimedia as a new set of stand-alone entertainment consoles -- a successor to the current generation of Personal Computers (PCs). As Businessweek wrote in a recent cover story on the computer industry, "PCs, high definition television, stereos, VCRs and laser disks will soon converge in a new multimedia information and entertainment system for the living room." The prototypes of this vision are the current line of smart Compact Disc (CD) TVs introduced by Commodore and Philips, and the video peripherals for PCs now offered by several computer manufacturers.

On the other side is the telecoms industry. Its multimedia vision is tied to a new generation of ISDN based terminals for dial-up video, high-fidelity audio, color graphics transmission and data exchange. The focus here is on connectivity and an integrated office console.

How will these two visions come together? In theory, a common set of standards could permit entertainment oriented and telecom oriented terminals to interwork on a common network. In practice, however, the computer industry's greater marketing clout and its long history of proprietary interfaces suggests that connectivity is likely to take a back seat to equipment sales.



This is potentially bad news for carriers as well as consumers. It could lead to a repeat of the PC era where networking (working "on line") was almost an afterthought. As a result the mass market for data transmission (E-mail), compared to fax, has been slow to develop. It could also retard the movement toward making the telecom network a platform which is at least as open for new ISDN applications as the current PC platform is for new software developers.

Nevertheless, there are those who believe that the multimedia age still might produce something more than a "smart TV" or a telephone with pictures -- more in the sense that a word processor is a different kind of medium than an electronic typewriter. And more too in the sense that the urban electrical grid brought with it night baseball as much as it did the air conditioner. And that global satellites made possible CNN as much as MTV.

Earlier this year, therefore, we were struck by the vision of Mitchell Kapor, the energetic chairman of ON Technology and co-developer of the popular PC spreadsheet program, Lotus 1-2-3. He put it this way during a U.S. Federal Communications Commission (FCC) forum on the future of the

public telecoms network:

"Applications will drive [the] demand for services [in the future] because users are interested in doing something new with technology in order to make a difference in their lives. They have an aversion to technology itself....The most valuable contribution of the computer industry in the last ten years is not a machine, but an idea -- the principle of open architecture...[W]e need to think how to make the [public network] into an attractive platform for the development of new information products and services...."

" The platform must be designed to be appealing to the application developers. It cannot be thought up in isolation and foisted onto the market in the hope that it will be found interesting."

These remarks deserve a wide audience. And a response. For the sooner that the computer and telecommunications community see multimedia as a platform for applications and connectivity rather than as a ready-made set of terminals, the more likely it is that the multimedia future will attract the kind of consumer base it will need to create a truly global market.

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Japanese companies have been at the forefront of multimedia developments on both the computer and telecoms side. The telecoms perspective is explored more fully in the articles section of this report by Tokyo's Infocom consultantcy, a major NTT advisor.

It is NTT, of course, which in 1990 placed multimedia at the core of its network vision for the 21st century. The key phrase, said NTT, is "V I & P - Visual, Intelligent & Personal." And by Infocom's account, NTT has already made significant strides toward this goal. By mid-1991, about 90% of Japan had access to a basic ISDN interface.

Other perspectives on the future of multimedia communications will appear in later IIC reports.

The Year In Review 1990 - 1991

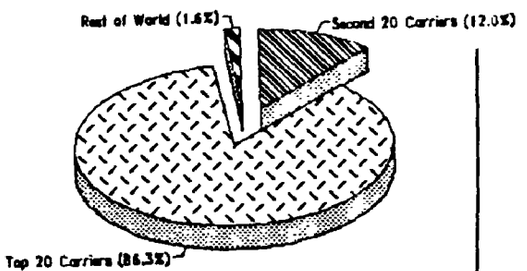
We have already flagged two of the most important stories of the last twelve months (to August, 1991) -- the relatively buoyant demand for international telecom services, a recession notwithstanding, and the new consensus, at least among major carriers from industrialized countries, that international accounting rates and call prices will be brought more into line with costs.

Our survey research indicates that the global demand for switched services topped 30 billion Minutes of Telecommunication Traffic (MiTT) in 1990 and will total 35 - 36 billion MiTT in 1991. By 1995, this figure likely will rise to 60 - 70 billion MiTT. As shown by the chart below, the market remains concentrated. The top 20 carriers have approximately 86% of the cross-border market. (See also Tables 7a and 7b.)

As for the pricing issue, 1991 saw a new determination by regulators in the U.S. (FCC) and Europe (Oftel, the EC's Competition Directorate - DG IV) to speed up reforms. The business press also began to add their voices to those calling for change. And, by late summer, steady pressure from the Americans, the Australians, the Swedes and the OECD Secretariat, among others, led the CCITT (International Telegraph & Telephone Consultative Committee), the Geneva-based organization which writes the ground rules for settling accounts between carriers, to begin a serious dialogue on a

more cost-bared compensation system. But do not look for a quick resolution. A new deal on intercontinental accounting rates is unlikely until 1993 or later.

International Telecoms Traffic
Carrier Market Shares (1990)



Several other development in 1990 and 1991 will continue to affect the market for international telecom services in the 1990s. Chief among these are:

o **Additional Privatizations.** The last year saw Argentina and Mexico complete their privatizations. Next are the U.K. (in November, 1991 the Government will sell its remaining 48% interest in BT), Singapore, Venezuela, Uruguay, Pakistan, the Ivory Coast, Poland and Hungary. Nigeria, Korea, the Netherlands and Germany have also begun the process. This trend is redrawing market boundaries because privatization almost always goes hand-in-hand with more competition and investment by foreign carriers.

o **Network Competition.** In 1990 and 1991, Sweden and Australia joined the ranks of countries willing to license more than one international telephone company. And in principle, the U.K decided that three or even four international carriers might be a good thing. Maybe. Those countries favoring network competition -- the U.S., Japan, the U.K., New Zealand, Sweden, Australia -- are still a minority. But, they are gaining important allies (notably within the European Commission). Thus, in retrospect, the 1990 - 1991 period may well be seen as a turning point. The burden of proof has been shifted from those favoring network competition to those in opposition.

o **Liberalization of Private Lines.** In July, 1991, after years of debate, the CCITT voted to liberalize the D-1 series of recommendations which govern the terms on which international private lines can be used. The new D-1 series essentially lets each nation decide for itself the extent to which such circuits can be subleased or interconnected to the switched network, i.e. resale of private lines for switched voice services is permissible under bilateral agreements.

o **Undersea Cable Projects.** The last year has seen the launch of an unprecedented number of new trans-oceanic fiber optic cable projects. TAT-10 and TAT-11 in the Atlantic; TPC-5, SEA-ME-WE2 and ASPAC in the Pacific. The long term impact on price and service competition, discussed further below, should not be underestimated.

We now take a closer look at developments in the world's major regions.

North America

North American carriers continued to experience strong growth in the demand for international service in 1990. Excluding cross-border routes,

(U.S.-Canada, U.S.-Mexico) U.S. outbound MiTT grew approximately 18% from 1989; for Canada growth was 21% in the year to March 1991, excluding traffic to the U.S.

This steady increase in demand pushed the U.S. and Canadian traffic deficits to new highs in 1990 (Mexico enjoyed a record surplus). The U.S. had a net traffic deficit of over 3.1 billion MiTT leading to net out payments (a trade deficit) of approximately $3 billion, up from $2.4 billion in 1989. The principal beneficiaries of this deficit were Mexico, Germany, the Philippines, South Korea, Colombia and various Central American and Caribbean countries.

Competition and discounted calling plans for the residential market plainly stimulated U.S. demand in 1990. MCI had an especially strong year recording a 70% increase in international call volumes (excluding Canada and Mexico). This boosted MCI's market share to 14.6% as compared to 10.2% in 1989. The gain was almost entirely at AT&T's expense. By the end of 1990, AT&T's international market share had fallen below 80% and was still declining. (In contrast, AT&T's share of the U.S. domestic long-distance market appears to have stabilized in 1990 with approximately 65% of switched traffic.)

MCI's 1990 performance made it the world's 7th largest international carrier (in terms of switched minutes). US Sprint, which has just over 6% of the U.S. international market, also advanced to the ranks of the top 20 carriers in 1990.

In Canada, 1990-1991 saw a number of actions by carriers and resellers to increase their share of the 2.6 billion MiTT U.S.-Canada cross border market and to keep Canada's overseas traffic on Canadian carriers. Yet, despite regulatory reforms designed to make Canadian carriers more competitive (e.g. by requiring Teleglobe to interconnect directly with the private networks of Canadian resellers), the appeal of cross-border networks to the U.S. continued. In June, 1991, this led the Canadian Radio-television and Telecommunications Commission (CRTC) to issue new guidelines to deter Canadian service providers from routing Canada-Canada or Canada-overseas traffic via the U.S.

However, the big competition issues are still ahead in Canada. The CRTC has now completed its hearing on the applications of Unitel and a BC Rail consortium to provide competitive long-distance service. If the CRTC approves at least one of these applications, as seems likely, it may well lay the basis for international competition with Teleglobe when that company's monopoly runs out in 1992.

In Mexico, the big story in 1990 was the completion of the Telmex privatization leading to the acquisition of a controlling stake by Grupo Carson, France Telecom and Southwestern Bell. Telmex's new owners must increase exchange lines by 12% annually to 1994. Despite a gradual reduction in the size of Telmex's settlements per minute from handling U.S. traffic, the new lines should be a major foreign exchange earner. In 1990, Telmex earned approximately $120 a line for terminating U.S. calls alone.

(Both Canada and Mexico are discussed at greater length below in the review article -- "Whose Traffic Is It Anyway?")

Europe

The European Community originated approximately 40% of the world's international telecom traffic in 1990 -- approximately 12 billion switched minutes. This IIC report provides the

first comprehensive statistical review of the pattern of traffic between the EC-12. (See Table 29.) What does it show?

Three countries - Germany, the U.K., and France - account for almost 2/3 of all outgoing international traffic. On average, using 1989 figures, approximately 55% of outgoing traffic from one EC state was destined to another member country. Luxembourg, Belgium and Ireland are the most EC oriented (83% - 88% of traffic) and the U.K. and Germany the least (about 43% - 44% of traffic).

Approximately 10% of the EC's outgoing traffic goes to the U.S. and about 1% goes to Japan. (By comparison,, about 25% of outgoing U.S. traffic and about 17% of outgoing Japanese traffic is directed to the EC.) The European telecommunity is growing; Turkey, Yugoslavia and parts of North Africa are becoming as much a part of it as Switzerland, Austria, and Scandinavia.

The volume of telecommunications traffic between Eastern and Western Europe is still very small. Supply constraints on cross-border facilities in the East are severe and they are unlikely to be eased until the mid-1990s. Mobile systems may provide alternative routing arrangements for some users. But such facilities cannot be expected to meet the great pent-up demand for international telecommunications which has been let loose by the new mobility of people and money in the East.

The international facilities bottleneck is most critical in the U.S.S.R. In 1990, it was reported that but 1200 international circuits were available for interconnecting over 38 million Soviet telephones to the global network. One result: in 1990 the Soviet Union's switched telecommunications traffic to the U.S. (13 million MiTT) was roughly the same size as that from Bahrain or Bolivia.

Next year, politics permitting, will see several new Soviet tele-bridges to the rest of the world. One bridge, largely financed by the American carrier, U.S. West, will place new international gateway switches in Kiev, Leningrad and Moscow so as to add over 20,000 circuits to the two gateways (in Moscow and Yerevan) now serving the Union. Another project involves the construction of an overlay network in Moscow with 240 dedicated international circuits for hotels and businesses. The operator, Sovintel, is a partnership between GTE Corp. and the Soviet Ministry of Communications.

The Ministry has also announced plans for several new cross-border cables -- one from Denmark across the Baltic to northern Russia, one under the Black Sea from Italy and Turkey to the Crimea, and one between South Korea and western Siberia. A microwave link between Magadan and Alaska, across the Bering Straight, is already in place.

Other new tele-bridges to the Soviet Union will be provided via InterSputnik and PanAmSat whose satellite facilities are currently under utilized. Beyond that, in 1991, the Soviet Union decided to join Intelsat, the global satellite consortium, and announced plans to expand the number of Intelsat ground stations in the Union.

These are all helpful signs. But it will take many more such projects before the Union or any of its Republics enters the ranks of the top 25 international carriers.

More network competition also received new attention in Western Europe in 1990 - 1991. Of prime importance was the European Commission's growing commitment to revisit the scope of reserved services in 1992. Equally significant in

1991 was the boost to the Commission's authority provided by the long-awaited decision of the European Court of Justice upholding the Commission's 1988 Directive liberalizing the provision of telecoms terminal equipment. A companion Directive providing for the phased opening of the telecom services market is still before the Court; the outcome of that case is less clear. Nevertheless, the legal victory on terminal equipment maintained the momentum of the Commission's reform program to 1992.

(The scope of the EC's network policies and the prospects for new pan-European carriers are discussed further in the review article "Rewiring Europe.")

Several national developments also deserve notice. German unification in September 1990 cemented the leading role of DBP Telekom as Europe's largest international carrier. (Telekom now handles over 40% more international traffic than British Telecom or France Telecom.) Long a junction state for intra-European traffic, the addition of 5 to 6 million more German exchange lines to 1998 (primarily in the East) and parallel modernization programs in Hungary, Czechoslovakia and Poland, will continue to boost Telekom's stature throughout the 1990s.

1990 also saw a historic reform of the French telecommunications law. From January 1, 1991 France Telecom became an autonomous state-owned corporation with sufficient control over its budget and strategic plans to compete on an equal footing with other major operators. Indeed, with its successful bids for ENTEL (Argentina) and Telmex (Mexico) already in hand, France Telecom now has the ability to become a global player well ahead of most of its European counterparts.

Meanwhile, in the U.K., Mercury Communications continued to do very well, despite a declining economy. In FY 1990, Mercury increased its market share (against BT) from 9% to 14%; outbound traffic rose over 75% and incoming traffic (where profits are substantially higher) over 110%.

In 1991, Mercury's parent, Cable & Wireless (C&W), also made plain its intention to try and repeat Mercury's success on the continent; the company acquired a 40% interest in Tele2 AB, the leading competitor to Swedish Telecom. C&W also signed an agreement to modernize the telephone system in Gdansk, Poland.

But Europe is a big market, even for a company with ambitions as large as C&W. A key question for the 1990s, therefore, is whether Europe's expanding markets (and especially Germany) will birth a new European-owned multinational carrier. Or will U.S. carriers remain C&W's major competitors for new licenses.

Asia

Carriers serving the Asia-Pacific region continue to experience the highest growth rates for international traffic. In 1990, outbound traffic for companies in this region was 20% - 30% higher than in 1989. The rapid expansion of regional traffic has especially affected the U.S. market which looks increasingly to the Pacific. Japan, India, Taiwan, the Philippines, Korea and Australia were all among the 15 fastest growing U.S. routes from 1988 to 1990. (See Table 15d.)

Japan continues to be a junction state for regional telecom traffic. It is the first or second most frequently called country for Korea, Taiwan, Malaysia, Thailand, the Philippines and Singapore. Several of these countries now have two-way traffic volumes of 75 million MiTT or more, comparable

to U.S. routes to South American and the Caribbean.

Since the last quarter of 1989, the demand for international telecom services in Japan has also been given a sharp stimulus from competition. The two new carriers, International Digital Communications (IDC) and International Telecom Japan (ITJ), which are largely user owned, have now won at least 25% of the outbound market from KDD, Japan's established overseas carrier. (The lower market shares reported in Table 9 for IDC and ITJ are based on the 1990 fiscal year to March 1991.) As competition has lowered calling prices in Japan, more traffic has begun to flow out of Japan than into the country (See Table 3 of the report). In 1991, this trend and the large stake of Japan's electronic industries in the next generation of multimedia terminals began to encourage Japan to bring about a more cost-based telecoms price platform at home as well as overseas.

Yet, despite the foregoing trends, Japan remains comparatively insular. In 1990, Japan's 55 million telephone lines accounted for only about twice the international telecom traffic of the 2.5 million lines in Hong Kong (excluding the Hong Kong - China route), or about the same as that of the Netherlands, which has about 7 million lines.

Japan's insularity is also evidenced by the small proportion of international calls (about .2% in F.Y. 1989) as compared to total calls. In the U.S. about 1% of total telephone calls are now international and in the U.K about 2%.

This data underscores the potential for a further expansion of the Japanese international telecommunications market as well as the incremental nature of such growth. Even though new price cuts are likely to sustain 20% plus year-on-year growth levels to 1995, there are unlikely to be any surprises, pending the widespread availability of new media terminals (eg., dial up video). But when such terminals become available (circa 1995), all bets are off. (See the second review article, "Looking Beyond The Fax Machine," for more detailed projections on Japan's international traffic to 2000.)

After Japan, Hong Kong continues to be Asia's telecom hub, followed by Australia and Singapore, with Taiwan and Korea increasingly active. As noted last year, China's international traffic is growing at 40 - 50% annually. This has been a boon to Cable & Wireless controlled Hong Kong Telecom International which, in 1990, began to serve as a gateway for southern China's outbound traffic. Reciprocity is at work here; Hong Kong now sends over 250 million MiTT to the Peoples Republic annually. The size of this "cross border" route thus is now similar to that between the largest European countries (France-Germany; Switzerland-Italy).

As China and Hong Kong become more integrated and the size of their joint international traffic base rivals that of Japan, the leading role which Japanese carriers have enjoyed in the region may well be challenged.

No recent summary of telecommunications matters in Asia would be complete without discussing the momentum of privatization and corporate restructuring. In Australia and New Zealand, this process has already laid the basis for two new international carriers, each of whom will benefit from the region's buoyant markets. Privatization in Singapore and the corporatization process in Malaysia, South Korea, and Taiwan could do the same for competition in these countries by the late 1990s.

Beyond that, transformation of the Asian region

(ahead of Europe) into a zone of investor-owned operators is likely to provide an additional stimulus to traffic and services in what are already the world's fastest growing markets.

This brings us to a final reflection on the region's future traffic -- the proliferation of new fiber optic cables. By 1994, the HAW-5 cable (U.S. mainland to Hawaii; 45,000 voice paths) and the PACRIM EAST (Hawaii - New Zealand; 37,500 voice paths)/PACRIM WEST (Australia - Guam; 37,500 voice paths) systems will be complete. So too will the ASPAC system linking Singapore, China (Shanghai), Hong Kong, Taiwan and Japan. And also the ASEAN network with cables linking Brunei, Singapore, Malaysia, the Philippines and Guam.

Then, in 1996 (or 1997), a KDD/AT&T consortium will complete the TPC-5 loop -- two fiber optic cables with alternative routes between Japan and the U.S. via Guam and Hawaii. TPC-5 system capacity: over 600,000 voice paths.

In short, the 1992 - 1996 period will radically change the supply constraints for trans-Pacific telecommunications. (See Table 6 for further details.) The commitment of the numerous carriers involved in the projects is a vote of confidence that market demand will keep pace. But, even if telephone traffic on key trans-Pacific routes doubles every three years, our estimates suggest that substantial excess capacity will remain through 2000, when plans for another generation of cable will be well underway.

It is unlikely that price will be the major means of closing the gap between supply and demand. As the cost per voice path of major Pacific cables falls to $2000 or less (see Table 5), a cable system may be quite profitable, even though it is only partially loaded. For this reason, as suggested earlier, the huge new capacity of the Pacific cable systems should lead some carriers to maximize their return on investment by marketing new bandwidth intensive (eg. multimedia) services.

This could be an exciting prospect. The rapid take up of fax during the 1980s suggests that there is a strong unmet demand for telecom services which can better bridge time zones and cultures across the Pacific. As such, in the 1990s, new transmission facilities and a new set of multi-function terminals could give the region the kind of telecoms power which Europeans have long taken for granted.

Concluding Thoughts

The "content" of a medium, Marshal McLuhan once said, is like the juicy piece of meat carried by the burglar to distract the mind's watchdog from the real message.

McLuhan was right, in part. The message of today's global telecoms network is telegeography. Whether a telephone circuit is used to seal a marriage between New York and New Delhi or to confirm a line of credit between Singapore and Seattle, the geographical implosion is much the same.

The message is so persuasive precisely because it uses the ordinary patter of business or the everyday pleasantries between families as a foil. But, all the while, the network is remapping the world. And we are only just beginning to have a picture of this new geography.

McLuhan was wrong, however, in suggesting that the content of the medium is of no importance in shaping the overall message. All of the statistics in this report -- on growth rates and traffic bases, thick routes and thin ones -- are shaped by the

changing desires of millions of people to make a call or to send a fax. Whether motivated by the need for rapport or reporting, medicine or money, curiosity or community, safety or sensation, the contours of telegeography reflect the sum of these desires.

The IIC's 1989 and 1990 traffic reports gave considerable attention to identifying the origins of the booming demand for international telecom services. Among other things, we looked at the linkages between cross-border telecom flows and travel, stock market activities, immigration, trade and the rise of global production.

This is a very large subject, however, and our knowledge remains fragmentary. Hence, in 1992, despite the risk of distracting some of our readers, we shall return to this subject and take a more searching look at those "juicy pieces of meat" which led people in North America, Europe and Asia to stay on the line with foreigners for over 35 billion minutes this year.

Gregory C. Staple
Washington D.C. - August 30, 1991

Rewiring Europe: New Politics, New Networks?

By Denis Gilhooly*

Europe has reached a turning point on the road to telecommunications reform. Since the European Commission launched its liberalization drive in 1987, the lowering of internal trade barriers and the accompanying extension of markets in goods, services and capital to cover the Community's entire territory has become the underlying dynamic for change. But despite the growing body of legislation aimed at opening up the market to competition, there is mounting concern that the measures so far adopted do not go far enough.

It is widely recognized that a Europe without internal borders will create an urgent demand for trans-European infrastructures for all types of transportation, whether via rail, road, air or telecommunications. The benefits of the single market to Europe's economy and competitiveness will materialize only if there is a network of adequate infrastructures, in both physical and technological terms. Unfortunately, at present, such systems either hardly exist, or are not emerging fast enough, or are prevented from being interoperable by the absence of vital links.[1]

These deficiencies are particularly acute in the context of Europe's network of information highways. While the Community has begun coordinating advanced telecommunications infrastructures -- in digital and mobile communications networks -- major gaps remain, particularly in trans-European applications.

Currently, intra-Community traffic accounts for much less than one-tenth of total telecommunications traffic, and the supply of trans-European electronic data transmission services has not developed in most cases beyond bilateral agreements limited to the strict minimum in terms of both capacity and quality.

This situation is in marked contrast to the United States and Japan where competitive, multi-billion dollar long-distance communications networks are firmly established.

According to recent surveys prepared for the European Roundtable of Industrialists and the European Commission, large business users of telecommunications are missing out on the opportunities created by technical innovation and liberalization. High tariffs for high speed international communications links, their inflexibility and their unpredictability; the lack of coordinated planning in Europe which limits the use of broadband capacity and creates problems for network management and maintenance; regulatory restrictions on the integration of voice and data, on the use of two-way satellite networks, and on the shared use of bandwidth; and, the

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absence of dynamic bandwidth allocation -- these all remain significant barriers to change.[2]

The limited quality and quantity of available trans-European networks and services, as well as the absence of one stop shopping and one stop billing facilities available from the public Telecommunications Organizations (TO) has held back demand. Moreover, in both regional and global markets, the lack of advanced, international communications is denying European multinational firms the competitive advantage enjoyed by their North American and Japanese rivals.

In part this reflects a failure of supply, and the fact that the TOs do not themselves set up international networks. Rather, they have experience at point-to-point connections and have proved consistently less effective where intermediate carriers are involved. (Examples include the problems associated with international X.25 packet switched data networks, the collapse in 1989 of the Conference of European Posts and Telecommunications (CEPT) administrations' managed data network services project, as well as delays in the pan-European introduction of ISDN.)

In part these failures are a result of stresses inherent in current regulatory policy at the European level. Here, the new reliance on competition law inhibits the coordination of infrastructure supply among the TOs. At the same time the continued protection of the TO monopolies on voice telephony and the network infrastructure prevents effective new competition.[3]

Perhaps most important, the current situation is a function of the crucial lack of political power to organize on a European scale. The tendency to condone nationalist and protectionist policies has inhibited a single entity from providing leadership in telecommunications policy.

However, change is in the air. With the advent of potential bypass technologies in the fields of mobile, satellite and optical fiber communications, the accelerated pace of liberalization, and the unforeseen developments in Central and Eastern Europe, a far more favorable climate is emerging for the deployment of trans-European networks and services.

In this evolving landscape it is not yet clear how the market or technology will develop, nor which systems will finally be deployed. But for the first time conditions are ripe to bypass the remaining roadblocks to full-scale telecommunications reform and put Europe's missing networks in place.

Latent Capacity, Latent Demand

Ironically, much of the infrastructure needed for advanced communications is, in piecemeal fashion, already being laid in Europe. The growing demand for inter-enterprise communications, as well as the emergence of new operators for text, data and mobile services, has increased pressure for broadband leased line capacity and the removal of usage restrictions on shared use and private-to-public network interconnection.

In Germany, the United Kingdom and France, for example, this has led to plans for national digital transmission networks. These nets will incorporate large broadband digital transmission links and digital cross-connect nodes able to switch different bandwidths of the Synchronous Digital Hierarchy (SDH) optical transmission standard from 2 Mbps (Mega bits-per-second) to 140 Mbps. These networks will be used as the basis for switched public telecommunications services and for a flexible offering of leased line services.

In addition, many international digital transmission links between the international gateways of the

telephone networks, based primarily on optical fiber transmission media, were implemented or are in the planning phase from 1987-1994. Most of these transmission projects are, however, purely bilateral projects between national TOs.

Thus, while all the planned digital transmission links are in principle equipped with broadband capacity they do not form a digital broadband transmission network, because they were not planned in the first instance for broadband switching facilities. Even for private operators and users who want to run international services based on leased lines it would be difficult to achieve a European leased line network with digital transmission paths at 2 Mbps or more.

The Amsterdam based Reseaux Associes pour Recherche Europeenne (RARE), for example, recently issued a report identifying the target network requirements for academic networking across Europe. But while the minimum requirement was for a network of 2 Mbps links, these were found to be unavailable to research users except on a limited basis in a few national networks.[4]

TABLE 1 shows the extremely uneven availability of high capacity 2 Mbps leased lines in Europe. This situation can be compared with the United States where much higher performance and low cost T1 (1.5 Mbps) links are available. This has led to a proliferation of applications for LAN to LAN interconnection, CAD/CAM applications, file transfer, videoconferencing, digital imaging and multimedia services.

TABLE 1

Number Of 2 Megabit-Per-Second Circuits in Europe

Country	1988	1990
Belgium	71	475
France	900	1,377
Western Germany	140	525 (leased line/fixed connection)
Ireland	7	17
Italy	0	114
Netherlands	81	301
Spain	14	110
Sweden	33	53
Switzerland	290	1,381
U.K. (BT)	22,705	40,470
U.K. (Mercury)	1,195	2,130

Source: European Commission

RARE estimates the cost for intra-European 2 Mbps circuits to be ten times that of equivalent capacity in the United States. Their conclusion is that major improvements to the European backbone carrier services are needed to enable them to handle the growing load of intra-European traffic as well as to be able to effectively connect to other continents.

The communications gap between Europe and the United States is well documented in the 1989 and 1990 Perspective on Advanced Communications in Europe (PACE) reports prepared for the European Commission. These show that long distance traffic in the United States accounted for more than 30% of overall telecommunications services revenues in 1988. But in the 12-nation Community, less than 10% of calls are international, of which intra-European traffic is only one part.

TABLE 2

Data Communications Service Tariffs in Europe

	Germany	France	Italy	U.K.*
X25 PSDN (ECU/ksegment)				
maximum	1.65	0.60	1.07	0.43 BT
marginal	0.80	0.36	0.73	0.26 BT
DLC (kECU)				
at 9.6 kbps	10.2	10.5	14.0	4.8 BT
at 64 kbps	23.4	31.5	31.1	6.9 BT
at 2 Mbps	222	105	311	32.8 Mercury

* The indicated tariffs for UK are those of the cheapest between the two operators for the specific service, almost always BT

Source: Pace 90, Vol. VI, p. 30

Also, when compared to the United States, the European data communications market is significantly underdeveloped, suffering both from poor X.25 and leased line infrastructures and distorted tariff levels across the Community. See TABLE 2.

Further, whereas data communications revenue in Europe reached about ECU5 billion ($3.7 billion)in 1989, equivalent revenue in the United States was about ECU20 billion the same year -- and is expected to reach about ECU40 billion by 1992. European spending on private networks was about ECU3 billion in 1989, versus ECU10 billion to ECU15 billion in the United States.

The data communications gap between Europe and the U.S. will become a critical concern as the installed computer base in Europe -- currently about half that of the United States -- increases and the number of local area network nodes grows to an estimated 1.7 million by 1993. With annual growth rates of 30 percent in Europe and 25 percent in the United States, compared to 5 percent growth for voice services, the demand for data communications is generating not only extra revenue for carriers, but is also the prime driver for the introduction of broadband services.

Broadband Plans

In 1986, the European Commission launched two major studies on the technical and economic feasibility of establishing a Europe-wide broadband network and the potential market for broadband services.[5] The studies showed that it would be technically feasible to set up a Europe-wide digital broadband network on top of the already ongoing establishment of bilateral digital transmission capacity with relatively low financial resources.

The studies also found a potential demand for broadband services from leading edge companies, with a concentration of about 70 percent in France, Germany, Italy and the United Kingdom. Yet, five years on, Europe is still without an effective international broadband infrastructure.

Nevertheless, this early work was the inspiration for the three principal, and ongoing, broadband initiatives from the TOs:

- the European Broadband Interconnection Trial (EBIT), between sixteen CEPT members offering pilot projects, particularly for the European Commission Research for Advanced Communications in Europe (RACE) project, at 2 Mbps switched connections progressing to 140 Mbps.

- the Global European Network (GEN), between TOs in five European countries based on existing switching and transmission links offering international leased lines up to 140 Mbps or transparent semi-permanent channels of 2 Mbps or more. The project envisions one-stop shopping and billing facilities.

