INTERNATIONAL TELECOMMUNICATION UNION
TELECOMMUNICATION DEVELOPMENT BUREAU

WORLD TELECOMMUNICATION DEVELOPMENT CONFERENCE (WTDC-98)

Valletta, Malta, 23 March - 1 April 1998

Document 69-E
26 February 1998
Original: English

For information

Agenda item: 2.0 **PLENARY MEETING**

Telecommunication Development Bureau

GLOBAL TELECOMMUNICATION DEVELOPMENT TRENDS

This report reviews the major developments and trends in the telecommunication sector since the World Telecommunication Development Conference in Buenos Aires, March 1994. The continual emergence of new technologies and the evolution of services, the shift towards a competitive marketplace, and a wave of privatizations has brought about dramatic change in the telecommunications sector over recent years. Four different areas are addressed: the impact of market liberalization, new technologies, policy issues, and the convergence with the computing and broadcasting sectors. Within each of these areas, the major developments over the last four years are identified. The report also reviews activities of the ITU in each area. Finally, a bibliography is attached for readers who are interested in pursuing these topics in greater depth.

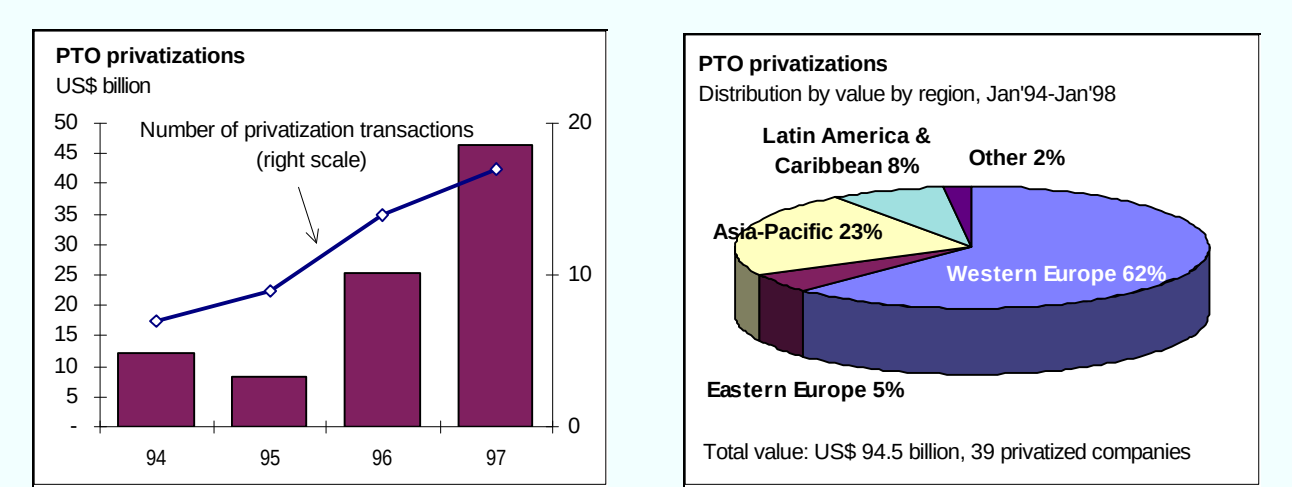
CONTENTS

GLOBAL TELECOMMUNICATION DEVELOPMENT TRENDS, 1994-98

I Market liberalization

Telecommunications reforms worldwide have been dominated by three trends: privatization, the introduction of competition and deregulation (or, perhaps more correctly, re-regulation). These changes can be seen as different components of market liberalization. Liberalization of the telecommunication sector has transformed a utility sector, dominated by state-owned enterprises, into a business for multinational companies and start-up entrepreneurs. Liberalization has brought new companies into the market, introducing competition and market-oriented practice. As a result, pricing structures have changed, innovative technologies have been developed and entrepreneurial business introduced.

Telecom privatizations, by number of transactions and value, and by region, 1994-1997.



NOTE - Percentages based on historical $US values.

Source: ITU PTO Database.

FIGURE 1

Privatizing

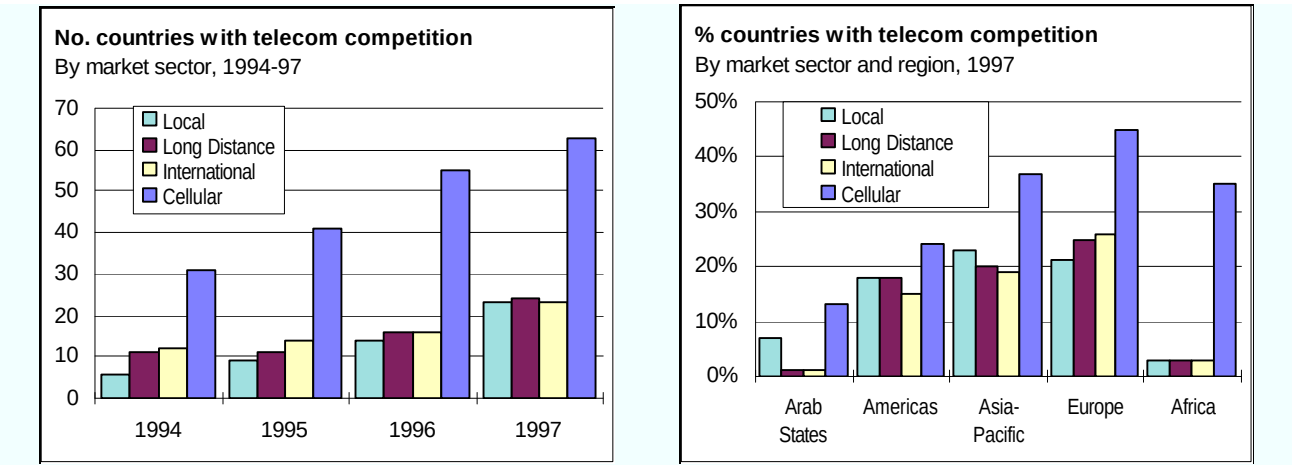
Privatization

Between January 1994 and January 1998, $US 94.5 billion was raised through the privatization - either fully or partially - of 39 Public Telecommunications Operators (PTOs). This is a process which has taken off dramatically through the 1990s. The process was initiated in the United Kingdom in 1981 when Cable & Wireless was privatized, and a first stake in British Telecom was sold through a public offer in 1984. NTT of Japan, and then CTC and ENTEL of Chile followed in the mid-1980s. By the end of 1997, some 59 PTOs worldwide had raised in excess of $US 208 billion. Indeed, 1997 was a banner year for telecom privatizations: with some 17 companies raising more than $US 46 billion, including the privatizations of Australia's Telstra ($US 10.9 billion) and France Telecom ($US 7.3 billion). One factor that has lead to privatization, at least in Europe, has

been the need of a number of governments to meet targets for the reduction of budget deficits for joining the forthcoming European Monetary Union. Privatizations of Western European operators (Telecom Italia, Telefonica, Portugal Telecom, OTE and France Telecom) totalled $US 29.9 billion.

Once a government has decided to privatize, two main options are open to it: sale to strategic equity partners or a public offering, depending upon the motivation of the government. The majority of privatizations in developing countries have been sales to strategic partners, usually telecom operators from developed countries. This has typically been accompanied by network expansion targets mandated in the licence conditions of the privatized operators.

Number of countries allowing some degree of competition 1994-97, and percentage allowing competition by region, 1997



Source: ITU World Telecommunication Indicators Database, ITU/BDT Regulatory Database.

FIGURE 2

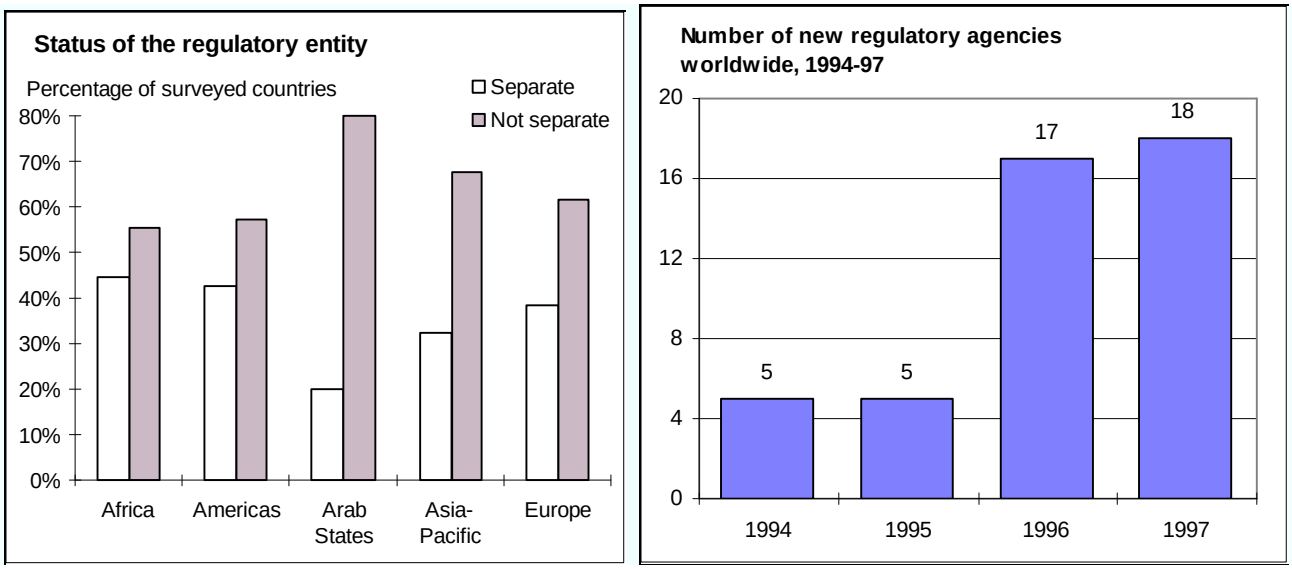
Competing

Competition

Between 1994 and 1997, the liberalization of the telecommunication industry created an increasing level of opportunity for new market entrants in local, long distance and international communications. This trend was most apparent in the areas of value added services and in the mobile communication market. By 1997, more than 60 countries with mobile cellular services had opened their market to some degree of competition. Across Africa, where basic services are still routinely provided by the incumbent on a monopoly basis, over one-third of countries have at least two cellular mobile operators. In some regions, however, such as the Arab States and most Central American countries, competition in the mobile cellular sector has yet to take hold. Although in most instances, new competitors have been created from scratch, in other cases existing companies have come together in strategic partnerships to create new investments and enter new markets while sharing risks.

European, Asian and, to a lesser extent, countries in the Americas have been able to extend the momentum for competition in the mobile and value-added sectors into basic services (local, long-distance and international). This has been taken furthest in the countries comprising the EU market (see below). While there are a few cases in basic telephony where majority foreign-owned companies have been established to provide competing service (e.g., New Zealand), these remain rare. In most instances, new telecommunication service operators have been established as joint ventures between strategic foreign investors and local partners. Market liberalization can be expected to come under increasing challenge following the World Trade Organization's agreement on basic telecommunications which, originally due to have begun on January 1, 1998, was delayed until February 5, 1998.

