Journal Title: ITU News

Journal Issue: No. 2, March 2006

Title: Special Edition: ICT for Development

ITU NEWS

ICT for development

Making it work for all

WTDC '06

World Telecommunication Development Conference 2006

Cover photos: ictQATAR, Bill Davenport, Photos.com

ITU News: ISSN 1020–4148
http://www.itu.int/itunews/
10 issues per year

Managing Editor
Patricia Lusweti
Production Editor
Janet Burgess
Art Editor
Dominique de Ferron

Printed in Geneva by the Printing and Dispatch Division of the International Telecommunication Union

CONTENTS

No. 2 SPECIAL EDITION MARCH 2006

WTDC '06
DOHA - QATAR

EDITORIAL OFFICE/SUBSCRIPTIONS
E-mail: itunews@itu.int

Delivering development

Yoshio Utsumi
ITU Secretary-General

The World Telecommunication Development Conference (WTDC) in Doha is the first ITU global event to be held since the World Summit on the Information Society (WSIS) concluded its second phase in Tunis in November 2005. To implement the important aims of WSIS, our task at Doha is to set priorities for development, along with clear and measurable goals.

There has been tremendous progress in information and communication technologies (ICT) since the first WTDC took place in Buenos Aires in 1994. Then, only a tiny percentage of the global population subscribed to mobile phone services. Now, almost one in three people worldwide is a mobile subscriber. In 1994, the internet had just started to make its influence felt. Today, nearly one billion people have access to an ever-growing range of online applications. However, as developed nations push ahead with newer technologies, such as broadband and 3G, many developing countries risk falling behind.

We have the technology, we have the will — and now we must act.

In the *Tunis Commitment* that resulted from WSIS, the international community agreed that our common goal should be to fight poverty by bringing the enormous potential of ICT to everyone. The social and economic benefits of ICT must be made available to even the remotest village, or the poorest urban dweller. ITU has a coordinating role in implementing the WSIS goals — especially in ensuring that infrastructure development gathers pace.

At WTDC-06 in Doha, we must use the momentum of WSIS to make concrete plans for progress. Strong, durable, partnerships should be our watchwords. The ITU *Connect the World* initiative is a recent example of an innovative partnership that involves governments, the private sector, regional and international organizations and civil society. They bring to the table their commitment to use technology to help people communicate, foster the flow of information and knowledge, and accelerate the pace of development.

It is essential for human needs to be the focus of all our efforts. Technology should be a tool for the betterment of people's lives. As a result of WSIS, the international community became fully aware of the central importance of ICT in achieving that common goal of progress. At Doha, we must take determined steps towards achieving it. ■

Building the information society together

Hamadoun I. Touré
Director, ITU Telecommunication Development Bureau (BDT)

The fourth World Telecommunication Development Conference (WTDC-06) is taking place at a time of remarkable changes in our industry, fuelled by a combination of technological, market, policy and regulatory developments. Top-ranking officials from government, the private sector, as well as international and regional organizations will meet in Doha (Qatar) on 7–15 March 2006 to help shape the future development of information and communication technologies (ICT) worldwide.

World telecommunication development conferences are held every four years to assess global achievements in ICT, to establish priorities and strategies for the sector's development, and to promote international cooperation and partnerships that can sustain and strengthen telecommunication infrastructure and institutions. For the first time, a WTDC is being held in the Arab States, and Qatar as one of the world's quality destinations for business conferences has also made tremendous achievements in ICT deployment that could provide valuable lessons for other countries.

The Doha debate

Picking up from Istanbul

The Istanbul Action Plan, our toolkit from the last WTDC, has been a true companion in our quest to transform the "digital divide into a veritable digital opportunity." Like every WTDC, the event in Doha is expected to adopt a comprehensive Action Plan that can help achieve the ICT development goals of ITU Member States over the next four years. But first, the conference will have to review a series of reports from the ITU Telecommunication Development Sector (ITU–D) to assess implementation of the Istanbul Action Plan.

Since 2002, we have significantly raised awareness of the importance of ICT for development at the highest level in all countries. We have increased multi-stakeholder participation in the ICT sector as evidenced by the high number of cooperation agreements signed during the past three years between ITU and a host of development partners (including South-South, and North-South arrangements). As a result, many projects are being co-financed, and the number of Sector Members has grown from 260, in December

2002, to 319 in February 2006. The regulatory environment has also improved at both national and regional levels, opening doors to increased private-sector participation in the ICT sector.

The link with WSIS

Also high on the agenda, are the outcomes of the World Summit on the Information Society (WSIS), which ended successfully in Tunisia in November 2005. The link between WSIS and this conference is important, because, at WSIS, world leaders committed themselves to promoting universal, ubiquitous and affordable access to ICT, so as to ensure that the benefits are more evenly distributed between and within societies. And this is also our mission. They made a commitment to building a people-centred, inclusive and development-oriented information society. The aim is for people everywhere to be able to share and utilize information and knowledge in order to achieve their full potential and attain internationally agreed development objectives, including the Millennium Development Goals. ITU's role in implementing concrete projects and initiatives is reaffirmed in the Geneva Declaration of Principles and Plan of Action adopted in December 2003, as well as in the Tunis Commitment and Tunis Agenda for the Information Society. Clearly, the Doha Action Plan must be designed to reflect the WSIS goals, particularly the target to extend the internet to all the world's villages by 2015 as the foundation for building the information society.

Regional proposals

The conclusions of regional preparatory meetings will be tabled at Doha. In 2004, the ITU Council approved the holding of six regional preparatory meetings. These were all held during 2005, and their conclusions were discussed and consolidated at a Coordination Meeting that took place in Geneva in December in conjunction with the Telecommunication Development Advisory Group (TDAG). In Europe, the meeting took place in Bucharest, Romania. The Arab States met in Algiers (Algeria), followed by Asia-Pacific in Hanoi (Viet Nam); Africa in Abuja (Nigeria); Americas in Lima (Peru); and the Commonwealth of Independent States in Moscow (Russian Federation).

At all of these meetings, participants expressed the desire to retain the Istanbul Action Plan's *six programmes* covering regulatory reform; technologies and telecommunication network development; e-strategies and e-services and applications; economics and finance, including cost and tariffs; human capacity-building, and the programme for least developed countries. Their wish is also to retain the plan's *two activities* (statistics and information on telecommunications/ICT, and partnerships and promotion) and *four special initiatives* (private sector, gender issues, youth initiatives and indigenous peoples).

Proposals have been made to add two new special global initiatives on "persons with disabilities" and "telecommunications for disaster relief". Another proposal (though no agreement was reached) is to increase the number of ITU–D study groups from the current two to three, and broaden study questions to pay special attention to national, regional and global needs.

Several regional initiatives have been put forward, and focus mainly on:

- Rural connectivity, including broadband access
- Regional internet exchange points
- Public internet access in remote areas
- Internationalization of domain names
- Enhancement of regional roaming capabilities
- Financial schemes to achieve universal service objectives
- Development of government portals to expand e-government
- Security and reliability of ICT
- Development of digital signatures and public keys for e-commerce
- E-health and telemedicine for rural areas.

Status and trends in ICT development

Two new ITU reports have been published to coincide with WTDC-06, and will certainly enrich the debate. These are the seventh edition of *Trends in Telecommunication Reform: Regulating in the Broadband World,* and the *World Telecommunication/ICT Development Report: Measuring ICT for Social and Economic Development.* The Trends report has grown to become an integral part of our dialogue with the world's ICT policy-makers and regulators.

Low-cost technologies exist today that can promote broadband access and enable developing countries to "leapfrog" older technologies and join the information society more rapidly. However, with the proliferation of new technologies also comes the concern that a solution to the lingering problem of uneven distribution of access to ICT across the world will continue to be elusive. This special edition of *ITU News* provides a preview of both reports.

The Doha Action Plan

With such a wealth of information, the much-anticipated Doha Declaration, and Doha Action Plan should pave the way for further actions to build the global information society. ■

Message from Hessa Al Jaber

Secretary General, ictQATAR
Qatar's Supreme Council for Information and Communication Technology

Qatar is pleased to host the World Telecommunication Development Conference 2006 (WTDC-06) in Doha. We trust that it will be a productive forum for discussion and, as we agree the development priorities for the next four years, a shared experience that will be remembered as a milestone in turning the digital divide into a digital opportunity.

Universal access to information and communication technologies (ICT) is widely viewed as a key to economic prosperity. And so our goal must be to ensure that the Doha Action Plan will clearly establish a road map for closing the digital divide. Development strategies will be prioritized and, in the process, we will gain a greater understanding and forge international partnerships that will sustain and strengthen ICT infrastructure and institutions around the world.

One of the key trends that will shape the long-term outcome of our discussions in Doha is the convergence of telecommunications, computing and multimedia applications. This clearly opens up greater opportunities for e-learning and other applications which are highly beneficial for social and economic development. This emerging new perspective also presents significant opportunities for collaboration between the public and private sectors, as innovative new applications and possibilities present themselves.

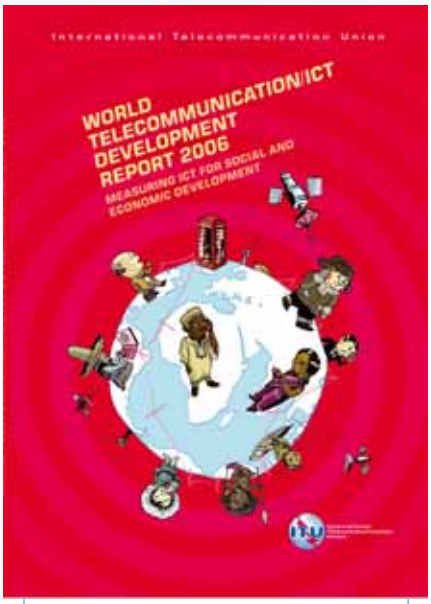
Our experience in Qatar has shown us the importance of such collaboration. In line with the principles of the World Summit on the Information Society, experts from the ICT sector in Qatar are working closely with government and industry to ensure that we can take full advantage of the opportunities presented by the advent of the global information society, as well as meet the challenges resulting from its increasingly rapid development.

A prime example of what can be achieved is ictQATAR's Q-Cert program collaboration with the Carnegie Mellon Software Engineering Institute in the United States to establish an organization in Qatar for coordinating cybersecurity activities to protect critical, national infrastructure, at a time when cyberspace is becoming the nerve centre of government, business and education systems.

The opportunity to host the conference is an honour, and we are looking forward to using the occasion to make a significant contribution to furthering the positive implementation of the global information society. ■

World Telecommunication/ICT Development Report 2006

Measuring ICT for social and economic development



The 2006 edition of ITU's World Telecommunication/ICT Development Report will be released to coincide with the World Telecommunication Development Conference in Doha. Besides looking at the progress made in measuring the impact of information and communication technologies (ICT) on social and economic development, the report provides indicators for some 180 economies.

Overview

At the time that *ITU News* went to press, the report was still being prepared. However, we can give readers an overview of its main points. First and foremost, it shows that since the previous report in 2003, there has been continuing growth in the telecommunications sector, as well as rapid progress in policy and technology development. The result is an increasingly competitive market and networked world.

ITU statistics demonstrate that the phenomenal growth rates in mobile telephony have been able to reduce the gap that separates developed from developing countries in that field. However, as technology advances, a divide remains in access to the latest forms of ICT, both among countries and between the social groups within them. Even as developing nations are catching up with regard to mobile telephony, for instance, other countries are surging ahead in such areas as broadband.