- the Managed European Transmission Network (METRAN), open to all 31 CEPT members and based on SDH technology. Digital cross-connects will operate at the SDH equivalent of 140 Mbps and 2 Mbps. METRAN will support all service networks: those supported by circuit switches for voice telephony and leased lines; and, those supported by new Asynchronous Transfer Mode (ATM) broadband switches. Ultimately the network will incorporate an automated network management system.

Two other proposals from the European Commission for linking government and corporate networks throughout the Community are the so-called Nervous System and the Integrated

Broadband Communications (IBC) Island Interconnection (3I) projects. But confusion over the aims of these projects and low level of support has put their future in question.[6]

In theory, the collaborative nature of EBIT, GEN, and METRAN should reap considerable benefits. Studies undertaken for the European Commission estimate that if the twelve countries of the Community cooperate on the synchronized introduction of broadband networks, break-even could occur up to seven years earlier than if one country were to proceed alone (see TABLE 3).[7]

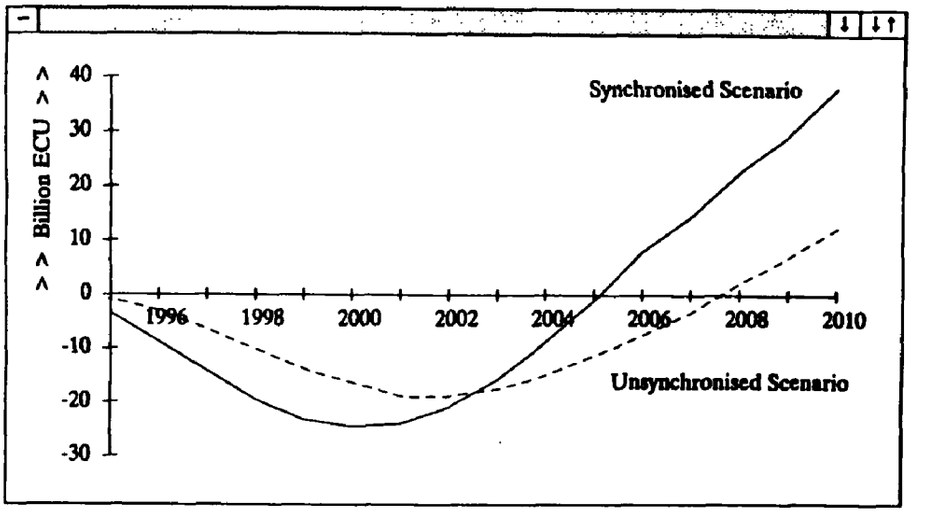
Here, a precedent is already being set in Central and Eastern Europe with the new Trans-European Line (TEL). Beginning in Frankfurt, passing Warsaw, Prague and Bratislava and ending in Budapest, the project consists of a fiber optic cable jointly financed by Germany, Poland, Czechoslovakia and Hungary. It is to be completed by the end of 1993. Although this kind of joint investment and use of facilities is common in the submarine cable environment this is believed to be the first example on land.

With their recent admission to the CEPT, the Eastern bloc countries should also soon be eligible to join the EBIT, GEN and METRAN projects, thus expanding the potential reach of a pan-European infrastructure.

But the commercial success of each of these projects is by no means assured. EBIT, in particular, has been beset by technical, managerial and tariffing problems. Signalling incompatibilities have hindered the TO's ability to communicate across borders, while agreement was impossible to

TABLE 3

Cash Balance for EC-Wide Broadband: Synchronised vs Unsynchronised Introduction



Source: European Commission

reach on tariffing procedures for the pilot projects, with some operators offering free service and others charging high fees. In fact, the situation became so serious that the European Commission cut off funding for the flagship project, a failure that casts considerable doubt on the likely success of GEN and METRAN.[8]

For example, it is unclear whether GEN will be open to all other members of CEPT or what its relationship to METRAN will be. While some observers have interpreted GEN as a political attempt to head-off competition from the HERMES project, it is unlikely that GEN's planned 1991 introduction will be achieved. In the case of METRAN, though the project will be based on SDH technology, for which firm international standards are in place and equipment will be available this year, it has not yet progressed beyond a draft memorandum of understanding between CEPT members.

The timing of METRAN is also extremely conservative, with SDH cross-connect capability planned for 1995 and network management for 1998 only. In the United States, AT&T plans to introduce SDH cross-connects from 1991 on for full deployment throughout the network in 1993, and the incorporation of ATM cross-connects from 1995 on. Further, the decentralized perspective of METRAN, with national peer network management centers, carries the risk of higher costs, technical difficulties, and cooperation problems.

Both GEN and METRAN, like the former CEPT managed data network project, could run into regulatory problems to the extent that they may be perceived as cartels, and in violation of Community competition law, if not structured properly. At the same time, however, for these projects to work, the TOs must exercise the kind of unified control and responsibility across frontiers which customers demand.

But, as international competitors, increasingly attempting to penetrate each other's markets, TOs have less and less incentive to cooperate. In this regard, BT has led the way in breaking up the old operator's club in Europe, primarily with its acquisition of Tymnet. Others are now also pursuing strategies of their own.

HERMES

Outside the national TOs a number of potential pan-European players can already be identified. They include Cable & Wireless (C&W) in the United Kingdom, as well as those North American telecommunications companies eager to expand in Europe, notably AT&T, US Sprint and some of the Regional Bell Operating Companies (RBOCS). They might also include computer and systems integration firms such as IBM, DEC, EDS and GEIS.

New players set to take advantage of expected satellite liberalization in Europe could likewise figure in the equation. But the main potential challenger to the TO's broadband plans to date is HERMES.

HERMES is a private consortium which, in its final phase, would upgrade the existing European railways network towards a broadband network with gateways in at least 60 cities. Dependent on most regulatory constraints being lifted, HERMES will be based on optical fiber technology offering a range of digital leased line, switched narrowband and broadband services, but mainly targeting 64 kbps and 2 Mbps leased line customers with a price level similar to that in the United States.

The investment for the network is calculated to be

around ECU 800 million. The private consortium would own the network and the railroads would only give their legal right for use of the physical wayleaves. Implementation is planned to be finished in eighteen months, with the investors setting a break-even target of four years. Profit after tax of at least 20 % is anticipated from which the railways should get 30%-40% for the land right of ways.

Apart from the European railways in Austria, Belgium, Denmark, France, Germany, the U.K., Italy, the Netherlands, Spain, Sweden, and Switzerland, the HERMES consortia includes Daimler Benz, Banque de Suez, Nynex, Telecolumbus, Tractabel and Sprint International. However, with the withdrawal of Racal Telecommunications earlier this year the consortium lost its sole partner with credentials as a European telecommunications carrier.[9] And so far the railways have not yet taken up the consortium's optical fiber plan, only the more modest proposal to upgrade the railways data network.

Other problems include the number of players in the consortium and the fact that some railroads are pursuing their own telecommunications strategies, and are considering becoming operators themselves, like British Rail. These companies may be reluctant to help a competitor set foot on their home market as well.

It is questionable, therefore, whether the railways have enough political clout to carry HERMES off, particularly in the more conservative countries. These major regulatory hurdles remain to be overcome in order to make third party access possible, and parallel regulatory coordination on interconnect arrangements to the public networks would be essential. All of these will impact the original timescale and ultimately could derail the entire project, at least as originally conceived.

1992 Review

In its landmark 1987 Green Paper on telecommunications liberalization, the European Commission recommended opening up the terminal equipment and value-added services markets to competition, but balked at tackling the underlying user need for inexpensive basic services.[10] It calculated that the introduction of competition on voice telephony and the network infrastructure -- which still accounts for more than 90 percent of the revenues and often 100 percent of the profits of the TOs -- was politically unacceptable.

Since then, by seeking to harmonize Europe's wildly divergent tariff, certification and procurement policies, the European Commission has attempted both to cooperate with and encourage competition among the TOs. But though the adoption of common, pan-European standards and norms remains vital to stemming the fragmentation of Europe's equipment and services markets, both the accelerated pace of technical change and of liberalization are tipping the scales in favour of competition.

In a recent report on the application of the European Commission's Open Network Provision (ONP) rules to voice telephony it was concluded that "there is a significant potential for the realization of additional long term efficiency gains if the reserved [monopoly] status of the voice telephony network and service is relaxed . . . network competition is the logical step in developing efficient and competitive European telecommunications networks which will benefit all users."[11]

Meanwhile, the European Commission's own work on ONP and voice telephony appears to be quickly

evolving to a form of "hands-on" regulation of the TOs as dominant players. The emphasis has shifted to the critical competition issues of interconnection, tariffing, numbering, quality of service and performance.[12]

In this environment, radical change could come as soon as the second half of 1992 when the European Commission will review the status of the voice telephony and network infrastructure monopolies in the Services Directive and the ONP Framework Directive.[13] That review will be a major factor in determining the success not only of HERMES but of other alternative private network projects.

In a number of countries, however, developments have already preempted the 1992 review. In the United Kingdom, the duopoly of British Telecom and Mercury was abolished this year. Sweden has also sanctioned a new fixed network operator to Televerket. Both countries now permit the simple resale of spare capacity and have been at the forefront of efforts to open the market for international resale.

In Germany, pressure to upgrade infrastructure in the country's new Eastern states has led to a relaxation of the voice monopoly on two-way satellite communications. And the second mobile cellular operator has been given permission to build its own national microwave network. A recent study by the German Monopolies Commission also strongly recommended licensing long distance competitors to Deutsche Bundespost Telekom, citing the German railroads and utility companies as potential competitors.[14]

Mobile and satellite communications are also bringing in competition on basic services across Europe through the back door. Competitive national networks for the pan-European GSM digital cellular radio system came into service on 1 July 1991. Potentially, these mobile communications networks could loosen the local loop monopolies of the TOs and introduce competition to the international services markets.

Opportunities from forthcoming satellite liberalization in Europe will likewise probably be exploited, particularly if the liberalization of terrestrial networks proceeds more slowly. Recent studies indicate that private satellite networking based on 2 Mbps capacity and switching, in particular, would be economically attractive.

The Way Ahead

It is likely that the dramatic advance in the cost-effectiveness and versatility of fiber optic systems will be the main driver for the renewal of the world's telecommunications infrastructure over the next decade. But it is also true that no single technological solution will prevail. Satellites are not interchangeable for fiber, nor is mobile communications for fixed voice telephony, yet all will substitute for one another to some degree.

But if it is not yet certain how the market or the technology will evolve, nor which systems will be adopted, it is clear that the telecommunications industry is entering a new era in which the dominant position of the historic TOs will be steadily eroded.

Today, the existing European telecommunications networks must be regarded as separate national networks, which work together for international traffic on the basis of bilateral agreements between the network operators. And only the telephone network, with similar technical usage and tariff principles, can really be regarded as a European network.

The simple fact is that the development of real European services and networks which are not the sum of national services or networks, but from the very beginning are planned and implemented as European, needs to be focussed through a European body with a truly commercial stance. And the focus must come far in advance of the planning phase.

For the TOs, this may be achieved through the new European Institute for Research and Strategic Studies in Telecommunications (EURESCOM). But, it is unclear whether national carrier egoism will prevent EURESCOM, or similar cooperative projects (GEN or METRAN) from developing new tariff and marketing structures for fear of conflicting with national strategies.

The solution could also, of course, come from the private sector. HERMES may not be the final solution. It will almost certainly not be the only solution, but the project clearly points the way to the future, with the potential to demonstrate the large elasticity of demand that exists for competitive networks in Europe. Given current constraints, however, it is perhaps unlikely that any projects will materialize with a full pan-European focus. It is more likely that a project between two to three countries, possibly in the North of Europe, will emerge building on existing traffic potential.

But whether the final solution comes from a joint effort among the TOs, an independent carrier that draws on the resources of the TOs, or from the private sector -- or, for that matter, from a mix of fiber, mobile or satellite technologies -- is not of primary importance. The solution to the relatively slow expansion of international communications in Europe would seem to lie in further Community-wide liberalization, coupled with incentives to stimulate improved coordination of infrastructure supply. Improved coordination of alternative transnational networks and measures to ensure that networks can be interconnected and used at competitive prices by all users is the key to effective advanced communications across national boundaries.

The need is for a new brand of politics that will create the conditions for this new brand of networks. In short, the need is for a European vision of the future.

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2. See "Missing Networks A European Challenge: Proposals for the Renewal of Europe's Infrastructure", European Roundtable of Industrialists, Brussels 1991; "Perspectives for Advanced Communications in Europe (PACE)", Vol I-II, European Commission, November 1989; and "Perspectives on Advanced Communications in Europe (PACE): 1990", Vol I-VIII, European Commission, November 1990.

3. See "Competition Guidelines on Telecommunications Policy in the European Community", European Commission, Brussels, 1991 and the Services and ONP Framework Directives (90/337 and 90/338 EC). Official Journal at the European Communities, Vol. 33, No. L 192/10 24 July 1990.

4. See "Final Report of the European Engineering Planning Group", Reseaux Associes pour Recherche Europeenne (RARE), Amsterdam, May 1991.

5. See "Investigation and Definition of a Transnational Broadband Backbone (TBB)" and "European Market Research for Broadband Services", European Telecommunication Consultancy Organization (ETCO), London 1988.

6. CommunicationsWeek International, December 11, 1989 and July 2, 1990.

7. "What Price Broadband?", Analysys, Proceedings of Blenheim Online Broadband Conference, London, 1991.

8. CommunicationsWeek International, November 12, 1990.

9. CommunicationsWeek International, May 27, 1991.

10. "Towards a Dynamic European Economy: Green Paper on the Development of the Common Market for Telecommunications Services and Equipment", COM (87) 290, Final, 30 June 1987.

11. "Study on the Application of Open Network Provision to Voice Telephony", National Economic Research Associates (NERA), London, 1991.

12. "Analysis Report on the Application of ONP to Voice Telephony", European Commission, Brussels, July 1991.

13. "The Networked Economy Conference", Speech by Sir Leon Brittan and Roundtable Discussion, Proceedings of the Conference Organized by CommunicationsWeek International in association with Blenhein Online, Paris, March 1991.

14. See "Zur Neuordnung Der TeleKommunikation" Sonder Gutachten Der Monopolkommission, Koln, July 1991.

The International Market for Multimedia Communications: Looking Beyond The Fax Machine

By Kiyoto Uehara and Hirotoshi Nishida *

1. Introduction

Recent years have seen a significant increase in non-voice international telecommunications, especially fax (facsimile) transmissions. Today more than half of the traffic between Japan and the United States is transmitted via fax machines. Since the usage of these machines is increasing steadily, we assume that the volume of international fax telecommunications will continue to grow.

However, fax transmission is just one of the numerous non-voice telecommunications modes available to us today. Others include audio-visual conferencing and PC (personal computers) communications, whose usage is making quantum jumps, especially in the developed world.

With the international standardization of ISDN (Integrated Services Digital Network) interfaces, more user-friendly multimedia communications have become possible. In this article, we shall focus on ISDN-based multimedia communications.

We look first, however, at the current status of ISDN in Japan and the technological background that has made such communications feasible. Thereafter, we shall outline the progress of multimedia development up to the early 21st century.

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2. ISDN Services in Japan

2.1 Provision of ISDN Services

NTT, Japan's largest domestic telephone carrier, began offering its version of basic rate ISDN INS Net 64 service in April, 1988. Consisting of two B (64 kb/s) channels and one D (16 kb/s) channel, INS is offered over an existing subscriber line. The B channels are utilized as basic telephone lines, as well as for data communications such as digital circuit-switched services and/or packet switched services. The D channel can be utilized as a control line for call-connection and as a data line for packet switched services.

In June, 1989, NTT introduced INS Net 1500, utilizing primary rate interface with optical fibers for local loops. It can provide service with 23 B channels, and one D channel (both 64 kb/s), or a combined use of six B channels (in total, 384 kb/s), which may be used for data transmission and video conferences. INS Net 1500 is also available at 1.5 Mb/s.

Furthermore, since August 1990, NTT has been offering INS Net Packet. This is a packet switched data transmission service, using either B or D

channels of the ISDN services.

Along with progress in the standardization of B-ISDN, broadband exchange service will be introduced by NTT in 1995. However, before this service can be widely used, NTT must install a greater number of optical fiber subscriber lines. This requires substantial investment, which may be risky, because the future demand for this service is uncertain.

An economically feasible method of introducing the broadband exchange service may be to utilize FTTC (fiber to the curb) rather than FTTH (fiber to the home). The so-called last mile to the home still would employ copper cables.

In other words, FTTC will enable us to use the existing PSTN (public switched telephone network) and only replace the copper cables linking the COs (central offices) to the curb with optical fibers.

2.2 Present Usage and Future Prospects for ISDN

At March 31, 1991, the total number of ISDN lines served by NTT was 32,913 -- 27,313 INS Net 64 and 560 INS Net 1500 lines (one INS Net 1500 line is equivalent to 10 INS Net 64 lines). By June 30 the total had increased by over 15,000 lines to 48,055, a 46% increase in three months (see Fig. 1.1).

We estimate this number at 1,060,000 by the end of fiscal year 1995 (22 times the number in June 1991), and at 14,155,000 by the end of fiscal year 2000 (295 times of the number in June 1991), (see Fig. 1.2).

Compared with the growth in DDX-P (NTT's Packet Switched Services), ISDN services have done very well. In the case of DD-P services, it took 5 years to reach the 10,000-lines level.

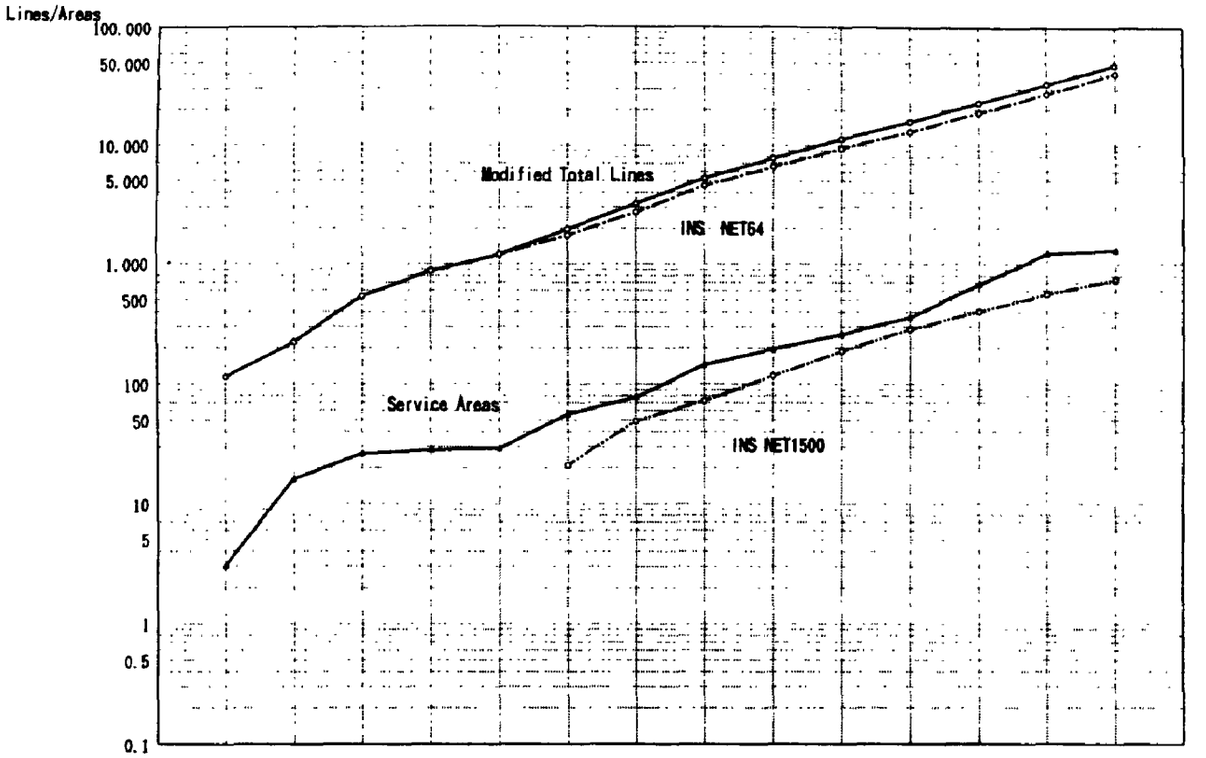
One of the factors behind this strong growth is the strategy employed by NTT in expanding service areas. Unlike the traditional rigid methods in which little attention is paid to users' needs, NTT concentrated its efforts in meeting users' demands. For instance, a company might need a communications network to interlink its head office, branch offices and plants. If some of these offices or plants were located in areas not served by ISDN, then NTT gave first priority to expanding ISDN services to such areas. Thus, customers would not be dissatisfied with only partial service; they would get the full benefit of ISDN.

The situation alluded to above, however, rarely occurred because NTT actually expanded INS service areas very rapidly. Service was first introduced in 1988 in the major metropolitan areas of Tokyo, Nagoya and Osaka. At March 31, 1989, the largest 29 cities in Japan were covered. The total number of service areas reached 199 cities by March 31, 1990; and 1,222 cities by March 31, 1991. Today, almost 90% of Japan is served by ISDN!

3. ISDN Terminals As Multimedia Terminals

ISDN services may be applied to a wide range of fields. In order to develop ISDN terminals, it is necessary to understand and appreciate users' needs, as well as to promote international standardization of telematic terminals. Moreover, the development of new services must ensure that they can be made available at low cost.

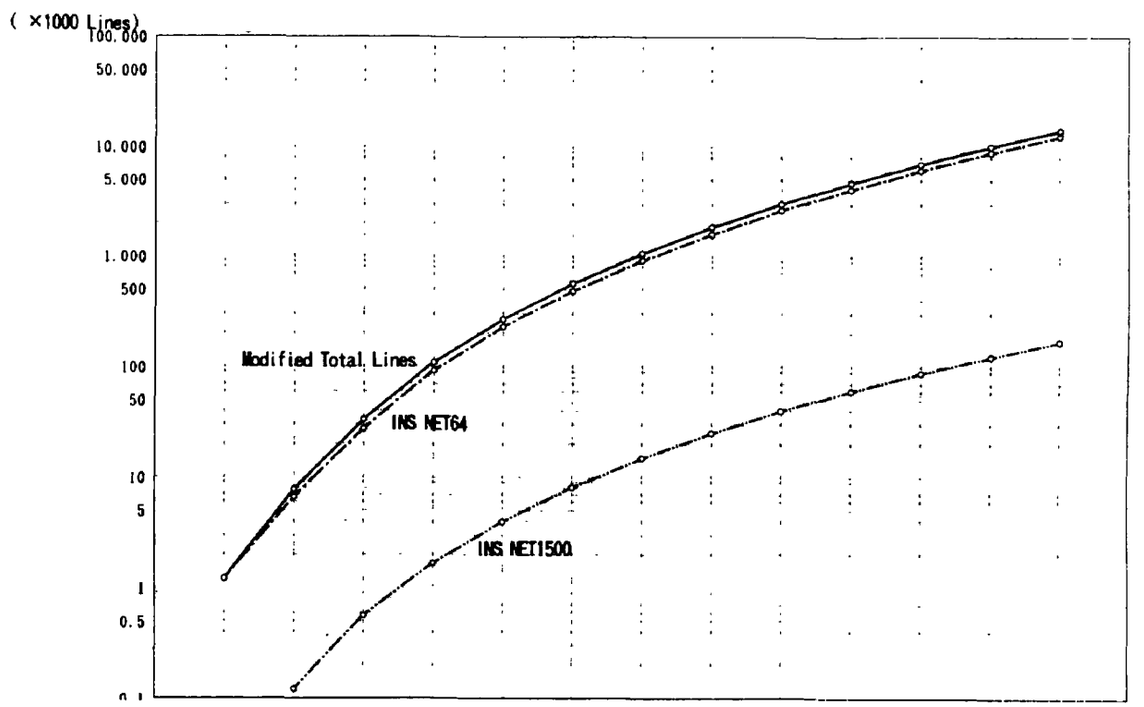
As for the telematic terminals, only a few services, such as G4 fax and video conferencing services, have been standardized. It is expected that services which may be offered by multimedia communications terminals, such as audio-graphic teleconference service or open document architecture, will be standardized soon.



	'88.4	6	9	12	'89.3	6	9	12	'90.3	6	9	12	'91.3	6
Modified Total Lines	114	221	537	877	1,198	1,949	3,213	5,274	7,744	11,283	15,902	22,893	32,913	48,055
INS NET64	114	221	537	877	1,198	1,739	2,723	4,554	6,574	9,413	13,062	18,873	27,313	40,595
INS NET1500	-	-	-	-	-	21	49	72	117	187	284	402	560	746
Service Areas	3	16	26	28	29	56	77	145	195	257	359	674	1,222	1,316

(Note: Modified Total Lines= INS NET64 +INS NET1500 ×10)

Fig. 1.1 The Number Of INS NET Lines and Service Areas



	'89.3	'90.3	'91.3	'92.3	'93.3	'94.3	'95.3	'96.3	'97.3	'98.3	'99.3	'00.3	'01.3
Modified Total Lines	1.2	7.7	32.9	109	266	560	1,059	1,846	3,018	4,692	7,003	10,100	14,154
INS NET64	1.2	6.6	27.3	92	226	479	911	1,595	2,619	4,088	6,123	8,860	12,454
INS NET1500	—	0.12	5.60	1.7	4.0	8.1	14.8	25.1	39.9	60.4	88.0	124.0	170.0

Actual Figure ← → Estimated

(Note: Modified Total Lines = INS NET64 + INS NET1500 ×10)

Fig. 1.2 Future Prospects for INS Net Services

Moreover, telematic terminals will benefit from the following three new elements/components in the near future: 1) large capacity memory elements, which are indispensable to the development of advanced, high-speed, compact terminals; 2) semiconductor elements permitting very high-speed information processing; and 3) high-definition, full-color, very thin Liquid Crystal Displays (LCD's).

An outline of the presently available ISDN terminals in Japan, and future prospects follows:

(1) Terminal Adapters

The following four types of terminal interfaces are now available in Japan: (a) an interface between circuit switched services of INS Net 64 and existing services of DDX-C, and leased circuits and analogue lines with modems; (b) between packet switched services of INS Net 64 and existing DDX-P services; (c) for both circuit and packet switched services of INS Net 64; and (d) for INS Net 1500.

Basic charges for INS Net services are lower than those for DDX services or digital leased circuit services. Communication charges for voice and/or data services using B channels are identical to those for analog services. Thus, digital services may be utilized at comparatively lower costs if customers subscribe to INS Net services. Therefore, many customers who are presently using DDX services and/or leased circuits services, may migrate to INS Net services.

(2) Multifunctional Digital Telephones

When NTT's INS-Net services were introduced, digital telephones were rather expensive compared with analogue telephones, partly because NTT engineers had added many features to simple voice communications services, such as teleconferencing, high-quality communications (7kHz) and image/drawing functions. Recently, however, the price of digital telephones has gone down considerably, thanks to several technological innovations. Today, NTT offers a digital telephone at less than ¥33,000 (about $230).

As for voice services, the 3.4 kHz voice signal is now transmitted via a 64 kb/s transmission path, but efficient coding technologies make it possible to transmit this 3.4 kHz signal via 32 kb/s, 16 kb/s and 8 kb/s transmission paths. On the other hand, broadband Hi-Fi transmission at 15 kHz and 20 kHz would be standardized at a 7 kHz transmission. This would make the utilization of stereo broadcasting possible via INS-Net services.

(3) G4 Facsimile Machines

The G4 fax machine perhaps provides a good example of the speed and quality of ISDN services. Users may transmit a fax page (in about 3 seconds) while making calls over the same line. The sizes of machines vary from console types to desk types. Some machines (especially console types) permit the transmission of documents by putting them on top of the machine (book-type), while others can transmit documents as large as A-3 size. As for the paper, a plain paper machine once cost as much as ¥2.5 million (about $18,000). NTT, therefore, began selling thermal paper machines in 1991 at ¥980,000 (about $7,500) per machine. Since most fax machines are still G3 types, the new G4 machines provide G3 functions as well. Standards for G4 color fax will be recommended in the near future.

(4) Video Conferencing Services

ISDN services make it easier to hold video conferences, which are in increasing demand by customers. It has become easier to use this service internationally since the International Telecommunications Union (ITU) International

Telegraph and Telephone Consultative (CCITT) adopted a recommendation for the standardization of international video conferencing services in 1990. The CCITT's recommendation has already led to a price reduction in the video conferencing systems.

Prior to the recommendation, it cost more than ¥10 million (about $73,000) per side; now it costs ¥7 million (about $51,000). Further technological innovations, such as the usage of Large Scale Integrations (LSI) in codecs, are expected to further lower the prices. As for video telephone service, one service provider began offering a video telephone system with a 5-inch color LCD display, at ¥950,000 (about $7,000).

For future teleconferencing services, it is expected that there will be standardization of systems which can permit multimedia communications such as audio-graphic teleconferences or open document architectures.

(5) Image Transfer Systems/Remote Monitors

ISDN also enables various image transfer applications. Still picture transfer systems, which are connected to a product database, provide real-time retrieval services. Other image transfer applications can be used to monitor cash dispenser machines, parking lots and warehouses.

(6) Others

Other ISDN services include interconnection of existing PBXs, multiplexers, and key-telephone systems. ISDN also facilitates the transfer of floppy disks (FD's) through special FD transfer terminals.

4. Usage of ISDN

Many companies in Japan are now employing ISDN services because:

(1) Basic and communications charges for ISDN are set lower than those for comparable digital services;

(2) Large volumes of information may be transmitted at lower communications rate;

(3) Image transmissions are available;

(4) A single line can be connected to several terminals and thus may be used as a multi-media communications tool; and

(5) Internationally standardized interfaces are available.

As the usage of multiple terminals and multimedia communications increased, ISDN applications are also bound to increase in the near future.

Mostly ISDN services are employed for data communications. Some principal cases are outlined below:

(1) The Distribution Industry

In the distribution industry, POS (point-of-sale) systems as well as sales-order systems have been widely introduced. Such systems enable member shops and branch offices to transmit data over communications lines to host computers at head offices, etc. -- thus making real time sales management and physical and distribution management possible.