Institutional status of regulatory bodies 1997, and introduction of independent regulatory agencies, 1994-97



Source: ITU/BDT Regulatory Survey 1997.

FIGURE 3

Separated and regulated

Regulatory reform

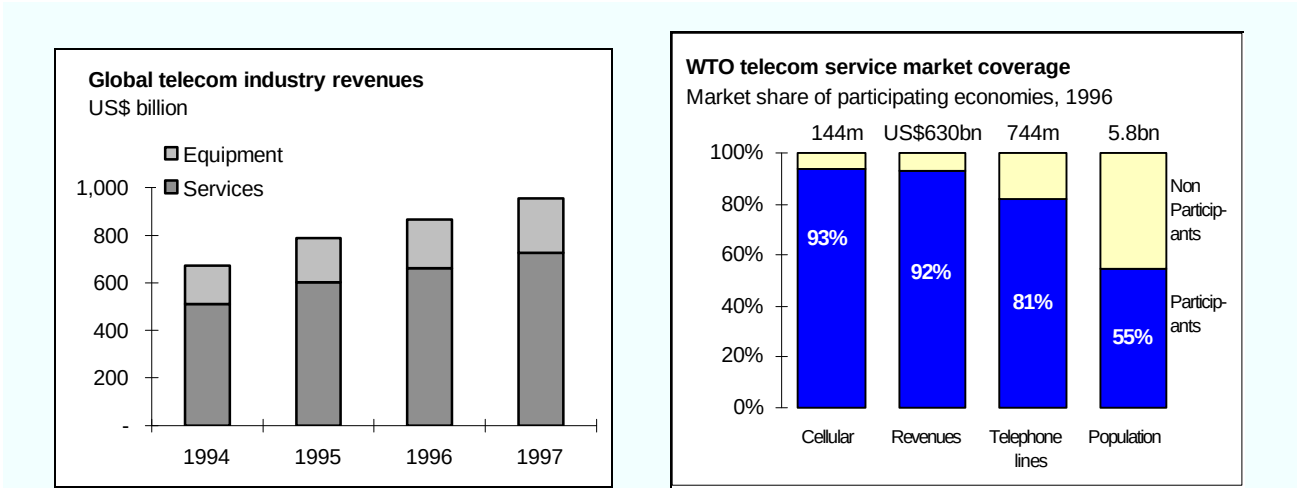
In association with the worldwide trend towards privatization and competition in telecommunications, has come the need to introduce regulatory reform. The appointment of independent sectoral regulators (or regulatory bodies) has perhaps been one of the most important developments in telecommunications during the last four years.

As the process of market-oriented reform in the sector has spread, governments have come to realize that an entire package of new regulations are required to support the transition to a new market structure. In other words, the new profile of the industry has brought with it the urgent need for the development of a separate and capable regulatory institution. Deregulation has become, somewhat more aptly, re-regulation.

Between 1994 and 1998, 44 new regulatory bodies were established worldwide. Three factors can be seen to have led to this dramatic increase: i) requirements for participation in the WTO telecommunication agreement (see below); ii) requirements imposed upon EU member states; iii) requirements accompanying the introduction of competition. The latter factor was particularly true in the Asia-Pacific and Latin America, where foreign investment in new market entrants has been encouraged.

Among the regulatory agencies to have emerged, two general types of institutions can be identified: 1) an independent agency with no (or strictly limited) policy oversight from the relevant ministry; or 2) a quasi-separate agency, with a given mandate to regulate the sector, but with oversight by the relevant ministry - in some cases remaining within the ministry - which retains the authority to issue general directives and/or control funding. This latter model has been predominant in the emerging markets of Africa, Asia, the Arab States and Eastern Europe.

Global telecom revenues 1994-97, and market share of countries participating in WTO telecom discussions, 1996



NOTE - The right chart shows the share of the global market accounted for by the economies which made commitments in the WTO agreement on basic telecommunications.

Source: ITU World Telecommunication Indicators Database.

FIGURE 4

Telecommunications: a traded commodity

The World Trade Organization (WTO)

On February 15 1997, basic telecommunications was brought within the framework of the General Agreement on Trade in Services (GATS) when 69 countries reached an agreement to liberalize their markets. (Subsequently, three more economies - Barbados, Cyprus and Suriname - joined the agreement.) Traditionally, international telecommunication services have been traded under a system of bilateral agreements between nations. The WTO agreement establishes a framework for multilateral trade, market opening, foreign investment and competition.

The WTO agreement is significant for four reasons:

- countries which made commitments account for approximately 92 per cent of the global telecommunication services market;
- negotiated as part of a multilateral treaty, the national commitments are binding on governments and therefore difficult to reverse;
- the agreement provides a framework with clear, stable and identifiable rules which are subject to a dispute settlement process. This will help to overcome investment uncertainty. (For many developing countries the multilateral agreement therefore represents a unique opportunity to attract private capital as long-term investment.);
- the negotiation process itself helped governments to overcome domestic barriers to liberalization.

TABLE 1

Country commitments on foreign investment under the WTO Basic Telecommunication Agreement

Country	Foreign ownership limitation	Country	Foreign ownership limitation
Antigua & Barbuda	Reserved for exclusive operator	Israel	80%
Argentina	None	Jamaica	None
Australia	None	Japan	20% in KDD and NTT. 100% in all other suppliers
Bahamas	None	Korea, Rep. of	20% in Korea Telecom (33% from 2001). 33% in all other suppliers (49% from 2001)
Bangladesh	Reserved for exclusive operator	Malaysia	30% in existing licensed PTOs
Barbados*	Reserved for exclusive operator	Mauritius	None
Belize	25%	Mexico	49%, higher for cellular
Bolivia	None	Morocco	Reserves the right to introduce limitations
Brazil	49%; direct and indirect investment in the voting capital	New Zealand	None, except no single foreign shareholder in TCNZ may hold more than 49.9%
Brunei Darussalam	Reserved for exclusive operator	Norway	None

Bulgaria	None	Pakistan	None
Canada	46.7% cumulative; 20% direct, 33.3% indirect investment in the voting capital	Papua New Guinea	Reserved for exclusive operator
Chile	None	Peru	None
Colombia	Reserves right to introduce limitations	Philippines	40%
Côte d'Ivoire	None	Poland	49%, none for local service
Cyprus*	None	Romania	None
Czech Republic	None	St Vincent & Grenadines	Reserved for exclusive operator
Dominica	Reserved for exclusive operator	Senegal	None
Dominican Republic	None	Singapore	49%
Ecuador	None	Slovak Republic	40%
El Salvador	None	South Africa	30%
European Union (15 countries)	None, except France (20%: radio-based services only) and Portugal (25%)	Sri Lanka	35% in Sri Lanka Telecom Ltd.
Ghana	Joint-venture required. Limit not specified.	Suriname*	Reserved for exclusive operator
Grenada	Reserved for exclusive operator	Switzerland	None
Guatemala	None	Thailand	20%
Hong Kong	None	Trinidad & Tobago	Reserved for exclusive operator
Hungary	75%	Tunisia	49% 10% in Tunisie Telecom as from 2002
Iceland	None	Turkey	None
India	25%	United States	None (indirect) Radio licences, 20% (direct)
Indonesia	35%, except PCS which only require a joint-venture with a local company	Venezuela	None

Source: ITU, adapted from World Trade Organization.

* None of these three late additions will be added to the protocol, but through other formal procedures will be legally in force as addenda to their Uruguay Round schedules of commitments and will have the same legal force as the commitments added to the Protocol resulting from the Basic Telecom negotiations.

The WTO Reference Paper: A commitment to implement rules of fair competition in basic telecommunications

Some 61 of the 69 governments which signed the GATS agreement on basic telecommunication services have attached to their specific commitments all or part of a Reference Paper on regulatory principles. It outlines a regulatory framework which ensures that service suppliers can compete on equal, non-discriminatory terms once they enter a market for which a commitment has been made. The Reference Paper deals with six principles of competition:

1) **Competitive safeguards** to ensure that dominant (major) suppliers do not engage in anti-competitive cross-subsidization, not use information in an anti-competitive manner, and not withhold essential technical and commercial information.

2) **Interconnection** to ensure that competing service suppliers can interconnect with the dominant operator (or former monopoly) under non-discriminatory terms and conditions, at the same cost-oriented and unbundled rates that the dominant operator charges itself or an affiliate and at any technically feasible point. Interconnection procedures, agreements and rates should be publicly available and there should be a mechanism to settle disputes arising from interconnection negotiations.

3) **Universal service obligations** should be administered in a transparent, non-discriminatory and competitively neutral manner and not be over-burdensome.

4) **Transparency of licensing criteria**. The terms, conditions, and time required to gain a licence should be publicly available. The reasons for the denial of a licence should be made known to the applicant.

5) **Independent regulator**. The regulator should be independent of any supplier of basic telecommunication services.

6) **Allocation and use of scarce resources**. Procedures for the allocation and use of scarce resources must be objective, timely, transparent, and non-discriminatory.

Source: Adapted from WTO.

The European Union

Since 1 January 1998, the EU telecommunications market, with the exceptions of Greece, Ireland and Portugal, has been formally open to full competition for all telecommunication services. Whilst Spain formally opened its market from 1 January 1998, it has yet to publish licensing conditions or interconnection rules, which it must do by the end of 1998. Ireland plans to liberalize by 2000; Greece and Portugal by 2001.

The open telecommunications market of the EU is the culmination of ten years of policy development within the EU, which began with a discussion document prepared by the European Commission (the Green Paper of 1987). The reform package which emerged from this process contains a range of framework legislation, most of which has now been enacted into national law across the member states of the EU, as required before the EU liberalization deadline of 1 January 1998.

The principal requirements of the package concerning the changing European industry structure are the liberalization of: terminal equipment; value-added services; data communications; satellite services and equipment; mobile services; use of cable TV networks to provide communications services (other than TV); and, voice telephony and infrastructure.

Concerning the "rules of the game" under which rival operators will compete, the main provisions of the EU package are grouped under common principles for access to public telecom networks and services (known as "open network provision" - ONP); a common regulatory environment; and harmonized technical standards. ONP principles include rules on the provision of leased lines, definition and funding of universal service obligations, terms and conditions for interconnection, the establishment of transparent cost accounting and cost-oriented tariffs. There are also ONP rules on the regulatory structure and processes required, including the independence and powers of the regulator.

Market liberalization: The role of the ITU

The ITU, as an inter-governmental organization, is founded on the principle of national sovereignty. In the context of market reform, this implies respect for the rights of each Member State to set its own policies and timetables for market reform. However, as the trend towards liberalization has grown among Member States, so too the ITU's role has changed. For instance, most Member States have now formally separated their regulatory and operational functions. Thus, the ITU's clients are now likely to be independent regulatory authorities, service providers, equipment manufacturers, policy-makers or investors, rather than simply "National Administrations". One sign of this change has been the admission into the work of the Development Sector of private sector members.