More competition

Two factors contributing to growth in the ICT sector are privatization and the opening of markets to competition (see Figure 1). By the end of 2005, of all markets for mobile telephony around the world, 87 per cent were competitive, as well as 93 per cent of the markets for internet services. Basic phone services remained the least competitive sector, with just 61 per cent of markets open to competition.

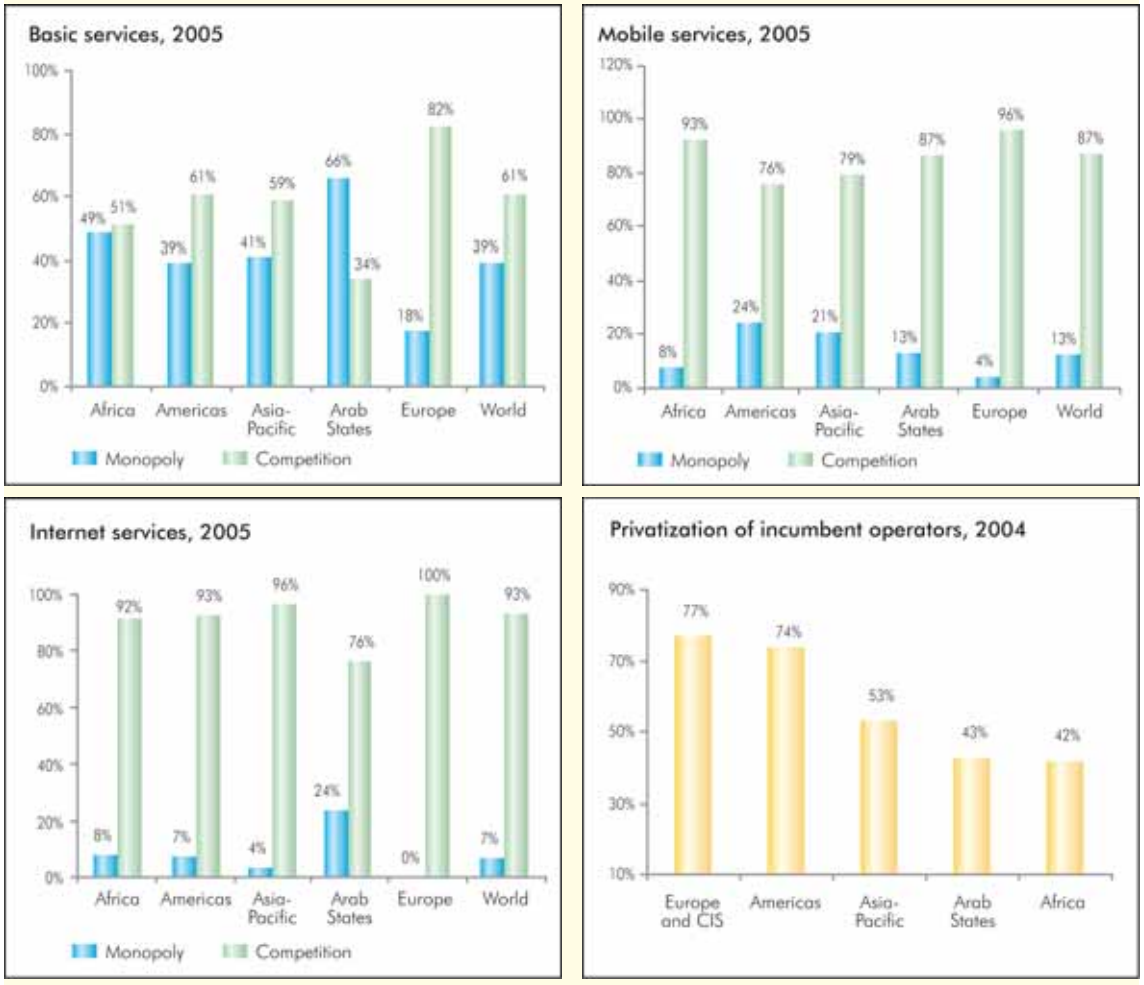
Private investment and participation in formerly State-owned telecommunication carriers is most evident in the European markets, where 77 per cent of carriers are privatized. This compares to 74 per cent in the Americas, 53 per cent in Asia-Pacific, 43 per cent in the Arab States, and 42 per cent in Africa.

Fixed-line networks see little change

Over the period 1994 to 2004, fixed-line networks grew at a global average of 5.1 per cent a year (see Figure 2). In several countries, the number of fixed telephone lines has actually been falling. Regional comparisons clearly show that high penetration levels are matched with low growth rates in the number of fixed lines, whereas low-penetration regions (such as Asia and Africa) show above-average growth rates. Although these higher growth rates in the developing regions have to some extent narrowed the digital divide in fixed lines, major differences remain.

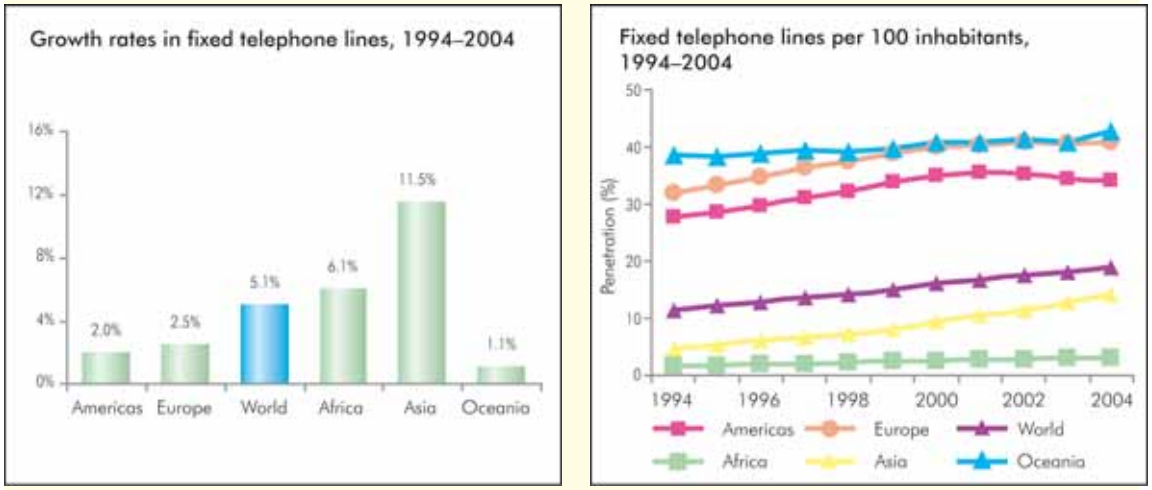
Figure 1 — Worldwide competition

Level of competition in the fixed line, mobile and internet markets by region (2005), and privatization of incumbent operators by region (2004)



Source: ITU World Telecommunication Regulatory Database.

Figure 2 — Fixed-line growth



Source: ITU World Telecommunication Indicators Database.

Mobile television

Siemens

For example, in 2004 Europe and the Americas (with penetration levels of 41 and 34 per cent respectively) were far ahead of Asia (14 per cent) and had more than ten times the penetration level of Africa (3 per cent).

The main reason for this apparent stagnation in the fixed-line market is the boom in mobile telephony. In developing countries particularly, people are going straight to mobile services. Other factors threatening fixed line operators' revenues are the entry of cable companies into the telephony and broadband markets, as well as the growth of voice over internet protocol (VoIP) services. However, since VoIP requires large amounts of bandwidth, it only provides a challenge in regions where broadband penetration is significant.

Mobile keeps booming

Mobile telephony has shown phenomenal growth, and since 2002, there have been more mobile subscribers than the number subscribing to fixed telephone lines. At the end of 2004, about 28 per cent of the world's population subscribed to mobile telephony services — but with 74 per cent of those people living in Asia and Europe (see Figure 3).

The main reasons for growth in mobile telephony have been the introduction of prepaid services, rapid network deployment, and a highly competitive environment. Across the world, the sector is marked by more competition than any other. Prepaid services allow operators to reduce risks and serve clients who might not qualify for a monthly subscription. They account for almost half of mobile subscriptions worldwide, and they are the norm in developing countries — in Africa, prepaid services make up almost 90 per cent of the entire mobile market (see Figure 4).

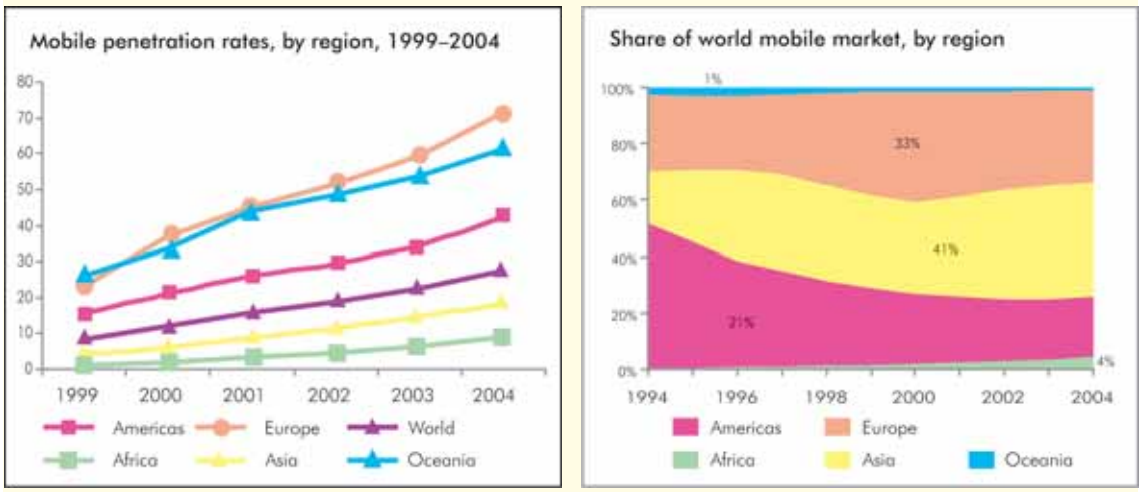
The rapid rise of mobile telephony is also attributed to falling service prices and subsidized handsets in a number of countries, as well as the introduction of such additional attractions as short message services (SMS). All of these factors have resulted in increasingly large gains from the mobile market as a proportion of total revenues for operators (see Figure 5). Although the average revenues per user (ARPU) have been declining as prices fall, operators are compensating for this by expanding the number of subscribers.

A few countries dominate the 3G market

Third generation (3G) services in mobile telephony have been available since 2001. With their higher transmission speeds and enhanced data capacity, 3G services promise a wide range of innovative applications for users and a new source of revenues for operators. By January 2005, they were on offer in 56 economies around the globe and, in total, 150 million subscribers worldwide had access to 3G services — a rise of almost 60 per cent from the previous year. Nevertheless, given the low revenues from 3G services in most developed countries, operators are unsure about the potential of 3G in developing markets and have been reluctant to invest in this sector. It seems that 3G services are unlikely to benefit poorer countries in the short term, as most have not yet deployed this technology.

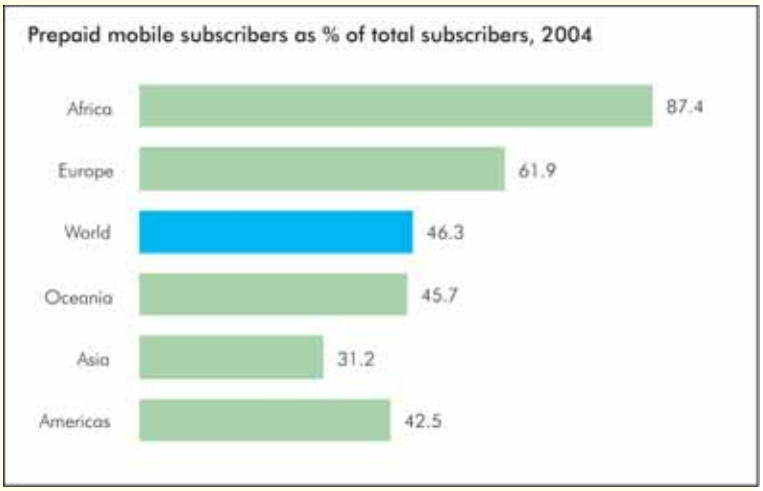
However, rather than a regional divide, the 3G market separates a few countries from the rest of the world.