Furthermore, by utilizing these systems, the industry was better able to develop its Strategic Information Systems (SIS) for utilization of information. Formerly, SIS depended on ordinary telephone lines or Value Added Network services. ISDN services have made SIS easier. For example,

Seven-Eleven Japan has changed more than 4,000 ordinary telephone lines, connecting member shops and their main computer to INS-Net 64. Now these shops can transmit information such as merchandise stock, sales and orders, etc., using G4 fax machines. This is the first step towards multimedia communications.

(2) The Manufacturing Industry

Many Japanese manufacturers have begun to use CIM (Computer Integrated Manufacturing). Under a CIM system, sales information is sent to the production management system, thereby optimizing component orders. Companies can send design information to sales and manufacturing departments, and thus aid sales operations and shorten the production period.

Companies thus enhance the information flow between the head office and the sales offices, so they send image information, such as pictures of new products or designs, in addition to orders. For example, Toyota is going to replace thousands of their communication lines with INS-Net lines, and thus reinforce its sales strategies.

Another example is that of a housing contractor. Contractors use CAD system together with INS-Net services, and thus design houses which better satisfy customers. For this industry, terminals need to be developed which can show high resolution images. For now, G4 fax machines and CAD systems are being introduced connecting design departments at factories and sales companies.

(3) The Printing Industry

The printing industry paid attention to ISDN services in very early stages. It uses G4 fax machines between print presses and clients to shorten the proofreading and editing periods. Printers also send the contents of floppy disks via ISDN service from their offices to factories and thus eliminate the need to use couriers. For this industry, color G4 fax machines and color video transmission systems ought to be developed.

(4) The Broadcasting Industry

Since INS-Net can transmit 7kHz voice, broadcasters use this service for transmission of radio programs from remote locations. INS-Net service might be utilized for stereo music broadcasting.

(5) Others

Other ISDN applications now under development in Japan include medical image diagnoses, home banking, home shopping and home security systems.

4. Current Status of International ISDN

In Japan, three companies (KDD, ITJ, IDC) offer international communications services. Among them, KDD began offering international ISDN in June 1989. At first, service was only to the U.K. and the U.S. Recently, KDD added Australia, France, Italy, San Marino, Vatican City, Germany, Belgium, Singapore and Hong Kong. KDD is planning to add Korea, Malaysia, Indonesia and Thailand in the near future.

Customers can use KDD's international ISDN services via NTT's INS-Net services or may access KDD's ISDN switches directly. Presently, circuit switched services using B channels of 64 kb/s are being offered. Customers can reach several of KDD's overseas networks such as VENUS-P (packet-switched service), F-port (international fax communications network) and Mesavia (international mailbox service) via KDD's ISDN lines.

They may also use VENUS-LP and/or Hybrid Link service (international digital leased circuit service) if their lines are directly connected to KDD's international ISDN switches (See Fig. 4.1).

KDD offers a basic rate interface (2B+D: B=64 kb/s, D=16b/s) and a primary rate interface (23B+D). Some ISDN services that KDD may introduce in the near future are: Caller ID, sub-address services and several value-added services, such as terminal selection function by protocol identification. Additionally, the introduction of (384 kb/s) digital service is being examined.

The number of international ISDN subscriptions was 120 lines in March 1990, and 390 in March 1991. About 40 to 50 new lines are being added every month and it is expected to reach the 900 level by March 1992. Major applications include: document exchange via G4 fax, video conferencing (replacing overseas business trips), and high speed data communications such as file transfers. Usage by industries is shown in Fig. 4.3, and usage by routes is shown in Fig. 4.2.

5. Asian ISDN and Multimedia Communications Market

We estimate that the international switched telecommunications traffic including ISDN service to and from Japan will increase at the pace outlined in Fig. 5.1a and Fig. 5.1b. According to our estimation, the total traffic in 1995 will be 2.89 times of that in 1990; and the total traffic of 2000 will be 8.14 times of that in 1990. As for the regional breakdown for 2000, North America accounts for 35.2%, Asia for 41.2%, Europe for 15.2%, and other areas for 8.4%. We estimate that the share of Korea, Hong Kong, Singapore, Thailand, Malaysia and Indonesia will increase throughout the 1990s.

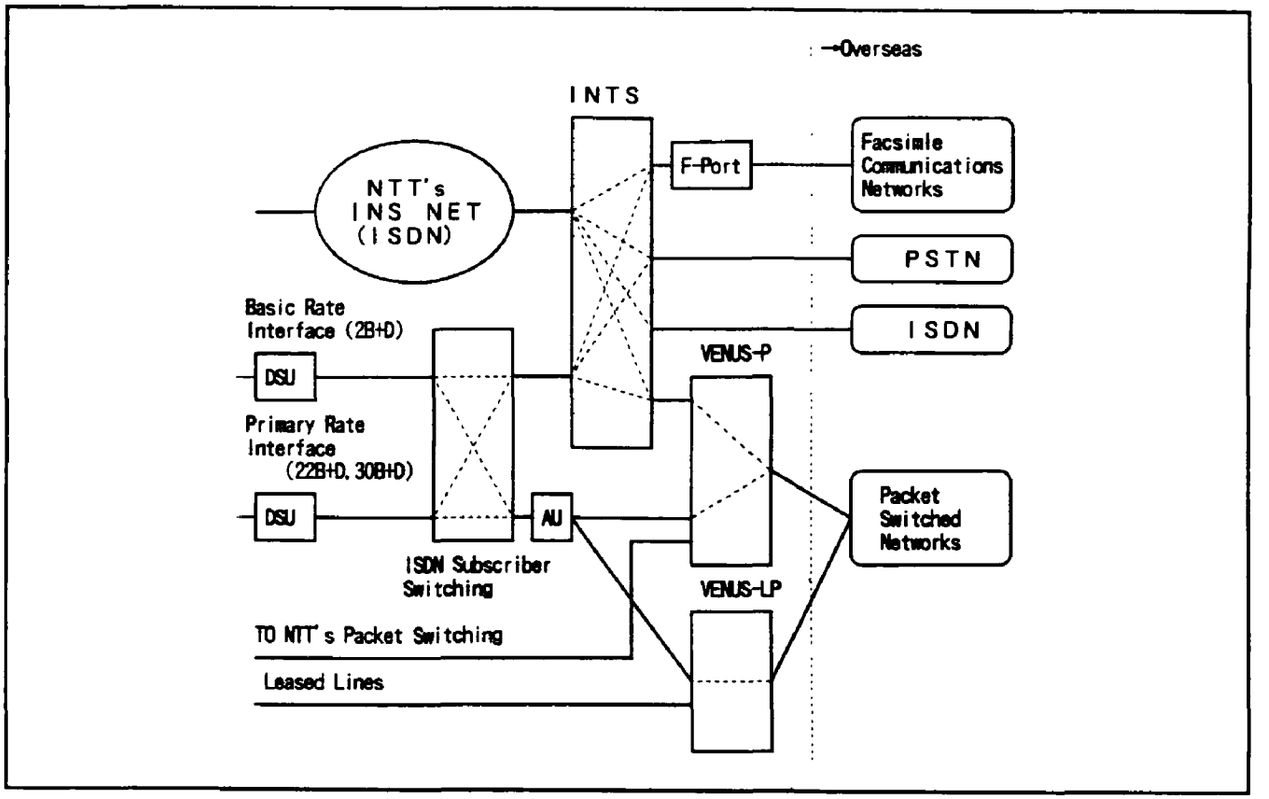


Fig. 4.1 KDD's International ISDN Network

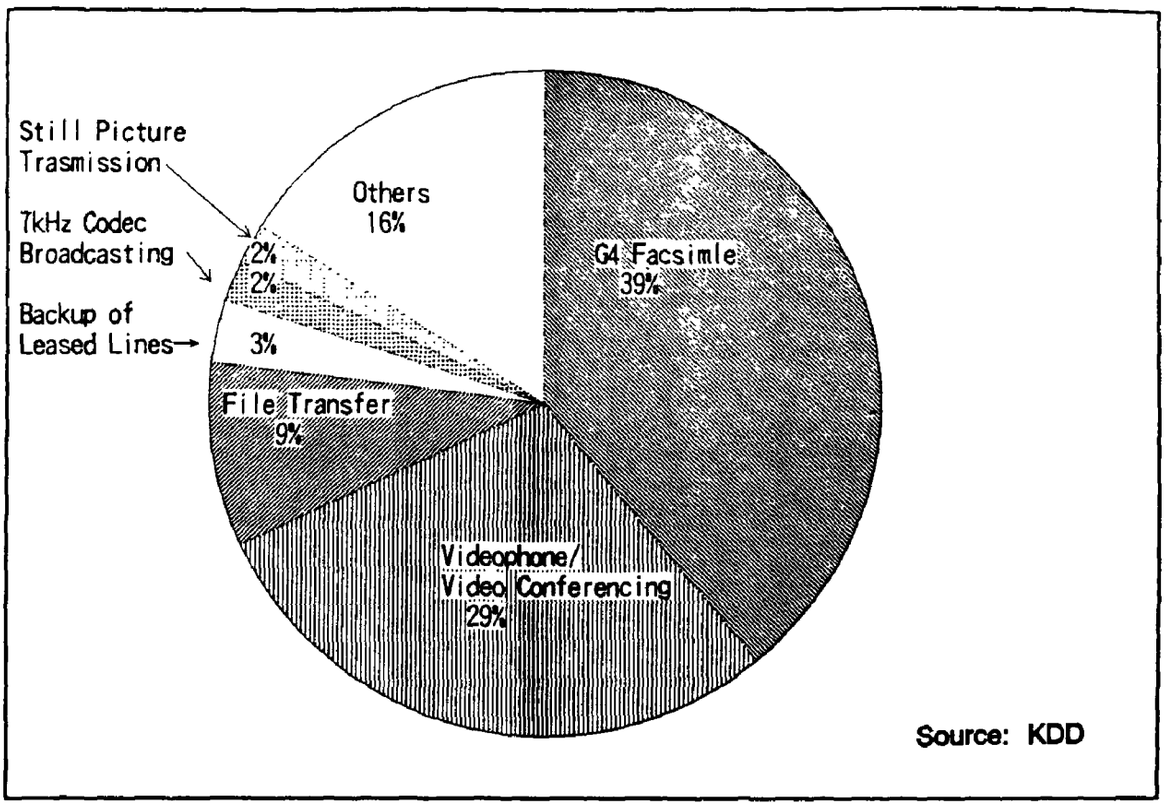


Fig. 4.2 Usage of International ISDN

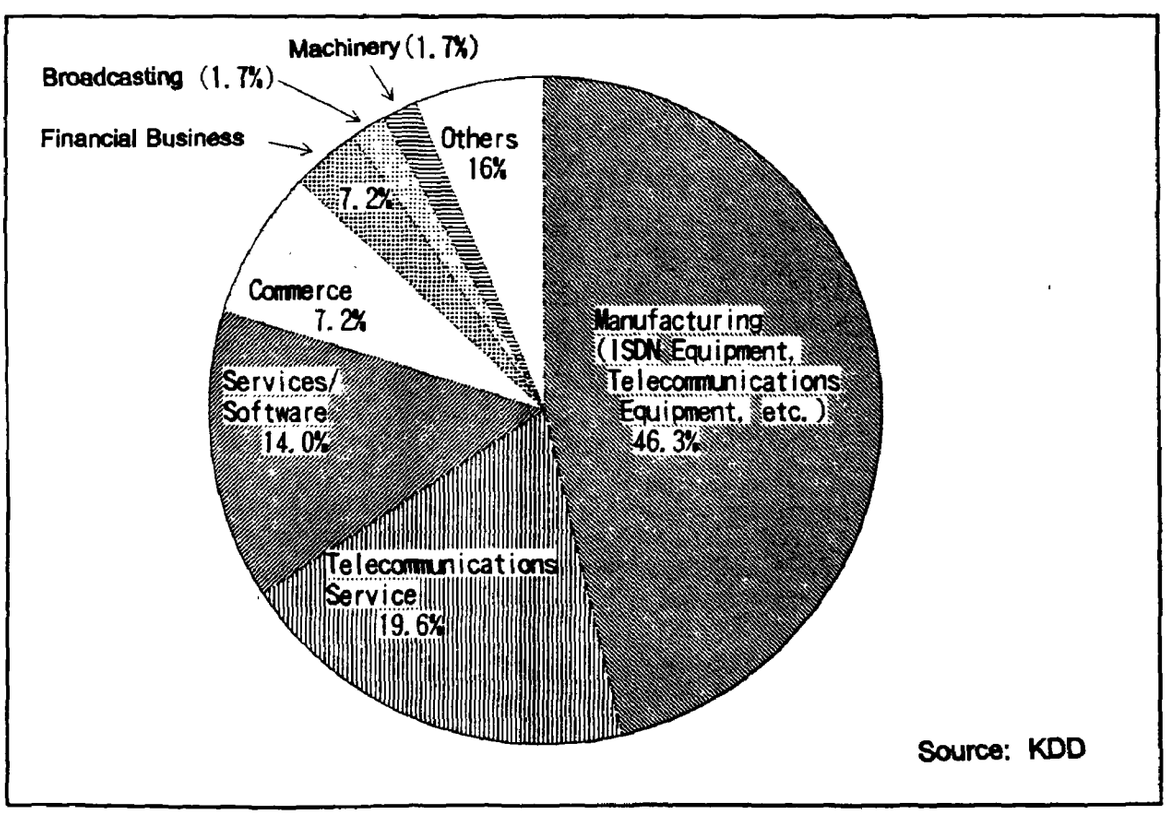


Fig. 4.3 Usage By Industrial Classification of International ISDN

Surveys conducted by InfoCom Research, Inc., suggest that non-voice traffic such as fax, data transfer, and other image communications will constitute a growing share of international traffic. Since users' demand for several media, employing ISDN services seems to be strong, and becoming stronger, we expect non-voice traffic will increase at a higher pace than voice traffic.

We estimate that in 2000 the share of telecommunications traffic by media will be as follows: telephones - 31%; facsimiles - 32%; data - 27%; and images - 10% (see Fig. 5.2).

Six principal Asian countries (Korea, Hong Kong, Singapore, Thailand, Malaysia, Indonesia) are promoting the infrastructure of ISDN. The ISDN market for these six countries may increase from less than 1% of total traffic in 1995 to 7% in the year 2000.

6. Conclusion

Multimedia communications can be expected to increase dramatically as ISDN increases communications efficiency and ease of terminal operations. Further advances are also likely in standardization and technological developments during the 1990s.

But, in order to take advantage of such standardization and technological development, it would be desirable to establish an international research organization where users, manufacturers, and carriers from each country may cooperate and carry out field trials. It is also necessary to establish infrastructures of ISDN in several countries. The industrially advanced countries should assist the plans of other countries in this regard, financially as well as technologically.

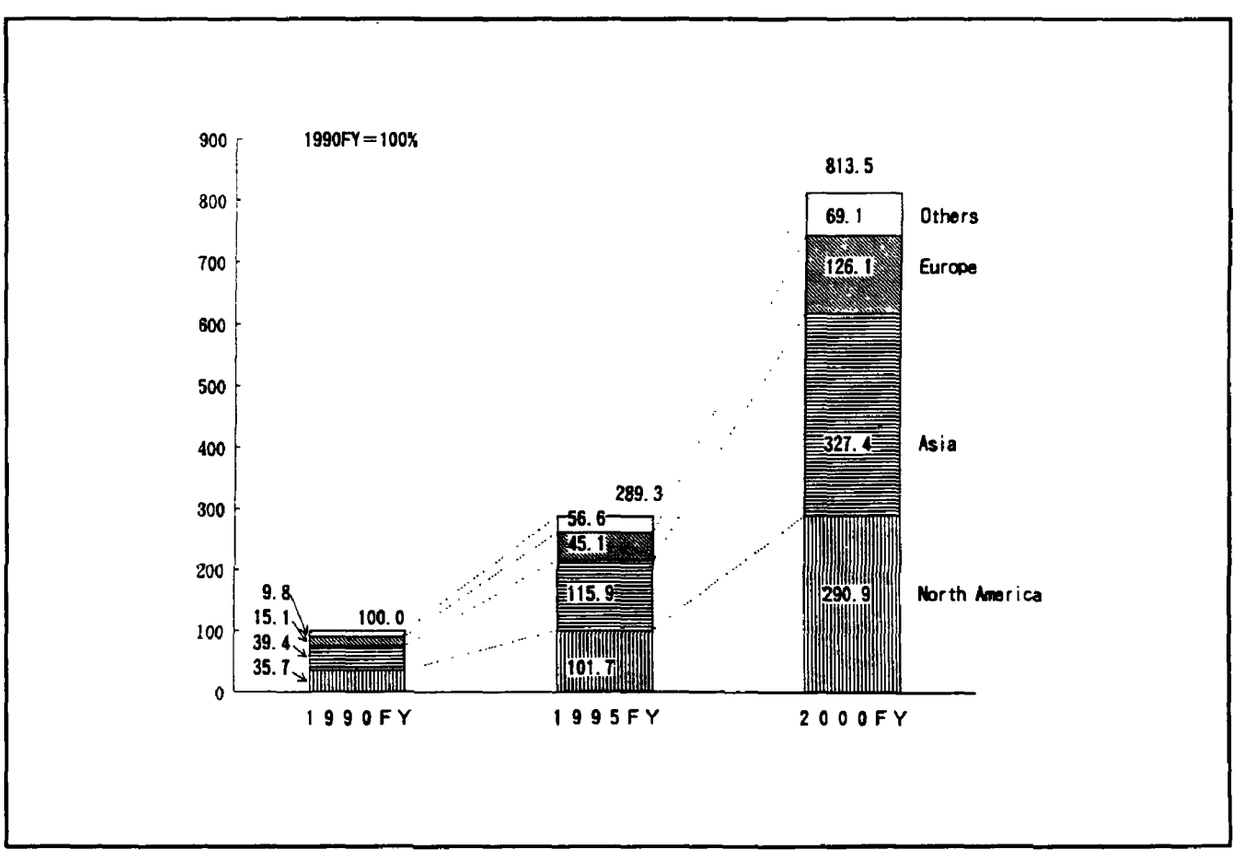


Fig. 5.1 a Growth in Japan's Total International Traffic by Global Regions (Incoming & Outgoing)

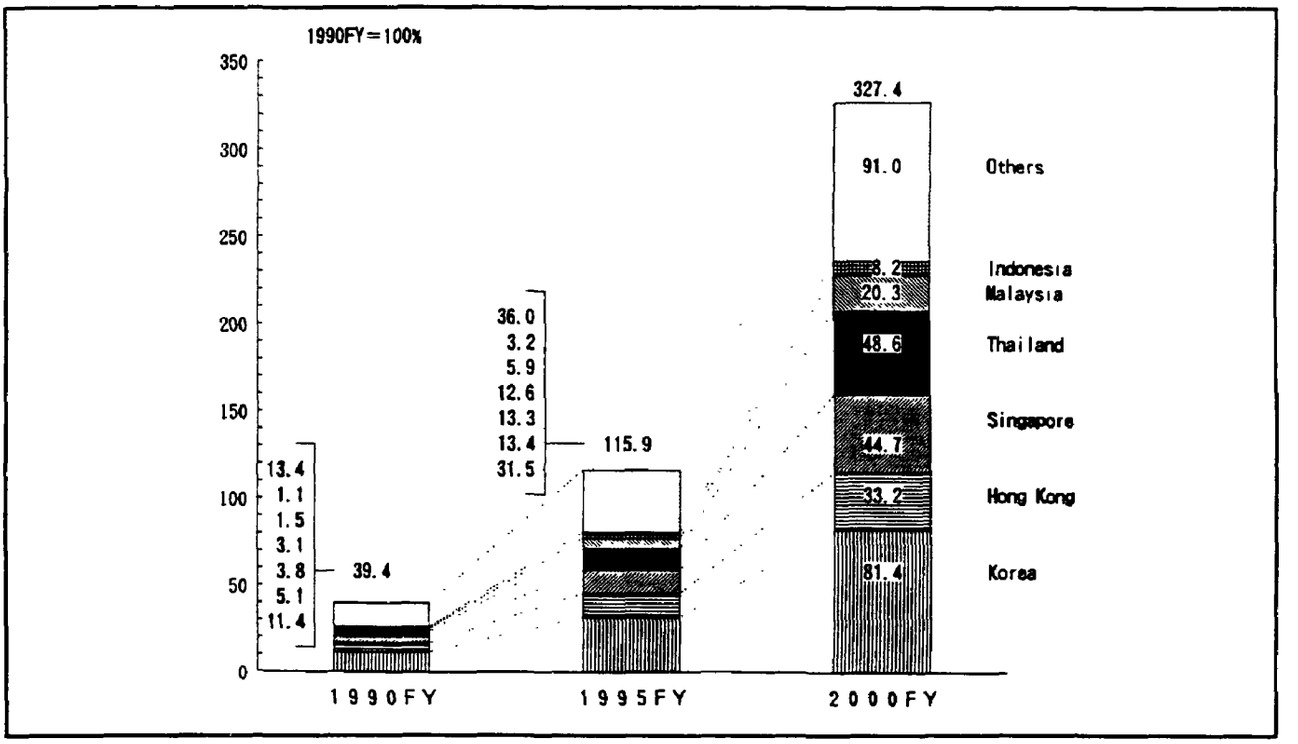


Fig. 5.1 b Growth In Japan's International Traffic by Principal Asian Countries(Incoming & Outgoing)

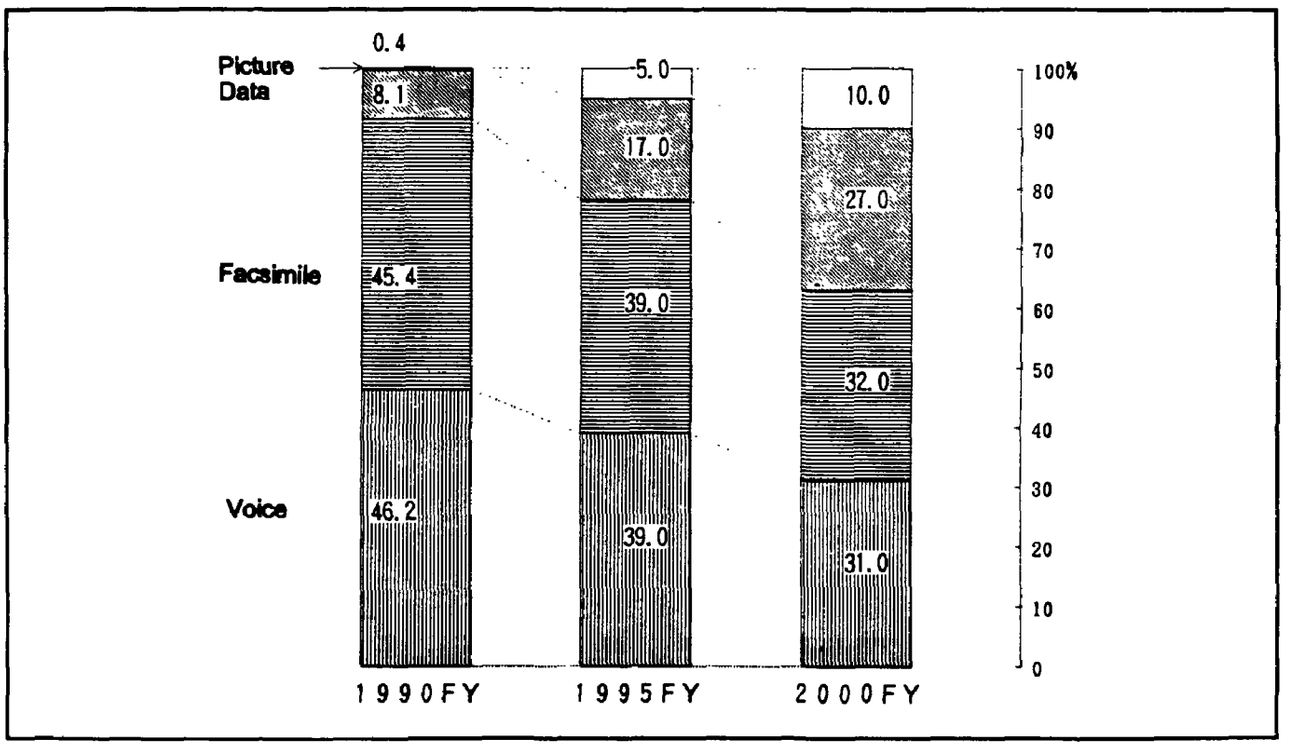


Fig. 5.2 Usage by Media of International Public Telecommunications Network

Whose Traffic Is It Anyway? A Survey Of Foreign Investment in North American Telecommunication Companies And National Ownership Rules

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By Gregory C. Staple

Preface

Whose traffic is it anyway?

There was once but one answer. Telecoms traffic belonged to the national PTT or a private operator with a similarly exclusive national franchise. But no longer. The vast national pools of traffic, once a country's patrimony, as much as its forests or its mines, have become the subject of multinational bidding.

Technology, market liberalization and corporate users are driving the process forward. Technology now enables multinational companies to hub their international traffic through a private line network originating in the most attractive national entrepot. The deregulation of value added services means that a fax or voice message from London to Rome may be lodged in an electronic mail box and then forwarded by an American company. Or one from Sweden. The new readiness of large users (IBM, Unilever) to "outsource" management of their networks means that a foreign company need no longer own any domestic facilities itself in order to manage a large slice of the traffic delivered to the companies which do own them.

So whose traffic is it? Surely it belongs to the customers who originate it. They pay the bill.

Many countries are moving toward that conclusion. Yet the pace is uneven, the terms highly contentious and the time frame unpredictable. Witness, for example, the long-running debate within the GATT negotiations on national treatment and the right of establishment for basic telephone services. Or the differences within Europe over what telecom services shall be reserved exclusively for Telecommunication Administrations and for how long.

Witness too the persistence of national rules which limit the extent to which telecoms carriers can be owned by foreigners. In effect, these ownership rules are a de facto traffic set-aside for national carriers. Even in competitive markets, such as Japan, the U.S. and the U.K., foreign ownership rules permit users to deliver traffic to a carrier of their choice, any carrier, so long as it is locally owned.

The debate over the merits of these national ownership rules -- over whose traffic it is or on national treatment, to use the vocabulary of trade negotiations -- is part of the larger challenge to national sovereignty posed by the growth of a global economy. The language of the debate is often one of "us" and "them", to borrow from

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Harvard Professor Robert Reich.[1] But, as Reich properly asks, in an age of networked production and supranational carriers, "Who is 'us'?" And "Who is 'them'?"

"Us" is not necessarily a company incorporated in our territory which manufactures and sells most of its products outside our borders. "Them" is not necessarily a domestic subsidiary of a foreign company which commits its capital and technology to develop a new service in our communities.

Global managers of supranational corporations have their own priorities -- winning market share, increasing stockholder value, securing the bottom line. Similarly, every nation wants to improve its economic performance and provide the jobs and services its people want. National security is also a legitimate concern. That is why all countries have basic ground rules -- regarding taxation, competition, employment and so on -- for doing business. For telecommunication carriers, these include price and service obligations as well.

"They must abide by "our" rules. But so long as "they" do, how much does it matter today what a company's national pedigree is. Isn't a common carrier a common carrier? Or whose traffic is it anyway?

Contents

This essay explores some of these issues in the context of the North American market for telecom services. There are three parts. Part one offers a primer on the rules regarding foreign ownership of telecom service providers in the U.S., Canada and Mexico.

Part two surveys the extent of foreign participation in these three markets, national ownership rules notwithstanding. It looks at who owns what and the likely targets for future foreign investment.

A final part resumes the opening discussion on national ownership laws and global markets. It suggests that, although North American telecoms traffic, especially in the U.S. and Mexico, is no longer the exclusive preserve of national carriers, the 1990s will see pressures for greater internationalization. Accordingly it now may be time, especially in light of the hemisphere's new free trade negotiations (see Figure 1), for the telecom industry and governments in North America to start a more thorough examination of the costs and benefits of national ownership rules than has occurred to date. And they should invite their counterparts in Europe and Asia to do so as well.

A. National Ownership Requirements For Telecommunication Service Providers

1. The United States

A foreign company may, in principle, provide any telecommunication service which can be offered by an American company. And, excepting government procurement, national treatment of foreign service providers is the rule. However, the U.S. does restrict foreign ownership or control of certain radio licenses issued by the Federal Communications Commission (FCC). These limits are stated in Section 310(b) of the Communications Act of 1934.[2]

Section 310(b) is often perceived as an unavoidable barrier to foreign entry. Telecom networks traditionally have relied upon point-to-point microwave and satellite radio facilities for trunk routes. But, as discussed below, the advent of fiber optic systems and regulatory flexibility have

reduced Section 310(b)'s significance to foreign investors, although trade negotiators on both sides may have reason to downplay these developments.

(a) Section 310(b) of the Communications Act

Section 310(b) states that no broadcast or common carrier or aeronautical radio license shall be granted to or held by an alien or a foreign corporation. Nor may such a license be directly held by any corporation with an alien officer or director or in which more than 20% of the capital stock is owned or voted by aliens or by a foreign government or by a corporation organized under the laws of a foreign country. Section 310(b)(3).

Unless the FCC finds that a waiver of the limits would be in the public interest, the statute also bars such radio licenses from being held by any corporation directly or indirectly controlled by another corporation of which any officer or more than 25% of the directors are aliens or of which more than 25% of the capital stock is owned or voted by aliens or by a foreign government or by a corporation organized under the laws of a foreign country. Section 310(b)(4).

What do these provisions mean in practice?

First, in the telecommunications field, the law only applies to common carrier and aeronautical licenses; private radio facilities, such as Specialized Mobile Radio (SMR) networks and microwave radio stations used for Cable Auxiliary Relay Services (CARS) are outside the statute's reach.[3] These are significant exceptions because the FCC generally permits the excess capacity of private (intra-corporate) radio facilities to be sold for a profit. Moreover the U.S. cable television industry already has a "wire" into over 80% of U.S. households.