Programme No. 1 (Policies, strategies and financing) of the Buenos Aires Action Plan was established in 1994 to assist ITU Members in formulating telecommunication development policies and strategies. Specific initiatives include the Coordinated African Programme of Assistance on Services (CAPAS, in association with UNCTAD and UNDDSMS), designed to bolster the national capacities of countries taking part in the negotiations on the multilateral liberalization of services held within the WTO. Programme No. 1 has aimed to, "prepare models and guidelines for the harmonization of national policies, regulations, funding and institutional structures conducive to accelerated and balanced development of telecommunication systems world-wide." To this end a series of Finance Colloquia have been held:

- Africa Telecommunications Finance Colloquium, Abidjan, Côte d'Ivoire, 25-29 March, 1996;
- Arab States Telecommunications Finance Colloquium, Amman, Jordan, 1-4 September, 1996;
- Latin America and Caribbean Finance and Trade Colloquium, Brasilia, Brazil, 14-16 July, 1997;
- Asia and Pacific Telecommunication Trade and Finance Colloquium, New Delhi, India, 4-6 November, 1997;
- Telecommunication Trade and Finance Colloquium for Europe, Geneva, Switzerland, 15-17 December, 1997;
- Telecommunication Trade and Finance Colloquium for CIS, St. Petersburg, Russia, 2-3 February, 1998.

Other outputs of the programme include:

- The documentation of national policies, strategies and regulation. Two telecommunication surveys were prepared and distributed. From the information collected a regulatory database has been established, and will be published shortly as *Global Trends in Telecommunication Restructuring*. To coincide with the release of the report a website has also been established providing: access to the full text of various telecommunication

legislation; access to documents, reports and studies dealing with key regulatory issues; and further links to national regulatory websites and contact information. Regional regulatory handbooks: the Americas Blue Book, the African Green Book and the Arab Book, were also published.

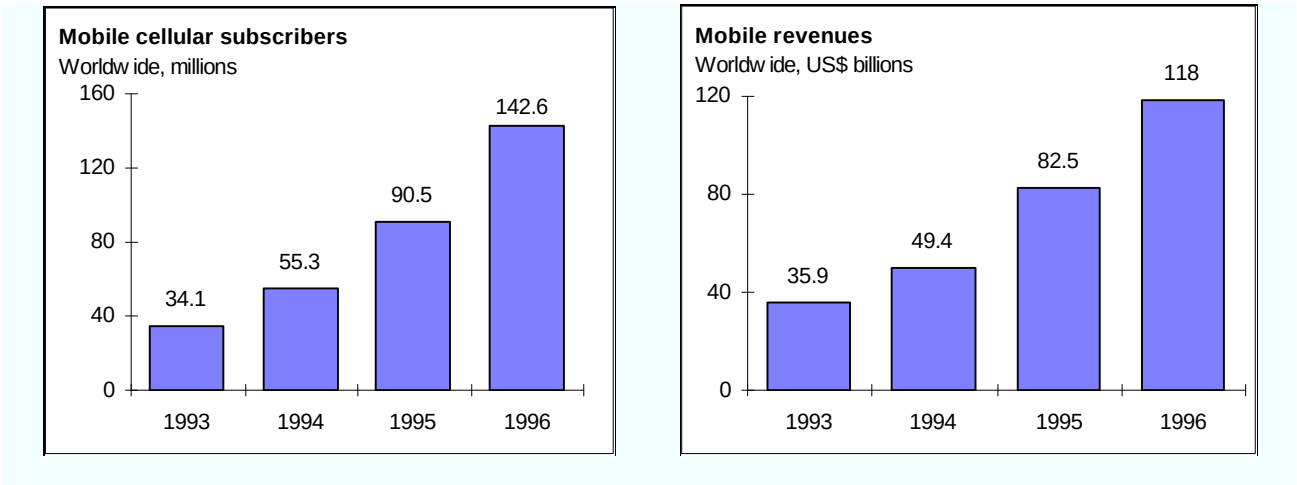
- Studies and analyses. Several studies were undertaken on the following subjects: trade in services in Africa; policies, legislation and regulation in the Asia Pacific region; the role of telecommunications in promoting social and cultural cohesion; the impact of new technologies and services on policies and regulation; and regulatory issues for least developed countries.
- Roundtables and seminars on telecom policies and strategies, at regional and subregional levels.
- Training workshops were conducted on restructuring the telecommunication sector (together with Programme 2, "Human Resource Development and Management"). In addition, fellowships were provided to various countries to attend training courses organized by other institutions.
- National Policy Assistance. Twenty-one countries received direct assistance on a range of regulatory and policy topics, including interconnection, licensing, frequency management, numbering, organizational structure, and establishing a regulator.

II New technologies

Cellular

Mobile cellular is one of the fastest growing segments of the telecommunication sector. The sustained increase in the number of mobile cellular subscribers has been phenomenal, growing by a factor of four between 1993 and 1996, from 34 million to more than 142 million. Wireless technologies are emerging as a serious competitor to wireline networks, not only because of the advantages related to mobility but also because of the possibility of rapid deployment. In developing countries and regions with under-developed telecommunication infrastructure, significant unmet demand has proven to be a strong stimulant for the growth of mobile services. In such cases, cellular technology is seen by consumers and proposed by operators as a direct substitute for traditional wireline services. In Cambodia, cellular services accounted for 60 per cent of all existing telecommunication subscribers in 1996. In the Philippines, where cellular market growth has been averaging 65 per cent per year, cellular subscribers represent approximately 35 per cent of all telephone subscribers. In Thailand, where cellular telephony has grown at an average of 40 per cent in the past two years, cellular subscribers account for approximately 30 per cent of all telephone subscribers.

Number of mobile cellular subscribers and mobile revenues, 1993-96



Source: ITU World Telecommunication Indicators Database.

FIGURE 5

On the move

The mobile sector includes analogue and digital cellular radio, radio-paging as well as specialized radio systems for the transportation industry. Many countries that do not allow either competition or foreign investment in the fixed-line network, have fewer restrictions for mobile communications. Foreign investment has been encouraged, particularly from strategic investors with capital and know-how in cellular technology.

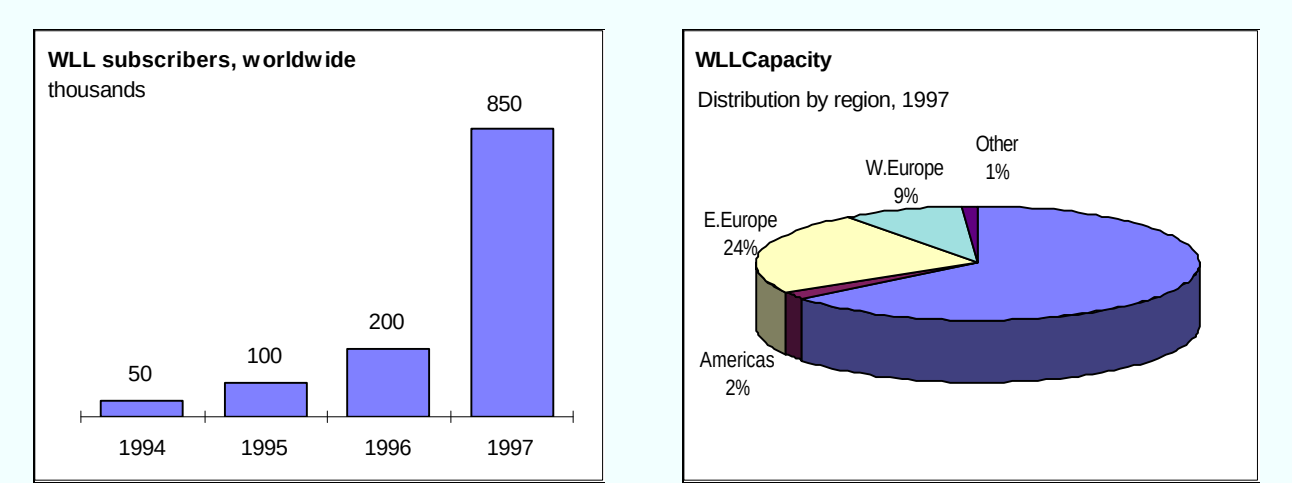
Two recent developments in the mobile cellular sector which have boosted subscriber take-up have been the advances in roaming technologies and agreements, and the introduction of micro-cellular technologies in Japan, Europe and the US. Roaming is implemented through bilateral agreements between operators. As long as there is an agreement and a compatible standard, then users who have roamed into another country are automatically picked up by that second country's operators. The user's home country operator and the operator in the country where the customer is roaming share the revenues. Roaming in western European countries increased by more than 100 per cent in the first half of 1996 alone. The introduction of micro-cellular technologies such as the Personal Handyphone System (PHS) and Personal Communication System (PCS) use fundamentally similar radio technology as with their macrocell counterparts, but with reduced cell sizes. In Japan, PHS take-up rates have been rapid since the service was introduced in July 1995, with the number of subscribers at almost 7 million by December 1997. By 1998, over two dozen new companies had entered the market to provide PHS, with tariffs set at half that for conventional cellular. As a consequence, mobile density over the same period increased approximately seven-fold, from 4 subscribers per 100 inhabitants to 28.

Wireless Local Loop

Wireless Local Loop (WLL) uses radio technologies to provide the final link from the telephone network to the subscriber, thereby raising the possibility of dramatically reducing connection costs. For example, a home telephone with a small antenna communicating with a base station, which is connected to the access node of WLL, and then via conventional wiring to the public switched

telephone network. A substantial proportion of the total costs of traditional fixed-line telephony is located in the last few hundred metres of the local loop, comprising not only the cost of the fixed capital, but also right of way costs, labour costs, and the costs of digging up and relaying busy urban streets. The prospect of simply locating a base station and then being able to add new subscribers, rapidly and at relatively low cost, is therefore extremely appealing - particularly to new operators who can minimize their infrastructure costs and emerging economies which can shorten the time of build-out and provide telephone access much faster.

WLL subscribers worldwide, 1994-1997, and by region, 1997



Source: ITU

FIGURE 6

WLL begins to connect

Furthermore, as a critical mass of users is reached, the cost of WLL systems are expected to fall even faster. With this expectancy in mind, orders for and deployment of WLL systems have begun to accelerate worldwide. The ITU estimates that around 50 systems were being trialed or in operation at the end of 1997 in some 25 countries. Installed capacity is over one million lines, of which about 85 per cent is connected to subscribers and it is forecast that there will be around 5 million WLL subscribers by the year 2000.

Global Mobile Personal Communications by Satellite (GMPCS)

A new generation of non-geostationary satellite systems is being developed to complement terrestrial infrastructure and thus to provide global communications coverage. Global Mobile Personal Communications by Satellite (GMPCS) systems promise to enable users to make and receive calls via mobile handsets from virtually anywhere in the world. GMPCS systems employ a constellation of comparatively small satellites orbiting close to Earth as the basic network infrastructure for delivering services. The satellites used are known in the industry as Low-Earth Orbit satellites (LEOs), Medium-Earth Orbit satellites (MEOs), or Geosynchronous-Earth Orbit satellites (GEOs). The new GEOs will operate at very high (e.g. Ku and Ka band) radio frequency.