Figure 3 — Mobile growth



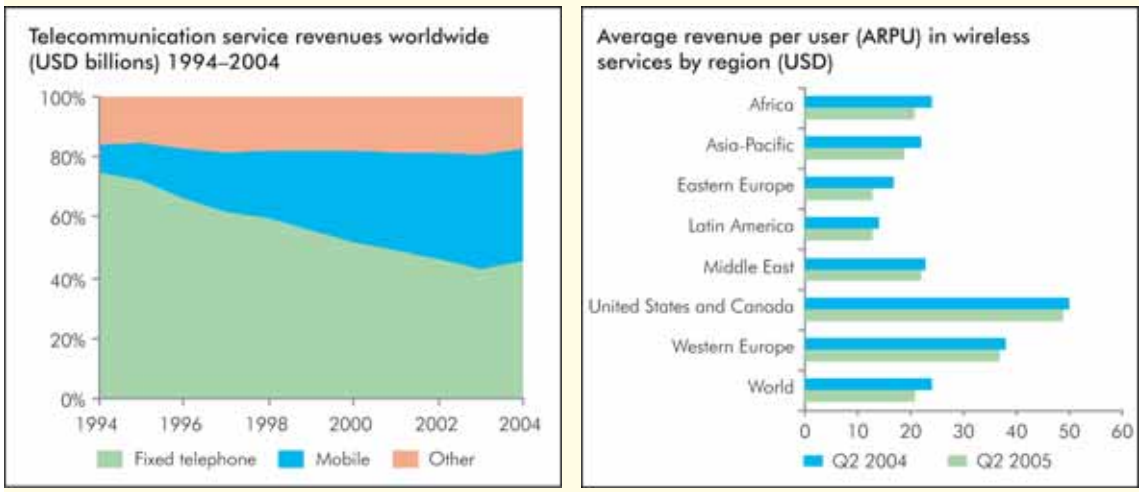
Source: ITU World Telecommunication Indicators Database.

Figure 4 — Prepaid mobile subscribers



Source: ITU World Telecommunication Indicators Database.

Figure 5 — Mobile revenues on the rise



Note — "Fixed telephone" includes revenue from installation, subscription and local, trunk and international call charges for fixed telephone service. "Mobile" includes revenues from the provision of all types of mobile communication services such as cellular, private-trunked radio and radio paging. "Other" includes revenue from leased circuits, data communications, telex, telegraph and other telecommunication-related revenue.

Source: ITU World Telecommunication Indicators Database (left), and Telegeography http://www.telegeography.com/press/releases/2005-10-19.php (right).

At the end of 2004, the United States, with 49.5 million subscribers to 3G, the Republic of Korea (27.5 million) and Japan (25.7 million) together accounted for more than two-thirds of the world total.

Internet access expands

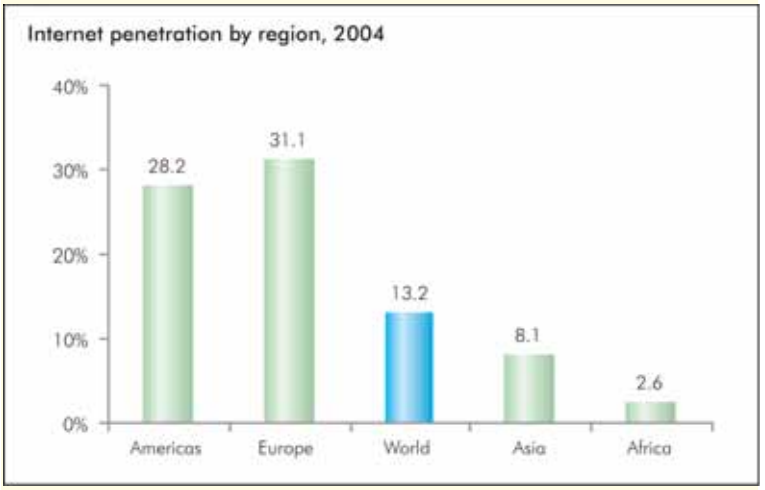
Based on various platforms, from fixed-line telephony to satellites, access to the internet continues to grow. By the end of 2004, there were an estimated 840 million internet users across the globe, representing 13.2 per cent of the total population (see Figure 6). The highest penetration rates were found in Europe and the Americas, where almost one third of the population was online. Penetration rates in the Asia-Pacific region vary widely, from over 60 per cent in countries such as the Republic of Korea, Australia, and New Zealand, to less than 5 per cent in others, including Bangladesh and Cambodia. And although in several countries more than 50 per cent of the population uses the internet, an average of only 2.6 per cent of Africans are online.

Broadband has a way to go

Broadband technologies bring significant improvements in terms of increased capacity and speed. This not only opens the door to more entertainment and educational applications, it can also provide public services, such as e-government, and create new business opportunities. More and more countries are moving from dial-up internet access to broadband services.

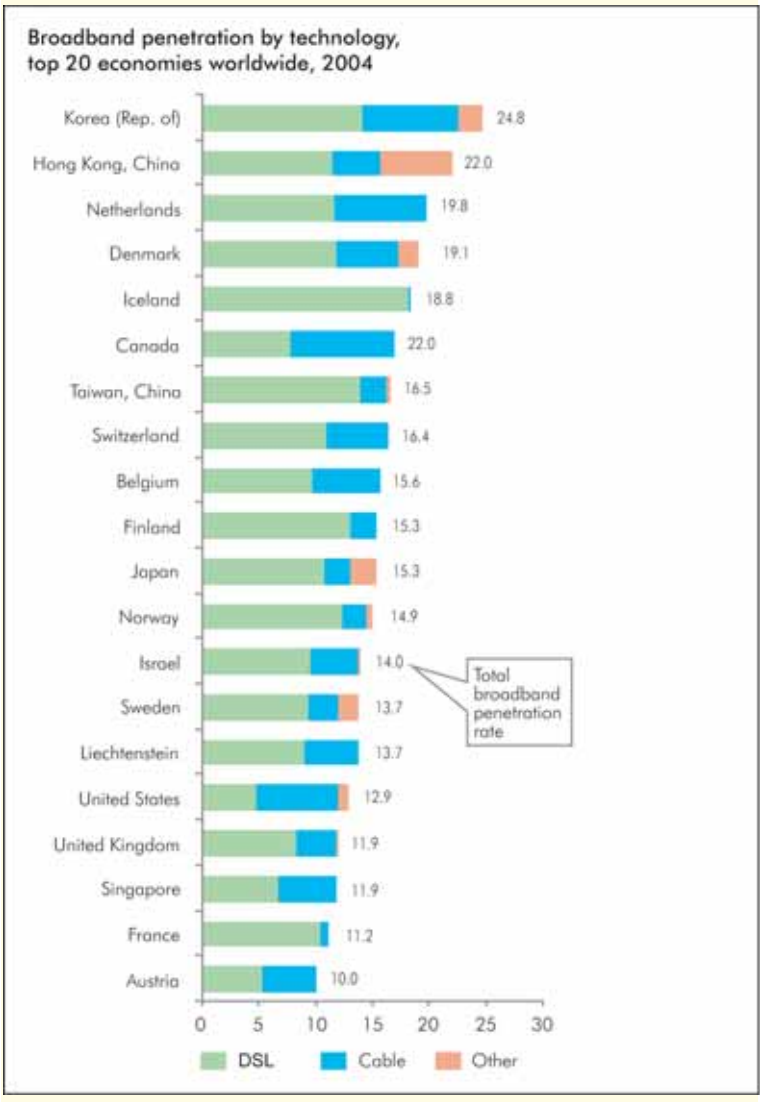
By 2004, subscribers to broadband internet services represented about 2.5 per cent of the world's population, and 38 per cent of all internet subscribers worldwide. The list of economies with the highest broadband penetration rates comprises 12

Figure 6 — Internet growth



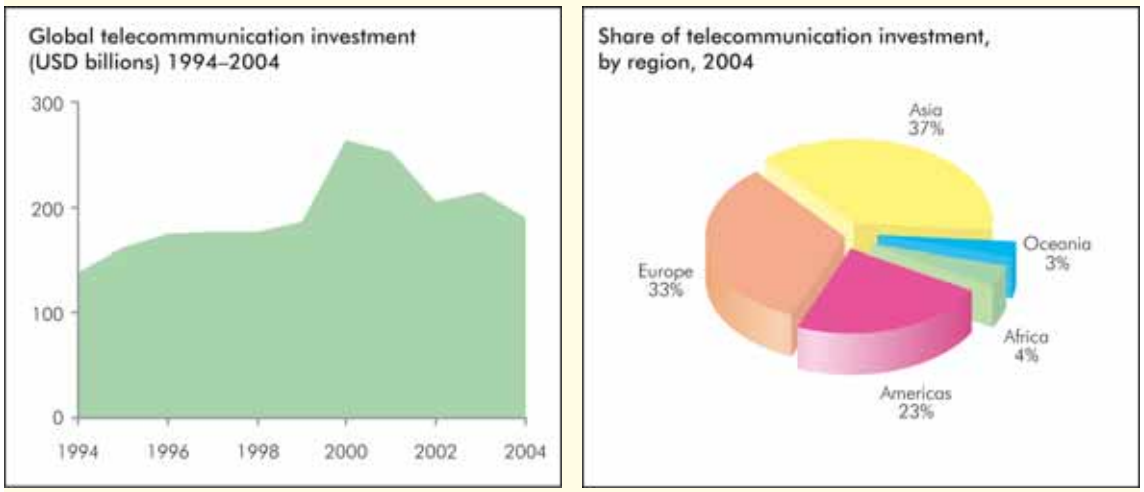
Source: ITU World Telecommunication Indicators Database.

Figure 7 — Broadband leaders



Source: ITU World Telecommunication Indicators Database.

Figure 8 — Global telecommunication investment (USD billions)



Source: ITU World Telecommunication Indicators Database.


Vismedia

in Europe and five in Asia, along with Canada, Israel and the United States (see Figure 7). Only 0.1 per cent of broadband users live in Africa, where many countries have not yet launched these services.

Investment in telecommunications/ ICT

Global investment in telecommunications reached its peak of more than USD 260 billion in 2000. While annual investment has since dropped to about USD 190 billion, this is still far above the level of a decade ago (see Figure 8).

In 2004, Asia was home to the highest share of investment in ICT. This reflects the leading position of several Asian economies in the newer ICT sectors, including 3G and broadband, as well as the major changes taking place in China's telecommunication sector. China's telecommunications investment alone stood at USD 27 billion in 2004, almost 15 per cent of the world's total. Europe and the Americas made up 33 and 23 per cent, respectively, while only 4 per cent was invested in Africa. This figure is low compared to Africa's population size, but it is an encouraging level in the light of the continent's current share of ICT/telecommunications. ■

ICT in Qatar

The country

A peninsula on the western coast of the Arabian Gulf, Qatar is home to about 813 000 people.* Despite its small size, it is a high-income economy with a well-developed communications infrastructure.