Second, the 20% direct / 25% indirect ceilings on alien stock ownership in Section 310(b) permit a foreign company, in aggregate, to own a substantial minority stake. The FCC does not cumulate a company's direct and indirect interests; it is permissible for a foreign company to own up to 20% directly and up to 25% indirectly. Further, the FCC uses a multiplier to account for the reduction of influence on the licensee caused by successive layers of minority ownership. For example, a foreign investor who owns 40% of Company A which holds 45% of the licensee Company B would be held to have a permissible 18% (.45 x .40) interest in Company B.[4]

Third, where a foreign interest is held indirectly (ie, through an intermediary company, as in the above example) the FCC may waive the 25% statutory limit if it would serve the public interest. A waiver is most likely to be granted if a common carrier license (ie, non-broadcast) is involved; the U.S. company might otherwise lack the funds to stay in business causing significant harm to customers and employees; the foreigners involved are from a country offering like opportunities for U.S. investment; and the FCC is satisfied that a U.S. national will maintain control over the license in question.

Fourth, where a waiver is not possible (eg, the foreign interest is held directly) the FCC seems willing to apply Section 310(b) flexibly to permit a U.S. company to accommodate a foreign investor so long as the deal leaves control of the radio license(s) in U.S. hands. This may be done: (a) by having the foreign entity manage the traffic carried by the Section 310(b) facilities rather than acquiring the facilities or (b) by segregating the Section 310(b) facilities from the communications business to be acquired by a foreigner and then executing a lease arrangement for the necessary transmission capacity.

For example, in one traffic management case, the FCC permitted a foreign company to operate and maintain a series of microwave facilities and to lease 90% of their capacity so long as the U.S. licensee (also owned 25% indirectly by the foreign company) maintained ultimate control.[5]

The second option is illustrated by Pacific Telecom's pending agreement to sell TRT/FTC to Cable & Wireless North America (C&WNA)[6]. See also Table 1. There, as an incident to the sale, the seller has proposed to transfer its radio licenses (primarily for earth station facilities) to a new subsidiary which, upon closing would lease 100% of the facilities' capacity to the buyer under a transmission services agreement. The seller has also agreed to manage the Section 310(b) facilities for the buyer under a separate agreement which, while allowing the buyer to designate the manager, leaves ultimate control in the hands of the seller.

At this writing, the FCC is expected to approve the TRT/FTC deal in the last quarter of 1991. Caveat emptor: If it does go through, the precedential value of the TRT/FTC case must be treated cautiously. C&WNA, the buyer, is well known to the FCC (it has been a major resale carrier in the U.S. since 1985) And the U.K., home of the C & W group, has shown a willingness to grant U.S. companies significant investment opportunities in its telecommunications sector.

The real lesson of C&W's success in North America may have more to do with network engineering than law. In 1989, CWCI, the existing C&W carrier in North America, had over $275 million in revenues relying exclusively on leased facilities and a national fiber optic cable network to carry traffic. Notably, the TRT/FTC business to be acquired by C&WNA, provided service to over 130 countries and generated revenues of $100 million in 1989 while holding but fourteen FCC radio licenses, primarily for satellite earth station facilities.

(b) Non Section 310(b) Considerations

It would be a mistake to suggest that Section 310(b) is the only legal hurdle with which a foreign company must contend to acquire a U.S. telecoms business. A major acquisition in this sector, as in other fields, typically requires a variety of regulatory clearances.

Section 5201 of the Omnibus Trade and Competition Act of 1988 also empowers the president to "suspend or prohibit" on national security grounds, any merger, acquisition or takeover by foreign persons of an entity engaged in interstate commerce.[7] (Section 5201 is sometimes known as the Exon-Florio amendment, after its Congressional sponsors, Senator James Exon and Congressman James Florio.) Although this law has rarely been invoked (it is not a factor in the TRT/FTC case) it might well come into play if the target company were one of America's premier carriers or a carrier with "bottleneck" facilities for domestic or international services. We shall return to the national security issue in the last section of this essay.

2. Canada

(a) Type I and Type II Carriers

The Canadian rules on foreign ownership of telecom carriers are somewhat simpler than in the U.S.

Foreign ownership is limited to 20% of the voting shares for all Type I facilities-based carriers. Type I carriers have the exclusive right to own facilities for providing basic telephone services between provinces and between Canada and other

countries. No foreign ownership restrictions apply to Type II carriers, which are defined as value added carriers providing service in whole or part using the network facilities of Type I carriers.

In Canada, thus, the foreign ownership bar is linked to a carrier's basic service license not to the licensing of a specified radio facility. But, with limited exception, Type II carriers may not own radio transmission facilities.

The foreign ownership rules stated above were announced in a July 1987 policy statement by the Minister of Communications and were restated in the government's January 1988 proposed guidelines for Type I and Type II carriers.[8] Under the guidelines (still pending at this writing), Type I carriers include the members of Telecom Canada (the provincial telephone companies, Bell Canada) Telesat Canada (the national satellite carrier), Teleglobe Canada (the country's overseas carrier) and Unitel (the major private line and data services provider which has long sought to become Canada's second long-distance telephone carrier). Cantel, the national cellular radio company, and the provincial cellular companies are also classified as Type I carriers.

The guidelines permit preexisting foreign ownership interests in excess of the 20% ceiling (eg, GTE's majority interests in BC Telephone and Quebec-Telephone; see Table 2) to continue. However, non-Canadians are barred from serving as a Director or presiding officer of a Type I company.

Cable television companies are not classified as Type I companies but are treated like broadcast companies. Foreign ownership is limited to 20% of the voting stock.

Canada has yet to consider many of the practical issues which have arisen in the United States in administering the 20% ownership ceiling. For example, it is unclear how the Government or the CRTC would view they kind of traffic management and transmission leases recently approved by the FCC.

(b) Route Canadian Policy

Apart from the legal limits on foreign interests in Type I carriers, any foreign company seeking to compete for a share of Canadian traffic must take account of the long standing route-Canadian policy. This policy favors the carriage of all Canadian domestic and international traffic on Canadian facilities. Prior to the 1930s, east-west traffic in Canada was handled largely by AT&T which, at the time, owned over 30% of Bell Canada.

Although this government mandated traffic set-aside has been eroded in recent years by corporate users (software defined networks and cross-border private lines to the U.S. allow many businesses to determine their own routing), it retains a strong political constituency. In June 1991, the CRTC also adopted new enforcement measures -- at least pending a decision on the scope for facilities-based competition in Canada -- by directing all domestic carriers to amend their tariffs and relevant customer contracts so as to prohibit any customer from routing basic telephone traffic by way of the U.S.[9]

The CRTC stated that its action was consistent with the terms of the 1988 U.S. Free Trade Agreement (FTA) because the FTA only liberalized the cross-border provision of network based computer services (ie, data traffic). The FTA expressly provides that the agreement shall not "prevent a Party from maintaining or introducing measures requiring basic telecommunications

transport service traffic to be carried on a basic telecommunications transport network within its territory," where such traffic originates or terminates within its territory. [10]

Absent the FTA, the text of the CRTC's order suggests that the Commission would have applied its route-Canadian policy to all telecoms traffic originating or terminating in Canada.

3. Mexico

In the late 1980s, Mexico embarked on a historic program of economic liberalization and reform. Foreign investment, long disparaged, is now welcome, especially where it may help to modernize the country's infrastructure. The telecommunications sector evidences the changes underway.

The new rules governing foreign participation are primarily stated in the 1990 privatization plan and terms of sale for Telefonos de Mexico (Telmex), the May 1989 Foreign Investment Regulations and the amended Telecommunications Regulations of October, 1990.[11] Taken together, these measure have probably made Mexico the most liberal regime for foreign ownership in North America. (Competition, however, is another story.)

Telmex provides local and long distance telephone service throughout Mexico; its exclusive concession for basic services runs through August 1996. Under the Telmex privatization plan, foreign investors were permitted to acquire approximately 25% of the company's voting stock as minority partners in a Mexican led buy-out consortium which acquired a controlling (51%) voting bloc. Up to 80% of Telmex's non-voting stock may be held by foreign interests pursuant to the privatization plan.

The government has agreed to grant competitive concessions for public telecom services where Telmex does not have an exclusive concession and where the services are not provided directly by the Government (eg, satellite and telegraph services). Fairly liberal national ownership rules apply to these concessions. With the exception of cellular radio, where a 30% ceiling applies, a foreign company may own up to a 49% interest in a competing service provider.

There are no foreign ownership limits per se on companies providing value added services. However, such companies must register their activities and apply for a permit. Foreign companies are likewise eligible for permits to construct private (intra-corporate) telecom networks; part of the capacity of these network may be shared with third parties.

Resale of basic services will not be permitted in Mexico prior to 1997. This rules out one of the principal avenues available in the U.S. and Canada for foreign companies to build a domestic traffic base. (As with the CRTC's recent route-Canadian decision, it will also limit the scope for alternate routing of Mexican overseas traffic.) Nevertheless, the Government has signaled its willingness to entertain competition and resale after 1996 by requiring Telmex's new owners to prepare a plan for equal access by 1994. If Telmex does not meet the agreed targets for network modernization and service improvement, competitive concessions may be granted even sooner.

B. Foreign Investment In North American Telecom Service Companies

How have the national ownership rules described above affected inward investment in North

American telecommunication companies? Who owns what?

The survey which follows is an informal one. Government data on the foreign ownership of telecoms carriers is not centralized and what data does exist is incomplete. With the exception of Mexico, value-added service providers are not regulated and hence need not disclose their ownership. Further, the largest telecom carriers in the U.S. and Canada are all publicly traded companies. Our research did not reveal any single foreign investor holding as much as 5% in these companies, but cumulative foreign ownership may be as much as 20%. Or more. A significant amount of telephone company stock is held under a "street name" or in trust, making it difficult for anyone to survey accurately the nationalities of the beneficial owners.

The main findings of the survey are compiled in Tables 1 and 2. Some of the highlights are discussed below.

1. United States

The most active U.S. players are currently two U.K. carriers, British Telecom (BT) and Cable & Wireless (C&W). It is not obvious that this should be so. 1989 data on foreign investment in the U.S. shows the leading role shared by the U.K. (32%), Japan (16%) the Netherlands (15%) and Canada (8%).[12] Yet, the U.K. liberalized its telecoms sector ahead of other major U.S. investors. (C&W was denationalized in 1981 and BT followed in 1985.) Hence once telecom companies in other key states begin to have the freedom of action enjoyed by those in the U.K., the British lead may well be challenged.

Second, foreign investments have been made primarily by telecom companies (not those outside the industry) and they have concentrated on what they know (carriers and value added services) and new franchises (mobile services) where capital is needed.

(a) Carriers

U.K., Swiss, Canadian and Italian companies have all acquired interests in U.S. based carriers, especially those servicing international routes. C&W's pending acquisition of TRT/FTC is the boldest step. International services are one of the fastest growing and most profitable market segments Buying into a U.S. carrier can enable a company to exploit both ends of the link in its home market; it may also benefit from acquiring an interest in an independent set of foreign operating agreements and commercial contracts secured by the U.S. carrier.

This strategy is still open to a foreign carrier in the 1990s. But the stakes may be higher. Domestic mergers and the first wave of foreign buyers have narrowed the number of independent U.S. long-distance and private line carriers. There are still some profitable independents in the market. And if the TRT/FTC deal is approved, it may also provide an opportunity for the sale or recapitalization of existing foreign interests. For a major international player, however, the price of becoming a U.S. carrier in the 1990s may be the price of buying into MCI, US Sprint or AT&T.

(b) Data Networks

Companies which own and manage data networks have offered a second target for foreign telecom

TABLE 1
Selected Foreign Interests in United States Telecommunication Businesses

Foreign Company (Nationality)	Target / Type of Business / Percent Interest	Value of Interest/ (Year Acquired)
British Telecom (U.K.)	McCaw Cellular Communications / Leading U.S. cellular radio provider / 22%	$1.48 billion/(1989/90)
	Tymnet / No. 2 U.S. packet switched data network / 100%	$355 million (1990)
	Other: BT has a 28% interest in VoiceCom Systems, a voice messaging company and owns 100% of Dialcom, the 3rd largest U.S. electronic mail service.	
Cable & Wireless (U.K.)	TDX Inc., now Cable and Wireless Communications Inc. / The 5th largest long distance carrier with a national fiber optic cable network primarily serving business users / 100%	N/A / (1985)
	TRT/FTCC / The 5th and 6th largest U.S. international service carriers / 100% (application pending before the FCC)	$174 million / (1991)
	Other: C&W also owns 50% of PTAT Systems, Inc., the owner of a trans-Atlantic private telecom cable and has a joint marketing agreement with U.S. Sprint, co-owner of PTAT; owns 20% of Pacific Telecom Cable, Inc., the owner of the North Pacific Cable (NPC) between the U.S. and Japan.	
DBP Telekom (Germany)	Infonet/ International packet switched data, EDI and network management company / 16% (Note: France Telecom also owns 16%; MCI owns 25% (bought for $27 million in 1990); the remaining shares are owned by eight other foreign telecom companies)	N/A / (1989)
Motor Columbus AG (Switzerland)	WorldCom (formerly ITT WorldCom) / International private lines and switched services carrier / 100%	N/A / (1989)
	Houston International Teleport / Competitive local access provider / 24%	N/A / (1990)
Memotec Data Inc. Canada)	IDB Communications Group / A leading supplier of international private lines / 20% interest held through Teleglobe Canada, Inc., a Memotec subsidiary (Note: Swissair also owns 4% of IDB which is majority owned by Contel.)	N/A / (1989)
Italcable (Italy)	LCI Communications Holdings, Inc. / Top 10 long distance carrier / 20% (application pending before FCC)	$50 million / (1991)
Coditel Branbant (Belgium)	United States Cellular / Cellular service provider majority owned by Telephone & Data Systems (TDS) / 6%	$11 million / (1987)
Maclean Hunter Cable TV (Canada)	Directly owns cable TV systems in Florida, Michigan and New Jersey with over 650,000 subscribers	N/A
Kansallis-Osake-Pankki (Finland)	Fleetcall / Leading Specialized Mobile Radio (SMR) company / N/A	N/A

Note: This table was complied from public sources as of July 31, 1991; the listing is not comprehensive and generally excludes publicly listed companies. Interests are valued in year of acquisition.

TABLE 2

Selected Foreign Interests in Canadian and Mexican Telecommunication Businesses

Foreign Company (Nationality)	Target / Type of Business / Percent Interest	Value of Interest/ (Year Acquired)
CANADA:		
GTE (U.S.)	British Columbia Telephone / Local exchange carrier for most of B.C. / 51% [Note: GTE also has a 55% interest in Quebec Telephone, a local exchange carrier for portions of Quebec.]	N/A / (1955)
Cable & Wireless (U.K)	Cable & Wireless Telecommunications, a former subsidiary of the U.K. based Telephone Rentals, acquired by Cable & Wireless/Reseller of long distance services/100%	N/A (1990)
MEXICO:		
Southwestern Bell (U.S.)	Telmex / Mexico's local and long distance telephone company with an exclusive concession for basic services to August 1996 / Upon privatization, a 20.4% block of stock with majority voting rights was sold to a consortium of Grupo Carso of Mexico (10.4%), SW Bell (5%) and France Telecom (5%). SW Bell also has an option on a further 5% of non-voting stock. (Note: The Government's remaining stock later was sold in an international public offering, in principle allowing up to 80% foreign ownership of Telmex capital.)	$486 million / (1990)
France Telecom (France)		$412 million / (1990)
Bell Canada (Canada)	Portacell and Telecom / Band "A" (non-wireline) regional cellular radio concession / 30% [Note: seven of the nine Band "A" cellular concessions have foreign partners including Bell South (U.S.), McCaw (U.S.), Contel (U.S.) and Millicom (U.S.). The Band "B" cellular carriers are owned by Telmex.]	N/A / (1990)
Mobile Telecommunication Technologies Corp. (U.S.)	Communicaciones Mtel S.A. / Start-up company, controlled by Televisa Group, to develop nationwide paging service / Mtel owns 49%	N/A / (1991)

Note: This table was compiled from public sources as of July 31, 1991; the listing is not comprehensive and generally excludes publicly listed companies. Interests are valued in the year of acquisition.

companies in the U.S. BT acquired Tymnet, which owns a leading packet switched data network in 1990. Infonet is primarily owned by a consortium of foreign carriers. As demand for data communications continues to grow more rapidly than that for voice traffic, this sector will continue to prove attractive.

Over the next decade, a portion of today's basic voice traffic is also likely to become value added traffic. Digital networks and "smart terminals" will make it possible for a broader number of users to migrate traffic from the basic telephone network to a value added network by subscribing to voice mail, computer data base services, enhanced fax, E-Mail and related services. Notably, both BT and C&W have been early investors in U.S. voicemail services and equipment manufacturers. The 1990s will challenge them to integrate the technologies offered by these companies into their core U.S. service offerings.

(c) Cellular Radio

Mobile services and especially cellular radio has drawn foreign interest, just as it has been a primary target for American companies abroad. Cellular radio is an industry which is hungry for capital, promises above average returns and has been marketed globally on a grand scale. What is surprising is not how large but how small is the amount of foreign investment in the U.S. cellular industry. To date, for example, none of the Regional Bell Operating Companies (RBOCs) have taken on a foreign partner (notwithstanding their foreign bids) and neither have independent telcos (US Cellular and McCaw are the exception).

(d) Future Targets?

As suggested above, thus far foreign telecom companies in the U.S. have largely invested in what they know, subject to the constraints of Section 310 (b). Two lesser known areas of the industry, however, have been largely passed over. One is private radio (intra-corporate networks), a service on which both MCI and Souther Pacific (later acquired by US Sprint) built up a considerable business. Private point-to-point microwave and specialized mobile radio facilities still offer some entrepreneurial opportunities.[13]

Another area is the growing business of competitive local access --metropolitan fiber optic networks and teleports. These companies (Metropolitan Fiber Systems and New York Teleport are the best known) typically install backbone networks in high-density metropolitan areas for business customers. The prospects for this business were given a boost in May 1991 when the FCC began a wide-ranging proceeding to facilitate interconnection between local fiber loops and the switches owned by local exchange carriers.[14]

And then there is cable television. Although cable television facilities fall outside Section 310(b), the 1980s saw relatively little foreign investment here either. This is largely due to the politics of the U.S. local franchising process, where close community ties are often the key to success. Yet, now that almost all of the big-city franchises have been secured and major systems have begun to position themselves as future competitors to the telephone company, some cable companies may begin looking for foreign capital, particularly if it is also backed by telecoms experience.

2. Canada

Foreign investment in Canada's telecoms markets has been static compared to the U.S. The main reason is that competition has been more limited and hence there have been fewer potential targets for foreigners. Cellular radio was the exception in the mid-1980s. Cantel, which holds Canada's only nationwide franchise, initially sold a 20% equity interest to Ameritech, the Chicago based Bell Operating Company (BOC). But in 1988 the

interest was sold back to Rogers Communications, Cantel's majority owner, ostensibly for business reasons. The buy-back, however, helped to quiet concerns over Cantel's compliance with the 20% foreign ownership limit given the significant non-Canadian ownership of Rogers' publicly trade shares.

There are signs that Canada's telecoms sector could become more internationalized in the 1990s. Notwithstanding the CRTC's recent route-Canadian decision, the Commission's general support for telecom service resellers does provide some new opportunities for foreign capital. Further, this year (or next) the CRTC will decide whether to grant a license to Unitel (and possibly others) to provide long distance service in competition with Telecom Canada. Unitel, jointly owned by Canadian Pacific Ltd. (60%) and Rogers Communications (40%), has stated that it will invest about $1.5 billion over the next few years, including over $400 million in long distance public voice service.

In addition, during the next year, the Canadian Government will likely decide whether Teleglobe's exclusive franchise for international services (excluding the U.S.) will be extended beyond April, 1992. Again Unitel is in the wings. But competition costs money and if Unitel succeeds in becoming Canada's second carrier, a foreign partner can not be ruled out downstream.

3. Mexico

The about-face by Mexico on foreign investment in the late 1980s has internationalized the country's telecom services sector in less than three years. In the short run, the sale of Telmex and the new mobile radio concessions, may have exhausted the best prospects for foreign investment. Opportunities may still exist in data networking (there were only about 30,000 modems hooked up to the telephone network in 1990) and private services. But much will depend on improvements to the basic network with which these services must interconnect.

In the longer term, as with the maquiladora factories along the U.S. border, Mexico may serve as a telecoms entrepot to the North. Certainly this must have been one of France Telecom's considerations in bidding for Telmex. This logic may also become apparent to other companies, such as those from Japan, whose growing investment in Mexico, could provide an attractive base for a Japanese value added carrier with wider ambitions (Japan is already Mexico's tenth largest foreign telephone correspondent.) Foreign money is also likely to play a role in the contest for a second (or third) long-distance concession in the mid-1990s.

C. Reconciling The Imperatives Of Global Markets And National Sovereignty

This essay began with a question: "Whose traffic is it?" In theory, we suggested, the answer should be "the user."

But, in practice, even where competition exists, North American laws still reserve the majority of telecommunications traffic for national carriers. (The situation, of course, is much the same in other regions of the world.) These traffic set-asides are far from absolute; the rules on national ownership differ markedly between the U.S., Canada and Mexico. Indeed, in the U.S., the relevant provisions of the Communications Act may no longer pose a serious barrier for an innovative foreign carrier.

Overall, however, our survey found only modest

foreign participation in the North American market for telecom services, Mexico aside. This finding is echoed by other reviews of inward investment in the region. For example, an international database which Booz, Allen & Hamilton maintains on cross-border telecom mergers and acquisitions shows that from 1989 to June 1991, the value of announced deals involving U.S. or Canadian telecom service companies was just over 1% of the $46 billion global total (the majority of deals involved equipment manufacturers and privatizations). Further, none of the 100 largest Japanese investors in the U.S. since 1985 (compiled in the May, 1991 issue of Business Tokyo) reported a significant interest in any U.S. telecom services provider.[15]

1. New Cross-Border Investment

What will happen in the period ahead? Can North America's national carriers expect to keep the majority of the continent's traffic or will foreign players begin to bid for it in greater numbers? There are several reasons for thinking that the latter scenario is more likely and that it will bring with it a renewed attention to the national ownership rules described above.

First, the 1990s will see a sharp increase in the ranks of potential bidders. In the last decade, there were only a handful of privately owned telecom companies which were in a position to develop an international strategy. By 1995, there may be twenty such companies from Singapore to the Netherlands and from Australia to Venezuela.

More cross-border investment in the telecom sector is also likely to be stimulated by the current negotiations for a North American Free Trade Agreement (FTA) (see Figure 1). Although an FTA might do little in and of itself to liberalize the cross-border provision of telecom services, as with the Europe 1992 phenomena, the attention given to the negotiations may lead foreign companies to believe that, as the various trade, investment, employment and tax concessions are worked out, the sooner they have a presence in this "single market", the better off they will be.

Given these parallel developments, it will be hard for government or industry to avoid a more searching review of the current limits on foreign ownership of telecom carriers, particularly in the U.S. and Canada, than has now occurred. This is probably all to the good, despite the issue's political sensitivities.

2. Rethinking National Ownership Rules

The current rules tend to protect carriers not consumers. Yet, although some carriers might think it unpatriotic to say so publicly, given a choice, many might trade in some of that protection for more access to foreign capital and a wider market for their equity. Telmex, of course, has already done so. (So have many of America's air carriers, whose dire financial condition has led them to be more vocal about the cost of the Section 310(b) style national ownership rules which have traditionally applied to their industry as well.[16])

The existing rules have several other costs. As technology changes, the rules tend to skew foreign investment in a way that may harm national telecommunications interests more than it helps. Where the rules are technology specific (ie, tied to radio licenses), foreigners tend to invest in alternative transmission systems such as fiber optics and cable television. Where the rules are service specific (ie, linked to the provision of basic services) foreigners are encouraged to invest in data networks, computer software and network management contracts.

One result is that the most capital intensive, slowest growing portion of the market -- the local network infrastructure -- is left to be modernized

FIGURE 1

Telecommunications and the North American Free Trade Agreement (NAFTA)

NAFTA Countries	Population (Millions)	GNP/Capita (U.S.)	Tel. Lines (Millions)
Canada	26.3	19,020	14.6
Mexico	85.4	1,990	4.7
U.S.	248.2	21,100	131.5

Note: All statistics are for 1989.

THE NEGOTIATIONS

The NAFTA negotiations started in the summer of 1991. They cover six main areas: market access, trade rules, services, investment, intellectual property and dispute settlement. Seventeen working groups have been set up to address these issues. Telecommunications cuts across several working groups and is likely to include the following issues:

Equipment

Abolition of tariffs on telephone terminals and phased reduction of same on central office switches and other equipment per Canada FTA, effective January 1, 1989.

Steps to increase government procurement (eg., by reducing "buy national" provisions).

Services

National treatment and right of establishment for companies offering enhanced services; interconnection rights of users and possible requirements regarding resale and unbundling of network elements.

Protection of monopoly concessions for basic telecom services and right to carry domestic traffic on domestic systems.

by domestic capital. Foreign capital can concentrate on the growth markets of tomorrow.

Another problem with the existing rules is their inconsistency.[17] In Canada, the proposed regulations for Type I and II carriers, "grandfather" the majority U.S. interest in two provincial telephone companies which have a monopoly over local service (see Table 2). Yet, the same rules would limit (to 20%) a new U.S. investment in a second or third long-distance service provider.

In the U.S., the internal logic of Section 310(b) is equally hard to follow. The FCC can not waive the statutory limit on direct investment under Section 310(b)(3) -- even though made by a national from a friendly country. However, an investor from a country which has been hostile to inward investment by American telecom companies may still invest a full 20% directly and (without a waiver) another 25% indirectly.

These problems aside, some would argue that the current rules, such as Section 310(b), provide an important bargaining chip for negotiations on trade and investment. Accordingly they should not be abandoned until they have been "cashed in" at the bargaining table. Perhaps. But, if so, the days when the chip can be "cashed in" for something worthwhile may be numbered. The marketplace and technology are devaluing national ownership rules more rapidly than many people realize.

Much of the fiercest competition today for telecom traffic is not being fought over licenses or carrier franchises but over traffic management contracts. This has been fueled by the growing willingness of corporations to "outsource" their telecom requirements. Modern signalling systems and distributed network intelligence are only likely to expand the future opportunities for separating network ownership and management.

In short, the current period may give the U.S. and Canada the best shot they are likely to get for some time to trade in their existing ownership rules for an equivalent set of market opening measures in other countries.

What should replace the current rules? In those markets where effective competition exists for public telecommunications services (cable TV and broadcasting raise more difficult issues) the answer might well be nothing. Of course, this may be impractical politically, as compared to raising the current foreign ownership ceiling (eg, to 49%). But it is not at all clear that the common carrier regulations and competition laws now on the books in North American markets are insufficient to protect the public from abuses by foreign and domestic carriers alike.

Where competition does not exist or where a carrier owns unique bottleneck facilities or holds strategically sensitive technologies or service authorizations, a government might reasonably decide to bar foreign control. This might be done on telecom policy or national security grounds.

In each case, a careful examination of the facts should be undertaken to ensure that the categories which are "off limits" to foreigners actually reflect current conditions and not those of a past age. Such a review is also necessary to ensure that national ownership laws for telecom carriers do not simply serve as a stand-in for a poorly defined national security interest. Otherwise, the rules may well disserve a country's real security interests as much as its national telecom policy.

Further, where foreign control is prohibited, it does not necessarily follow that the best method for achieving this is to set a fixed ceiling on the ownership of a telecom company's voting stock. Commonwealth governments have experimented with a variety of post-privatization mechanisms for protecting national security and community service

interests. One method relies upon Government retention of a "golden-share" (U.K.) or a "Kiwi-share" (New Zealand), entitling the Government to block corporate actions which would threaten the national interest. A variant of these schemes (eg. involving different classes of shares) might prove to be attractive elsewhere, as a means of facilitating a greater degree of foreign investment without ceding control on corporate decisions of overriding national importance.

D. Conclusion

So whose traffic is it? However defined, that is the question. And it is likely to be at the forefront of business and public policy discussion in North America during the 1990s. Which suggests that, to the extent privatization has not already done so, Europe and Asia will soon find this question at the top of their agendas as well.

1. See Robert Reich, "Who Is Them?", Harvard Business Review, Vol. 69, No. 2, March - April 1991, p. 77, and "Who Is Us?", Harvard Business Review, Vol. 68, No. 1, January - February 1990, p. 53.

2. 47 U.S.C. Sec. 310, (1990).

3. For this reason, however, some members of the U.S. Congress have proposed to amend Section 310 to cover CARS stations, multipoint distribution services and direct broadcast satellite services. See eg, the "Cable Television Consumer Protection and Competition Act of 1991," H.R. 1303, 102d Cong., 1st Sess. at Sec. 15.

4. In addition, a foreign investor may maximize its interest in a U.S. radio license by use of a limited partnership, non-voting stock, a preferential dividend policy, debt, stock options or otherwise, so long as the interest does not give the investor de facto control over the Section 310(b) facility. For a more complete discussion of these options, see Ronald W. Gavillet, Jill M. Foehrkolb, Simon Wu, "Structuring Foreign Investments In FCC Licenses Under Section 310(b) Of The Communications Act," 27 California Western Law Review 7 (1991).

5. See Limited Partnership, 5 FCC Rcd 1673 (1990).

6. FCC Public Notice, Mimeo No. 11788, dated February 13, 1991, File No. W-P-C-6694.

7. 50 U.S.C. app. Sec. 2158 (1989).

8. See A Policy Framework for Telecommunications in Canada, Ottawa, Dept. of Communications, July 1987 and Proposed Guidelines for Type I Telecommunications Carriers, Ottawa, Dept. of Communications, January 1988.

9. Teleglobe Canada Inc. - Resale of Transborder Services, Telecom Decision CRTC 91-10, 26 June 1991, (Decision 91-10).

10. See U.S.- Canada Free Trade Agreement, Chapter 14, Annex 1404, Part C. Computer Services and Telecommunications Network-Based Enhanced Services, Article 6: Exceptions (1988).

11. I have relied here upon unofficial U.S. Department of Commerce translations of the "Plan For The Privatization Of Telefonos De Mexico, S.A. De C.V. (TELMEX)", dated August 27, 1990 and the original "Telecommunications Regulations," published in the Mexican Official Daily, October 29, 1990. For a discussion of the new Foreign Investment Law (FIL), see Ignacio Gomez-Palacio, "The New Regulation On Foreign Investment In Mexico: A Difficult Task," 12 Houston Journal of International Law 181 (1990).