TABLE 2

GMPCS System types

Characteristics	Data-only GMPCS	Narrowband GMPCS	GEO-MSS	Broadband GMPCS
Known as…	Little LEO	Big LEO	Narrow/Broadband	Broadband LEO
Services available	Data only	Voice and data	Voice, video, data	Multimedia
Terrestrial counterpart	Messaging services such as paging an dmobiel dat	Cellular telephone	Cellular ISDN	Fibre
Bit rate	2.4-4.8 Kbit/s	About 9.6 Kbit/s	2.4-14.4 Kbit/s	Up to 155 Mbit/s
Frequency range	Below 1 GHz	1 to 3 GHz	1.5-1.6 GHz and around 2 GHz	Above 10 GHz
Type of service	Store-and-forward	Real-time	Store-and-forward; real-time	Real-time
Source: ITU				

LEOs are divided into "big" LEOs - operating above 1 GHz and intended primarily for the delivery of voice and other Internet services - and "little" LEOs - operating below 1 GHz and designed for the delivery of text and data. The systems offer the possibility of reaching anybody, anywhere, with high-quality transmissions that suffer no interference and no delay, and are not as vulnerable to natural disasters as terrestrial networks. Whereas GEO systems may achieve effective global coverage with only a few satellites, MEO systems require 10-15 satellites with an orbit altitude of 10 000 kilometres and orbit period of 6-12 hours. LEO systems require more than 48 satellites at an altitude of only 700 kilometres and orbit periods of about 1.5 hours.

TABLE 3

Operational and proposed GMPCS systems

System	Type of system	Type of services	Operational
HealthSat	Little LEO	data	1995
Orbcomm	Little LEO	data	1997
E-Sat	Little LEO	data	1997
FAISAT	Little LEO	data, voicemail, voice paging	1997
VITAsat	Little LEO	data	1997
Koskon	Big LEO	voice, data, fax, paging	1997
Globalstar	Big LEO	voice, data, fax, paging	1998
Iridium	Big LEO	voice, data, fax, paging	1998
GE Starsys	Little LEO	data, messaging	1998
GEMnet	Little LEO	data	1999
Kilcomm	Little LEO	data	1999
LEO One USA	Little LEO	data	1999

M-Star	Broadband LEO	broadband services	1999
ECCO	Big LEO	voice, data, fax, paging	2000
ICO	MEO	voice, data, fax, paging	2000
Ellipso	LEO/MEO	voice, data, paging, email	2000
Celsat	GEO	voice, data, fax, paging	2000
Spaceway	GEO	voice, data, video, broadband serv.	2000
SkyBridge	Broadband LEO	broadband services	2001
Teledesic	Broadband LEO	broadband services	2001
Inmarsat	GEO	voice, fax, data	in service

Source: Operators and ITU.

GMPCS has emerged to satisfy a need to which neither traditional satellite systems nor conventional terrestrial mobile networks have been able to adequately respond. Traditional geostationary satellites can provide global coverage but suffer from significant transmission delays and are sensitive to interference. Moreover, the terminal equipment used to communicate with them is too large for a person to be able to carry around with ease. Conventional terrestrial mobile networks offer a user-friendly handheld terminal, but still suffer from limited roaming capabilities and do not enjoy global coverage. Compatibility between networks has also emerged as a major barrier to international or even regional service coverage. GMPCS systems will provide global coverage of mobile telecommunication services viable through a small handheld terminal.

However, GMPCS is a high-risk venture. Challenges facing the GMPCS systems include: 1) the relatively high cost of infrastructure deployment and maintenance (ranging from $US 2.2 to 9 billion, according to the system); 2) the limited lifespan of the satellites, approximately 5 to 15 years; 3) handset costs ranging between $US 700 and $US 2 500; and 4) tariffs, which range between $US 1 and $US 3 per minute. In addition, the viability of the GMPCS systems depends upon at least 80 to 100 governments granting GMPCS operators authorization to provide service locally. A number of countries are wary of private-sector participation in the telecommunication sector and others are worried that GMPCS services could bypass the public network and harm the operations of their national carrier. These are not insurmountable obstacles, but for GMPCS operators dealing with countries on a bilateral basis, overcoming them would be a costly and cumbersome task. Diverging national regulations could continue to make it difficult for systems to operate smoothly. On the other hand, while GMPCS systems were initially designed to serve international businessmen, their flexibility, rapid deployment and wide coverage, has continued to fuel interest in their potential as an attractive means for reaching remote and isolated communities.

A further type of proposed satellite system to have emerged are known as "stratospheric satellites". Proposed separately by the US company SkyStation and the Japanese Ministry of Posts and Telecommunications, "stratospheric satellites" are 140-metre long balloons (or "helium-filled aerostats, to give them their correct name) which will "hang" about 25 kilometres above the Earth's surface, and transmitting in the 47 GHz waveband to a footprint of some 750 000 square kilometres. Like the big LEOs, stratospheric satellites will be looking to provide broadband multimedia services.

New access technologies and the role of the ITU

The ITU's Radiocommunication Sector (ITU-R) is carrying out standardization work in the area of wireless access systems. See "ITU Standards Development for Wireless Access Systems - WAS" at the ITU-R website (www.itu.int/bredh/was/index.htm). The work on Wireless Local Loop (WLL) is carried out in ITU-R by the Joint Rapporteurs Group 8A-9B. Work encompasses five areas: 1) frequency bands and spectrum requirements; 2) suitable technologies; 3) system characteristics and operational requirements; 4) performance and availability objectives; 5) frequency sharing criteria.

The following ITU-R Recommendations and Handbooks have already been established:

- Recommendation ITU-R F.701-2: Radio-frequency channel arrangements for analogue and digital point-to-multipoint radio systems operating in frequency bands in the range 1.350 to 2.690 GHz (1.5, 1.8, 2.0, 2.2, 2.4 and 2.6 GHz);
- Recommendation ITU-R F.754: Radio-relay systems in bands 8 and 9 for the provision of telephone trunk connections in rural areas;
- Recommendation ITU-R F.755-1: Point-to-multipoint systems used in the fixed service;
- Recommendation ITU-R F.756: TDMA point-to-multipoint systems used as radio concentrators;
- Recommendation ITU-R F.757-1: Basic system requirements and performance objectives for fixed wireless local loop applications using cellular type mobile technologies;
- Recommendation ITU-R M.819-2: International Mobile Telecommunications (IMT-2000);
- Recommendation ITU-R F.1098-1: Radio-frequency channel arrangements for radio-relay systems in the 1900-2 300 MHz band;
- Recommendation ITU-R F.1103: Radio-relay systems operating in bands 8 and 9 for the provision of subscriber telephone connections in rural areas;
- Recommendation ITU-R F.1104: Requirements for point-to-multipoint radio systems used in the local grade portion of an ISDN connection;
- Recommendation ITU-R F.1105: Transportable fixed radiocommunications equipment for relief operations;
- Recommendation ITU-R F.1244: Radio local area networks (RLANs);
- Recommendation ITU-R F.1332: Radio-frequency signals transported through optical fibres;
- Handbook on digital radio-relay systems (1996);
- Handbook on land mobile (including wireless access), Volume 1 (1996) and Volume 2 (1997).

There are four global activities that have influenced the development of GMPCS:

- The ITU World Radiocommunication Conferences (WARC-92, WRC-95, WRC-97);
- The World Telecommunication Policy Forum (WTPF);
- The development of the GMPCS Memorandum of Understanding and its Arrangements; and
- The World Trade Organization Agreement on Basic Telecommunications Services

In October 1996, the first World Telecommunication Policy Forum, hosted by the ITU, brought together 129 Member States and 70 private sector participants to consider policy and regulatory

issues posed by GMPCS.[1] The Forum issued five opinions covering standard principles to consider in regulating GMPCS:

1) The role of GMPCS in the globalization of telecommunications;

2) Shared vision and principles for GMPCS;

3) Essential studies to facilitate introduction;

4) Establishment of a Memorandum of Understanding (MoU) to facilitate free circulation of GMPCS terminals; and

5) Implementation in developing countries.

The MoU - a broad multilateral agreement among governments and operator - has served to pave the way for fast development and deployment of GMPCS services around the world.

In addition, the ITU allocates international dialing codes for countries, geographic areas, and global services. To facilitate the implementation of GMPCS networks, the ITU assigned country code "881" for Global Mobile Satellite Systems (GMSS). Different Big LEO GMSS operators will share this code, and they will be identified by the digit following "881".

III International policy issues

Accounting rate reform

The accounting rate system is a dual price system whereby, for each call, one price is charged to users by the originating PTO (the *collection charge*), and a second price is agreed between the terminating PTO and the originating PTO (the *accounting rate*). This is used to determine the price charged to the originating PTO by the terminating PTO (the *settlement rate*, usually half the accounting rate). If there is an imbalance in the volume of incoming and outgoing traffic, then the originating PTO which generates more traffic pays for the difference to compensate the terminating PTO (the *net settlement payment*).

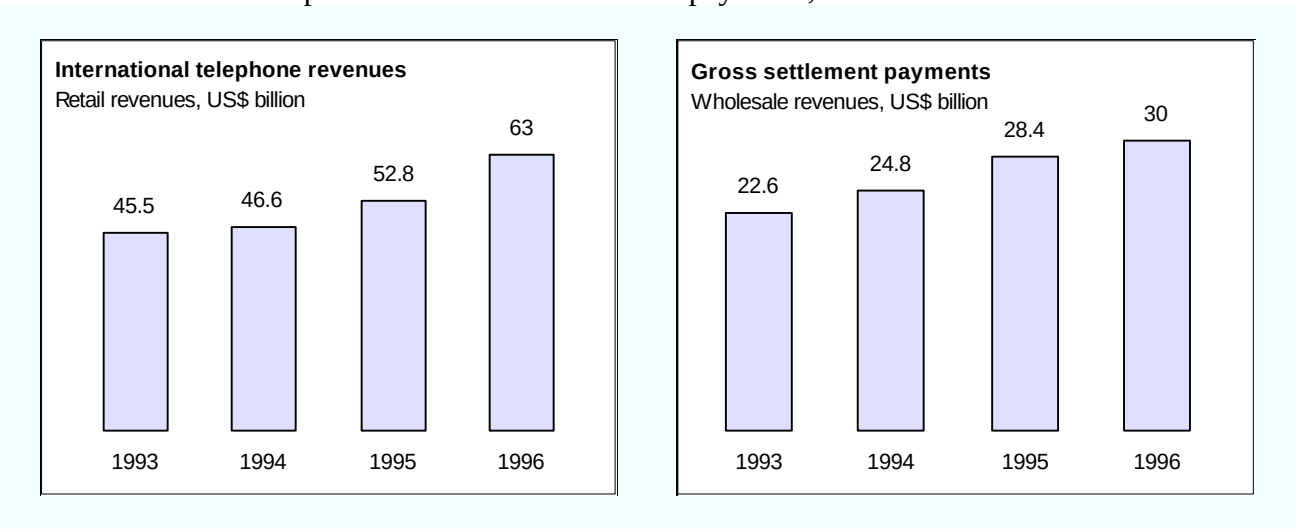
The system generally works well provided that five conditions hold true: i) collection charges are approximately equal for the same call made in different directions; ii) incoming and outgoing traffic is approximately in balance for each main bilateral relationship between countries; iii) collection charges, even for off-peak discounts and volume discounts, are no lower than accounting rates; iv) inflation rates and exchange rates are relatively constant between countries; v) international services are jointly-provided by monopoly partners.