Almost half the country's population live in Qatar's capital and commercial centre, Doha. In 2003, the per capita gross domestic product (GDP) was USD 28 920 — seventeenth in world rankings and higher than several members of the "G8" group of industrialized countries. Petroleum and natural gas form the basis of Qatar's economy, and at the end of 2004, they accounted for almost 80 per cent of its total exports.

ICT infrastructure

The expansion of information and communication technologies (ICT) in Qatar has taken the country to a leading place in this field among its neighbours in the region. It comes fourth in ICT penetration rates among the Arab States, behind Bahrain, the United Arab Emirates and Kuwait. The incumbent telecommunication operator, Qatar Telecom (Q-Tel), was partially privatized in 1998, and the Supreme Council for Communication and Information Technology (also known as ictQATAR) was created in 2004 with the mandate of regulator and enabler of the country's ICT sector.

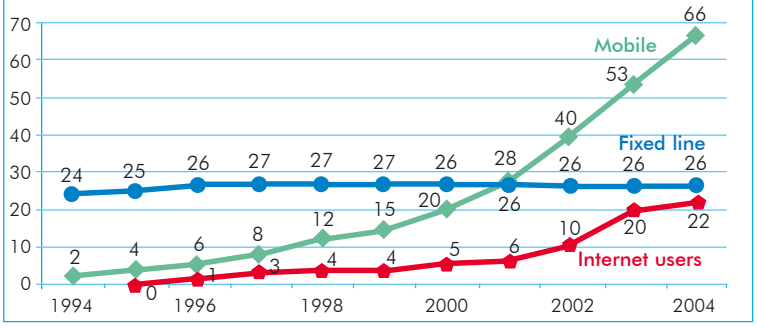
Qatar has seen particularly strong growth in the number of mobile phone subscribers, which overtook the number of fixed telephone lines in 2001 (see chart). The number of subscribers to mobile telephony services rose by an average of 42 per cent per year between 1999 and 2004 — a considerably higher rate than in most other countries in the region, or the world as a whole. By the end of 2004, some 66 per cent of Qatar's population were subscribers to mobile phone services. In contrast, the number of fixed telephone lines has hardly changed over the last ten years. As in other countries, it seems that people in Qatar are going straight to mobile telephony.

Internet and broadband services are growing. Today, 22 per cent of Qatar's population use the internet. By the end of 2004, Qatar had 10 652 broadband subscribers. This was 6.5 per cent of internet users, and 1.4 per cent of the country's population as a whole. Promoting broadband is one of the top priorities of ictQATAR, which plans to establish and manage a "Broadband For All Access Fund." The years to come are likely to see more broadband services in Qatar, built upon what is already a solid foundation of ICT infrastructure and new initiatives. ■

World Population Prospects: The 2004 Revision, Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat (2005).

Growth in ICT in Qatar

Qatar's ICT penetration rates, 1994–2004



Source: ITU World Telecommunication Indicators Database.

Egypt

A PC for Every Home and the *Broadband Initiative*

Leading Egypt into the information age, the country's Ministry of Communications and Information Technology has launched several citizen-oriented initiatives to promote the use of information and communication technologies (ICT). These initiatives have paved the way for the people of Egypt to participate in the information society, and successful models and best practices are now being shared with other nations.

The Egyptian government's initiatives are successful examples of public-private sector partnerships. One of them is the *PC for Every Home* project. Of major importance too is the *Broadband Initiative* launched in May 2004.

A computer for every home

The idea behind the *PC for Every Home* project is to enable Egyptian families to own a personal computer (PC) at an affordable price, mainly by offering simple and approved credit schemes to help purchase equipment. The initiative was launched in cooperation with the carrier Telecom Egypt, with Egypt's leading financial institutions and with 24 local ICT companies. It not only makes personal computers available at 10 per cent below normal prices, but also, and more importantly, buyers can pay in instalments extending up to three years at a reduced interest rate. This credit is secured with the buyer's telephone landline as collateral.

The initiative is operational nationwide through participating bank branches, which are connected to Egypt Telecom's database to conduct the credit approval process. Similarly, the procedures for buying computers have been modernised by obliging sales outlets to use an e-commerce application specifically designed to manage the sales.

The boost in availability of computers has created a host of opportunities for ordinary Egyptian citizens. Along with their purchase, families can also choose from a range of locally produced educational and informative software packages.

Introducing ICT to the next generation is a central aim of Egypt's initiatives

Broadband initiative

Egypt's commitment to its goal of bridging the digital divide is not as an end in itself, but rather a means to achieve the more fundamental goals of improved public services, a stronger economy, increased productivity and greater opportunities for all. In line with this vision, the *Broadband Initiative* promises affordable, always-on, high-speed connection to the internet.

The first step is to increase the penetration of asymmetric digital subscriber lines (ADSL). To achieve this, the initiative is focusing on halving monthly charges for 256 kbit/s ADSL services, simplifying installation procedures, and increasing public awareness of ADSL through marketing campaigns. The initial target was 50 000 residential and business subscribers during the first year. By the end of 2005, there were reportedly more than 80 000 ADSL subscribers across Egypt.

As well as residential users, the scheme targets small enterprises, by offering high-speed connection at the same time as constant availability of the phone line to receive voice calls. Wireless access is also included in Egypt's broadband agenda as an attractive option for providing services, particularly in rural areas and newly developed towns. ■

GSM Association

Making mobile phones affordable


Bill Davenport

Ultra low-cost handsets

Mobile phones have become an integral part of modern society, helping to revolutionize the way we conduct our personal and business lives. In many parts of the world they are the most reliable, and sometimes the only, form of telecommunications available. To individuals and communities mobile phones provide innumerable personal, business and safety benefits. Making ultra low-cost handsets available is helping to reduce the barriers to accessing these benefits.

The Global System for Mobile communications (GSM) platform is used by over a billion customers across more than 210 countries and territories, according to the GSM Association. However, it believes that millions more can enjoy the benefits of mobile communications if handsets and services can be made more affordable. The association's "Connect the Unconnected" programme includes the *Emerging Markets Handset Initiative*, which has helped to drive down the cost of mobile handsets in developing countries.

In June 2005, association member Motorola announced that it had reduced the wholesale cost of two of its models (the C113 and C113a) to USD 30 per handset. Ten key operators from emerging markets have committed to buying six million of these devices, including Grameen Phone, based in Bangladesh. The handsets offer talk times of up to 450 minutes and up to 330 hours of standby time, reducing the need for frequent recharging of batteries.

Tax and regulation studies

The *Emerging Markets Handset Initiative* has catalyzed a new, ultra low-cost segment of the market for telecommunications, but this is only one part of a wider campaign to address the digital divide. The GSM Association believes that taxation and regulation also play an important role in fostering the adoption of mobile communications and it has undertaken work to examine these issues. The association's study on taxation highlighted how mobile telephony can be put outside the reach of people in developing countries when it is taxed too highly (see the January-February 2006 issue of *ITU News*). A new report is soon to be released on how regulatory policy also has a major effect on the growth of mobile telephony.

The Motorola C113 is one of the newly developed mobile phones that will be made available at low prices

Source: GSMA

Mobile communications is already well down the path towards connecting the unconnected four billion people worldwide. The GSM Association says that it hopes its work will have a lasting impact on promoting the technology in areas that have not so far been able to benefit from mobile communications. ■

Japan

The Asia Broadband Program

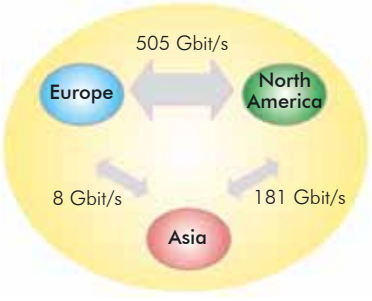
In March 2003, Japan's Ministry of Internal Affairs and Communications (MIC), together with other ministries and agencies, drew up a programme with the aim of making Asia a global information hub by promoting broadband and increasing the volume of data distribution. It is called the *Asia Broadband Program*.

Linking up Asia

Information and communication technologies (ICT) have been recognized by the international community as an essential key to growth and prosperity. But significant digital divides remain, including between world regions. This can be seen in the case of Asia.

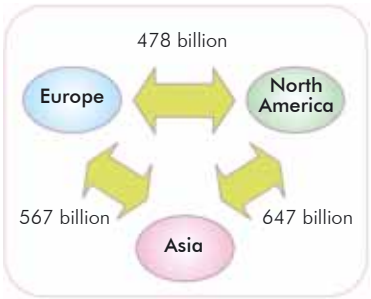
As Figure 1 illustrates, the amount of data moving to and from Asia is very small compared to the information flow between Europe and North America. This contrasts with a balanced picture in the case of trade flows (Figure 2). To make the best use of ICT in promoting social and economic development in Asia, it is necessary to expand information exchange within the region, as well as between it and the rest of the world.

Figure 1 — Information flows (in international internet bandwidth)



Source: TeleGeography Inc., 2004.

Figure 2 — Trade volume (in USD)



Source: WTO, 2003.

Building up broadband

The *Asia Broadband Program* has seven goals, to be achieved by the target year of 2010. Goal 1 is to ensure that all people in Asia have access to broadband, either through their own equipment or at public facilities. Other goals include building networks of sufficient bandwidth to link Asian countries directly; facilitating the transition of networks from internet protocol version 4 (IPv4) to the next-generation protocol, IPv6, and raising the numbers of ICT engineers and researchers. The programme also aims to develop machine translation technologies between Asian languages, and create an environment in which people can use ICT easily and securely. In addition, there are plans to digitize and archive information about major Asian cultural assets.

To help achieve these goals, MIC has been very active in three particular fields:

- Construction of network infrastructure to expand information distribution in the region.
- Development of applications, content and basic technologies (including for telemedicine and IPv6) to be used with the new infrastructure.
- Improvement of human resources development in Asia. Through various types of cooperation and assistance by MIC (together with such bodies as the Japan International Cooperation Agency and the Asia-Pacific Telecommunity), more attractive and efficient programmes are being developed in the region to improve human resources in ICT. Projects are created through discussion with individual countries about their particular needs.

MIC will continue to strengthen relationships with Asian countries and further promote specific projects under the Asia Broadband Program, in cooperation with governments, private enterprises, non-profit organizations and international institutions in the region. ■

Siemens

Trends in telecommunication reform

New ITU report highlights regulatory framework for promoting broadband

To coincide with the World Telecommunication Development Conference 2006, ITU has published the seventh edition of *Trends in Telecommunication Reform: Regulating in the Broadband World*. The aim is to inform policy-makers and regulators in the field of information and communication technologies (ICT) about the latest developments. To accomplish this, the report incorporates input from a range of experts, inside and outside ITU.

When talking about telecommunications, the future is definitely broadband. Legacy, single-purpose networks are being replaced by broadband ones that can carry any combination of voice, data and multimedia (graphics, video and audio), in any format. Broadband is potentially as different from standard voice telephony as telephony is from the telegraph services of 150 years ago. Not only for education and entertainment (such as downloading music), broadband also enables a wide range of applications (such as telemedicine) to be used to improve the quality of life.