12. See Foreign Ownership Disclosure Act of 1989: Hearings Before the Senate Committee on Commerce, Science and Transportation, 101st Cong., 1st Sess. at 8-9 (1989).

13. The Section 310 (b) ownership restrictions do not apply to private radio licenses but the FCC's rules do bar foreign governments and their representatives from holding a private radio license. 47 C.F.R. Sec. 90.115 (1990).

14. See Notice of Proposed Rulemaking and Notice of Inquiry, (CC Docket No. 91-141), FCC 91-159, released June 6, 1991.

15. Business Tokyo, Vol. 5, No. 5, May 1991, p.13.

16. In June 1991, the U.S. Secretary of Transportation announced that the Administration would seek legislation to allow foreigners to own up to 49% of the voting stock of U.S. airlines. Several foreign carriers already own minority stakes in U.S. airlines: KLM owns 10.5% of the voting rights and 20% of the equity of Northwest Airlines; SAS owns 18.4% of the voting rights and 16.8% of the equity of Continental Airlines; Swissair and Singapore Airlines each own about 5% of Delta Airlines. See "Plan To Raise Foreign Cash For Airlines," by Steven Prokesch, The New York Times June 21, 1991, p. D1.

17. For a fuller discussion, see H.N. Janisch, "Emerging Issues In Foreign Investment In Telecommunications," University of Toronto, International Business and Trade Law Program, Working Paper 1988-89 (1).

STATISTICAL TABLES AND MAPS

The Global Telecommunications Traffic Report - 1991
Countries Having Route-By-Route Tables

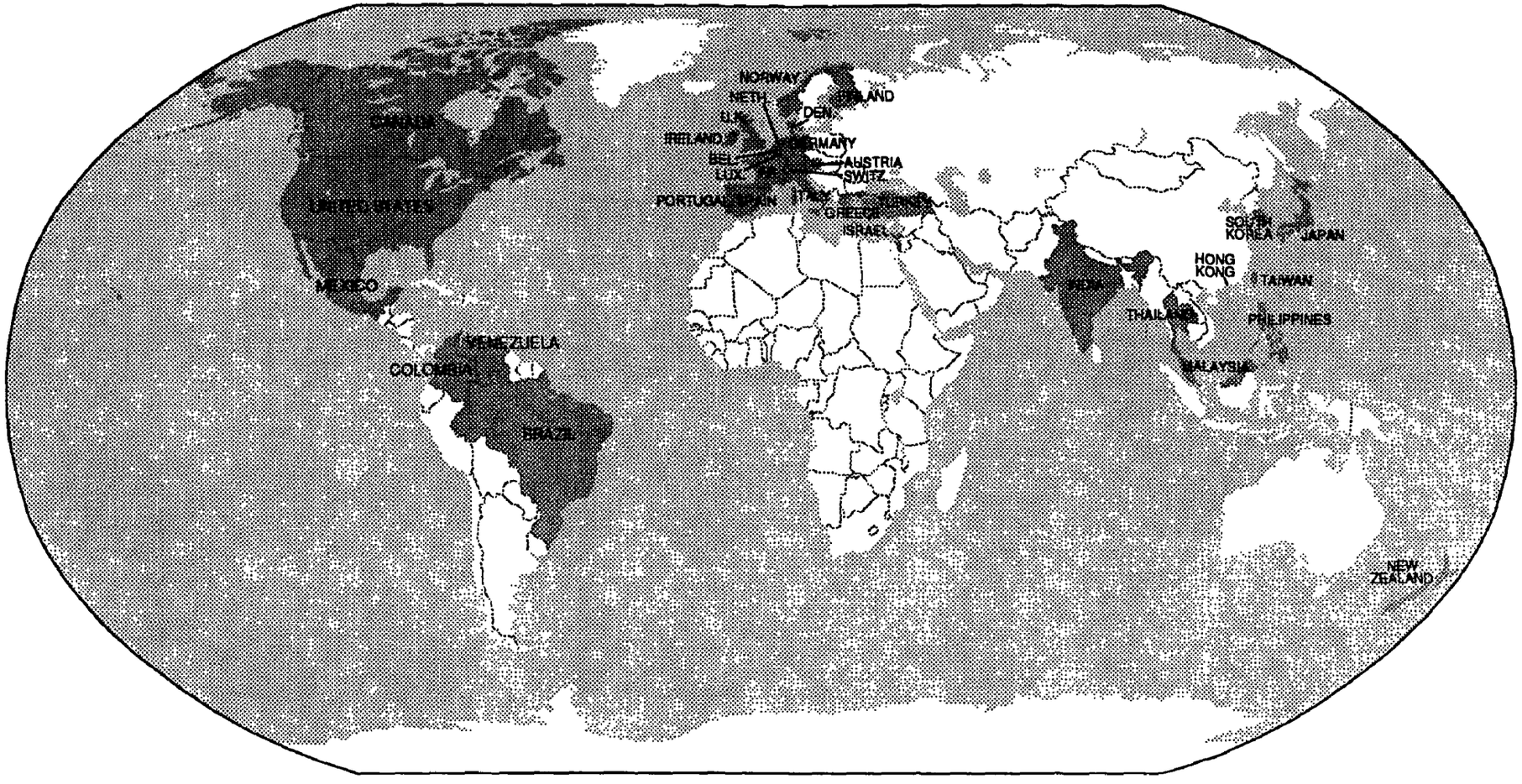


Table 1

NATIONAL STATISTICS (1989)

Country	Population (millions)	Per Capita GNP (US$)	Area (000 sq. km)	Telephone Lines per 100 people
Australia	16.8	14,440	7,687	46.3
Austria	7.6	17,360	84	40.7
Belgium	9.9	16,390	31	37.5
Brazil	147.4	2,540	8,512	6.0
Canada	26.2	19,020	9,976	55.8
China (PRC)	1,119.7	360	9,561	.9
Colombia	30.8	1,190	1,139	7.4
Denmark	5.1	20,510	43	55.5
Dom. Republic	7.0	790	49	4.8
Finland	5.0	22,060	338	52.1
France	56.2	17,830	552	47.3
Germany, FR	62.0	20,750	249	39.7
Greece	10.0	5,340	132	37.8
Hong Kong	5.8	10,320	1	40.7
India	811.8	340	3,288	.6
Ireland	3.5	8,500	70	25.9
Israel	4.5	9,750	21	34.0
Italy	57.5	15,150	301	37.0
Jamaica	2.4	1,260	11	3.6
Japan	123.1	23,730	378	43.2
Korea, Repub. of	42.4	4,400	99	28.3
Luxembourg	0.4	24,860	<1	46.4
Malaysia	17.3	2,160	330	8.0
Mexico	84.5	1,990	1,958	5.6
Netherlands	14.8	16,010	37	45.1
New Zealand	3.3	11,800	269	46.5
Norway	4.2	21,850	324	48.9
Philippines	60.1	700	300	1.1
Portugal	10.4	4,260	92	20.1
Saudi Arabia	14.4	6,390	2,150	8.9
Singapore	2.7	10,450	1	37.1
Spain	38.8	9,150	505	30.4
Sweden	8.5	21,710	450	67.3
Switzerland	6.7	30,270	41	56.9
Taiwan (ROC)	20.0	7,997	36	30.6
Thailand	55.5	1,230	513	2.1
Turkey	54.7	1,370	779	10.4
United Kingdom	57.2	14,570	245	44.6
United States	248.8	21,100	9,373	53.3
U.S.S.R.	286.7	NA	22,402	11.2
Venezuela	19.3	2,450	912	12.2

Sources: World Bank; Siemens

Table 2

NATIONAL TELECOMMUNICATION STATISTICS (1989)

Country	Telephone Lines (Millions)	Mobile Telephone Subscribers (Thousands)	Fax Machines 1990 est. (Thousands)
Australia	7.8	185	400
Austria	3.1	51	110
Belgium	3.7	31	60
Brazil	8.9	N.A.	60
Canada	14.6	370	430
China (PRC)	9.7	10	N.A.
Colombia	2.3	N.A.	35
Denmark	2.8	124	N.A.
Dom. Republic	4.8	N.A.	N.A.
Finland	2.6	158	40
France	26.5	169	580
Germany, FR	31.2	164	920
Greece	3.8	N.A.	25
Hong Kong	2.3	99	120
India	4.6	N.A.	N.A.
Ireland	0.9	14	40
Israel	1.5	10	N.A.
Italy	21.3	66	203
Jamaica	90.0	N.A.	5
Japan	53.2	490	4300
Korea, Republic of	12.0	40	N.A.
Luxembourg	0.2	<1	N.A.
Malaysia	1.4	44	27
Mexico	4.7	9	N.A.
Netherlands	6.7	56	180
New Zealand	1.5	29	70
Norway	2.1	168	90
Philippines	0.6	N.A.	N.A.
Portugal	2.1	3	30
Saudi Arabia	1.3	14	N.A.
Singapore	1.0	25	50
Spain	11.8	30	360
Sweden	5.7	349	170
Switzerland	3.8	73	N.A.
Taiwan (ROC)	6.1	37	N.A.
Thailand	1.2	N.A.	40
Turkey	5.9	16	30
United Kingdom	25.5	975	670
United States	132.7	3,500	4400
U.S.S.R.	32.2	N.A.	80
Venezuela	1.5	4	N.A.

Sources: ITU, Siemens, Industry Interviews

Table 3a

TELECOMMUNICATION TRAFFIC BALANCE FOR SELECTED COUNTRIES (1990)

Country	Outgoing MiTT in Millions	Incoming MiTT in Millions	Balance of MiTT	(Deficit)/ Surplus as % of Total MiTT
Belgium	731	755	24	1.6
Canada	565	358	(207)	(22.4)
Denmark	362	343	(19)	(2.7)
Finland	186	213	27	6.8
France	1921	2091	170	4.2
Ireland	75	122	47	23.9
Israel	118	202	84	26.3
Japan	764	732	(32)	(4.0)
Korea, Repub. of	188	350	162	30.1
Luxembourg	151	83	(68)	(29.1)
Malaysia	80	100	20	11.1
Netherlands	905	852	(53)	(3.0)
Norway	281	277	(4)	(0.7)
Portugal	126	270	144	36.4
Spain	611	653	42	3.3
Switzerland	1356	1016	(340)	(14.3)
Taiwan	212	302	90	17.5
Turkey	159	441	282	47.0
United States	5265	2604	(2661)	(33.8)

Note: MiTT is Minutes of Telecommunication Traffic. Data are for international public voice circuits only. Canada figures are for Teleglobe only and exclude U.S. and Mexico traffic. Data for Ireland are for the fiscal year April 1990 to March 1991 excluding U.K.-Ireland route. Taiwan data are for fiscal year ending June 1990. Japan data are for KDD only for the fiscal year ending March 1991; France data are for fiscal year ending March 1991. U.S. data are for traffic between continental U.S. and foreign points for AT&T, MCI, US Sprint and TRT/FTC combined and exclude traffic to Canada and Mexico.

Table 3b

TELECOMMUNICATION TRAFFIC BALANCE FOR SELECTED COUNTRIES (1989)

Country	Outgoing MiTT in Millions	Incoming MiTT in Millions	Balance of MiTT	(Deficit)/ Surplus as % of Total MiTT
Australia	517.7	397.7	(120.7)	(13.2)
Austria	476.3	486.8	10.5	1.1
Belgium	643.9	666.1	22.2	1.7
Canada	467.3	308.9	(158.4)	(20.4)
Denmark	323.4	311.0	(12.4)	(2.0)
Germany, FR	2833.0	2369.0	(464.0)	(8.3)
Ireland	225.0	269.0	44.0	8.9
Italy	908.0	1161.0	253.0	12.3
Japan	701.0	654.0	(47.0)	(3.5)
Luxembourg	129.1	97.1	(32.0)	(14.1)
Netherlands	796.3	760.5	(35.8)	(2.3)
Portugal	130.7	276.5	145.8	35.8
Spain	525.9	551.1	25.2	2.3
Switzerland	1182.0	892.0	(290.0)	(14.0)
U.K.	2252.8	2330.3	77.5	1.7
U.S.	4462.9	2249.2	(2213.7)	(32.9)

Note: MiTT is Minutes of Telecommunication Traffic. Data are for international public voice circuits only. Japan data are for KDD only. Canada figures are for Teleglobe only and exclude U.S. and Mexico traffic. U.S. figures exclude traffic to Canada and Mexico. Data for U.K., Japan, Ireland and Australia are for the fiscal year April 1989 to March 1990.

Table 4

INTERNATIONAL TELEPHONE CHARGES AND TRAFFIC BALANCES FOR SELECTED OECD COUNTRIES (1989)

	1989 Traffic Balance[1] (Deficit)/Surplus as % of Total MiTT	Tariff Level[2]	
		Business	Residential
Portugal	35.8	131.1	131.3
Italy	12.3	116.2	116.8
Ireland	8.9	121.9	108.1
Spain	2.3	123.0	121.1
Belgium	1.7	101.6	114.9
U.K.	1.7	96.5	101.8
Austria	1.1	95.5	89.6
France	.1	87.3	92.2
Denmark	(2.0)	76.2	90.8
Netherlands	(2.3)	107.0	97.5
Germany	(8.3)	87.3	92.2
Australia	(13.2)	79.6	71.8
Switzerland	(14.0)	85.2	78.4
Luxembourg	(14.1)	107.0	97.5
Canada	(20.4)	84.2	83.8
U.S.	(32.9)	89.7	78.0

Notes: [1] *MITT is Minutes of Telecommunication Traffic. Data are for public voice circuits only. Traffic balance is stated as a % of total two way traffic. See Table 3 for further details on country-by-country data.*

[2] *Tariff level based on Purchasing Power Parity indicies for international tariffs at November, 1989 as reported at Figure 3.13 in Performance Indicators For Public Telecommunications Operators (OECD), Paris, 1990).*

Table 5

COST AND CAPACITY, PER VOICE PATH, OF SELECTED TRANS-OCEANIC CABLES (1956-1996)

Trans-Atlantic Systems

Year In-Service	Cable System	Cost (US$) per voice path	Capacity in voice paths
1956	TAT-1	557,000	89
1965	TAT-4	365,000	138
1970	TAT-5	49,000	1,440
1976	TAT-6	24,500	8,000
1983	TAT-7	23,000	8,400
1988	TAT-8	9,000	37,800
1989	PTAT	6,000	85,000
1992	TAT-9	5,500	75,600
1993	TAT-10	2,500	125,000
1993	TAT-11	2,000	125,000

Trans-Pacific Systems

Year In-Service	Cable System	Cost (US$) per voice path	Capacity in voice paths
1957	Hawaii 1	378,022	91
1964	TPC-1	405,928	167
1974	Hawaii 3	41,183	1690
1975	TPC-2	72,781	1690
1988	TPC-3	51,852	18,900
1991	North Pacific Cable	5,000	85,000
1992	TPC-4	5,500	75,600
1996	TPC-5	2,000	605,000

Notes: Costs are capital and construction costs only stated in $US to the nearest $500 in the year given, unadjusted for inflation. Current technology permits approximately 5 virtual voice paths to be derived from a digital channel operating at 64,000 bits per second (64 kbps). Fiberoptic submarine cables are expected to have a useful life of at least 30 years. Table reports average cost per voice path for cables with multiple landing points. For example, the TAT-9 system interconnects the U.S. and Canada with the U.K., France and Spain. The average U.S.-U.K. cost per voice path is approximately $4000.

Source: FCC and U.S. carriers

Table 6

ESTIMATED CAPACITY OF TRANS-OCEANIC CABLE AND SATELLITE SYSTEMS (1986-1996)

Trans-Atlantic
(North America to Europe)

Year	Cable Voice Paths	Satellite Voice Paths
1986	22,000	78,000
1987	22,000	78,000
1988	60,000	78,000
1989	145,000	93,000
1990	145,000	283,000
1991	221,000	283,000
1992	346,000	496,000
1993	471,000	496,000
1994	471,000	540,000
1995	640,000	720,000
1996	809,000	720,000

Trans-Pacific
(North America to Japan via Hawaii or Guam)

Year	Cable Voice Paths	Satellite Voice Paths
1986	2,000	39,000
1987	21,000	39,000
1988	21,000	39,000
1989	21,000	39,000
1990	21,000	39,000
1991	106,000	27,000
1992	183,000	27,000
1993	183,000	117,000
1994	183,000	207,000
1995	183,000	207,000
1996	783,000	207,000

Notes: Estimates based on year cable/satellite facilites begin service. Estimate of cable voice paths assume that 5 virtual voice paths can be derived from one 64kbps digital circuit; cable estimates include circuits held in reserve for cable/satellite restoration services. Estimate of satellite voice paths based on Intelsat satellites only and Intelsat's July, 1991 deployment and launch schedule; satellite estimates exclude one satellite in each region held in reserve. Satellite estimates also assume one voice path per channel until 1989 deployment of Intelsat VI series with 24,000 channels or 120,000 voice paths using Digital Code Multiplication Equipment (DCME). The Intelsat VII series, to be deployed in 1992, will have a nominal capacity of 18,000 channels or 90,000 voice paths using DCME. A small numer of additional satellite voice paths in the Atlantic and Pacific likely will be available to 1996 from PanAmSat (PAS-1; ORBX-2); Columbia Communications (using NASA's TDRSS system); and InterSputnik. Regional capacity estimates do not necessarily imply that full capacity is available to satisfy demand on any given bilateral route.

Table 7a

THE TRAFFIC BASE OF THE TOP 25 INTERNATIONAL CARRIERS (1990)

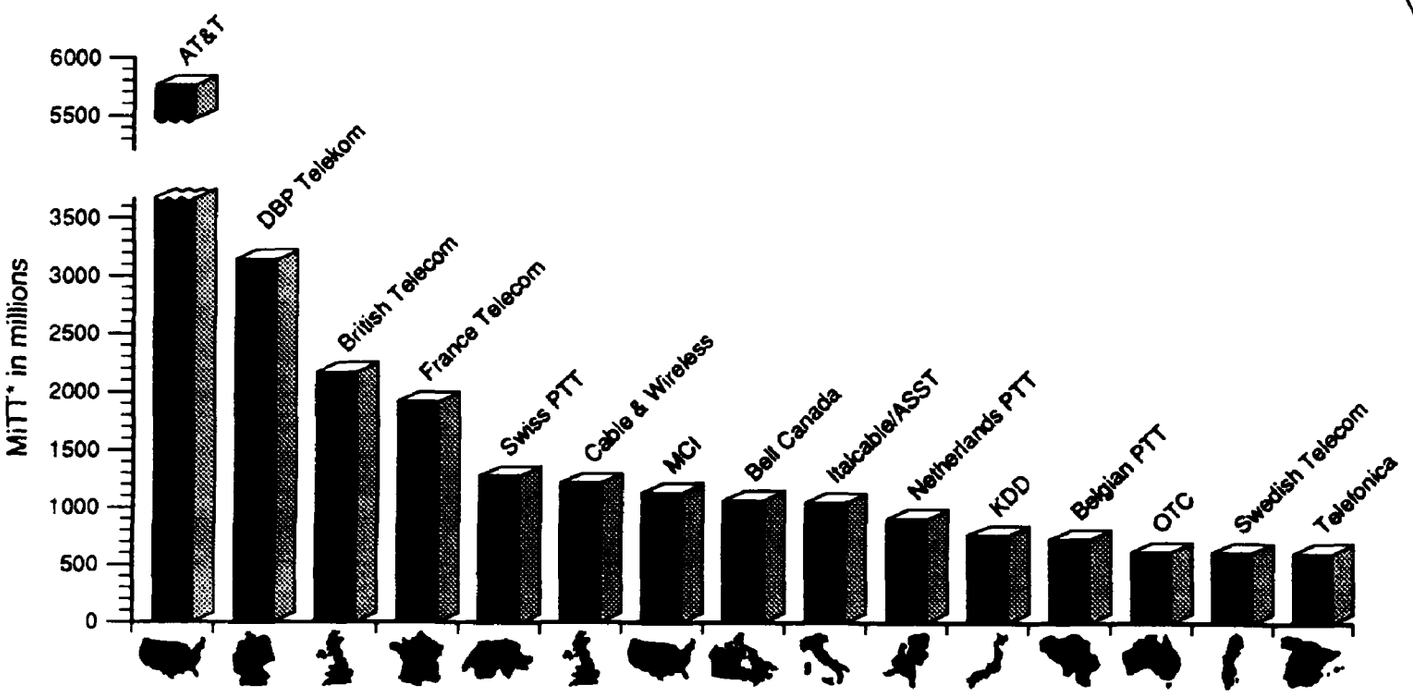
Rank	Carrier	Outgoing MiTT in Millions*	Country
1	AT&T	5780	United States
2	DBP Telekom	3146	Germany, FR
3	British Telecom	2170	United Kingdom
4	France Telecom	1921	France
5	Telecom Canada	1420	Canada
6	Swiss PTT	1356	Switzerland
7	Cable & Wireless	1291	United Kingdom
8	MCI	1132	United States
9	Italcable/ASST	1045	Italy
10	Netherlands PTT	905	Netherlands
11	KDD	764	Japan
12	Belgian PTT	731	Belgium
13	OTC	620	Australia
14	Swedish Telecom	615	Sweden
15	Telefonica	611	Spain
16	Saudi Communications Ministry	590	Saudi Arabia
17	US Sprint	577	United States
18	Teleglobe	565	Canada
19	Austrian PTT	559	Austria
20	China PTT	460	China (PRC)
21	Telmex	421	Mexico
22	Danish PTT	363	Denmark
23	Norwegian Telecom	281	Norway
24	Telecom Ireland	263	Ireland
25	U.A.E. Comm. Ministry	248	United Arab Emirates

**MiTT is Minutes of Telecommunication Traffic. Data are for public telephone circuits only. Data for U.S. carriers includes estimated traffic to Mexico and Canada; data for U.K. and Irish carriers includes U.K.-Irish traffic. Telecom Canada total includes U.S. and Mexico traffic originated by nine provincial telephone companies and Telesat Canada of which 1079 million MiTT was originated by Bell Canada. Cable & Wireless total includes only traffic originated by Hong Kong Telephone (729), Mercury Communications (362), Bermuda and Caribbean companies (200). For Italy, the share of Italcable is 208 million MiTT.*

Note: BT, France Telecom, KDD, C&W and OTC data are for 1990 fiscal year (April 1990 to March 1991).

Table 7b

The Top 15 International Carriers



*MiTT is Minutes of Telecommunication Traffic. Data are for outgoing traffic on public telephone circuits only.

Table 8

THE FASTEST GROWING INTERNATIONAL CARRIERS

Carrier	1990 Outgoing MiTT	1986 Outgoing MiTT	Cumulative Growth 1986-90
US Sprint	338	43	686%
MCI	772	103	649%
Comm. Auth. Thailand	134	20	570%
Cable & Wireless	1064	160	565%
Embratel (Brazil)	157	53	196%
Bezeq (Israel)	118	41	187%
OTC	620	239	159%
Teleglobe Canada	565	223	153%
China PTT *	460	190	142%
KDD	764	319	139%
United Arab Emirates	248	120	107%
Singapore Telecoms*	186	99	88%
Telefonica *	611	330	85%
France Telecom	1921	1095	75%
Austrian PTT	559	321	74%
AT&T	4124	2492	66%
DBP Telekom	3146	1977	59%
Korea Telecom*	188	131	44%

**MiTT is Minutes of Telecommunication Traffic. Data are for public telephone circuits only. C&W data are for Hong Kong and Mercury Communications excluding U.K. - Ireland route. AT&T, MCI and US Sprint are for traffic from the continental U.S. excluding traffic to Mexico and Canada. The table excludes the new Japanese carriers IDC and ITJ, which only began service in 1989. Singapore data are for 1986-1989. Korea Telecom, Telefonica and China PTT data are for 1988-1990.*

Table 9

Market Share of Competing U.S., U.K. and Japanese International Carriers: Percent of Outgoing Voice Circuit MiTT* (1986-1990)

United States	AT&T	MCI	US Sprint
1986	94.3	4.0	1.6
1987	93.0	4.7	2.3
1988	89.1	7.0	3.5
1989	83.3	10.2	5.8
1990	78.4	14.6	6.4
United Kingdom	BT	Mercury	
1986/87 (FY)	99.8	0.2	
1987/88 (FY)	98.5	1.5	
1988/89 (FY)	95.5	4.5	
1989/90 (FY)	91.0	9.0	
1990/91 (FY)	86.0	14.0	
Japan	KDD	ITJ	IDC
1989/90 (FY)	93.3	3.7	3.0
1990/91 (FY)	88.0	6.5	5.5

**MiTT is Minutes of Telecommunication Traffic.*

Sources: US: FCC (excludes traffic to Canada and Mexico)
UK: Oftel and Industry Sources (excludes traffic to Ireland)
Japan: MPT and Industry Sources

Table 10

INTERNATIONAL ROUTES WITH THE LARGEST VOLUME OF TELECOMS TRAFFIC (1990)

Continental	Intercontinental
More than 1 Billion MiTT*	
United States - Canada	United States - United Kingdom
United States - Mexico	
More than 500 Million MITT	
Austria - Germany, FR	United States - Germany, FR
Switzerland - Germany, FR	United States - Japan
More than 250 Million MiTT	
France - Italy	France - United States
France - Belgium	
France - Spain	
France - Switzerland	
France - United Kingdom	
France - Germany, FR	
Hong Kong - China (PRC)	
Netherlands - United Kingdom	
Netherlands - Belgium	
Netherlands - Germany, FR	
Switzerland - France	
Switzerland - Italy	
United Kingdom - Germany, FR	
United Kingdom - Ireland	

** MITT is Minutes of Telecommunication Traffic. Data are for two-way traffic for switched voice circuits only.*

THE AMERICAS

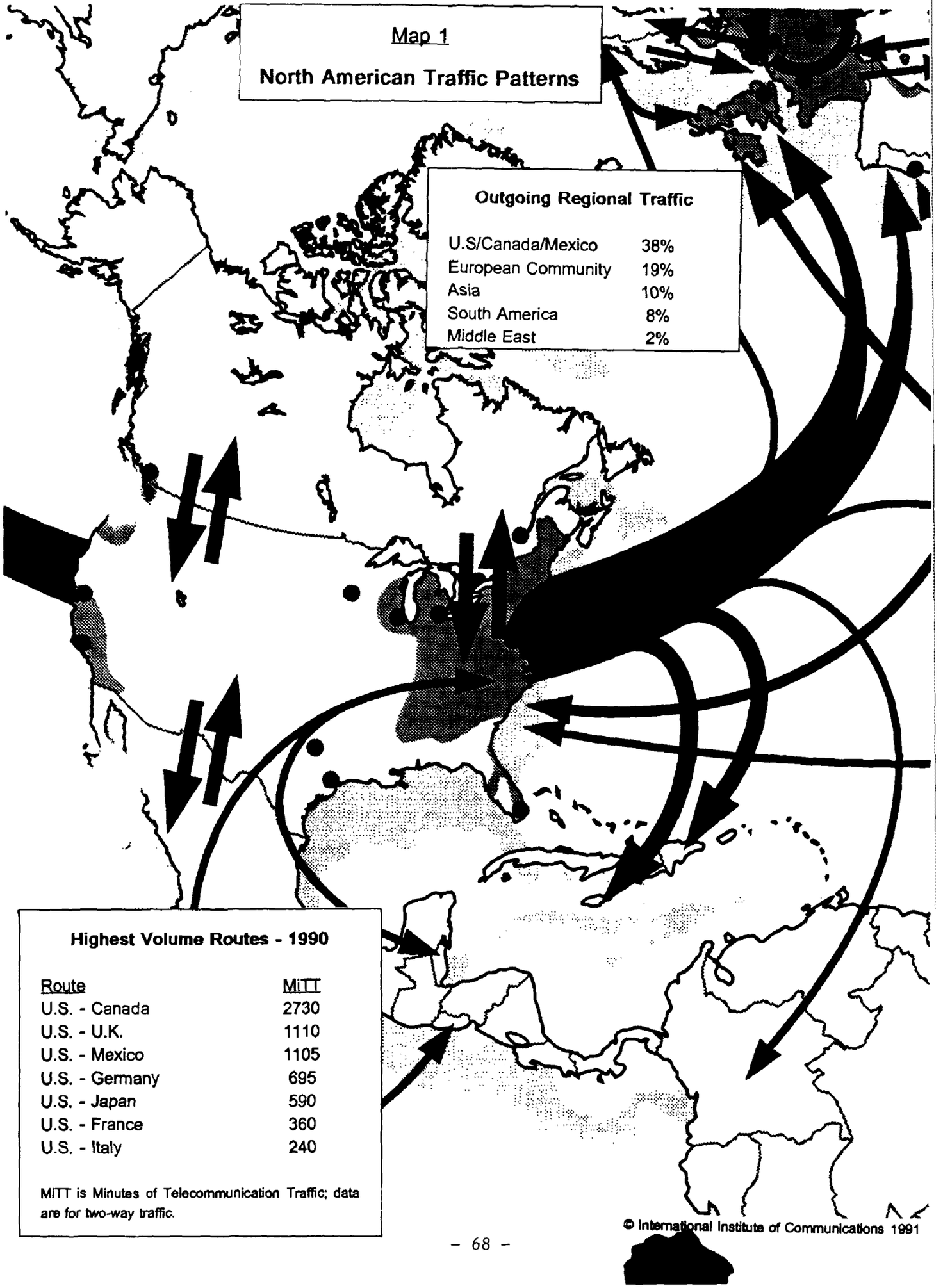


Table 11

Brazil and its
Major Telecommunications Correspondents (1990)

Destination	Outgoing MiTT in Millions*	Share of Total (%)
United States	53.4	34.1
Argentina	12.5	8.0
Germany, FR	9.0	5.8
Italy	9.0	5.8
Portugal	7.4	4.7
France	7.0	4.5
United Kingdom	6.7	4.3
Japan	4.7	3.0
Paraguay	4.3	2.8
Uruguay	4.2	2.7
Switzerland	4.2	2.3
Spain	3.3	2.1
Chile	3.1	2.0
Canada	3.1	1.9
Netherlands	1.8	1.2
Other Countries	23.0	14.7
Total Outgoing	156.5	100