However, these conditions are breaking down. Technological change is reducing the cost of providing services. But the pace of change has been uneven. In particular, the benefits of network modernization are only partially reflected in accounting rate cuts and are even less evident in reduction of prices paid by end-users. Cost differences, exacerbated by exchange rate fluctuations, have generated significant differences in the level of accounting rates between countries. Consequently, imbalances in the traffic flow between countries have grown substantially leading to a similar growth in net settlements.

---

[1] The second ITU World Telecommunication Policy Forum will be held on 16-18 March, 1998, and will examine trade in telecommunications services, including the WTO Agreement.

Retail international telephone revenue and settlement payments, 1993-96



NOTE - Left chart shows retail international telephone revenues (tariffs collected in the country where the service is billed).
Right chart shows estimated gross settlement payments made for terminating calls abroad.

Source: ITU World Telecommunication Indicators Database.

FIGURE 7

International telephone revenue and settlement payments

International telephone calls have risen from 48 billion minutes in 1993 to over 70 billion in 1996, a growth rate of 13 per cent a year. In 1996, international telephone calls generated $US 63 billion in revenues. However, the total amount paid to settle international telephone calls was around $US 30 billion - more than half of the generated international call revenues. These settlement payments have been growing at a faster rate than overall traffic. The increase has been caused, at least in part, by differences in the rate of market liberalization particularly for call origination. Competition tends to result in lower prices and the availability of bigger discounts. This stimulates more outgoing calls from countries which allow competition, causing growing traffic imbalances. Operators with low prices are penalized because they must share their revenues with operators at the other end for terminating the call.

The Federal Communication Commission's "Benchmarking Order"

In early 1997, the US regulator, the FCC, announced its intention to oblige US carriers to pay no more in settlement rates than a prescribed rate or "benchmark". On August 7th 1997, after a period of consultation during which more than 90 foreign governments and carriers expressed their concerns, the FCC confirmed that the benchmarks would be implemented at rates ranging from $US 0.15 per minute for high income countries to $US 0.23 for low income countries with the deadline for implementation staggered between 1999 and 2003. The significance of this step is that it represents a move away from bilaterally negotiated rates towards a unilateral action.

Rather than reduce accounting rates, as the United States is trying to do, some countries would prefer to abandon the whole system and replace it with a system that provides genuine incentives for price-cutting and which offers more flexibility for the establishment of innovative, new

international services such as freephone numbers, International Virtual Private Networks (IVPNs) or online computer services, notably the Internet.

Call-back

Call-back in particular has exacerbated the problems of the accounting rate system because it is recorded as outgoing traffic from the country in which the call-back company is located. Call-back services refer to an alternative calling mechanism in which a customer calls a designated number and after a certain number of rings hangs up. The uncompleted call is registered by the call-back operator and it calls the customer back providing them with the dial tone of a country with a less expensive calling rate. Thus, the call-back operator bypasses the public telecommunications operator in the customer country and the call becomes an inbound call from the foreign country into the customer's country. Arguably, this deprives the public telecommunications operator of the collection rate revenues that it would have typically received from the customer, though this is compensated by an increased level of settlement payments. Many governments have attempted to prohibit such services because they threaten the locally collected revenue potential of the telecommunication provider.[2]

Alternative calling procedures

Other "alternative calling procedures" which are impacting upon PTO revenues and may help to challenge the existing international settlement system include:

- *Calling cards*: telephone credit cards which enable a subscriber to make calls when abroad;
- *Country-direct services* (or *call re-origination*): enables contact from abroad with an operator in the home country. From there, the call can be switched to the chosen number. Market access for both calling card services and country-direct services is usually negotiated at the same time as the negotiation of the accounting rate;
- *Refile*: a form of alternative calling which exploits asymmetric accounting rates between countries. For example, if the combined accounting rates between the United Kingdom and the United States and the United Kingdom and France was lower than that between France and the United States, there would be an incentive to route calls between France and the United States via the United Kingdom as this would be the least cost route;
- *International simple resale (ISR)*: permits a company to gather traffic to a particular destination from a variety of different customers and then route it via a leased line. The company offering the service is thus able to charge its clients per minute while paying only a fixed-rate fee to the operator from whom it leases the line;

---

[2] As of 20 November 1997, 79 countries and territories had adopted the position that incoming and outgoing call-back was prohibited in their territories: Algeria, Netherlands Antilles, Saudi Arabia, Bahamas, Bahrain, Belarus, Brunei Darussalam, Burkina Faso, Burundi, Cambodia, Central African Rep., China, Cyprus, Colombia, Costa Rica, Cuba, Korea Rep., Djibouti, Ecuador, Egypt, United Arab Emirates, Spain, Ethiopia, Fiji, Gabon, Gambia, Ghana, Greece, Guinea, Honduras, Hungary, India, Indonesia, Ireland, Jamaica, Jordan, Kazakstan, Kenya, Kuwait, Kyrgyzstan, Latvia, Lebanon, Lesotho, Macau, Madagascar, Malawi, Malaysia, Mali, Mauritius, Moldavia, Morocco, Nicaragua, Niger, Nigeria, Oman, Uganda, Pakistan, Panama, Papua New Guinea, Peru, Philippines, Poland, Portugal, Qatar, Slovak Republic, Slovenia, Western Samoa, Seychelles, Syrian Arab Republic, Tanzania, Chad, Thailand, Tonga, Turkey, Venezuela, Viet Nam, Wallis & Futuna, Yemen, Zimbabwe.

- *International virtual private network services (IVPNS)*: offer clients the chance to gain the benefits of a private network (facilities such as short number dialing, centralized billing, call discounts etc.) while retaining the flexibility of the public network. IVPNs have been facilitated by the formation of PTO alliances such as Concert or Unisource;
- *Voice over data networks*: uses packet switching techniques such as X.25, Frame Relay or the Internet.

Universal access

The concept of universal access is that a telephone should be within a reasonable distance of home or work for all persons. The distance depends upon the coverage of the telephone network, the geography of the country, the density of the population and the spread of habitations in the urban or rural environment. This concept differs significantly from that of universal service where universal service is defined as a telephone in every home. For developing countries, basing telecommunications development around policies of universal service can be problematic. This is because universal service is not a single concept but, rather, a composite, comprising nationwide coverage, non-discriminatory access and affordability - which have tended to be achieved in stages. Where all three are attempted simultaneously, these criteria frequently require conflicting policy choices; reconciling the three contending criteria has proven a difficult task for most governments.

As a result, developing countries in particular have begun to articulate transitional goals more in tune with local economic, demographic, social and geographic circumstances. Underlying the various policy approaches is the common notion of universal access. The diversity inherent in the definition of universal access has been reflected in a range of innovative policies adopted: from the use of payphones to public call offices to community telecentres. Essentially, a universal access approach can take a variety of forms. Communication access points can be established for remote dwellers, such as a policy to provide a telephone to every village or, for marginalized urban residents, a telecommunication outlet in places where they are likely to come together, such as community centres. Access is then based upon a reasonable distance from a user's location. The result has been a variety of definitions, from a telephone "within one kilometre of both public and private access" in Costa Rica, to "a telephone within five kilometres (or two hours walk)" in rural South Africa to China's "One family, one telephone" in urban areas and telephone service to every administrative village in rural areas by the year 2000.

Technology also allows for a re-evaluation of access options. In Brazil, voice-mail boxes are made available so that individuals without a telephone are able to receive as well as to make calls. In South Africa, there is an initiative to assign e-mail addresses to every Post Office box address in the country, thereby providing electronic mail to around eight million South African households.

For developing countries, revising universal service is not simply a matter of redefinition, but rather a reconceptualization. Just as the deployment of digital networks allows countries to leapfrog the limitations of analogue voice provision, new broadband and hybrid technologies provide the possibility of delivering essential social services such as education and health. Like developed countries, a number of initiatives are being undertaken in developing countries to extend access to the Internet at the community level. Governments can encourage these efforts by adopting pro-Internet policies. These include opening up the Internet service provision market, decreasing import tariffs for telecommunication and computer equipment, mandating the provision of community centres with Internet access in the licences of telecommunication operators (combined with reduced tariffs), and providing financial assistance for connecting schools, hospitals and libraries to the Internet.

TABLE 4

Year 2010 goals for universal access

Indicator	Current level 1996	Proposed level 2010
Global household telephone penetration	39 †	Over 50 per cent
Teledensity in low income countries	1.22 ‡	Over 5 main telephone lines per one hundred inhabitants
Global payphone density Payphone density in low income countries	1.55 ¤ 0.05 §	5 payphones per 1 000 inhabitants Above 1 payphone per 1 000 inhabitants

NOTE - † Household telephone penetration excluding high income countries was 18 per cent.

‡ Excluding China whose teledensity was 4.46. Forty two low income countries had a teledensity of less than one.

¤ Payphone density excluding high income countries was 0.84 per 1 000 inhabitants.

§ Excluding China.

Source: ITU, *World Telecommunication Development Report, 1998: Universal Access*.

Technology that theoretically provides telecommunication access from anyplace on the surface of the Earth is already available. At the same time, the introduction of cheaper, more efficient sources of supply and new players should help shift the balance from supply-deficit to demand stimulation. As a result, universal access is now not so much an engineering or supply-side problem but rather a regulatory and policy challenge. The adoption of relevant universal access policies with committed monitoring, enforcement and funding mechanisms could go far to ensuring that all of the world's citizens have reasonable access to telecommunications, early in the 21st century.

The role of the ITU in recent international policy issues

ITU-T Study Group 3 has attempted to define the cost of providing international telecommunication services (ITU-T Recommendation D.140 and its annexes). Study Group 3 has also focused on a move towards call termination charges which are favoured by many countries. The report of the ITU Informal Expert Group, together with other ITU Recommendations, speeches, position papers and analyses, can be found on the ITU website at http://www.itu.int/intset.

Selected ITU-T Recommendations

ITU-T Rec. D.140	*Accounting Rate Principles for International Telephone Services*, 1992, revised September 1995.
ITU-T Rec. D.150	*New System for Accounting in International Telephony*, October 1992
ITU-T Rec. D.155	*Guiding Principles Governing the Apportionment of Accounting Rates in Intercontinental Telephone Relations*, July 1996
ITU-T Rec. D.300R	*Determination of Accounting Rate Shares in Telephone Relations Between Countries in Europe and the Mediterranean Basin*, Geneva 1995, Recommendation for regional application.

ITU-T Rec. D.400R	*Accounting Rates Applicable to Telephone Relations Between Countries in Latin America*, 1993.
ITU-T Rec. D.500R	*Accounting Rates Applicable to Telephone Relations Between Countries in Asia and Oceania*, 1993.
ITU-T Rec. D.600R	*Determination of Accounting Rate Shares and Collection Charges in Telephone Relations between Countries in Africa*, October 1993.

In December 1997 Study Group 3 proposed a revision to ITU-T Recommendation D.150, which recognizes that, in a liberalized environment, operators may, by bilateral agreement, choose from an expanded menu of options, including settlement rates and termination charges, or any other commercial arrangement more suited to their relationship. The Study Group also proposed transitional arrangements towards the new regime which would commit members to a target of reducing settlement rates to below 0.5 SDR (excluding transit arrangements) by the end of 1998.