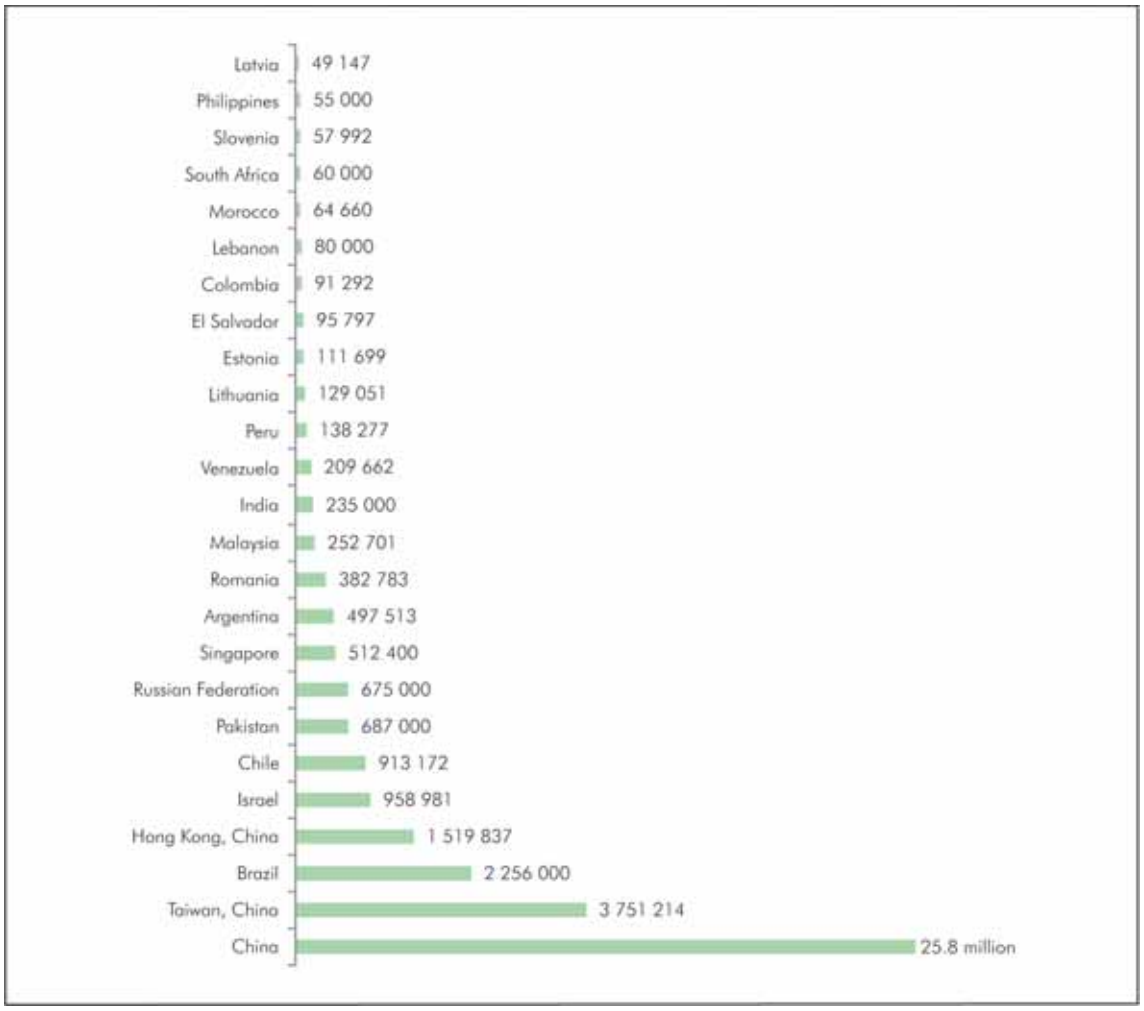
"Bringing broadband to the masses is one of the major challenges facing the global ICT community."

The 2006 *Trends* report begins with a chapter on market and regulatory trends in the ICT sector. A second chapter answers basic questions about broadband: what it is, and the elements of its networks. The design of broadband technologies is covered in the next section, followed by an examination of the role of regulators in promoting broadband. Spectrum management for broadband is the subject of a chapter in the report, as well as regulation of voice over internet protocol (VoIP) services. Finally, there is discussion of ways to tackle the increasingly harmful impact of spam upon information networks through enforceable codes of conduct. This system of managed self-regulation and current regulatory practices for VoIP were featured in *ITU News*, December 2005.

Broadband and development

The vast majority of today's broadband users are in the industrialized world. But broadband deployment is expanding in the developing world as well. For example, in Chile, the carrier Telsur has begun a broadband project that has garnered a total investment of USD 20 million in the last five years. In Africa, the number of broadband subscribers rose by a factor of 30 between 2002 and 2004. Figure 1 shows the 25 non-OECD economies with the highest numbers of broadband subscribers, led by China, which has the second largest number of subscribers in the world, after the United States.

Figure 1— Non-OECD economies with highest numbers of broadband subscribers (2004)



Source: ITU World Telecommunication Indicators Database.

Broadband is one of the keys to development, because it increases the potential for generating content that is relevant to communities and produced in their languages — thus stimulating further demand for services. Eventually, people in even the remotest areas could become broadcasters and educators in their own communities and the wider world. In line with this trend, the report has much information of particular interest to developing countries.

Market structure: the poor pay more

The *Trends* report points out that, because broadband can be deployed flexibly, it offers a good business model for expanding ICT. Many broadband technologies can be deployed incrementally, as demand develops, rather than requiring expensive network-wide upgrades. This means that a full range of players, large and small, private and public, can become ICT service providers and help to close the broadband divide.


Siemens

But there need to be big improvements in the services typically offered in developing countries, and in the pricing of those services. Currently, the average fee paid by broadband subscribers in low-income countries is USD 291 per month, compared with USD 18 in upper-income countries, according to the report. And the poor are not only paying more for their broadband service, they are also receiving less bandwidth. The average high-speed downlink in upper-income countries is 3.8 Mbit/s, but only 712 Kbit/s in low-income countries.

Market structure is one of the factors influencing this situation. In developed countries, users can usually choose among competing broadband providers, as well as converged and complementary services. In marked contrast, many developing nations may initially see only "exclusive environments" for broadband, because investors are wary of low income levels and scattered populations. "It is not that regulators (in developing countries) seek to create monopoly markets," the report says. "The problem is that they may only succeed, at least in the short term, in attracting one broadband provider." And because of this, the report adds, "it is critical to pick the technology family and put into place the institutional and policy environment to support the network." This also makes it vital that regulators understand broadband technologies, so that they can appreciate operators' investment and business concerns and be better able to promote broadband deployment.

And although privatization has slowed down somewhat in recent years, the report says that there is a strong trend towards liberalized markets, privatized operators, separate regulatory authorities and new regulations relating to convergence. "It is unlikely that countries today will attempt to shut down competition and bolster the formation of new monopolies," it says.

Broadband access platforms

The major platforms available for broadband services today are wire-line and wireless technologies, including upgrades (for example to xDSL or 2.5G networks) and entirely new infrastructure, such as all-fibre networks, wireless local area networks (WLAN) and 3G systems. A third option is satellite or stratospheric systems, which have been deployed on a smaller scale. The *Trends* report examines how each of these might be used in developing countries. It looks at how geographic, economic, demographic, and public policy factors might determine the viability of the various solutions.

Wire-line broadband

The earliest internet access was through the public switched telephone network (PSTN), via "dial-up" modems. This continues to be a standard form of internet access in many countries, but it does not meet most definitions of a broadband service. For that, you need to use either digital subscriber line (DSL), cable television, optical fibre networks or satellite technology.

DSL

DSL uses spare areas of the frequency spectrum to provide internet connection via copper-wire telephone lines. Unlike with dial-up services, users can go online and make phone calls at the same time. Where a PSTN is already in place, DSL technology can be added to create a significantly improved service, at the same time protecting the investment in infrastructure that has already been made. The report notes that "researchers have argued that fixed wire-line solutions are

Optical fibre networks and internet exchange points (IXP)

are being established in developing countries to provide broadband services more effectively.

- In ***Pakistan***, the Pakistan Education and Research Network connects all public universities.
- ***Laos*** has a national fibre infrastructure reaching all provincial and district capitals. The universities are in the process of setting up a national research and education network (NREN), and internet service providers are linked to an IXP.
- A network provider in ***Kenya*** plans to install a 1140-kilometre optical fibre network by the end of 2006. It will provide a core network extending from the coastal city of Mombasa in the southeast to Kenya's western border.
- In ***Rwanda***, Terracom is deploying a fibre network to all schools and other priority groups, and academic institutions are organizing an NREN. Rwanda has connected all internet service providers to an IXP.
- ***Tanzania*** and ***Mozambique*** have various owners of fibre-optic networks. Both nations have IXPs and are in the process of establishing NRENs.
- ***Malawi*** and ***Zambia*** rely on power utilities for optical fibre deployment. They are also deploying IXPs, and the universities are in the process of setting up NRENs.
- ***Bolivia*** has a national fibre backbone, an IXP and an expanding NREN.

the most cost-effective, compared with available wireless solutions, in environments with more than 40 broadband subscribers per square kilometre." This is seldom the case, however, in developing countries.

Optical fibre

Nevertheless, there is a way in which developing countries can use their lack of existing infrastructure to "leapfrog" to better systems of wireline broadband access. The answer is optical fibre. According to the report, the advantage of this technology is that it "is not that expensive" and it can be "coordinated and even shared with other infrastructure-dependent sectors, namely power utilities…railways, pipelines and roads." As the report says, for example "every power grid substation — including those in rural and under-served areas — can become a point of presence for access to fibre."

According to the *Trends* report, a growing number of developing countries have started to establish fibre-optic backbone networks, which are needed for national and international links. Many of these are growing out of national research and education networks. The report urges developing countries to use fibre to replace any microwave links that might have been used to connect their second-generation (2G) wireless networks. Internet exchange points (IXP) are also becoming more common, and this is especially important in such regions as Africa, where IXPs mean that an "island" of connectivity can connect directly with a neighbouring "island," without that connection needing to be routed via a distant hub.

Wireless ways

It is wireless technology that is providing the strongest growth in telecommunications in areas that are too sparsely populated to be of commercial interest to providers of fixed, wire-line services. Nowadays, wireless is also being used to offer broadband services. "Increasingly," the report says, "developing countries are employing low-cost technologies — many of them wireless — to strategically introduce broadband capabilities." A common way to do this is by creating WLANs or "hot spots" in public places (such as internet cafés or libraries), where you can surf the internet through being connected by "Wireless Fidelity" (Wi-Fi). Such WLANs can be deployed by the private sector as well as local governments, international organizations and non-governmental organizations providing services in rural areas.

Vismedia

Wi-Fi and WiMAX

Wi-Fi was designed as a short-range networking technology, to be used in small hot spots to connect users wirelessly to the internet. WiMAX is a more powerful infrastructure technology, on the order of DSL or cable modem technology, according to the report. It is more bandwidth-efficient than Wi-Fi and it supports high-throughput broadband connections over long distances. This makes WiMAX capable of delivering a variety of applications, including high-speed ones.

Wi-Fi technology allows a wireless internet connection within a radius of some hundreds of metres. Such "islands" of connectivity can be further connected to each other and to core networks through using WiMAX

routes that are tens of kilometres long. Another possibility under development is for WiMAX base stations to provide an area of connectivity that is up to 20 kilometres wide, which in turn has long-distance connections through optical fibre or microwave networks.

The *Trends* report says that "there is currently very little in the way of a track record by which to gauge the cost-effectiveness of WiMAX as a technology." Nevertheless, where there are fewer than five subscribers per square kilometre, Wi-Fi, WiMAX and related networks could be economic ways to offer broadband internet access through wireless means. "Deployments of these systems can be bottom-up and potentially incremental," the report points out, adding that "Wireless systems can work in environments with relatively weak institutional support and small capital markets."

Developing countries have recognized this potential. The report notes that there is considerable preliminary deployment of WiMAX under way in Africa, Asia and the Arab world. It says that in Mali, for example, the carrier Ikatel, (a subsidiary of France Telecom), has plans to offer a WiMAX network in the capital, Bamako. "Large-scale international manufacturers are also doing their part," adds the report, citing Intel, which has announced plans to conduct WiMAX trials in Malaysia, the Philippines, Thailand, Indonesia and Viet Nam.