**MITT is Minutes of Telecommunication Traffic. Data are for public telephone voice circuits only.*

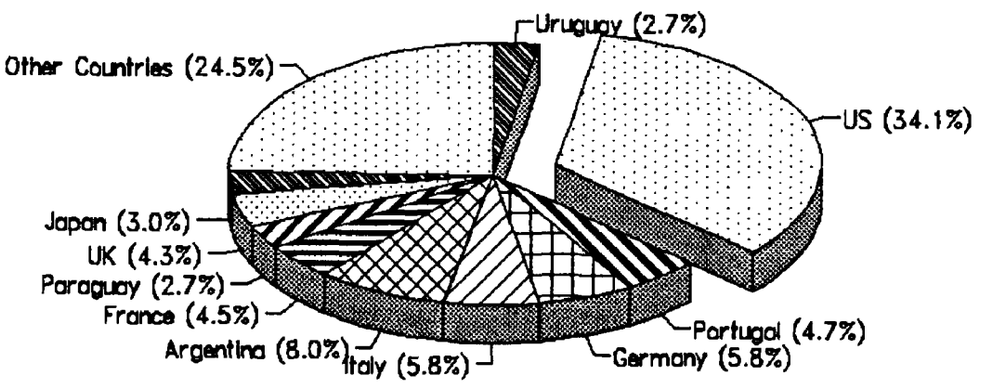


Table 12

Canada and its Major Telecommunications Correspondents (1990)

Destination	Outgoing MiTT in Millions*	Share of Total (%)
United States	1420.0	71.2
United Kingdom	105.1	5.3
Germany, FR	33.8	1.7
France	33.6	1.7
Hong Kong	31.2	1.6
Italy	27.2	1.4
Australia	17.2	0.9
Japan	14.8	0.7
Trinidad & Tobago	13.7	0.7
Jamaica	13.3	0.7
Philippines	13.0	0.7
Netherlands	12.2	0.6
India	11.6	0.6
Portugal	11.3	0.6
Greece	10.8	0.5
Other Countries	224.5	11.3
Total Outgoing	1993.3	100

**MITT is Minutes of Telecommunication Traffic. Data are for public telephone voice circuits only.*

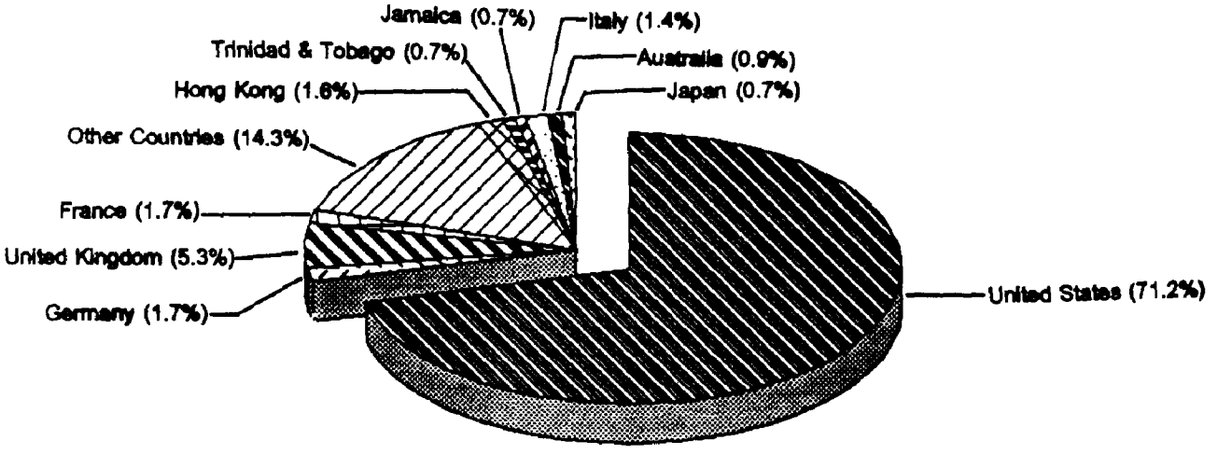


Table 13

Colombia and its
Major Telecommunications Correspondents (1989)

Destination	Outgoing MiTT in Millions*	Share of Total (%)
United States	39.4	58.8
Venezuela	4.6	6.9
Panama	2.3	3.4
Ecuador	2.1	3.1
Spain	1.9	2.8
Mexico	1.9	2.8
United Kingdom	1.3	1.9
Germany, FR	1.1	1.6
France	1.1	1.6
Brazil	1.0	1.5
Italy	1.0	1.5
Canada	0.9	1.3
Peru	0.9	1.3
Argentina	0.9	1.3
Costa Rica	0.6	0.9
Other Countries	6.0	9.0
Total Outgoing	67.0*	100

**MITT is Minutes of Telecommunication Traffic. Data are for public telephone voice circuits only. Total outgoing minutes estimated given 83.791 million outgoing minutes for top 25 destinations.*

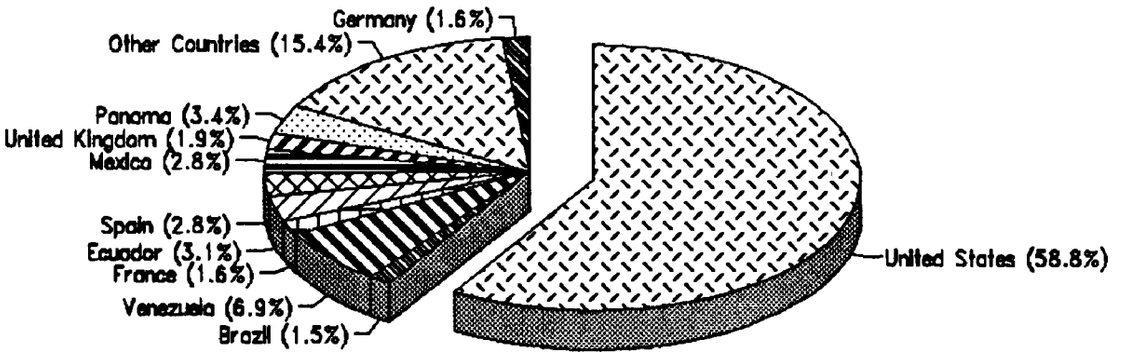


Table 14

Mexico and its
Major Telecommunications Correspondents (1990)

Destination	Outgoing MiTT in Millions*	Share of Total (%)
United States	373.9	88.8
Canada	6.9	1.6
Spain	5.2	1.2
United Kingdom	3.7	0.9
France	3.0	0.7
Germany, FR	3.0	0.7
Italy	2.4	0.6
Colombia	2.3	0.5
Argentina	1.8	0.4
Brazil	1.5	0.4
Costa Rica	1.4	0.3
Japan	1.4	0.3
Venezuela	1.4	0.3
Switzerland	1.1	0.3
El Salvador	1.1	0.3
Other Countries	11.0	2.6
Total Outgoing	421.1	100

*MTT is Minutes of Telecommunication Traffic. Data are for public telephone voice circuits only.

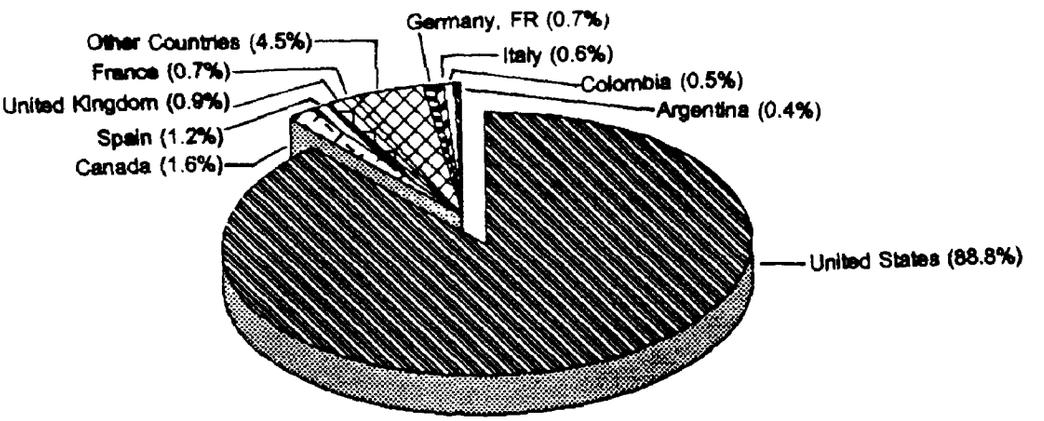


Table 15a

United States - Outgoing Traffic (1990)

Destination	Outgoing MiTT in Millions*	Share of Total (%)
Canada	1460.0	19.5
Mexico	780.0	10.4
United Kingdom	626.7	8.4
Germany, FR	493.5	6.6
Japan	313.8	4.2
France	201.4	2.7
Italy	169.0	2.3
Dominican Republic	165.0	2.2
Korea, Republic of	163.9	2.2
Philippines	163.3	2.2
Colombia	132.5	1.8
Taiwan (ROC)	119.8	1.6
Brazil	108.7	1.4
Israel	106.8	1.4
Jamaica	96.8	1.3
Australia	92.8	1.2
Hong Kong	85.0	1.1
El Salvador	84.0	1.1
Switzerland	77.4	1.0
Netherlands	70.9	0.9
Guatemala	70.5	0.9
Spain	68.9	0.9
Saudi Arabia	68.1	0.9
Peru	64.4	0.9
Poland	64.2	0.9
Other Countries	1651.3	22.0
Total Outgoing	7498.7	100

**MITT is Minutes of Telecommunication Traffic. Data are for public telephone voice circuits only between continental U.S. and foreign points for AT&T, MCI, US Sprint and TRT/FTC combined. Outgoing traffic to Canada and Mexico is estimated.*

Table 15b

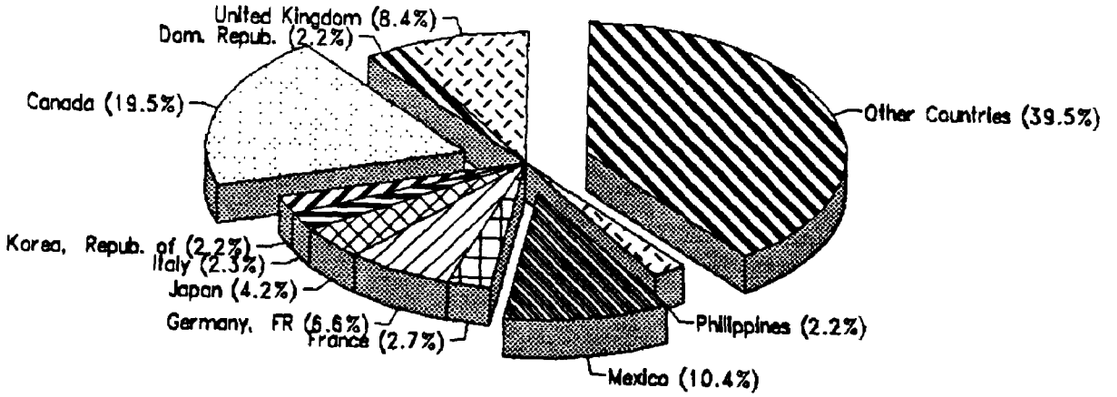
United States - Incoming Traffic (1990)

Destination	Incoming MiTT in Millions*	Share of Total (%)
Canada	1420.0	32.3
United Kingdom	482.6	11.0
Mexico	373.9	8.5
Japan	267.9	6.1
Germany, FR	201.1	4.6
France	136.6	3.1
Australia	94.6	2.2
Taiwan (ROC)	73.9	1.7
Italy	69.9	1.6
Hong Kong	67.0	1.5
Switzerland	61.2	1.4
Brazil	57.6	1.3
Korea, Republic of	56.9	1.3
Netherlands	54.1	1.2
Sweden	48.5	1.1
Colombia	42.0	1.0
Dominican Republic	41.7	0.9
Israel	41.0	0.9
Greece	39.5	0.9
Venezuela	38.8	0.9
India	37.5	0.9
Ireland	35.3	0.8
Spain	35.2	0.8
Bahamas	32.0	0.7
Saudi Arabia	31.0	0.7
Other Countries	558.8	12.7
Total Incoming	4398.6	100

**MiTT is Minutes of Telecommunication Traffic. Data are for public telephone voice circuits only between continental U.S and foreign points for AT&T, MCI, US Sprint and TRT/FTC combined and are estimated for Canada.*

Table 15c

United States Outgoing Traffic 1990



United States Incoming Traffic 1990

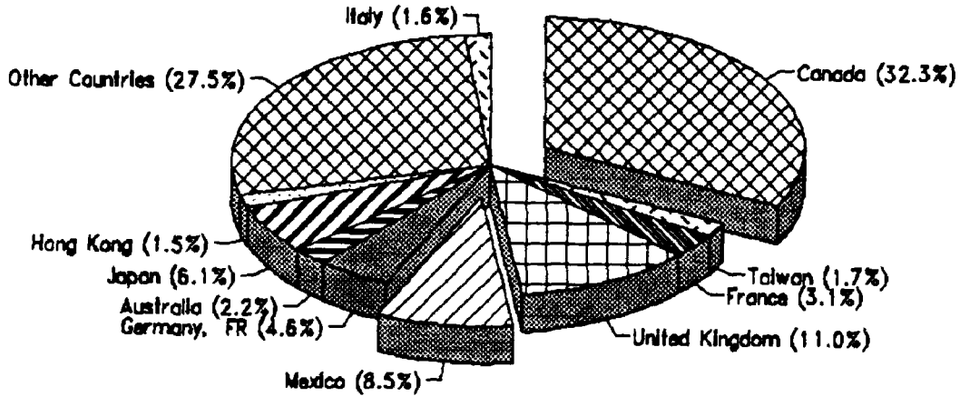
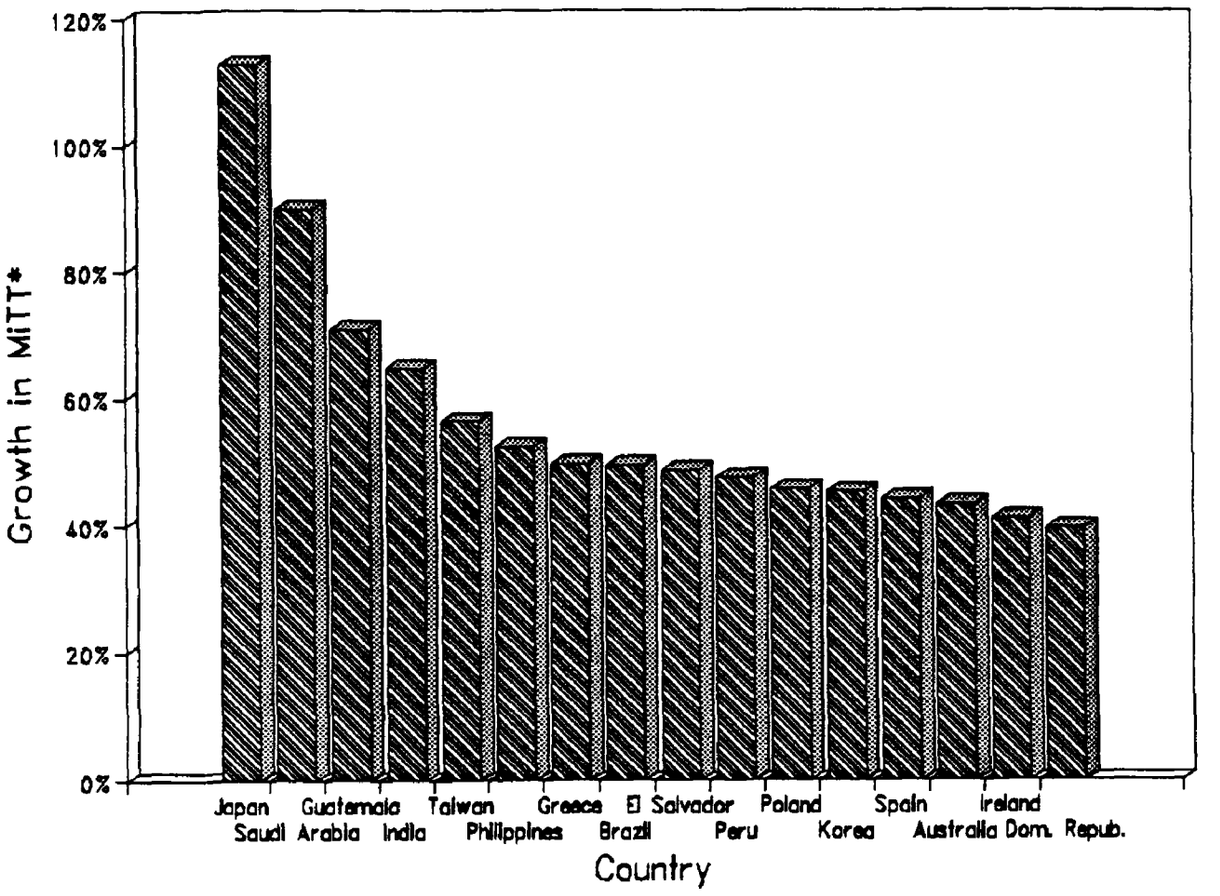


Table 15d

United States Fastest Growing Routes 1988-1990



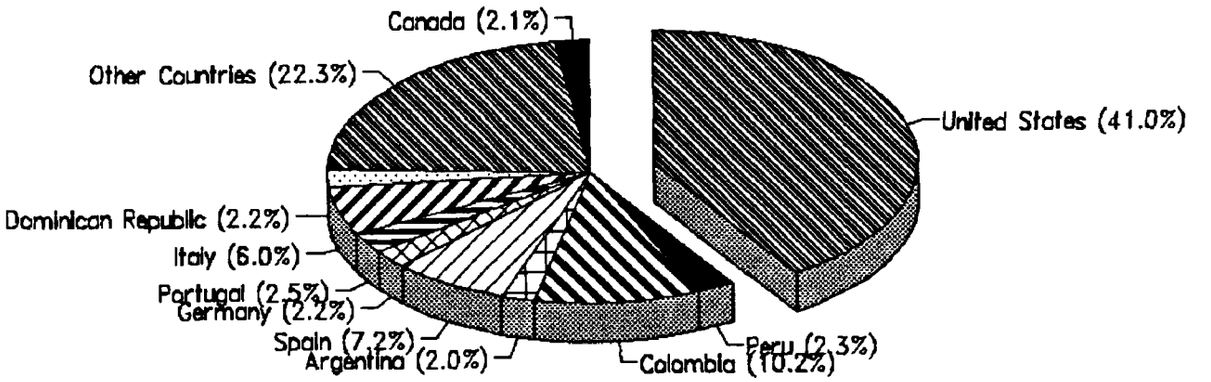
Data are for two-way traffic on public voice circuits only

Table 16

Venezuela and its
Major Telecommunications Correspondents (1990)

Destination	Outgoing MiTT in Millions*	Share of Total (%)
United States	35.0	41.0
Colombia	8.7	10.2
Spain	6.1	7.2
Italy	5.1	6.0
Portugal	2.1	2.5
Peru	2.0	2.3
Germany, FR	1.9	2.2
Dominican Republic	1.9	2.2
Canada	1.8	2.1
Argentina	1.7	2.0
France	1.6	1.9
Brazil	1.5	1.8
Mexico	1.3	1.5
Puerto Rico	1.3	1.5
United Kingdom	1.3	1.5
Other Countries	12.0	14.1
Total Outgoing	85.3	100

**MITT is Minutes of Telecommunication Traffic. Data are for public telephone voice circuits only.*



EUROPE AND THE MIDDLE EAST

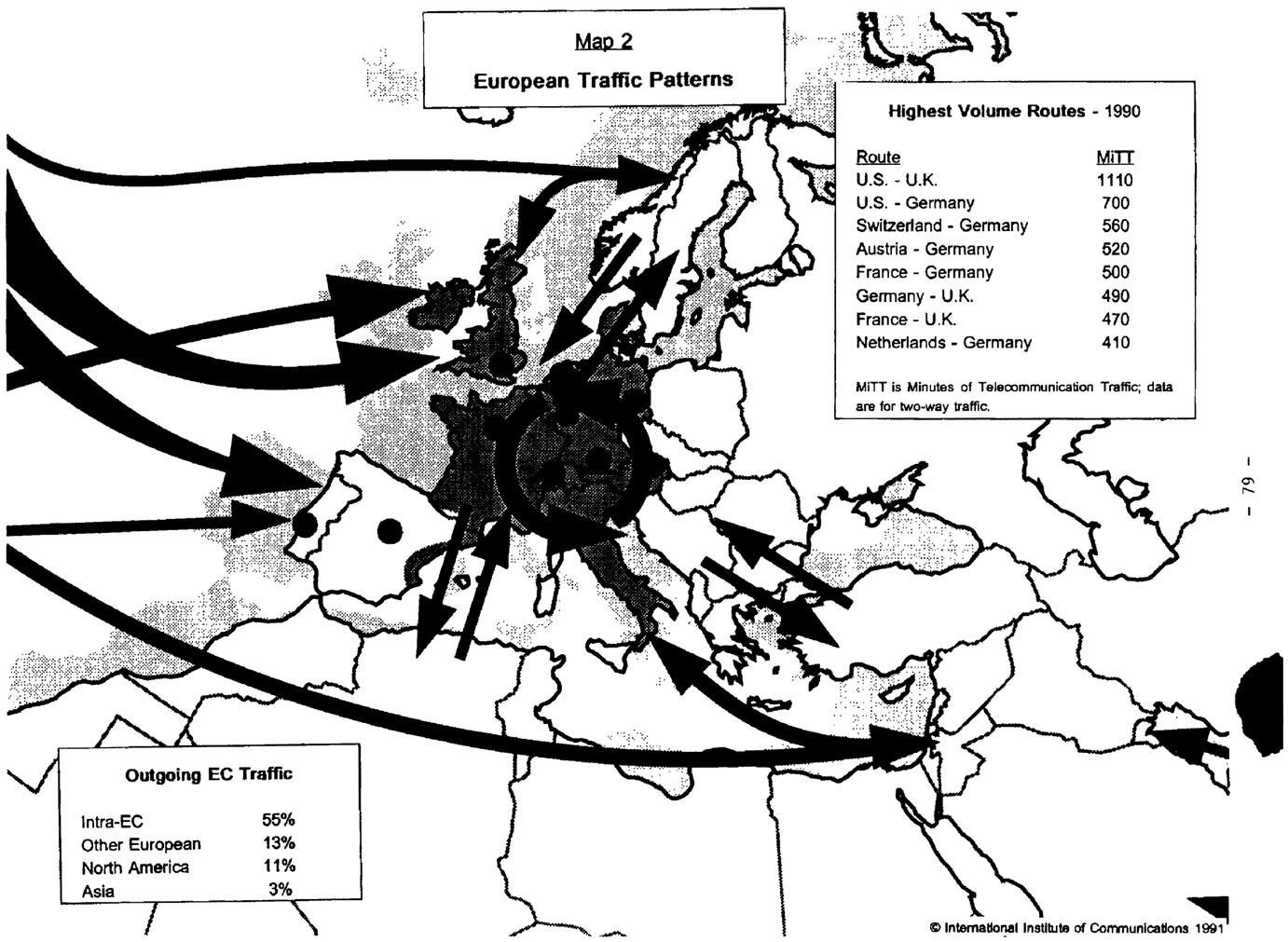

Map 2
European Traffic Patterns
Highest Volume Routes - 1990
Route MiTT
U.S. - U.K. 1110
U.S. - Germany 700
Switzerland - Germany 560
Austria - Germany 520
France - Germany 500
Germany - U.K. 490
France - U.K. 470
Netherlands - Germany 410
MiTT is Minutes of Telecommunication Traffic; data are for two-way traffic.
Outgoing EC Traffic
Intra-EC 55%
Other European 13%
North America 11%
Asia 3%
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Table 17

Belgium and its
Major Telecommunications Correspondents (1990)

Destination	Outgoing MiTT in Millions*	Share of Total (%)
France	184.8	25.3
Netherlands	151.3	20.7
Germany, FR	99.6	13.6
United Kingdom	66.4	9.1
Italy	38.2	5.2
United States	26.9	3.7
Luxembourg	26.8	3.7
Switzerland	20.5	2.8
Spain	19.9	2.7
Sweden	9.2	1.3
Greece	6.6	0.9
Portugal	6.5	0.9
Turkey	6.4	0.9
Denmark	6.3	0.9
Austria	5.4	0.7
Other Countries	56.5	7.7
Total Outgoing	731.3	100

**MITT is Minutes of Telecommunication Traffic. Data are for public telephone voice circuits only.*

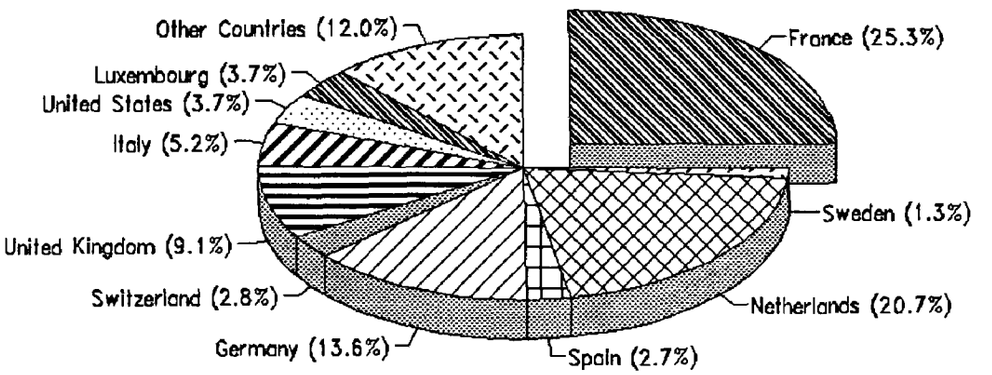


Table 18

Denmark and its
Major Telecommunications Correspondents (1990)

Destination	Outgoing MiTT in Millions*	Share of Total (%)
Sweden	69.0	19.0
Germany, FR	63.1	17.4
United Kingdom	42.0	11.6
Norway	40.1	11.0
United States	18.5	5.1
France	16.5	4.5
Netherlands	13.6	3.7
Italy	8.8	2.4
Switzerland	8.3	2.3
Spain	7.6	2.1
Finland	7.6	2.1
Belgium	7.0	1.9
Turkey	4.1	1.1
Poland	3.9	1.1
Austria	3.3	0.9
Other Countries	49.5	13.8
Total Outgoing	362.8	100

**MITT is Minutes of Telecommunication Traffic. Data are for public telephone voice circuits only.*

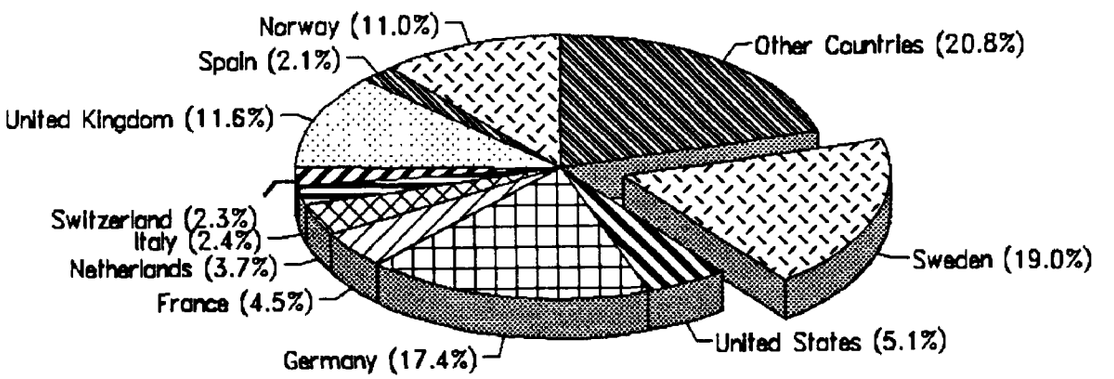


Table 19

France and its
Major Telecommunications Correspondents (FY 1990)

Destination	Outgoing MiTT in Millions*	Share of Total (%)
Germany, FR	250.6	13.0
United Kingdom	240.9	12.5
Italy	192.1	10.0
Belgium	166.4	8.7
Spain	132.0	6.9
United States	131.6	6.8
Switzerland	130.0	6.8
Portugal	98.2	5.1
Netherlands	70.0	3.6
Algeria	47.9	2.5
Morocco	46.8	2.4
Tunisia	34.3	1.8
Turkey	28.1	1.5
Canada	27.2	1.4
Sweden	19.3	1.0
Other Countries	306.1	15.9
Total Outgoing	1921.5	100

**MITT is Minutes of Telecommunication Traffic. Data are for public telephone voice circuits only.*

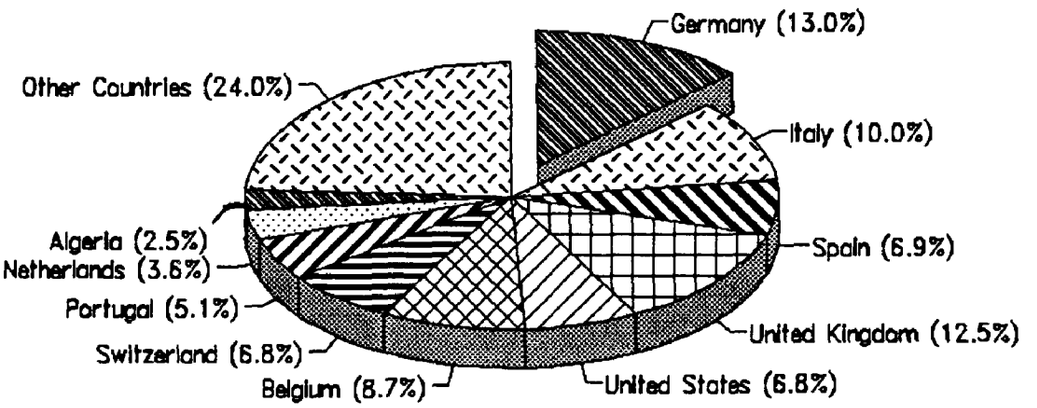


Table 20

Germany, FR and its Major Telecommunications Correspondents (1989)