Study Group 2 has focused upon the impact of Alternative Calling Procedures (ACPs) on network performance and quality of service issues. Statistical analysis techniques to study the impact of alternative calling procedures by examining data such as "call detail records" will be investigated. Performance statistics such as "answer seizure ratio", "call holding time" and "call abandon", will help to develop quantification of quality of service criteria and corrective actions.

Universal Access

The ITU has been promoting the telecentre concept for several years, and has in particular demonstrated how such centres can become sustainable and largely self-supporting while fulfilling this essential development function. Existing public facilities such as schools, hospitals, libraries, community centres, post offices, can be targeted as sites with the idea that all organizations providing information content for development - both governmental and non-governmental - should cooperate in developing services and applications.

The ITU's Buenos Aires Action Programme (BAAP) 9, "Integrated Rural Development" and BAAP Programme 12, "Development of Telematics and Computer Networks" in particular have aimed to facilitate access to information resources by establishing connections to computer networks from many locations including rural communities and inaccessible regions in countries that have little or no access to such services. The ITU Special Development Initiative launched in 1996 focuses on community oriented access to telecommunication in rural and remote areas. The objective is to reach the people who need telecommunications to gain access to information and to enable effective delivery of public services. The Initiative also focuses on the need to maintain "centres of excellence" and the establishment of a virtual training centre.

The ITU projects also address the need for development in human resources. In Africa, where a shortage of adequately trained personnel is a serious bottleneck at all levels, the ITU project aims to consolidate and strengthen two of the existing training institutions to ensure that Africa can generate its own expertise in the core areas of telecommunication technology, management and policy. The project on infrastructure development aims to upgrade and expand the Pan-African Telecommunication Network (PANAFTEL) and help develop structures and mechanisms for inter-country interconnection, operation and maintenance.

Additionally, WorldTel - conceived and sponsored by the ITU - offers a strategic access and innovative approach for the development of rural communications. WorldTel is a commercially structured consortium, acting both as a venture capitalist and a developmental operator/solution

provider. It aims to increase the teledensity and connectivity of the telecommunication systems in developing countries, focussing on countries with a teledensity below one per cent and a waiting time of more than five years for the installation of telephone lines. Its projects seek to complement and reinforce already existing telecommunication services, especially to rural areas.

IV Convergence

The convergence of the telecommunications sector with the computer and broadcasting worlds has brought about the possibility of synergy - the benefits to be had by companies in one industry utilizing their technology in another industry at relatively little extra cost. Convergence is being driven by four factors:

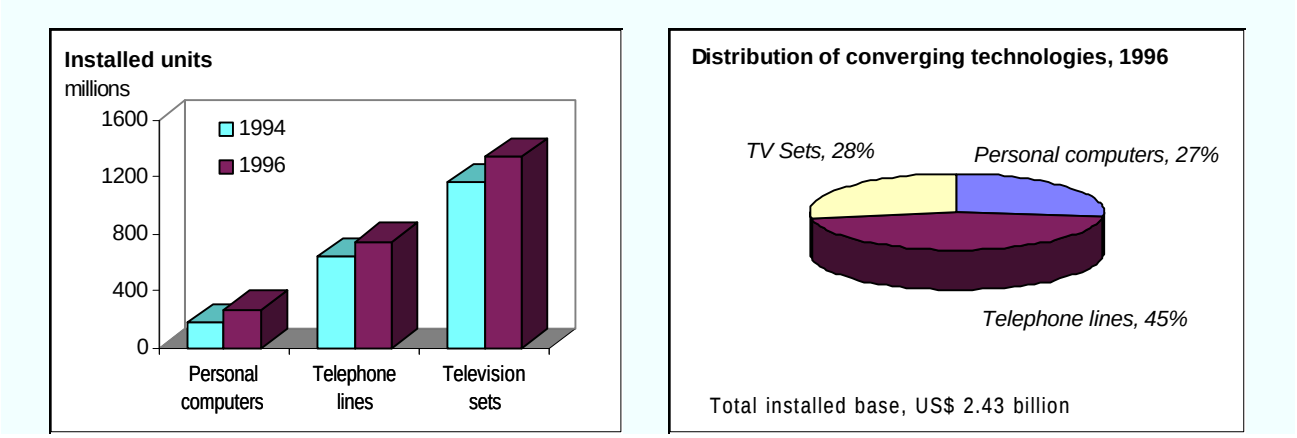
1) *Deregulation* of the information industries. The telecommunications, computer and broadcast industries have very different histories and, until recently, have had substantially different industrial structures. The public switched telephone network has traditionally been a highly regulated industry maintained in the hands of the state, or of a private national monopoly. The computer industry has essentially been part of the private sector, although with considerable early support from the state in terms of military and civilian contracts. The history of television stations is more mixed being partly state-run and partly privately owned. Given the influence of the mass media and the importance of content, the broadcast medium has usually been subject to comparatively stringent regulation and has remained largely domestic. Deregulation is increasingly allowing companies from one sector to gain market entry into another.

2) *Digitization*. The process of digitization which began in the computer industry, is already well-advanced in the telecommunication industry and is now spreading to the broadcasting sector. It will become increasingly difficult, and unnecessary, to distinguish between the different parts of the "bit business". Information should, in theory, be able to flow from any source to any destination, providing the network is digital, and some form of transmission and switching is available.

3) *Rapid growth of the service economy* has meant that the processing, storage, transmission and retrieval of electronically-coded information has assumed increasingly strategic significance. It has also resulted in the "niching" or "personalization" of services. The process of personalization happened in the computer sector with the arrival of personal computers; it is happening in the telecommunications sector with the development of personal mobile communications; it will happen in the broadcasting sector as individually-tailored viewing or narrowcasting increasingly supersedes programme schedules.

4) *Globalization* of markets has placed a premium on fast, secure and reliable transnational communications links. It has also challenged the concept of domestic or "home" markets, as communications has become less defined by geography and more by "communities of knowledge".

Installed base of television sets, telephone lines and personal computers, by volume, 1994-96, and by value 1996



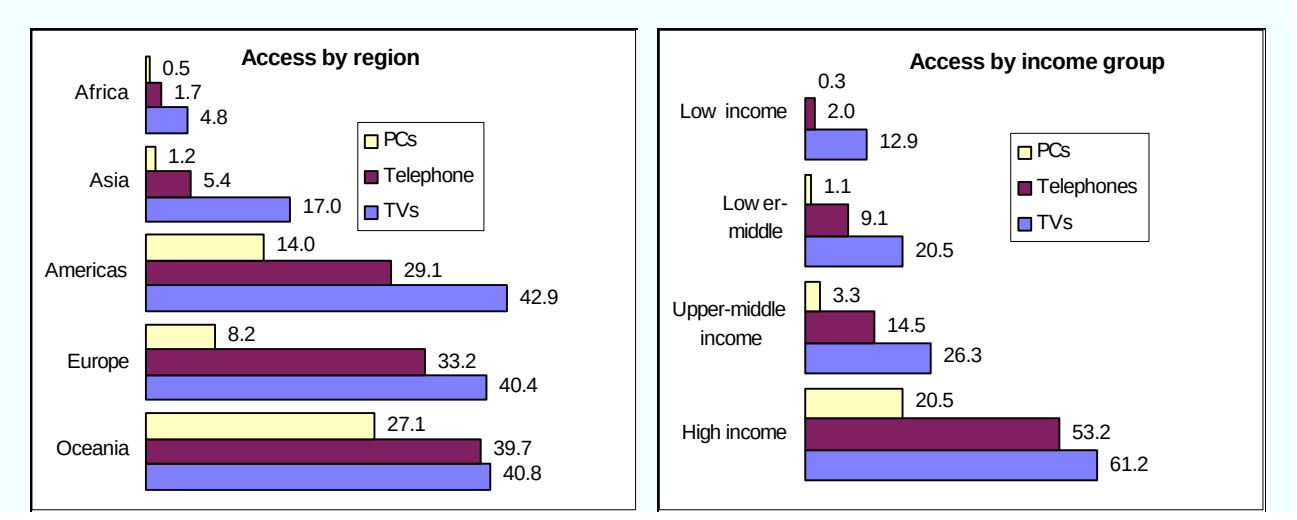
NOTE - Installed value based on the following assumptions: television set ($US 500), telephone line ($US 1 500), personal computer ($US 2 500).

Source: ITU World Telecommunication Indicators database.

FIGURE 8

Technological convergence

Television sets, telephones lines and personal computers per 100 inhabitants, by region and by income group, 1995



Source: ITU World Telecommunication Indicators Database.

FIGURE 9

Global divergence

The Global Information Infrastructure (GII)

".. a planetary information network that transmits messages and images with the speed of light from the largest city to the smallest village on every continent. ... This GII will circle the globe with information superhighways on which all people can travel ... These highways - or, more accurately, networks of distributed intelligence - will allow us to share information, to connect, and to communicate as a global community. From these connections we will derive robust and sustainable economic progress, strong democracies, better solutions to global and local environmental challenges, improved health care, and - ultimately - a greater sense of shared stewardship of our small planet ... Hundreds of billions of dollars can be added to world growth if we commit to the GII."

– Excerpts from speech by United States Vice-President, Al Gore, to the ITU World Telecommunication Development Conference, Buenos Aires, March 21, 1994.

The GII involves the interconnection of information infrastructures in different countries around the world. If the GII is to become a reality, national information networks will have to be built and interconnected. In some countries, particularly those which have recently privatized or introduced competition in their telecommunication sector, the development of information infrastructures is being left to the newly private or competitive market forces. In other countries, information infrastructures are perceived as an upgrade to existing communication networks not requiring any new policies. In a small but growing number of countries, information infrastructures are viewed as not only strategically important but also as raising a number of new policy and regulatory issues which require special attention.

Internet

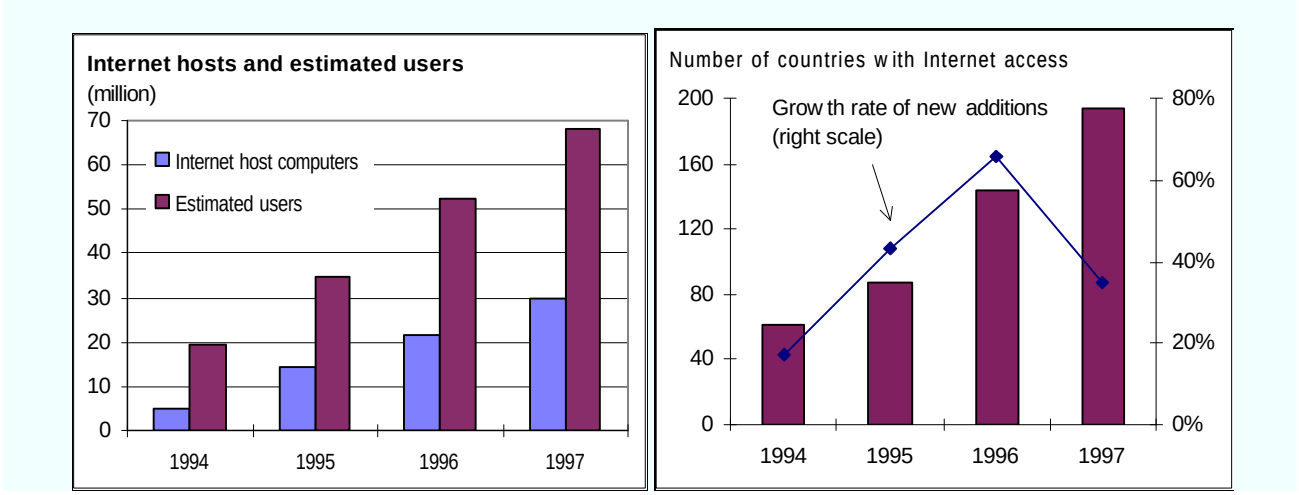
The Internet - an international network of networks which connects over 35 000 different networks - is often touted as the precursor, or the prototype, of the global information infrastructure. But the Internet will need to be extended from the academic and research communities it has traditionally served to a broader commercial marketplace, without losing the openness and innovation that have been a critical part of its success.