Third-generation (3G) networks

Another type of wireless connectivity can be provided through third-generation (3G) networks used by mobile phones. These can offer ubiquitous and seamless internet access, even when users are travelling in moving vehicles. The demand for such vehicular services is likely to be limited in many developing countries. However, because 2G networks enjoy very high penetration even in some of the world's most remote and low-income areas, it could be effective to upgrade them to 3G capacities for offering broadband connectivity. In other areas, the 2G base station infrastructure might be suitable for deploying WiMAX. The *Trends* report aims to demystify the array of 3G migration paths to enable regulators to be more effective in their dealings with the private sector.

Télécoms Sans Frontières

In Pakistan, emergency communications via satellite links were provided to survivors of the major earthquake in October 2005

Solutions in the sky

Compared with other possible ways to achieve broadband access, non-terrestrial solutions are expensive. Thus, they are most relevant to developing countries in areas that are very remote or difficult to connect by other means. Stratospheric platforms that operate high in the Earth's atmosphere, however, could offer the coverage benefits of satellites at costs close to those of fixed infrastructure, according to the *Trends* report. It adds that these platforms could also play a key role in conjunction with wireless technologies such as WiMAX.

Stratospheric platforms are under development. Meanwhile, very small aperture satellites (VSAT) can be effective in reaching areas with difficult terrain. High prices, though, mean that satellites are not likely to be used in providing broadband connectivity for the majority of users in developing countries.

Running broadband equipment

It is no use providing broadband access if there are no reliable electricity supplies for people to operate computers or other necessary equipment. As the *Trends* report points out, "any effort to deploy broadband networks must also consider the availability of power solutions, both on and off the electrical grid." Solutions for providing electricity in areas without access to a mains grid include generating power from the sun, wind or water. It is also possible to burn various fuels. The report cites examples in Tanzania of innovative ways to make electricity through such methods. At the Mtabila refugee camp, solar power is used to operate a VSAT terminal, while at the Kasulu Teachers Training College the chosen fuel is cow manure!

Broadband Power in Tanzania

Kasulu Teachers Training College

The Kasulu Teachers Training College (KTTC) in north-western Tanzania had no electricity supply and its 15 phone lines have no data capabilities. Nevertheless, to help equip the next generation of teachers with ICT tools, it has an internet centre that is operated with an unusual source of power — cow manure.


Michael L. Best

Kasulu is close to the Burundi border, and the region has seen a huge influx of refugees escaping from violence in that country. In 2000, the Global Catalyst Foundation (GCF), in collaboration with the United Nations High Commissioner for Refugees (UNHCR) and Schools Online, decided to explore the feasibility of setting up a Kasulu Internet Project to promote co-operation and understanding between refugee Burundians and their Tanzanian neighbours. Another objective was to promote economic development and entrepreneurship in the impoverished region.

The first computers arrived in 2002, and the 800 students enrolled in KTTC's teacher-training programme are their main users. However, the facility is also open to the public every evening and weekend, when internet access costs about USD 1 per hour. Local representatives of non-governmental organizations and UNHCR are also frequent users. The students take a variety of professional courses to gain computer qualifications. Revenues from these training programmes help KTTC to pay for internet access, maintenance and operational costs. The college has a satellite connection to the internet through a VSAT service provided by I-way.

Dung from twelve cows belonging to the college is used in a 50-cubic-metre biogas plant to make methane. This is mixed with diesel and fed into a power generator producing 10 kilowatts of power — enough to run 15–16 computers for eight hours daily. And nothing goes to waste. After the methane is extracted, the remaining sludge is removed from the biogas plant to provide fertilizer for the crops the college grows to feed its staff and students.

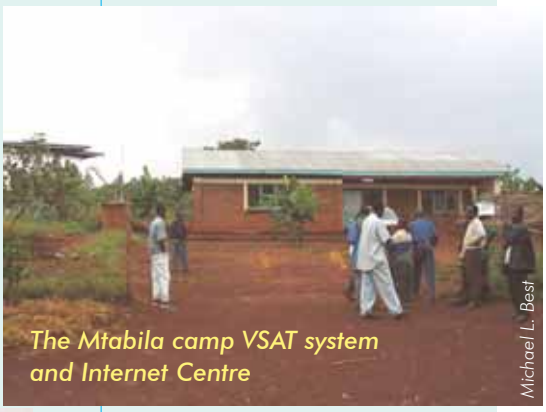

Michael L. Best

The Kasulu facility uses cow power

Apart from powering computers, the college also wants to use methane for cooking, instead of the several tons of timber it currently burns every year. To do this, the college plans to increase the capacity of the biogas plant and maintain a herd of up to 50 cattle. The Swedish International Development Agency is considering funding the expansion. It would also like to replicate the biogas system at 30 teacher training schools in Tanzania and some 3000 secondary schools.

Mtabila Refugee Camp

More than 50 000 Burundian refugees live at the Mtabila camp, where conditions are bleak and there is little to occupy the residents, who face an uncertain future. With no telephone service in the camp, the ten computers installed at the Mtabila Internet Centre are the refugees' main connection to the outside world.


Michael L. Best

The Mtabila camp VSAT system and Internet Centre

Every day, about 30 residents use the centre to send e-mail, at a cheaper cost than the postal service. Others benefit too as news and information are shared. People can also learn to access websites, including those in local languages. The centre is equipping refugees with skills they can use to help reconstruct Burundi. Ten teachers, for example, are studying for computer qualifications.

Broadband internet access is provided through a VSAT terminal, with the electrical power coming from 48 solar panels, generating 75 watts each. Setting up the centre was a demanding task, but despite these hurdles, the project is beginning to deliver the intended benefits. This can be seen in what one refugee wrote in an e-mail from the Mtabila camp: "I just can't tell you how happy we are to get connection to the internet! Before I was connected, I felt lost. But now that I am connected, I feel saved. The world will not forget us now, because we, the refugees, can speak to the outside." ■

Broadband spectrum management

Spectrum management is taking on an increasingly important role around the world. Many developing countries are expected to grow their broadband markets through broadband wireless access (BWA) technologies. The *Trends* report looks at the challenges that regulators face in assigning spectrum, especially concerning frequencies below 6 GHz, which are considered ideal for many BWA applications.

The challenge

The main challenge for spectrum managers is to provide for flexible, market-oriented spectrum licence rights, which can create a positive investment climate for BWA services. Another task is to discourage uneconomic speculation and the hoarding of spectrum, which could delay the roll-out of services to consumers.

The report urges regulators to understand that technological advances are increasing spectrum capabilities, allowing licensees to do more with the same resources and enabling entirely new spectrum uses. Licensees can now offer new products by making trade-offs between power, bandwidth, throughput and bit error rate.

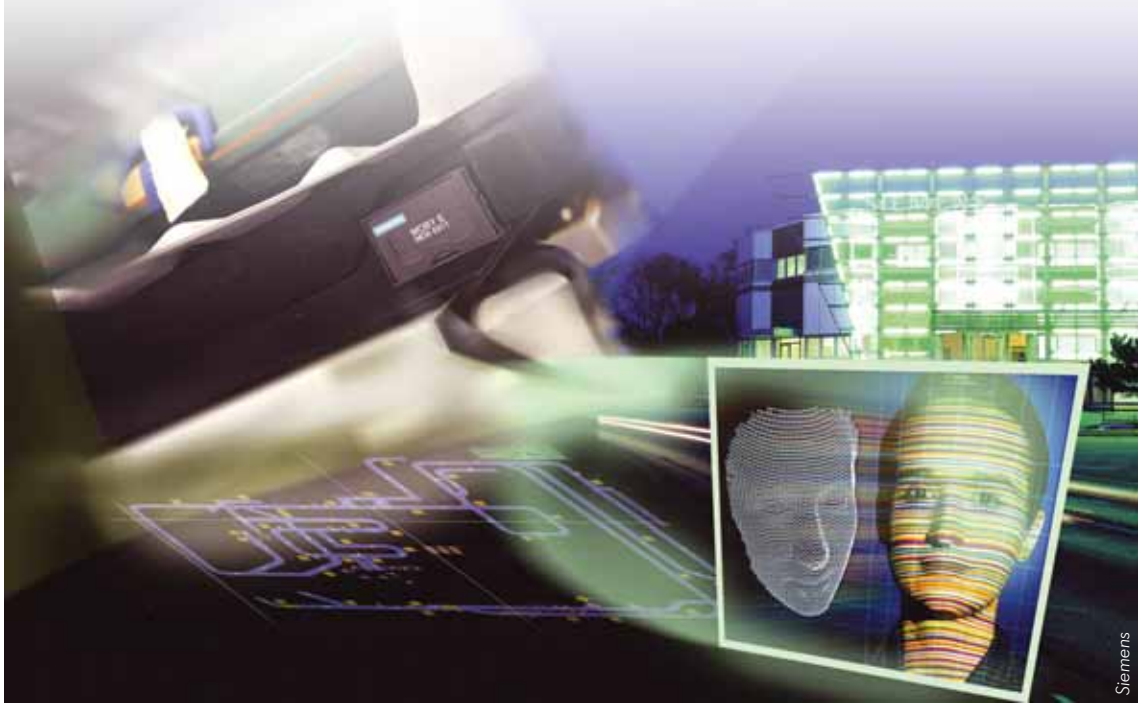
In addition, the report says that spectrum regulators need to look at the "best practices" that have fostered the widespread deployment of wireless services. It explores these good examples, including those specifically endorsed by ITU's Global Symposium for Regulators.

Existing regulatory models

Are traditional approaches to spectrum management sufficient to deal with the new technological and market realities? Three models are examined in the *Trends* report, and the conclusion drawn is that none is sufficient in itself to deal with the evolving world of broadband. Their problem is that they focus on defining usage rights of spectrum licensees without articulating how to help achieve the underlying policy goals of the regulator.

Command and control

In the command-and-control model, strict operating parameters and service rules define a licensee's spectrum rights. According to some experts,


Siemens

there is tight government control over spectrum use — an approach that has its origin in the technological limitations of radio systems during the last century. Those called for four steps in regulation: allocation of spectrum, enactment of service rules, assignment (licensing), and enforcement of the rules and licence requirements.

Under the command-and-control regime, the task of regulators is never done, as they must continually revisit and referee the spectrum environment as new radio systems and devices are introduced into the marketplace. This process can lead to delays in the deployment of new BWA services.

Exclusive rights

Under this model, a licensee is given rights (which may be transferable and flexible) to use a specified spectrum band within a defined geographic area and during a fixed period of time. Spectrum use rules are primarily technical (as opposed to service-based), because they are designed only to protect the spectrum licensee and adjacent spectrum users from generating or receiving harmful interference. There is no intention to influence the market or promote a particular service.

Although the exclusive use model can encourage new market entrants, it also creates perverse incentives for incumbent licensees to hoard spectrum, as a way to thwart possible competition. Critics of this model argue that it does not prevent incumbents from simply buying up spectrum rights, with no guarantee that they will use those resources to offer innovative and competitive wireless systems.

Spectrum commons

The commons (or unlicensed) model allows unlimited numbers of users to share a block of frequencies, without giving priority to any individual or group. Use of the spectrum is limited only by technical criteria that specify bandwidth and emitted power, but provide no enforceable rights to protect against interference. A well-known form of the commons approach has been the deployment of wireless local-area networks using Wi-Fi technology.