Destination	Outgoing MiTT in Millions*	Share of Total (%)
Austria	269.0	9.5
Switzerland	253.0	8.9
France	246.0	8.7
United Kingdom	238.0	8.4
Turkey	229.0	8.1
Italy	227.0	8.0
United States	216.0	7.6
Netherlands	195.0	6.9
Yugoslavia	132.0	4.7
Spain	90.0	3.2
Belgium	88.0	3.1
Greece	62.0	2.2
Denmark	55.0	1.9
Luxembourg	25.0	0.9
Canada	21.0	0.7
Australia	12.0	0.4
Ireland	9.0	0.3
Other Countries	467.0	16.5
Total Outgoing	2834.0	100

**MITT is Minutes of Telecommunication Traffic. Data are for public telephone voice circuits only and are rounded to the nearest million minutes. Traffic to the former German Democratic Republic is excluded.*

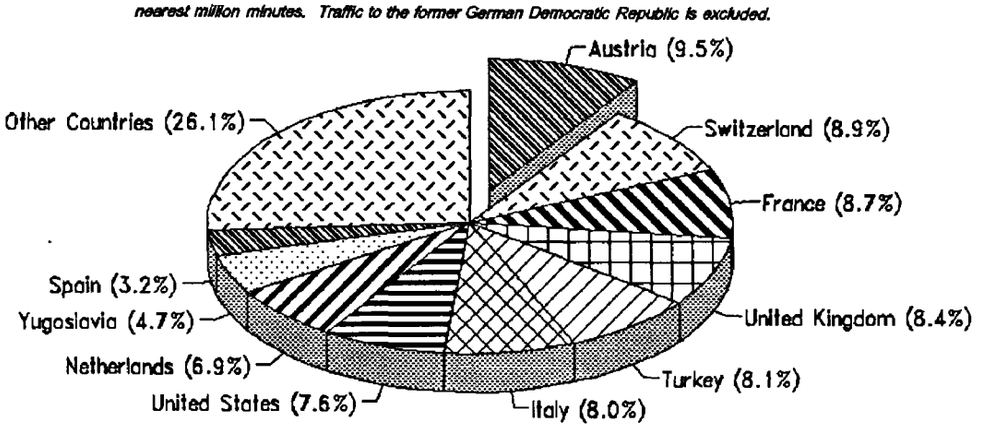


Table 21

Greece and its
Major Telecommunications Correspondents (1990)

Destination	Outgoing MiTT in Millions*	Share of Total (%)
Germany, FR	48.0	22.5
United Kingdom	28.6	13.4
United States	20.3	9.5
Italy	19.6	9.2
France	13.6	6.4
Cyprus	9.5	4.5
Switzerland	7.3	3.4
Belgium	6.4	3.0
Netherlands	6.1	2.9
Yugoslavia	4.6	2.2
Austria	4.2	2.0
Turkey	4.1	1.9
Canada	4.0	1.9
Australia	3.9	1.8
Sweden	3.8	1.8
Other Countries	29.4	13.8
Total Outgoing	213.4	100

**MITT is Minutes of Telecommunication Traffic. Data are for public telephone voice circuits only.*

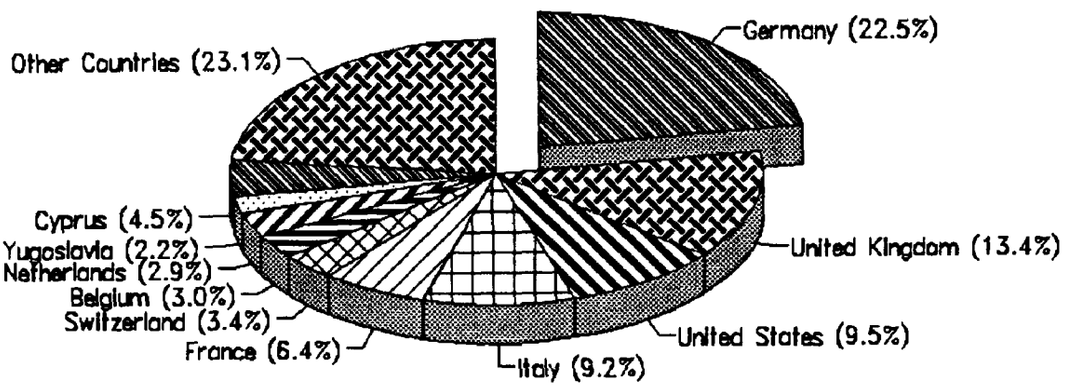


Table 22

Ireland and its
Major Telecommunications Correspondents (FY 1990)

Destination	Outgoing MiTT in Millions*	Share of Total (%)
United Kingdom	187.0	71.3
United States	25.4	9.7
Germany, FR	9.3	3.5
France	8.0	3.1
Netherlands	4.5	1.7
Canada	3.0	1.1
Belgium	2.9	1.1
Italy	2.9	1.1
Spain	2.8	1.1
Australia	2.6	1.0
Switzerland	1.7	0.6
Denmark	1.4	0.5
Sweden	1.2	0.5
Japan	0.7	0.3
Austria	0.6	0.2
Other Countries	8.2	3.1
Total Outgoing	262.2	100

**MiTT is Minutes of Telecommunication Traffic. Data are for public telephone voice circuits only.*

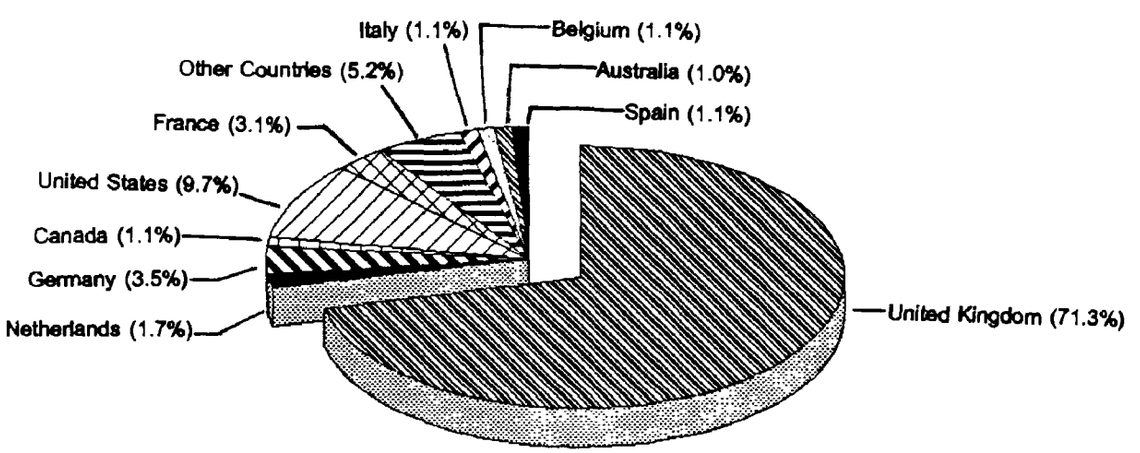


Table 23a

Italy and its
Major Telecommunications Correspondents (1990)

Destination	Outgoing MiTT in Millions*	Share of Total (%)
United States	98.3	47.4
Canada	13.8	6.7
Brazil	10.3	5.0
Argentina	9.4	4.3
Australia	8.9	4.3
Japan	8.0	3.9
Venezuela	4.4	2.1
Israel	4.4	2.1
Hong Kong	3.0	1.4
South Africa	2.5	1.2
Saudi Arabia	2.4	1.2
Colombia	2.2	1.1
Mexico	2.2	1.1
Singapore	1.7	0.8
Iran	1.7	0.8
Other Countries	34.5	16.6
Total Outgoing	207.5	100

**MITT is Minutes of Telecommunication Traffic. Data are for Italcable's intercontinental traffic on public telephone voice circuits only.*

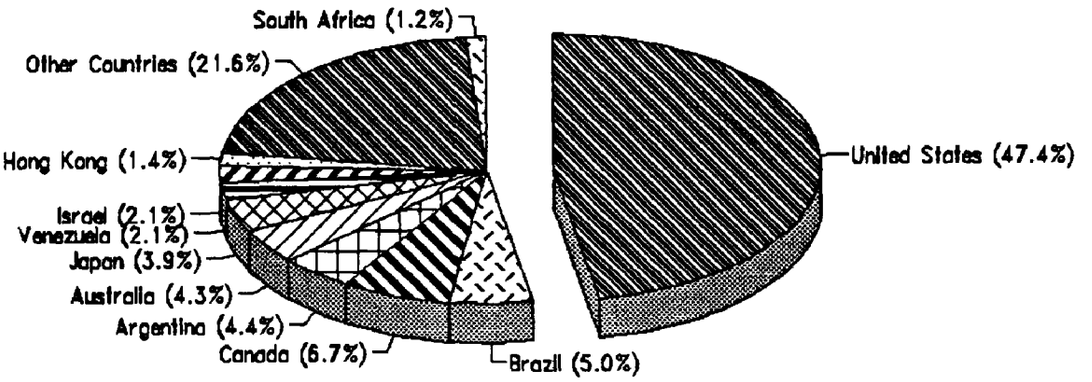


Table 23b

Italy and its
Major Telecommunications Correspondents (1989)

Destination	Outgoing MiTT in Millions*	Share of Total (%)
Germany, FR	165.0	18.2
France	143.0	15.6
Switzerland	113.3	12.5
United States	86.0	9.5
United Kingdom	85.5	9.4
Spain	31.9	3.5
Belgium	31.8	3.5
Austria	27.6	3.0
Netherlands	22.4	2.5
Yugoslavia	18.8	2.1
Greece	15.2	1.7
Canada	12.5	1.4
Sweden	9.1	1.0
Brazil	8.2	0.9
Australia	7.2	0.8
Other Countries	130.5	14.4
Total Outgoing	908.0	100

**MITT is Minutes of Telecommunication Traffic. Data are for italcable and ASST traffic combined for public telephone voice circuits only.*

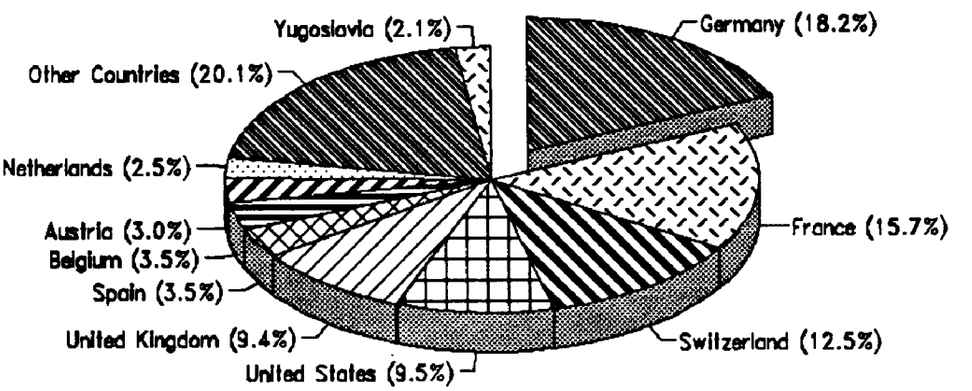


Table 24

Luxembourg and its
Major Telecommunications Correspondents (1990)

Destination	Outgoing MiTT in Millions*	Share of Total (%)
Belgium	33.9	22.5
Germany, FR	30.8	20.5
France	29.4	19.5
United Kingdom	10.3	6.8
Portugal	8.0	5.3
Italy	7.5	5.0
Netherlands	5.6	3.7
Switzerland	5.2	3.5
United States	3.5	2.3
Denmark	3.2	2.1
Spain	2.2	1.5
Sweden	1.7	1.1
Austria	1.4	0.9
Greece	0.9	0.6
Norway	0.7	0.5
Other Countries	6.3	4.2
Total Outgoing	150.6	100

**MITT is Minutes of Telecommunication Traffic. Data are for public telephone voice circuits only.*

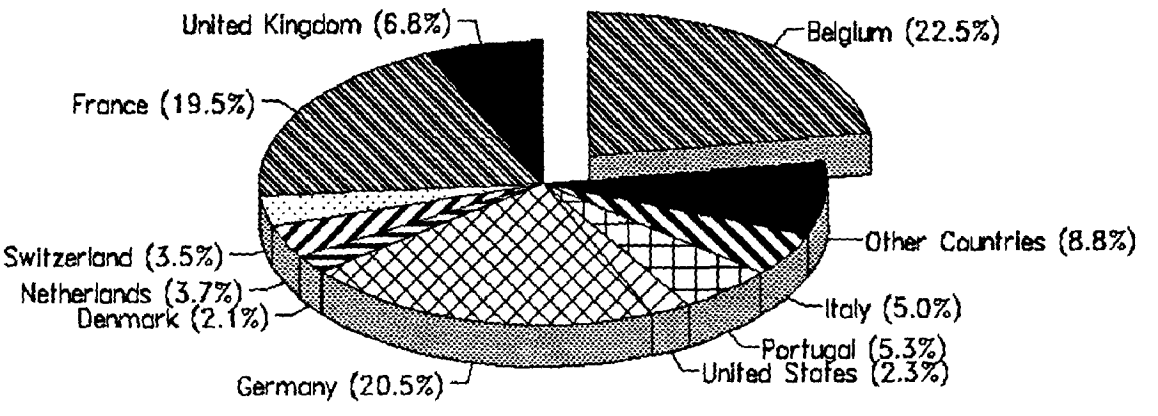


Table 25

Netherlands and its Major Telecommunications Correspondents (1990)

Destination	Outgoing MiTT in Millions*	Share of Total (%)
Germany, FR	218.4	24.1
Belgium	154.1	17.0
United Kingdom	124.5	13.8
France	69.4	7.7
United States	53.1	5.9
Italy	29.7	3.3
Switzerland	28.5	3.1
Spain	22.3	2.5
Turkey	21.8	2.4
Sweden	15.1	1.7
Austria	13.8	1.5
Denmark	13.8	1.5
Canada	10.2	1.1
Norway	8.7	1.1
Surinam	6.5	0.7
Other Countries	115.3	12.7
Total Outgoing	905.2	100

**MTT is Minutes of Telecommunication Traffic. Data are for public telephone voice circuits only.*

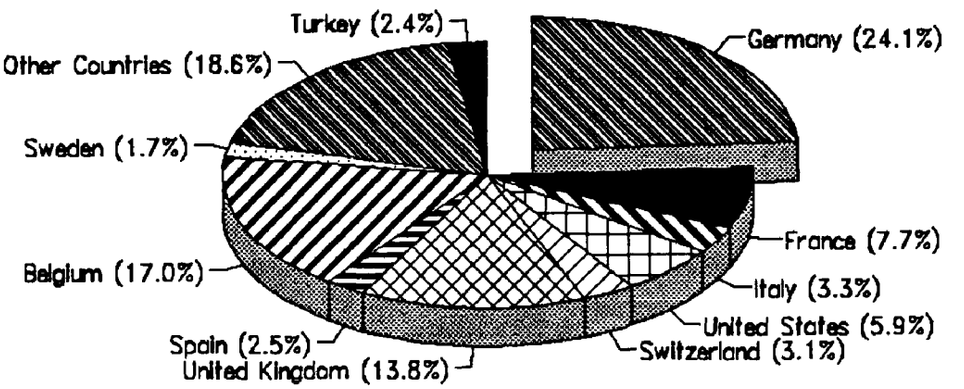


Table 26

Portugal and its
Major Telecommunications Correspondents (1990)

Destination	Outgoing MiTT in Millions*	Share of Total (%)
France	33.3	21.3
Spain	20.8	13.3
United Kingdom	19.7	12.6
Germany, FR	15.6	10.0
Switzerland	9.6	6.1
United States	7.9	5.0
Brazil	6.1	3.9
Italy	5.8	3.7
Netherlands	5.3	3.4
Belgium	5.3	3.4
Canada	3.0	1.9
Sweden	2.6	1.7
Angola	2.3	1.5
Guinea-Bissau	1.9	1.2
Denmark	1.6	1.0
Other Countries	15.8	10.1
Total Outgoing	156.6	100

**MITT is Minutes of Telecommunication Traffic. Data are for public telephone voice circuits only.*

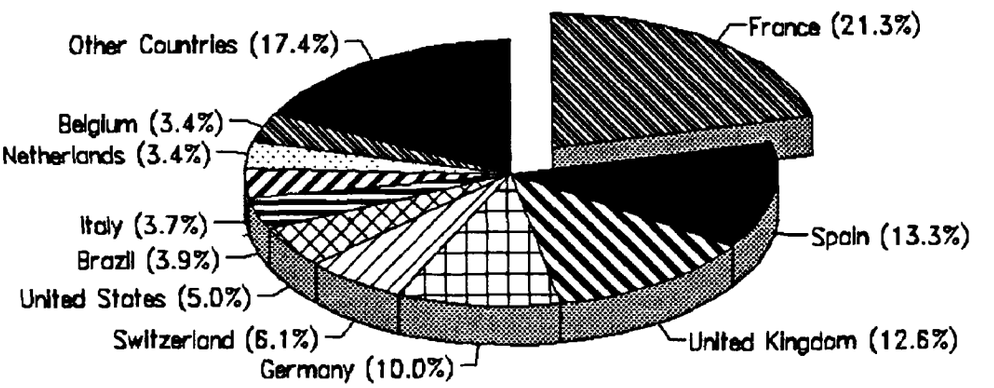


Table 27

Spain and its
Major Telecommunications Correspondents (1990)

Destination	Outgoing MiTT in Millions*	Share of Total (%)
France	119.0	19.5
United Kingdom	98.0	16.0
Germany, FR	93.0	15.2
Italy	45.0	7.4
United States	36.0	5.9
Switzerland	27.0	4.4
Netherlands	25.0	4.1
Belgium	22.0	3.6
Portugal	21.0	3.4
Sweden	12.0	2.0
Argentina	12.0	2.0
Venezuela	6.0	1.0
Colombia	4.0	0.7
Brazil	4.0	0.7
Other Countries	87.0	11.9
Total Outgoing	611.0	100

**MITT is Minutes of Telecommunication Traffic. Data are for public telephone voice circuits only.*

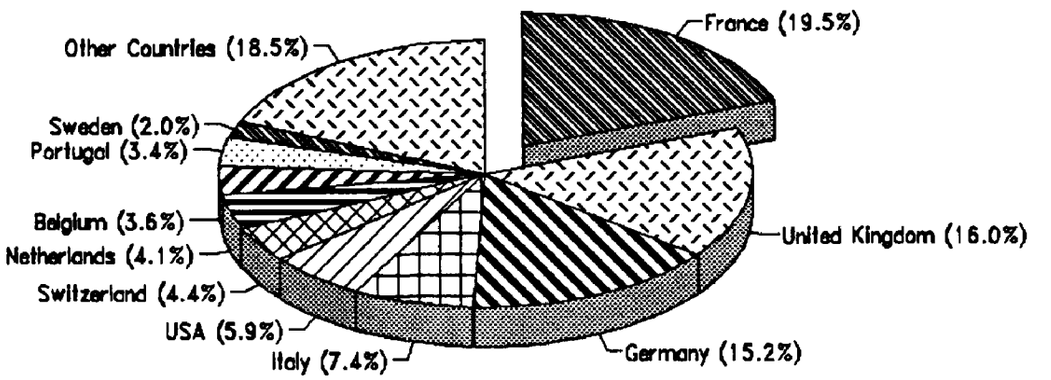


Table 28

United Kingdom and its Major Telecommunications Correspondents (FY 1990)

Destination	Outgoing MiTT in Millions*	Share of Total (%)
United States	530.0	20.9
Germany	250.0	9.9
France	230.0	9.1
Ireland	180.0	7.1
Netherlands	110.0	4.3
Italy	100.0	4.0
Spain	100.0	4.0
Switzerland	90.0	3.6
Canada	90.0	3.6
Australia	80.0	3.2
Belgium	60.0	2.4
Sweden	60.0	2.4
Japan	50.0	2.0
Denmark	40.0	1.6
Norway	40.0	1.6
Other Countries	520.0	20.6
Total Outgoing	2530.0	100

**MITT is Minutes of Telecommunication Traffic. Data are for public telephone voice circuits only. Totals rounded to nearest 10 million MITT. Other U.K. routes in FY 1990 with more than 15 million MITT outgoing included South Africa, Hong Kong, Greece, Austria, Singapore, India, Turkey and New Zealand.*

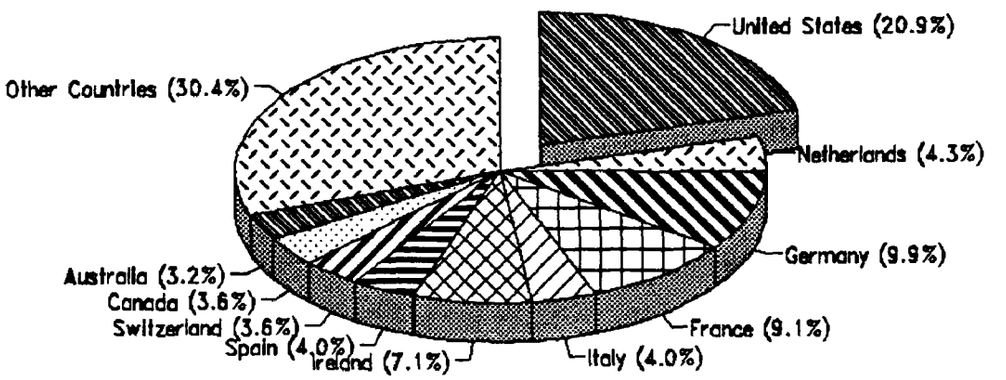


Table 29

Cross-Border Traffic Between The Nations Of The European Communities: A Statistical Matrix (1989)

		OUTGOING MITT (X10^6)*															
INCOMING MITT		B	D	FRG	G	S	F	IR	IT	L	N	P	U.K.		Total		Surplus (Deficit)
	BELGIUM	--	6	88	6	21	158	3	32	30	136	4	55		539		(1)
	DENMARK	5	--	55	2	7	11	1	8	3	12	1	34		139		(15)
	GERMANY	88	59	--	44	85	233	8	165	27	197	13	192		1111		(146)
	GREECE	4	2	62	--	2	13	0	16	1	6	1	23		130		6
	SPAIN	18	7	90	2	--	119	2	32	2	20	16	74		382		(12)
	FRANCE	165	15	246	15	103	--	7	143	25	62	27	209		1017		60
	IRELAND	3	2	9	1	5	10	--	2	1	5	1	170		209		24
	ITALY	34	8	227	21	38	170	2	--	7	26	4	86		623		106
	LUXEMBOURG	24	2	25	1	2	11	0	7	--	4	1	9		86		(30)
	NETHERLANDS	136	12	195	5	22	62	4	22	5	--	4	99		566		(11)
	PORTUGAL	5	2	22	1	17	85	0	4	6	5	--	16		163		75
	UNITED KINGDOM	58	39	238	26	92	205	158	86	9	110	16	--		1037		70
	TOTAL EC	540	154	1257	124	394	1077	185	517	116	583	88	967		6002		

* MITT is Minutes of Telecommunication Traffic. Matrix shows millions of MITT. Data based on survey of operators and IIC estimates. Data are for public voice circuits only.

Table 30

Austria and its
Major Telecommunications Correspondents (1990)

Destination	Outgoing MiTT in Millions*	Share of Total (%)
Germany, FR	250.3	44.8
Switzerland	46.7	8.4
Yugoslavia	43.9	7.9
Italy	33.1	5.9
United Kingdom	18.6	3.3
United States	17.6	3.2
Hungary	16.3	2.9
France	15.8	2.8
Turkey	15.8	2.8
Netherlands	15.1	2.7
Czechoslovakia	12.6	2.3
Poland	11.4	2.0
Sweden	6.2	1.1
Belgium	5.8	1.0
Spain	4.7	0.8
Other Countries	44.8	8.0
Total Outgoing	558.7	100

** MITT is Minutes of Telecommunication Traffic. Data are for public telephone voice circuits only.*

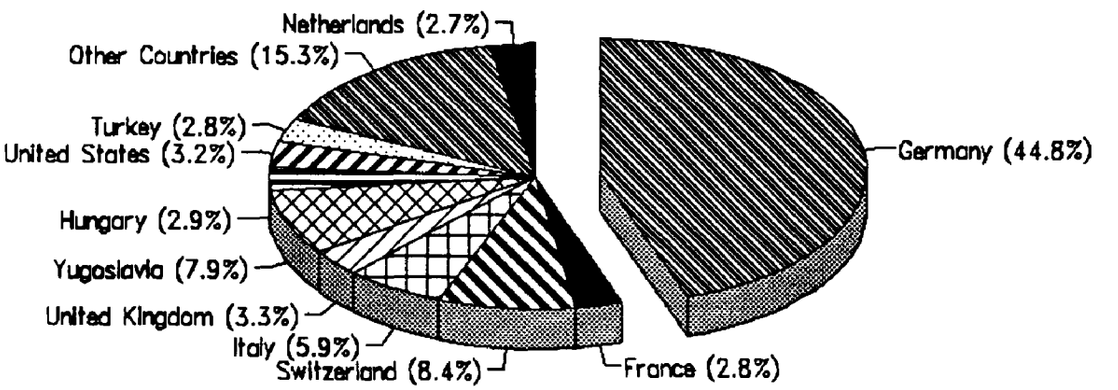


Table 31

Finland and its
Major Telecommunications Correspondents (1990)

Destination	Outgoing MiTT in Millions*	Share of Total (%)
Sweden	85.1	45.8
Germany, FR	17.0	9.1
United States	12.2	6.6
United Kingdom	11.8	6.3
U.S.S.R.	8.0	4.3
Denmark	6.5	3.5
Norway	6.4	3.4
France	5.8	3.1
Switzerland	4.1	2.2
Netherlands	3.8	2.0
Italy	3.4	1.8
Spain	3.3	1.8
Belgium	2.3	1.2
Canada	2.0	1.1
Austria	1.5	0.8
Other Countries	12.8	6.9
Total Outgoing	186.0	100

**MITT is Minutes of Telecommunication Traffic. Data are for public telephone voice circuits only.*

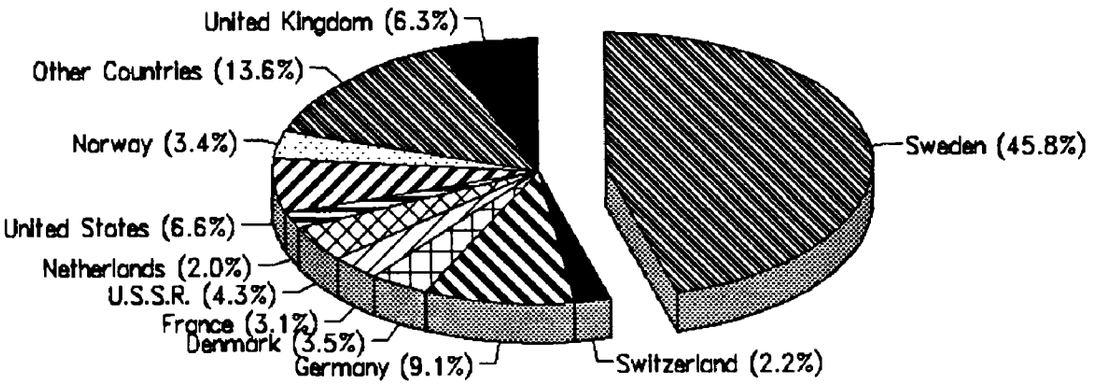


Table 32

Norway and its
Major Telecommunications Correspondents (1990)

Destination	Outgoing MiTT in Millions*	Share of Total (%)
Sweden	85.1	30.3
Denmark	42.7	15.2
United Kingdom	36.6	13.0
Germany, FR	20.6	7.3
United States	20.2	7.2
France	8.9	3.2
Netherlands	7.9	2.8
Finland	7.7	2.7
Spain	4.9	1.7
Switzerland	4.3	1.5
Italy	4.2	1.5
Belgium	3.4	1.2
Poland	2.7	1.0
Canada	2.5	0.9
Yugoslavia	1.8	0.6
Other Countries	27.7	9.9
Total Outgoing	281.2	100

**MITT is Minutes of Telecommunication Traffic. Data are for public telephone voice circuits only.*

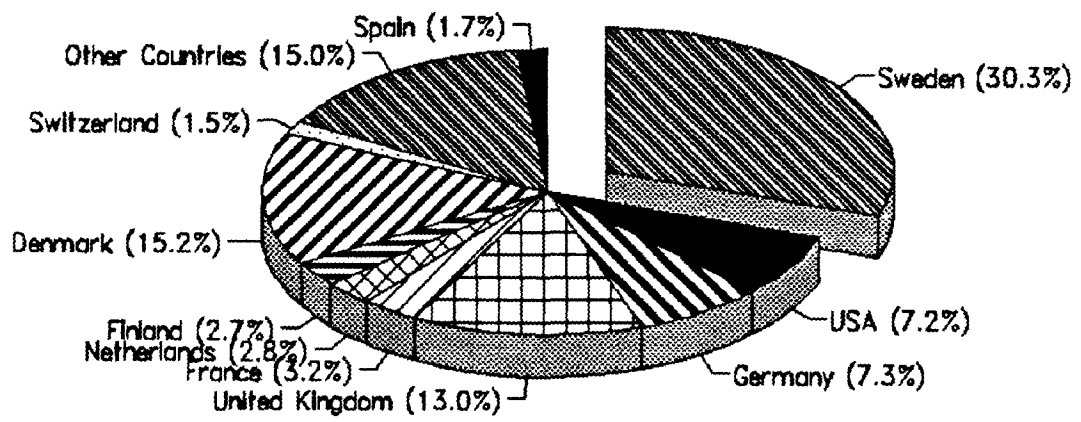


Table 33

Switzerland and its
Major Telecommunications Correspondents (1990)

Destination	Outgoing MiTT in Millions*	Share of Total (%)
Germany, FR	308.6	22.8
France	235.1	17.3
Italy	205.8	15.2
United Kingdom	75.1	5.5
Austria	60.7	4.5
United States	58.8	4.3
Yugoslavia	57.8	4.3
Spain	48.3	3.6
Portugal	47.7	3.5
Netherlands	32.4	2.4
Turkey	29.8	2.2
Belgium	23.9	1.8
Sweden	14.5	1.1
Canada	10.4	0.8
Denmark	8.4	0.6
Other Countries	139.0	10.2
Total Outgoing	1356.3	100