The exponential growth rate of the Internet through the 1990s is indicative of the huge increase in the amount of information available on line.

By one set of estimates the Internet has grown from 2 million hosts in 1994 to almost 30 million hosts by January 1998, making it the fastest growing marketing medium in history. Precise figures of the number of individuals with direct and full access to the Internet are impossible to come by. Estimates go as high as 107 million individuals using the Internet by the start of 1998. A more strictly defined and widely accepted definition of users suggested that at the start of 1996, there more than 50 million people who had direct access and used the Internet regularly.

Another measurement of note is the number of countries that have opened access to the Internet. By 1997 a total of 194 countries had joined the Internet, increasing from 144 in 1996 and 85 in 1995. With some 225 countries worldwide, more than 85% of countries there have at least one Internet domain.

Worldwide Internet hosts and estimated users and number of countries with Internet access, 1994-1997



Source: ITU adapted from Network Wizards.

FIGURE 10

The Internet keeps on growing

The Domain Name System (DNS)

Domain names are the familiar and easy-to-remember names for Internet computers (e.g. "www.itu.int"). They map to unique Internet Protocol (IP) numbers (e.g. xx.xx.xxx.xx) that serve as routing addresses on the Internet. The domain name system (DNS) translates Internet names into the IP numbers needed for transmission of information across the network. The domain name space is constructed as a hierarchy. It is divided into top-level domains (TLDs), with each TLD then divided into second-level domains (SLDs), and so on. More than 200 national, or country-code, TLDs (ccTLDs) are administered by their corresponding governments or by private entities with the appropriate national government's acquiescence. A small set of generic top-level domains (gTLDs) do not carry any national identifier, but denote the intended function of that portion of the domain space. For example, .com was established for commercial users, .int for international treaty organizations and Internet databases, and .net for network service providers. The registration and propagation of the key gTLDs are performed by Network Solutions, Inc. (NSI), a Virginia-based company, under a five-year cooperative agreement with the US National Science Foundation (NSF). This agreement expires on 30 September, 1998.

As the Internet has grown exponentially, members of the Internet community have increasingly called for the establishment of an improved DNS and, in particular, an extension and improvement of the top-level domains. To this end, a Memorandum of Understanding (MoU) covering the way gTLDs are allocated and managed, was signed on 1 May, 1997. The gTLD MoU calls for the establishment of seven new generic TLDs and for the establishment of an initial 28 new registrars

around the world - four from each of the world's seven regions.[3] More registrars are expected to be added as operational and administrative issues are worked out. Registrars will compete on a global basis, and users will be able to shop around for the registrar which offers them the best arrangement and price. Users will also be able to change registrar at any time while retaining the same domain address, thus ensuring global portability.

TABLE 5

Domain names

Three-letter Top Level Domains	**Intended usage**
.gov (specific to the US)	government
.edu (generally just for the US, but there are some exceptions)	education
.mil (specific to the US)	military
.org (controlled by NSI)	organization
.com (controlled by NSI)	commercial
.int	international treaty organizations and Internet databases
.net (controlled by NSI)	networking providers
Proposed gTLDs	**Intended usage**
.firm	businesses or firms
.shop	businesses offering goods to purchase
.web	entities emphasizing activities related to the World Wide Web
.arts	entities emphasizing cultural and entertainment activities
.rec	entities emphasizing recreation/entertainment activities
.info	entities providing information services
.nom	individual or personal nomenclature (i.e., a personal nom de plume)
Source: ITU, *Challenges to the Network*; The Generic Top Level Domain Memorandum of Understanding (gTLD-MoU) Frequently Asked Questions (FAQ) (www.gtld-mou.org/docs/faq.html#whatis)	

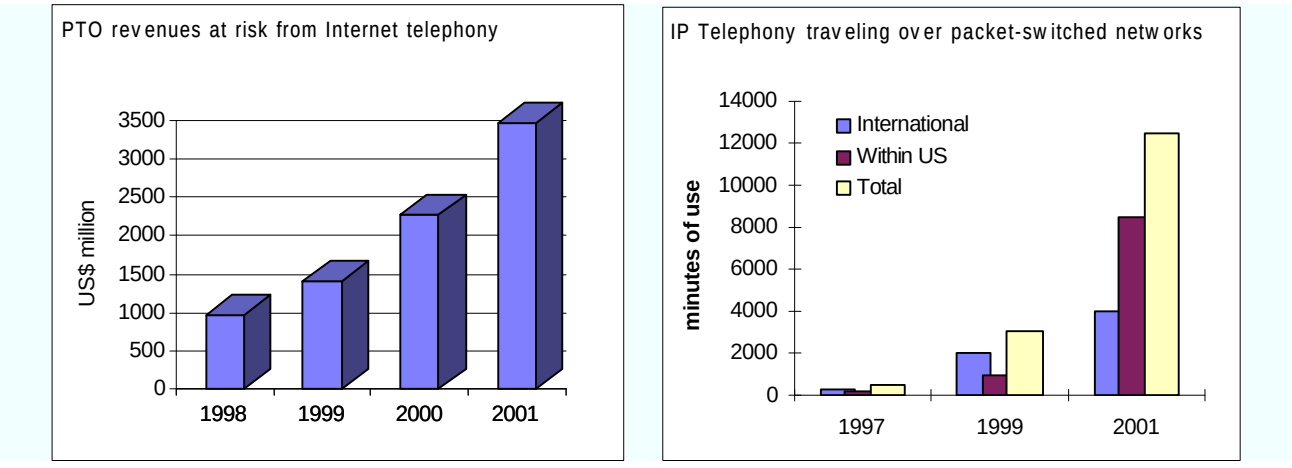
[3] In January, 1998, the Clinton administration released a "request for comment" paper on its plan to "privatize the central nervous system of the Internet". In the paper, the US Government calls for only five new gTLDs to be established. The working paper can be found at the US Department of Commerce site: www.ntia.doc.gov/ntiahome/domainname/dnsdrft.htm.

Internet telephony

Internet telephony has evolved over the last few years from a service that was available only between similarly equipped computers, then to a service that allowed a call to be made from a computer to any telephone or fax, and finally to the possibility of making calls from telephone to telephone, routed via the Internet, but originating and terminating on the public network. The technology works by digitizing a conversation through a sampling process in which the voice is represented as a series of digits (to describe amplitude over time). The digitized data are sent to the telephone gateway of an Internet telephony provider. The provider then relays this data to the Internet and finally to another telephone gateway near its destination. The data is sent to the receiver where it is converted back to the sound of the spoken voice.

Internet telephony raises two challenges to the existing public telephone network. The first is to the price structure, the second is to the architecture of the network. The effective rates charged by Internet telephony providers for international service tend to be substantially below the rates offered by the PTOs. This is because Internet telephony providers are able to effectively by-pass the accounting rate system. One of the major service providers, Net2Phone for example, claims to have carried more than five million minutes of Internet Telephony traffic during 1997, generating revenues of $US 2.3 million, at around 40 US cents per minute. This initial challenge to the network has induced some of the major PTOs to themselves become involved in Internet telephony. Deutsche Telekom, for instance, spent $US 48 million in August 1997 on a strategic 21.3 per cent stake in VocalTec Communications, a pioneer of the technology, and then launched a phone-to-phone Internet telephony trial in several large cities around the world. Also in August AT&T announced a new service, "@phone", through its Japanese joint venture, AT&T Jens. This is a transparent Internet telephony service, meaning that one simply uses it through a telephone, without realizing through which medium the call passes.

As the major PTOs continue to involve themselves in the Internet telephony market they will find more cause for installing packet-switched networks and less justification for circuit-switched networks, further accelerating the transition to packet-switched voice traffic.



Source: Action Information Services; International Data Corporation

FIGURE 11

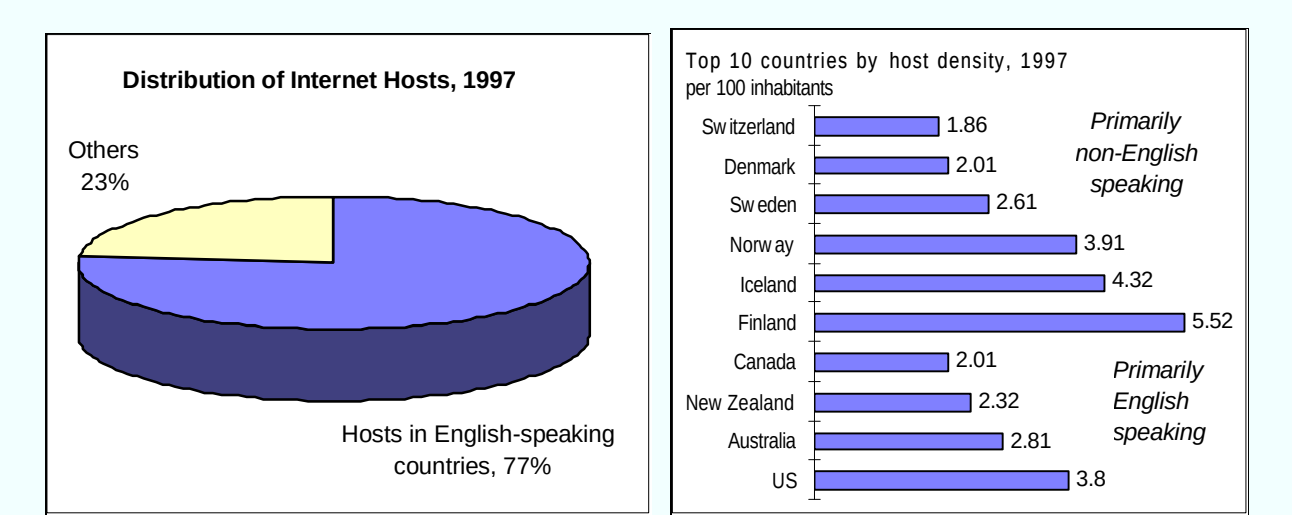
Estimates of the amount of money and minutes at stake with Internet telephony, 1997-2001

Content

The Internet provides access to an increasing array of databases and other electronic content services, based anywhere in the world. To some public authorities this represents a further challenge as they may consider some of the material made available to be illegal or socially undesirable, either for the whole population of the country or a part of it (e.g., children). Examples of content services that may be considered illegal or undesirable run the gamut from crimes against the person or the state - such as libel and sedition - to activities that, if not always strictly illegal, are considered harmful to certain groups - such as pornography and racism - to services that are considered socially or culturally inappropriate because they do not conform to accepted patterns of behaviour in a particular country.