The commons approach makes it relatively easy to enter a market, beginning services at lower costs and

Ireland: Balancing the use of licensed and licence-exempt spectrum

A number of regulators are using a mix of licensed and unlicensed spectrum to promote low-cost broadband services in under-served areas. Ireland, for example, allows small operators to launch services in rural areas using unlicensed spectrum, and at very low cost. These operators can migrate to licensed spectrum once they have established a successful business.

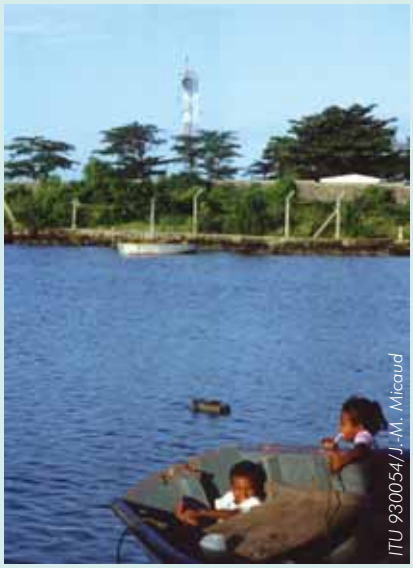
Since July 2002, wideband data transmission systems for the provision of fixed wireless access networks or metropolitan area networks in Ireland have been permitted in the 5.8 GHz (5725–5875 MHz) band on a licence-exempt basis, provided that the maximum radiated power does not exceed 2W eirp. This power level, which is above the European harmonized standard, has increased potential coverage and hence the utility of the 5.8 GHz band.

Irish regulator ComReg announced a new scheme in 2004 for the licensing of broadband fixed wireless access services in local areas, defined by a 15-km radius from a base station, with an interference zone extending to a 30-km radius. Since inception of the scheme, 110 licences have been granted across the country. Initial concerns that new services would only be offered in urban areas have proved to be unfounded.

In the past, Ireland has awarded national licences for broadband wireless access that incorporated roll-out and coverage obligations. But roll-out of services was not satisfactory. Ireland's experience indicates that regulators should, instead, minimize barriers to entry by allowing broadband suppliers to begin operations on a small scale, and by not imposing onerous roll-out and coverage conditions. ■

Mauritius
Overcoming the pitfalls of the commons approach

In Mauritius, the Information and Communication Technologies Authority (ICTA) has a mandate that calls for it not just to manage spectrum, but also to increase the reach of ICT throughout the country. In 2005, ICTA began a development programme by exploring the demand for broadband wireless access. At the same time, it identified key factors that have had a negative impact on past attempts to develop BWA services in


ITU 930054/J.-M. Micaud

Mauritius. It found that operators in the unlicensed 2.4 GHz band were exceeding designated power limits, using licence-exempt systems for long-range transmissions — contrary to their design and purpose. ICTA concluded that the previous "commons" model had led to overuse and overcrowding in the 2.4 GHz band.

ICTA then took note of other countries' decisions to define bands for BWA uses, and it took account of the potential of new standards, such as WiMAX. In the case of the 5.4–5.8 GHz band, for instance, ICTA determined that the presence of radar incumbents required postponing any allocation decision for broadband, even though this band had been harmonized globally for higher-powered unlicensed operations through negotiations at the World Radiocommunication Conference in 2003. ■

then rapidly expanding them. The model could be attractive to regulators who want to promote BWA deployment, especially in rural and under-developed areas. But the *Trends* report points out that the spectrum commons model also has risks: the rapid proliferation of systems can lead to interference, crowding and an unstable spectrum environment.

Tricky issues

In dealing with spectrum management, regulators are likely to face a number of challenging issues in future, such as how to deal with competing technologies, and the question of harmonization.

Technology neutrality

The term "technology neutrality" describes a regulatory policy that does not favour one type of technology over another. This may be highly desirable, but the *Trends* report underlines that promoting a standard, or creating a harmonized spectrum band and associated service rules, enables economies of scale leading to cheaper equipment for operators and users. It says that "for the regulator as resource manager, full technological neutrality is an impossible goal, because the desire to achieve efficiency and rapid utilization of the spectrum ultimately requires decisions that point to particular technology paths."

The report urges regulators to take a pragmatic approach, balancing social and policy objectives, such as universal access, with the need to maximize the efficient use of scarce resources.

WLAN versus 3G?

The report warns that the disparity between massive fees paid for 3G licences (for example in Europe) and the unlicensed use of WLAN could cause problems for regulators, especially if both technologies converge into a single broadband wireless market. But for now, it appears that licensing as a regulatory mechanism is being applied in limited ways to the realm of WLANs. In all regions of the world, around two-thirds of countries do not require spectrum licences for WLANs.

Inconsistency

A lack of consistency among national spectrum policies — particularly on unlicensed "commons" models — is becoming an issue. Lack of coherence from country to country in the fees and costs associated with spectrum access may be manageable in the short-term, but it could become problematic in the long term, as innovations sweep through the market.

Siemens

Singapore: Using auctions to manage spectrum

One way to prevent licensees from hoarding spectrum is to use the transparent process of auctions. In Singapore, the Info-Communications Development Authority (IDA) successfully auctioned spectrum in the 2.3 GHz and 2.5 GHz frequency bands for broadband wireless access services in May 2005. The starting price for each of the spectrum blocks put up for auction was SGD 1000, and the highest closing price bid was SGD 550 000. IDA decided to grant successful bidders a ten-year licence, in order to provide an acceptable level of security for their investment.


Interart Images

Singapore's distribution of spectrum for BWA services was conducted in a transparent fashion. IDA had earmarked the 2.3 GHz and 2.5 GHz bands for broadband wireless services in February 2004, and in April launched a public consultation on spectrum allocation and the licensing framework for these services. In February 2005, IDA released licensing details for broadband wireless services notifying interested parties that it would hold an auction if demand exceeded the supply of available spectrum. ■

A flexible regulatory approach for new times

Today's spectrum regulator needs a practical, outcome-oriented policy framework, the *Trends* report says. A pragmatic approach that rewards economic risk-taking by spectrum holders will reduce the likelihood that they will hoard spectrum.

According to the report, regulators can start by offering to grant spectrum holders maximum flexibility for their spectrum rights on the condition they meet two threshold obligations. First, even before gaining any new spectrum rights, they must demonstrate their commitment to increasing competition. Second, they must agree to licence conditions that enforce the opportunity cost of their newly allocated spectrum rights. Pricing policy can be used to show licensees the value of their spectrum holdings and discourage them from hoarding spectrum. Regulators can also combat this practice by simply recapturing spectrum, or by using such methods as open auctions.

In developing countries, and particularly in remote areas, where spectrum scarcity is a much smaller problem than in developed countries, spectrum management policies could include a less dense environment of spectrum use, allowing greater power and range for wireless systems.

No longer just a dream

Broadband networks are no longer a dream for the future; they are at the centre of ICT development *today*. The growth of converged, "triple-play" offerings is coming to dominate business and regulatory developments. This is particularly true in developed countries, but it is also a powerful factor in developing ones. A full range of broadband technologies can, and are, being deployed in rural and underserved areas of developing countries. And increasingly, discussions about regulatory issues focus on the fundamental question of how all communities can participate in, and benefit from, the deployment of broadband capabilities. As the *Trends* report says:

"Broadband internet access (whether through fixed lines or wireless) is becoming increasingly relevant to the demands of subscribers in developed and developing countries alike. The essence of voice telephony is being transformed. Next-generation networks are being designed and developed, even as 3G services begin to gain widespread acceptance. Through all of these trends, one thing appears certain: the sector is tending towards a more open, competitive, and transparent model, in which governments, operators, development agencies, educational institutions, civil society groups, and end users all have equally important stakes." ■

Designing spectrum monitoring networks in the Kyrgyz Republic

B.N. Nurmatov, Deputy Director of the State Communications Agency of the Kyrgyz Republic

Although spectrum management in the Kyrgyz Republic is assured by means of a well-developed system, spectrum monitoring lags behind other domains such as frequency assignment, licensing, and administration. To improve the situation, the State Communications Agency (SCA), the national body responsible for regulatory matters and spectrum management, decided to design and implement a network of fixed monitoring stations, particularly for VHF and UHF. The challenge it faced was how to tackle the design process.

Ideally, a network should be optimized at the design stage, taking into account future developments to provide the best mix of functional and operational capabilities while keeping costs to a minimum. However, two factors have made it difficult to apply this principle in Kyrgyzstan: lack of design tools (until recently), and the country's complex terrain — much of it consists of high mountains. The answer was found in the first-ever use of new planning tools designed by ITU.

ITU model helps in planning

To assist in their task, SCA looked at the methodology that was developed in Study Group 1 of the ITU Radiocommunication Sector (ITU–R), and implemented in a software application, for use in optimizing the design of spectrum monitoring networks.[1] The methodology involves the calculation of actual coverage areas (based on exact terrain data) for various spectrum monitoring functions such as listening, emission parameter measurement, direction finding (DF), and location determination (LD) by triangulation — a function that is as important as it is difficult.

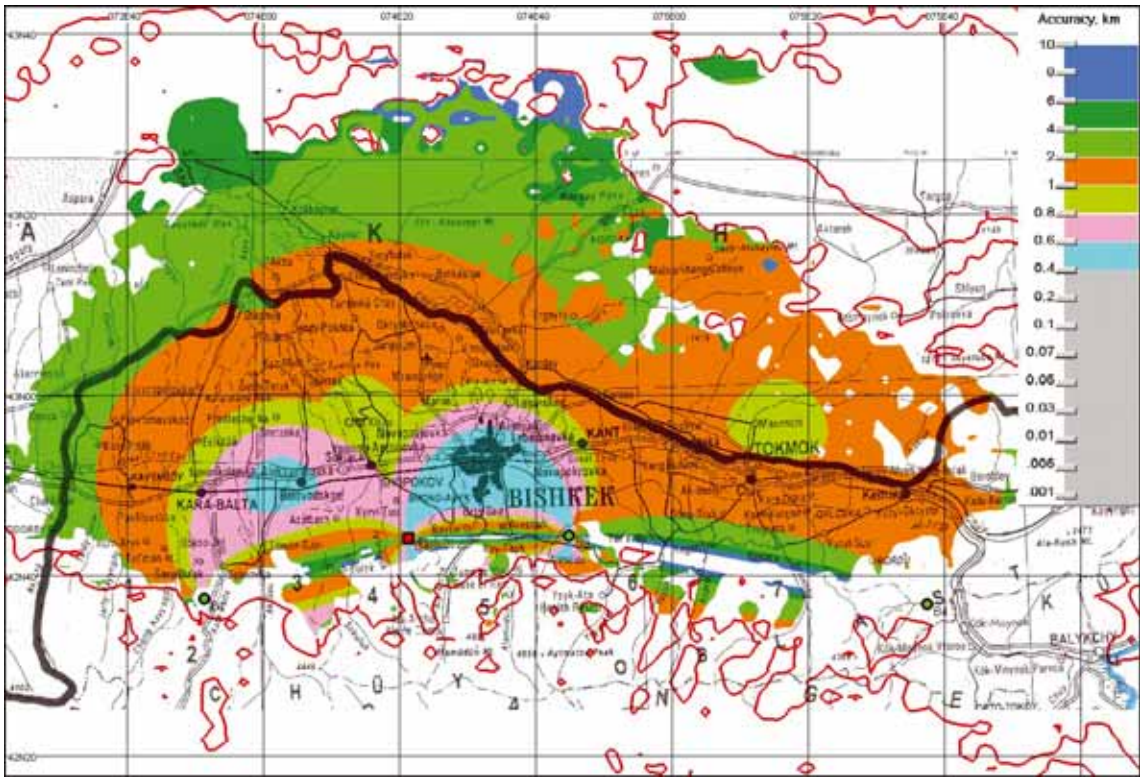
Location determination by triangulation depends on the availability of bearing data from at least two monitoring/direction-finding stations, and is thus subject to significant constraints that do not affect other functions which can be performed by a single station working alone. Furthermore, location uncertainty is a phenomenon that can vary considerably, as it depends not only on the distance from the direction finding/monitoring stations, but also on the angles formed by the crossing of bearings. Thus, any given combination of DF stations is associated with a specific pattern of LD uncertainties (known as the Kogan-Pavlyuk location template), which is also dependent on the actual terrain. This makes it impossible to predict location coverage features without a detailed simulation. For this reason, LD is the most critical function in spectrum monitoring, and should be taken as a basis for planning a spectrum monitoring network.