**MITT is Minutes of Telecommunication Traffic. Data are for public telephone voice circuits only.*

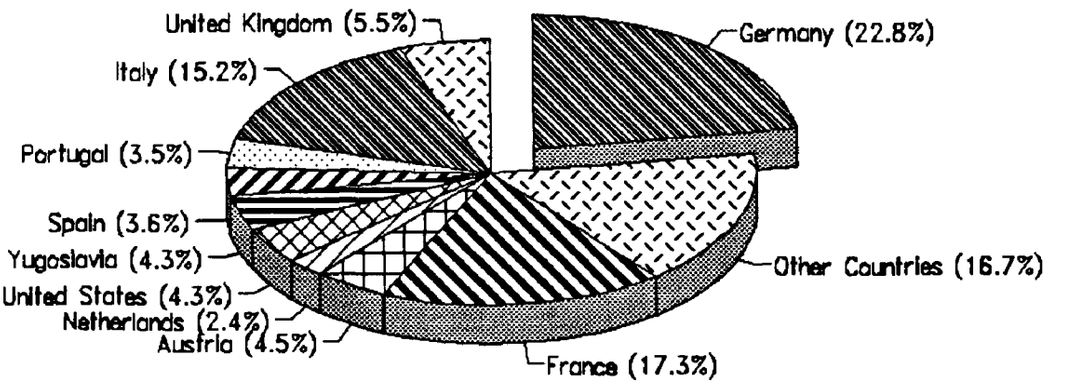


Table 34

Israel and its
Major Telecommunications Correspondents (1990)

Destination	Outgoing MiTT in Millions*	Share of Total (%)
United States	40.2	34.1
United Kingdom	13.0	11.0
France	9.7	8.2
Germany, FR	8.5	7.2
Italy	4.4	3.7
Canada	3.9	3.3
Switzerland	3.8	3.2
U.S.S.R.	3.1	2.6
Belgium	3.0	2.5
Netherlands	2.9	2.5
South Africa	2.3	2.0
Turkey	1.4	1.2
Australia	1.3	1.1
Egypt	1.3	1.1
Argentina	1.3	1.1
Other Countries	17.8	15.1
Total Outgoing	117.9	100

**MITT is Minutes of Telecommunication Traffic. Data are for public telephone voice circuits only.*

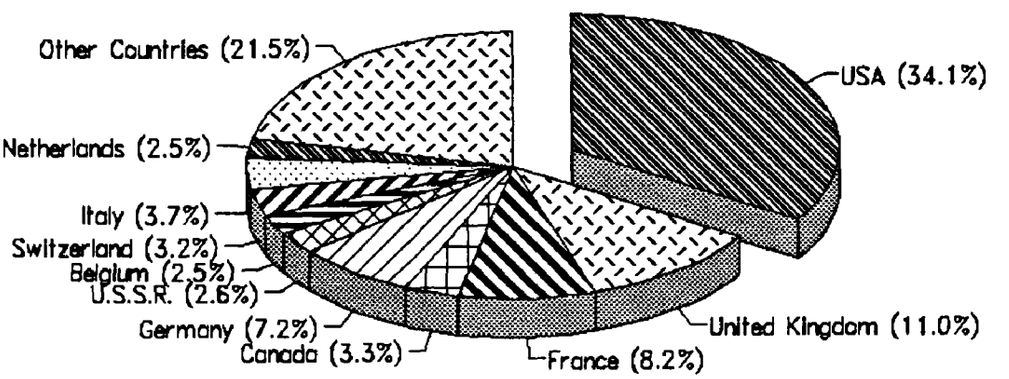
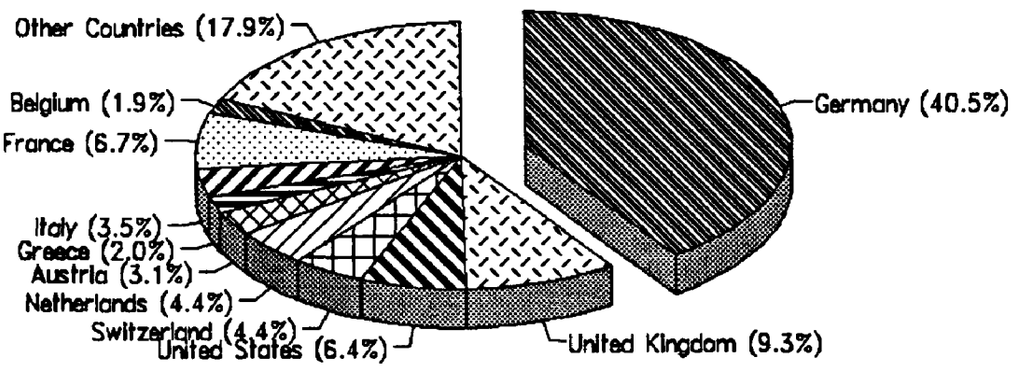


Table 35

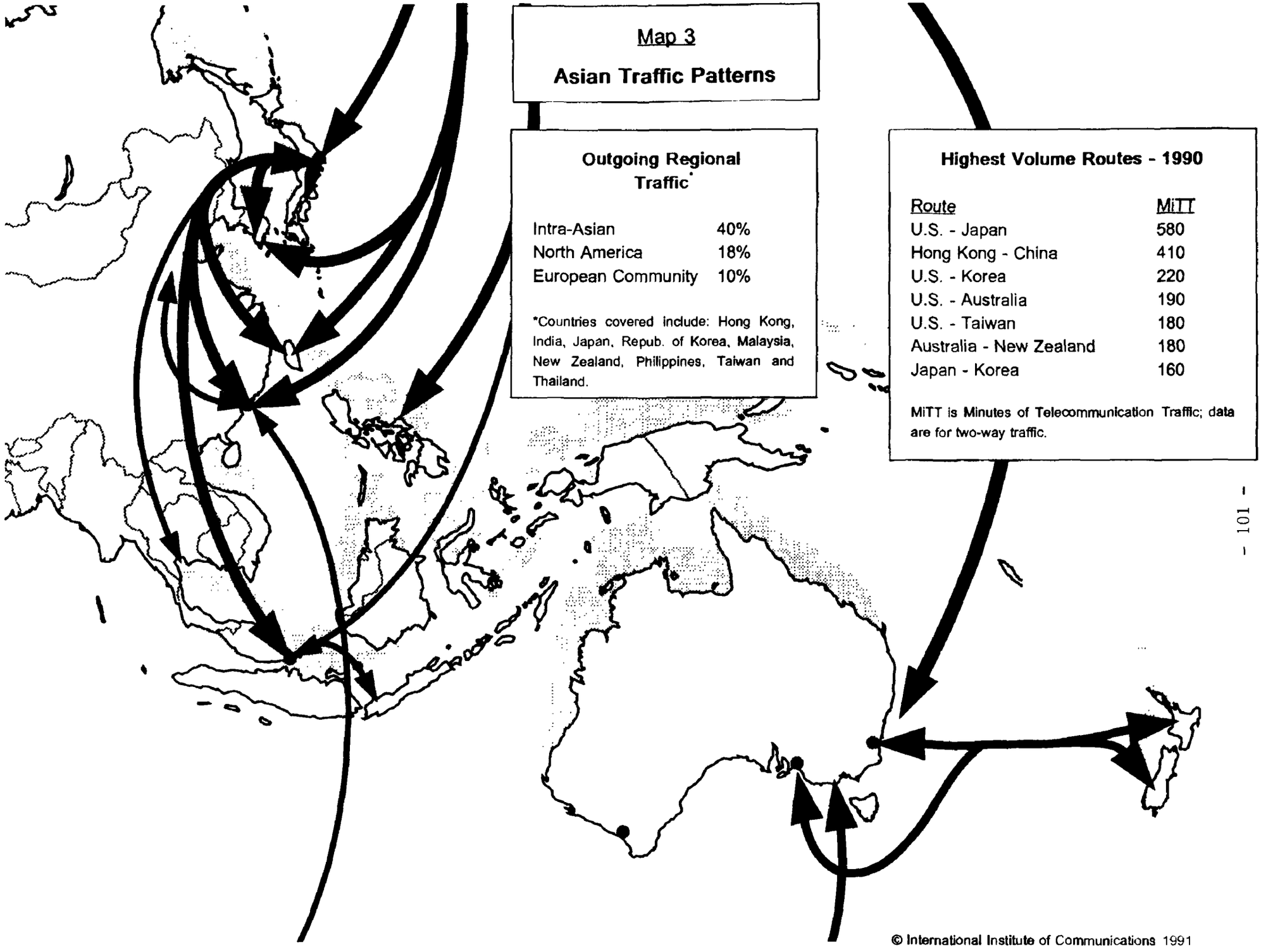
Turkey and its
Major Telecommunications Correspondents (1990)

Destination	Outgoing MiTT in Millions*	Share of Total (%)
Germany, FR	64.2	40.5
United Kingdom	14.7	9.3
France	10.6	6.7
United States	10.1	6.4
Switzerland	7.0	4.4
Netherlands	7.0	4.4
Italy	5.5	3.5
Austria	4.9	3.1
Greece	3.2	2.0
Belgium	3.0	1.9
Iran	2.7	1.7
Saudi Arabia	2.4	1.5
Bulgaria	2.1	1.3
Yugoslavia	2.0	1.3
Sweden	1.9	1.2
Other Countries	17.2	10.8
Total Outgoing	158.6	100

**MITT is Minutes of Telecommunication Traffic. Data are for public telephone voice circuits only.*



ASIA AND THE PACIFIC



Map 3

Asian Traffic Patterns

Outgoing Regional Traffic*

Intra-Asian	40%
North America	18%
European Community	10%

*Countries covered include: Hong Kong, India, Japan, Repub. of Korea, Malaysia, New Zealand, Philippines, Taiwan and Thailand.

Highest Volume Routes - 1990

Route	MiTT
U.S. - Japan	580
Hong Kong - China	410
U.S. - Korea	220
U.S. - Australia	190
U.S. - Taiwan	180
Australia - New Zealand	180
Japan - Korea	160

MiTT is Minutes of Telecommunication Traffic; data are for two-way traffic.

Table 36

Hong Kong and its
Major Telecommunications Correspondents (FY 1990)

Destination	Outgoing MiTT in Millions*	Share of Total (%)
China (PRC)	265.0	36.4
United States	70.0	9.6
Taiwan (ROC)	50.0	6.9
Japan	40.0	5.5
United Kingdom	30.0	4.1
Canada	30.0	4.1
Macao	25.0	3.4
Australia	25.0	3.4
Other Countries	194.0	26.6
Total Outgoing	729.0	100

**MITT is Minutes of Telecommunication Traffic. Data are for public telephone voice circuits only. Data rounded to the nearest 5 million MITT.*

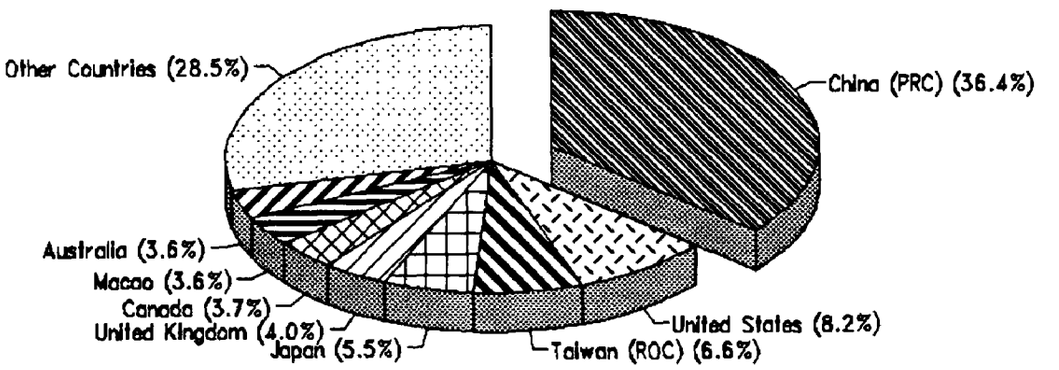


Table 37

India and its
Major Telecommunications Correspondents (FY 1988)

Destination	Outgoing MiTT in Millions*	Share of Total (%)
United States	26.8	29.6
United Kingdom	13.8	15.2
United Arab Emirates	8.1	8.9
Saudi Arabia	4.3	4.7
Singapore	3.9	4.3
Canada	3.3	3.6
Germany, FR	2.8	3.1
Hong Kong	2.7	3.0
Japan	2.4	2.6
Australia	1.8	2.0
Kuwait	1.8	2.0
Oman	1.7	1.9
France	1.6	1.8
Bahrain	1.1	1.2
Belgium	1.0	1.1
Other Countries	13.5	14.9
Total Outgoing	90.6	100

**MITT is Minutes of Telecommunication Traffic. Data are for public telephone voice circuits only and exclude traffic to Pakistan.*

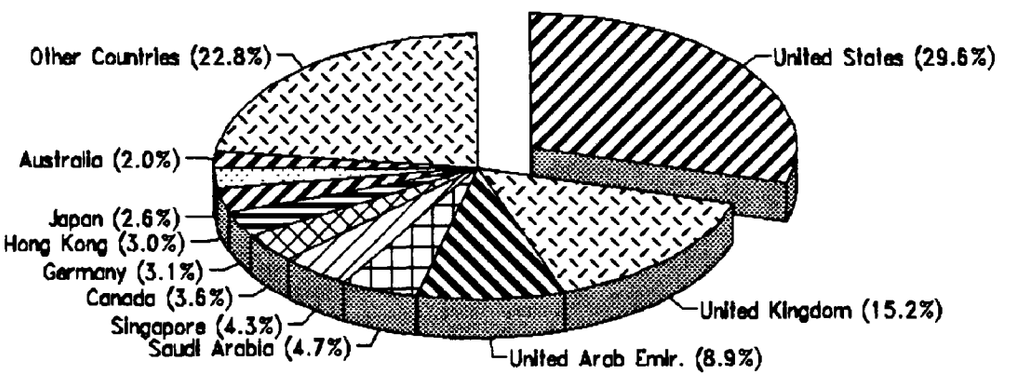


Table 38

Japan and its Major Telecommunications Correspondents (FY 1989)

Destination	Outgoing MiTT in Millions*	Share of Total (%)
United States	162.4	27.2
Korea, Republic of	83.9	14.1
Taiwan (ROC)	55.0	9.2
United Kingdom	33.4	5.6
Philippines	31.2	5.2
Hong Kong	30.1	5.0
China (PRC)	20.8	3.5
Singapore	19.2	3.2
Germany	18.2	3.1
Thailand	17.7	3.0
Australia	16.4	2.7
France	13.1	2.2
Malaysia	8.5	1.4
Canada	8.2	1.4
Indonesia	7.5	1.3
Other Countries	49.4	8.3
Total Outgoing	596.5	100

**MITT is Minutes of Telecommunication Traffic. Data are for public telephone voice circuits only. Country breakdown on outgoing MITT include only IDD calls. Total outgoing MITT for FY 1989 is 701.4 million.*

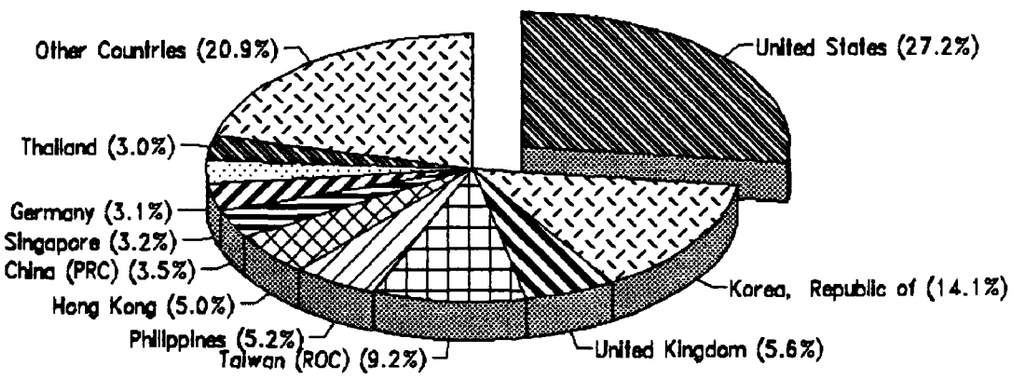


Table 39

Republic of Korea and its Major Telecommunications Correspondents (1990)

Destination	Outgoing MiTT in Millions*	Share of Total (%)
Japan	63.2	33.6
United States	51.9	27.6
Hong Kong	9.3	4.9
Germany, FR	6.2	3.3
Taiwan (ROC)	5.0	2.7
United Kingdom	4.5	2.4
Australia	3.8	2.0
Singapore	3.4	1.8
France	3.2	1.7
Canada	3.1	1.6
Indonesia	2.9	1.5
China (PRC)	2.1	1.1
Philippines	1.9	1.0
Italy	1.8	1.0
Thailand	1.6	0.9
Other Countries	24.2	12.9
Total Outgoing	188.1	100

**MITT is Minutes of Telecommunication Traffic. Data are for public telephone voice circuits only.*

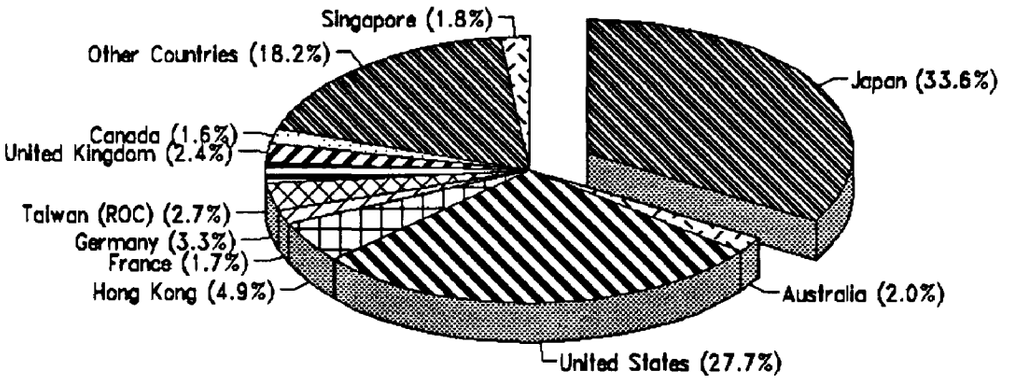


Table 40

Malaysia and its
Major Telecommunications Correspondents (1990)

Destination	Outgoing MiTT in Millions*	Share of Total (%)
Japan	11.3	14.1
United States	9.0	11.3
Australia	8.9	11.1
United Kingdom	7.9	9.9
Hong Kong	7.2	9.0
Taiwan (ROC)	6.9	8.6
Thailand	5.7	7.1
Indonesia	3.4	4.3
India	2.5	3.1
Philippines	1.8	2.3
Canada	1.7	2.1
Germany, FR	1.6	2.0
Korea, Republic of	1.4	1.8
Brunei	1.1	1.4
New Zealand	1.0	1.3
Other Countries	8.6	10.8
Total Outgoing	80.0	100

**MITT is Minutes of Telecommunication Traffic. Data are for public telephone voice circuits only and exclude traffic to Singapore.*

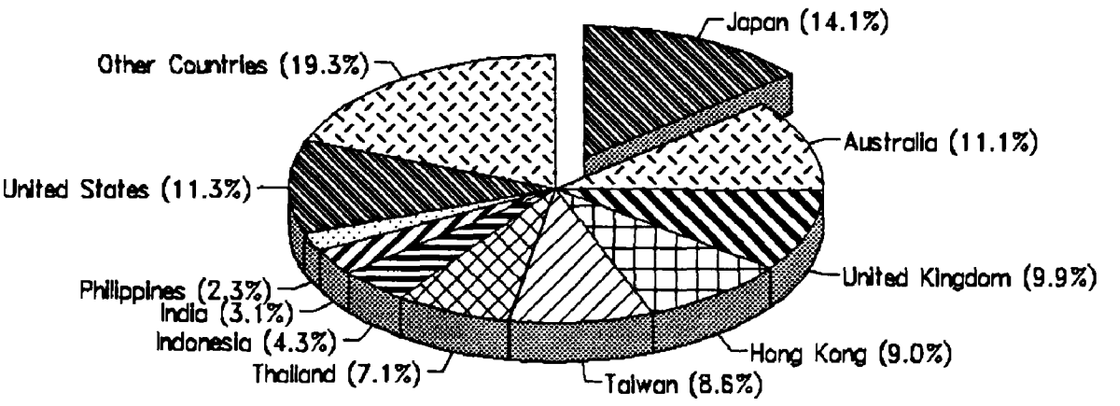


Table 41

New Zealand and its
Major Telecommunications Correspondents (FY 1990)

Destination	Outgoing MiTT in Millions*	Share of Total (%)
Australia	84.0	48.3
United Kingdom	16.0	9.2
United States	15.0	8.6
Japan	13.0	7.5
Hong Kong	9.0	5.2
Fiji	8.0	4.6
Singapore	6.0	3.4
W. Samoa	5.0	2.9
Canada	4.0	2.3
Germany	4.0	2.3
Other Countries	10.0	5.7
Total Outgoing	174.0	100

**MiTT is Minutes of Telecommunication Traffic. Data are for public telephone voice circuits only and have been estimated to the nearest million MiTT.*

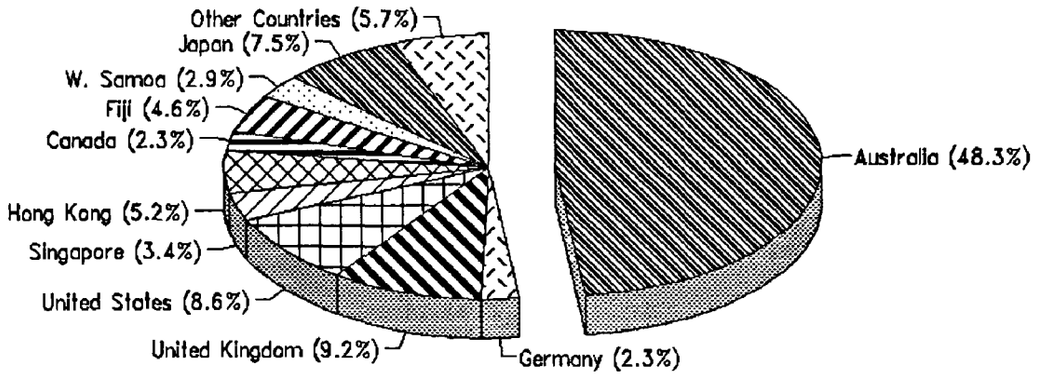


Table 42

Philippines and its Major Telecommunications Correspondents (1990)

Destination	Outgoing MiTT in Millions*	Share of Total (%)
United States	51.4	51.0
Japan	12.5	12.4
Hong Kong	9.3	9.2
Taiwan (ROC)	3.7	3.7
Australia	3.1	3.1
Singapore	2.9	2.9
United Kingdom	2.1	2.1
Saudi Arabia	1.8	1.8
Guam	1.6	1.6
Canada	1.3	1.3
Korea, Repub. of	1.3	1.3
Germany, FR	1.2	1.2
Other Countries	8.5	8.4
Total Outgoing	100.7	100

**MITT is Minutes of Telecommunication Traffic. Data are for public telephone voice circuits only.*

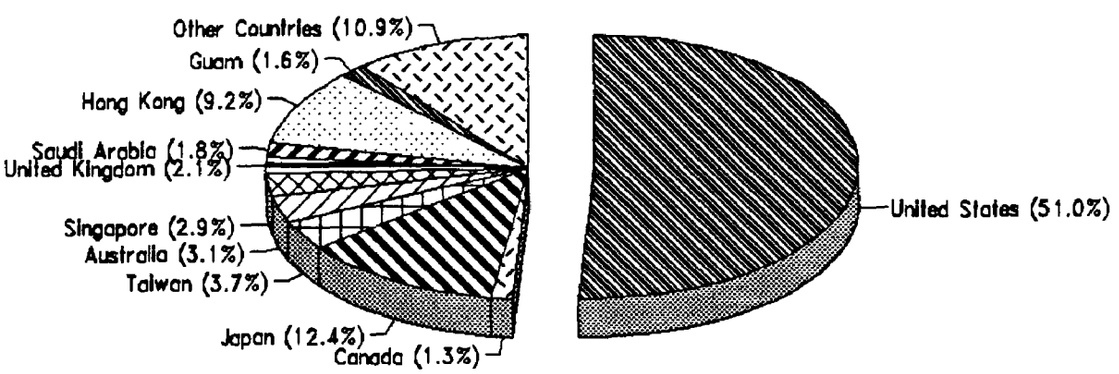


Table 43

Taiwan (R.O.C.) and its Major Telecommunications Correspondents (FY 1989)

Destination	Outgoing MiTT in Millions*	Share of Total (%)
United States	56.2	26.5
Japan	43.3	20.4
Hong Kong	36.7	17.3
Singapore	8.3	3.9
China (PRC)	8.1	3.8
Malaysia	6.1	2.9
Philippines	5.4	2.5
Thailand	5.3	2.5
Canada	4.5	2.1
Germany, FR	4.4	2.1
Korea, Republic of	4.1	1.9
Australia	4.0	1.9
Indonesia	4.0	1.9
United Kingdom	3.3	1.6
France	2.1	1.0
Other Countries	16.1	7.6
Total Outgoing	211.9	100

**MITT is Minutes of Telecommunication Traffic. Data are for public telephone voice circuits only for FY ending June 1990.*

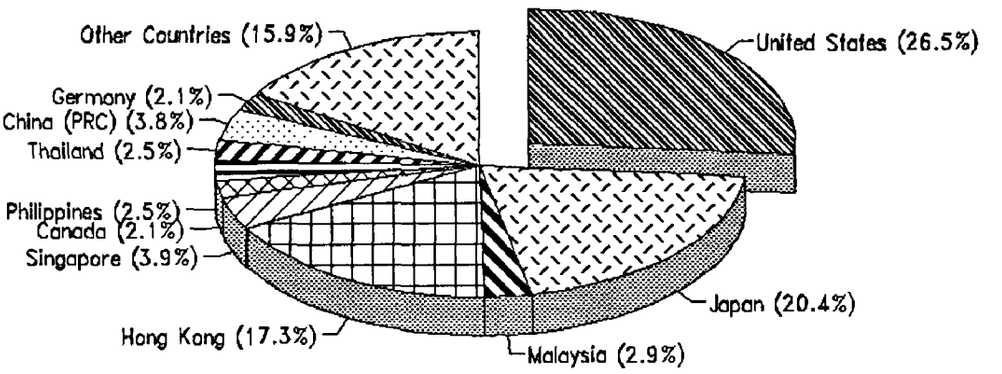
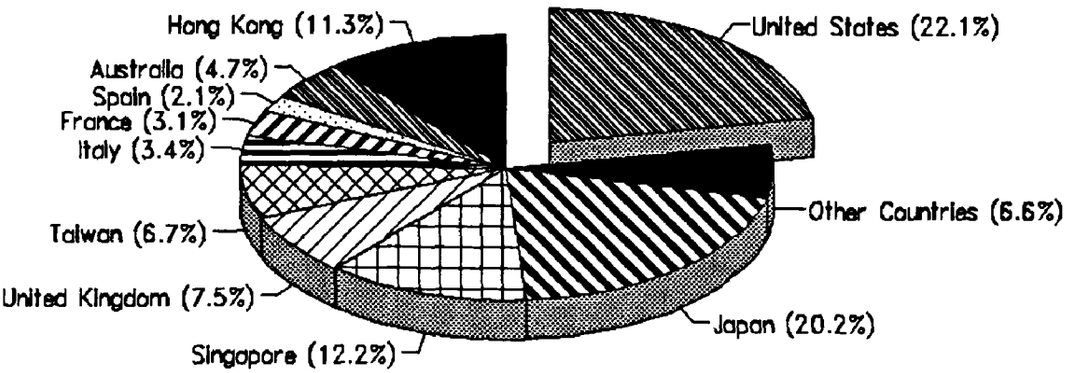


Table 44

Thailand and its
Major Telecommunications Correspondents (FY 1989)

Destination	Outgoing MiTT in Millions*	Share of Total (%)
United States	29.6	22.1
Japan	27.0	20.2
Singapore	16.3	12.2
Hong Kong	15.1	11.3
United Kingdom	10.1	7.5
Taiwan (R.O.C.)	9.0	6.7
Australia	6.3	4.7
Italy	4.6	3.4
France	4.2	3.1
Spain	2.8	2.1
Korea, Republic of	2.5	1.9
Sweden	2.4	1.8
Canada	2.2	1.6
Indonesia	1.6	1.2
Other Countries	0.2	0.1
Total Outgoing	133.9	100

**MITT is Minutes of Telecommunication Traffic. Data are for public telephone voice circuits only.*



METHODOLOGY AND SOURCES

The telecommunications traffic statistics in this report were primarily compiled by the International Institute of Communications (IIC) from an independent survey of service providers. In some cases, the data have been estimated based upon annual reports, government publications and industry interviews. The following publications were also consulted: Yearbook of Statistics (ITU, Geneva, 1991); International Fernsprechstatistik (Siemens, Munich, 1991); The World's Telephones January 1987 - 88, (AT&T, Indianapolis, IN, 1989); and The World's Telephones January 1989 (AT&T, Indianapolis, IN, 1990).

A common accounting unit known as MiTT -- Minutes of Telecommunication Traffic -- is used throughout the report. Unless otherwise stated, MiTT refers to paid minutes of public voice circuit traffic including operator assisted calls. Depending upon national conditions, therefore, MITT may include voice and non-voice (eg., facsimile, slow speed data) traffic.

For a discussion of the origins of MiTT and its various applications (eg., economic forecasting, competition policy, geography), see G. Staple and M. Mullins "Telecom Traffic Statistics - MiTT Matter", Telecommunications Policy, Vol. 14, No. 2, June 1989, pp. 105-128.

Carrier traffic statistics do not include traffic from foreign subsidiaries or investment interests, unless otherwise stated. Calendar year data have been used wherever possible; fiscal year data are used elsewhere (eg., the U.K., France, Japan, Taiwan, Australia).

Traffic data compiled in calls for certain countries and service providers have been converted to MiTT based upon average call lengths, exchange lines in service and national calling patterns. For a further discussion of the basis for deriving MiTT from call data, see Appendix A to Global Telecommunication Traffic Flows and Market Structures (IIC, London, 1989).

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