A further perceived challenge for a number of states is the fact that English remains the primary language of the Internet. English-language predominance is beginning to rapidly erode however. The emergence of the graphically-oriented World Wide Web has led to an increasing number of resources and browsers for other languages and character sets. With the emerging trend being to enhance the availability of resources in native languages plus an option for another language (typically English) the development of a multilingual Internet is allowing many more people to access and use the network.

Distribution of Internet hosts by primarily English-speaking countries and hosts per 1 000 inhabitants



Source: ITU adapted from Network Wizards, OECD.

FIGURE 12

The multilingual Internet

The role of the ITU in promoting convergence

At the ITU's first World Telecommunication Development Conference in Buenos Aires in March 1994, US Vice President Al Gore defined the Global Information Infrastructure (GII) as a "...planetary information network that transmits messages and images with the speed of light from the largest city to the smallest village on every continent." Five principles were elaborated as

composing the framework for GII development: private investment, competition, flexible regulation, non-discriminatory access and universal service.

Subsequently, the ITU has created a series of Recommendations specifically dedicated to standardization of technologies that will underpin the GII. These are the ITU-T Y-series Recommendations. The first three Recommendations: give a general descriptive overview of the GII (Y.100); describe the basic principles and concepts for the GII architecture (Y.110); and, describe the methodologies and scenarios which may be used for developing the GII (Y.120). Forthcoming Recommendations focus on the terms and definitions to be used in the context of the GII.

As regards development of the Internet, the ITU has initiated a number of Recommendations to help deliver multimedia and interactive applications. In September 1997, two Recommendations were issued concerning text "conversation": i) T.140 defines a universal presentation-level protocol for text conversation which will work with all multimedia protocols and with the existing Recommendation for text telephony, V.18; ii) T.134 defines a simple data protocol for text conversation in a data conferencing environment.

The role of the ITU in the on-going reform of the Domain Name System has been substantial, with the ITU hosting the conference (29 April - 1 May, 1997) which resulted in the signing of the gTLD MoU. Subsequently, the ITU has played the role of depository of the gTLD MoU.

As regards the facilitation of Internet telephony, ITU Recommendation H.323, "Video-conferencing over computer networks", has already met with widespread industry support and is expected to form the basis of future Internet telephony products. In a complementary fashion, Recommendation H.324 (Video-conferencing over standard telephones) covers terminals using the PSTN to carry real-time voice, data and video, or any combination of these, and forms the basis of videotelephony.

In terms of electronic content, Articles 34 and 35 of the ITU Constitution give ITU Member administrations the right to stop communications and to suspend services "which may appear dangerous to the security of the State or contrary to its laws, to public order, or to decency". ITU Standardization Sector Study Group 1, which is responsible for defining telecommunication services, has drafted "Suggested Guidelines on Operational Aspects Regarding Content" in order to assist ITU Member administrations in co-operatively resolving issues related to the regulation of content services, within the framework of national sovereignty.

BIBLIOGRAPHY

The following list of publications, journals and websites is designed to guide readers interested in further research on each of the discussed topics.

Market liberalization

Globerman, Steven. "Foreign ownership in telecommunications: A policy perspective", *Telecommunications Policy* Vol. 19, No. 1, 1995.

___/BDT. *Asia-Pacific Telecommunication Indicators: New Market Entrants*. Geneva: ITU, 1997.

_____. *Telecommunication Policies for the Arab Region: The Arab Book*, Geneva: ITU, January 1997.

_____. *World Telecommunication Development Report 1996/97: Trade in Telecommunications*, Geneva: ITU, 1997.

_____. Finance and Trade Colloquia website: http://www.itu.ch/ITU-D/Finance/Conclusions/Conclustions.htm

_____. *The Development of Telecommunication in Africa and the General Agreement on Trade in Services*, 1996.

_____. "Final Report ITU-D Study Group 1, Question 2/1 - Telecommunications policies and their repercussions at the level of institutional, regulatory, and operational aspects of services". (www.itu.ch/itudoc/itu-d/study/study1/recs/42171.thml)

_____. *Telecommunication Policies for Africa: The African Green Paper*, Geneva: ITU, May 1996.

_____. *Telecommunication Policies for the Americas: The Blue Book*, Geneva: ITU, March 1996.

_____. *The Changing Role of Government in an Era of Telecom Deregulation: Trade Agreements on Telecommunications: Regulatory Implications*, Geneva: ITU, 1995.

Melody, William (ed.). *Telecom Reform: Principles, Policies and Regulatory Practices.* Lyngby: Technical University of Denmark, 1997.

OECD. *Communications Outlook 1997*. Paris: OECD, 1997.

Petrazzini, Ben A. *The Political Economy of Telecommunications Reform in Developing Countries*, London: Praeger, 1995.

Petrazzini, Ben A. *Global Telecom Talks: A Trillion Dollar Deal*, Washington D.C.: Institute for International Economics, 1996.

*Pipe, Russell. *The Uruguay Round trade agreement and telecommunications*, Geneva, October, 1994. **URL**

*Primo Braga, Carlos A. "Liberalizing Telecommunications and the Role of the World Trade Organization", *Private Sector*, Vol. 11 (September), 1997. **URL**

Saunders, Robert, Jeremy Warford, and Bjorn Wellenius. *Telecommunications and Economic Development*, 2nd edition. Baltimore MD: Johns Hopkins University Press, 1994.

WTO. *General Agreement on Trade in Services*, Geneva, April, 1994.

*WTO. *The WTO negotiations on basic telecommunications*, Geneva, May 1997. (*http://www.wto.org/wto/press/summary.htm*)

New technologies

Ananasso, F. "Global satellite networks: Effectively deploying worldwide communications infrastructures", *Annual Review of Communications*, Chicago: International Engineering Consortium, 1996. (*http://www.iec.org*)

Egan, Bruce L. "The role of wireless communications in the global information infrastructure", *Telecommunications Policy*, Vol. 21, No. 5, 1997.

Frieden, Rob. "Business, Legal, Regulatory and Spectrum Challenges to Widespread Deployment of Wireless Telephony", 1997 (*http://www.citi.columbia.edu/wireless/frieden.htm*)

Hac, A. "Wireless and cellular architecture and services", *IEEE Communications Magazine*, November 1995. (A good primer on the cellular structure and basic engineering criteria for cellular radio networks.)

ITU "GMPCS-MoU" website: *http://www.itu.int/GMPCS/gmpcs-mou/*

___ "IMT 2000" website: *http://www.itu.int/imt/*

___. "ITU Standards Development for Wireless Access Systems - WAS" at the ITU-R website (*www.itu.int/bredh/was/index.htm*).

Jacobsen, Alan. *Wireless Local Loop Technology: Motivations and Alternatives*. October 1995. (*www.diva.com*).

"The Economics of Wireless Local Loop" available on the CDMA Development Group web site (*www.cdg.org/economics/*).

Willis, Peter. *Wireless in the Local Loop: Growth opportunities in Europe*. FT Telecoms & Media Publishing, 1996.

International policy issues

Brooks, Albery. "What level of dialtone penetration constitutes "universal service"?" *Telecommunications Policy*. Vol. 19, No. 5, 1995.

Ernberg, Johan. "Universal access through Multipurpose Community Telecentres - a business case?" Global Knowledge Conference - GK'97, Toronto, 22-25 June, 1997.

Federal Communications Commission. *In the Matter of International Settlement Rates*. Washington D.C., 7 August, 1997.

ITU. *World Telecommunication Development Report 1998: Universal Access*, Geneva: ITU, 1998.

___. "Report of the Informal Expert Group on International Telecommunication Settlements", 24-26 March, 1997. (*http://www.itu.int/intset/expert/issuesp2.htm*)

*___. *Accounting rate principles for international telephone services*. ITU-T Recommendation D.140. Geneva, September, 1995. **URL**

___. "gTLD-MoU" website: *http://www.gtld-mou.org/*

___ "Right to Communicate" website: *http://www.itu.int/acc/rtc/index.htm*

___. "WTPF" website: *http://www.itu.int/intset/*

ITU/TeleGeography Inc. *Direction of Traffic, 1996*. Geneva: ITU, 1996.

Mueller, Milton. *Universal Service: Competition, Interconnection, and Monopoly in the Making of the American Telephone System*, London and Cambridge: MIT Press, 1997.

_____. "Universal service in telephone history: a reconstruction", *Telecommunications Policy*. Vol. 17, No. 5, 1995.

OECD. *International Telecommunication Pricing Practices and Principles: A Progress Review*, Paris: ICCP Series No. 36, 1995. (The call termination fee approach was originally pioneered at the OECD where work on accounting rates has been in progress since 1991.)

Tyler, Michael. *Universal Service and Innovation: Fostering Linked Goals through Regulatory Policy*. Briefing Report prepared for the second ITU Regulatory Colloquium. Geneva, December 1993.

UNDP. *Proposal To Establish An ACC Inter-Agency Project On Universal Access To Basic Communication And Information Services*, 1995. (*http://www.itu.int/acc/rtc/acctor1.htm*)

Convergence

*Al-Shehri, Abdullah and Jeff J. Jones. "The National Information Infrastructure: Myths, Metaphors and Realities", School of Library & Information Sciences, University of Pittsburgh, 1995. **URL**

Clinton, President William, J. and Vice President Albert Gore, Jr. *Technology for America's Economic Growth, A New Direction to Build Economic Strength*. Washington D.C.: US Government Printing Office, February 22, 1993.

Hafner, Katie and Matthew Lyon. *Where Wizards Stay Up Late: The Origins of the Internet*. New York: Simon & Schuster, 1996.

"How Many Online?" at the NUA Internet Surveys site: *http://www.nua.ie/surveys/how_many_online/*

IAHC website: at *http://www.iahc.org/*

ITU. *Challenges to the Network*, Geneva: ITU, 1997.

___. *World Telecommunication Development Report 1995: Information Infrastructures*, Geneva: ITU, 1995.

King, J.L. and K.L. Kraemer. "Information infrastructure, national policy, and global competitiveness", *Information Infrastructure and Policy* Vol. 4, No. 1, 1995.

Kraemer, Joseph S. "The Realities of Convergence" EDS Management Consulting Services, 1994.

Matrix Information and Directory Services Internet surveys website: *http://www.mids.org*

McKnight, Lee and Joseph P. Bailey (eds.), *Internet Economics*, Cambridge: MIT Press, 1997.

Melody, William H. "Toward a framework for designing information society policies", *Telecommunications Policy* Vol. 20, No. 4, 1996.

Network Wizards Internet surveys website *http://www.nw.com*

Schware, R. and P. Kimberley. *Information Technology and National Trade Facilitation: Making the Most of Global Trade*, Washington D.C.: World Bank Technical Paper 316, 1995.

Sears, Andrew. "The Effect of Internet Telephony on the Long Distance Voice Market." (*http://rpcp.mit.edu/~itel/ldabstract.html*)

Sommerer, Peter. "The Impact of the Internet on the Phone Industry: Facts and Vision" (*http://www.newbridge.com/Information/Archives/VOI_Pres/index.html*)

US Department of Commerce. "A Proposal To Improve Technical Management Of Internet Names And Addresses Discussion Draft", 30 January, 1998. At the US DoC website: www.ntia.doc.gov/ntiahome/domainname/dnsdrft.htm