The Istanbul Action Plan in operation

Convinced by the study results achieved at ITU–R, the State Communications Agency requested that ITU's Telecommunication Development Bureau conduct a technical assistance project in the Kyrgyz Republic to propose the design of the planned spectrum monitoring network. This falls under Programme 2 of the Istanbul Action Plan, and the response from ITU was prompt.

The project was conducted by an ITU expert in close cooperation with senior SCA personnel. It was decided to determine the minimum number of V/UHF monitoring/direction-finding stations and their optimum geographical placement with respect to three local monitoring networks, for

[1] *"Handbook on computer-aided techniques for spectrum management"* chapter 5, example 9; and Annex 1 to ITU–R Document 1C/54 of the current study period.



In the Chuisk region of Kyrgyzstan, four spectrum monitoring stations are distributed in the optimum arrangement determined by the computer simulation. The Kogan-Pavlyuk location template shows how the level of accuracy has been maximized around the capital, Bishkek, and in other highly populated areas. (The heavy line is the border with Kazakhstan.)

the Chuisk and Issyk-Kul administrative regions and for portions of the Osh and Jalal-Abad regions. The various monitoring functions (listening, emission parameter measurement, DF and LD by triangulation) were to be available throughout the densely populated portions of those regions. The location uncertainties were to be minimized in the country's major urban centres: the capital Bishkek and the cities of Jalal-Abad, Osh and Karakol.

Simulations lead to higher accuracy

The dedicated software application produced a series of simulations that were compared to find the optimum solution with regard to the number of stations and their sites. The best arrangement of stations was determined using the digital terrain map (DTM) data at a resolution down to 100 metres horizontally and less than 2 metres in the vertical axis. Digital maps for display purposes were produced using standard geographical maps at a scale of 1:1 000 000.

Three local networks were designed for spectrum monitoring within three main lowland areas of the country. Initially, each local network will consist of four fixed spectrum monitoring/DF stations, later to be expanded to five. This arrangement of stations in the Chuisk region, for example, with known DF instrumentation uncertainties of one degree, allows LD by triangulation to reach an accuracy of 0.6-0.8 kilometres within the Bishkek city area. Virtually the entire lowland portion of the region is covered at an acceptable accuracy of 2 kilometres or less.

Similar results were obtained for the other regions. The exercise made it possible not only to specify the number and best placement of the monitoring stations for all three local networks, but also to derive the optimum ratio of measuring and DF stations for those networks.

Computer-designed spectrum monitoring

This international project showed, for the first time, how it is possible to use state-of-the-art methodology and a dedicated software application to design a spectrum monitoring network from the ground up (or to optimize an existing one). Detailed simulations that took account of the mountainous Kyrgyz terrain were able to produce an effective plan. ■

Galileo gets off the launchpad

Europe's new satellite radionavigation system

Giove-A sent its first signals to Earth in January 2006, as part of its mission to test critical technologies for the Galileo system

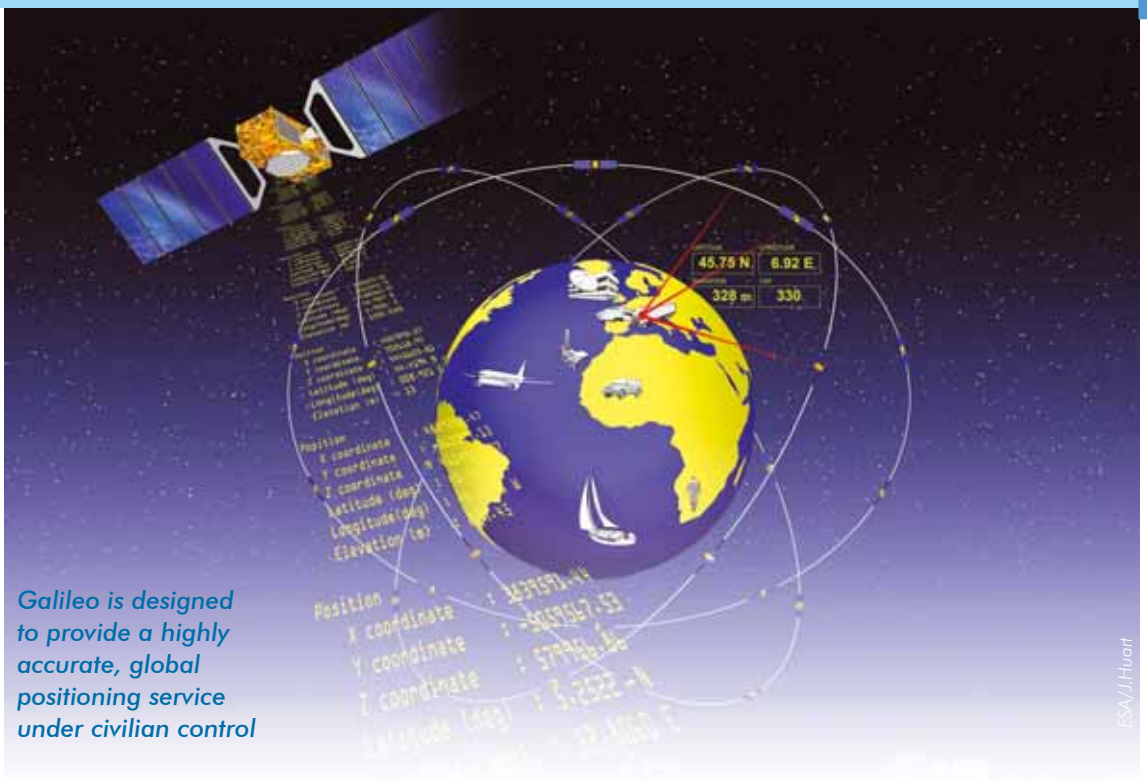
The 600-kilogram Giove-A was launched in December 2005 from Baikonur in Kazakhstan, aboard a Russian Soyuz-FG rocket

How can you find out exactly where you are on the planet? How can you best track the movement of an aeroplane? Nowadays, global navigation satellite systems are likely to provide the answer, with their myriad applications. Two such systems exist at present: the US Global Positioning System (GPS) and Russia's Global Navigation Satellite System (GLONASS). These will soon be joined by Galileo, a new European system that is expected to improve positioning accuracy even more.

Giove-A blazes a trail

Galileo is an initiative of the European Commission and is being developed by the European Space Agency (ESA) as well as the private sector. On 12 January 2006, the first signals came from its pilot element, the *Giove-A* satellite that was launched into a 23 258-kilometre circular orbit on 28 December 2005. Its name is an acronym for "Galileo in-orbit validation element," and its primary mission is to establish Galileo's use of the radio frequencies that were allocated to the system by ITU at the World Radiocommunication Conference in 2000. *Giove-A* also has the task of testing technologies that will be crucial for operational Galileo satellites, including receivers on the ground, and of investigating the radiation environment of the satellites' planned orbits.

Giove-B, is scheduled to be launched in the first half of 2006 with more test equipment on board, including a passive hydrogen-maser atomic clock that is being built in Switzerland. Eventually, it is planned that 30 satellites will be deployed in the Galileo system, over three planes in medium Earth orbit. A spare satellite will be included in each plane, which controllers will be able to move as a replacement for any that becomes faulty. The system as a whole will offer a global service that is expected to start in 2010.



Galileo is designed to provide a highly accurate, global positioning service under civilian control

ESA/J.Huart

Why another system?

The demand for positioning systems has increased tremendously in recent years and it can be said that new ones are needed to provide the wider array of services that will be offered to a booming market. Another argument in favour of Galileo is that it gives users more than one global system upon which to rely. Continuity of service is an important priority for many users.

In addition, ESA says that Galileo will offer a highly accurate service. When signals from its two frequency bands are received, the free-of-charge "open service" will locate items to within 4 metres; location to within 1 metre is expected under Galileo's paid-for "commercial service," and this could go down as low as 10 centimetres if ground stations complement the satellite signal. In addition, Galileo has enhanced reliability through including a signal "integrity message" that immediately tells the user about any errors. Also, it will be possible to receive Galileo in areas at extreme latitudes.

How will it be used?

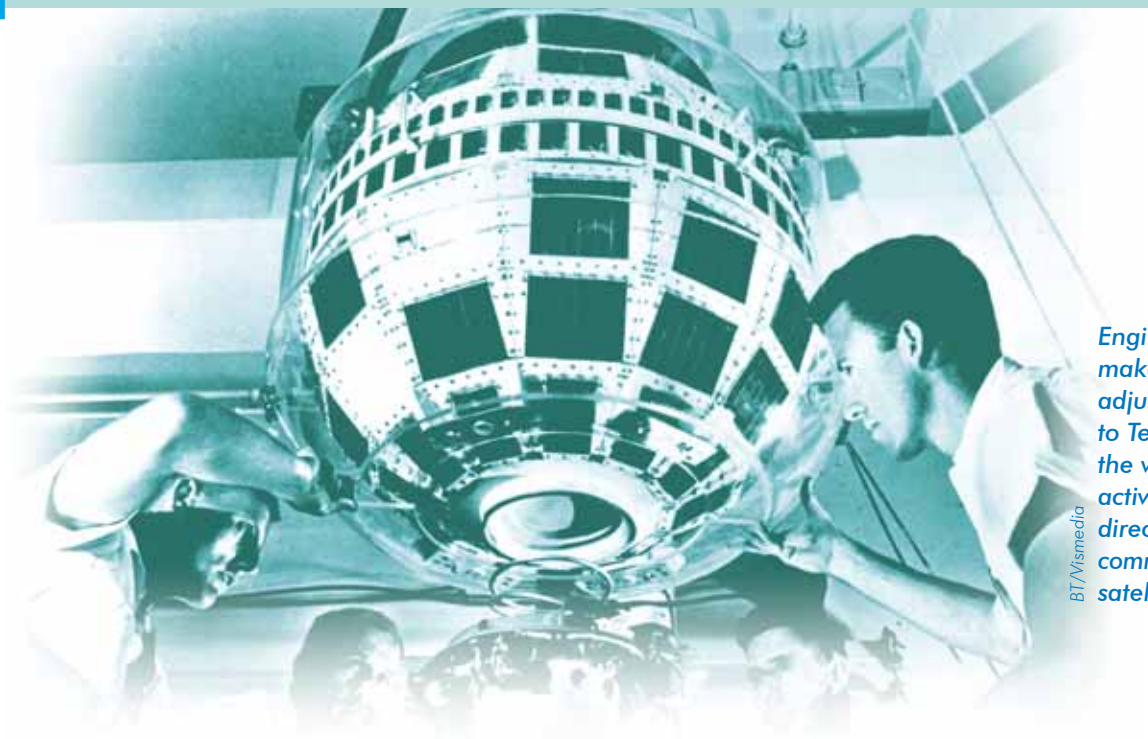
As well as offering an open service and an encrypted commercial one, Galileo will also provide an encrypted safety-of-life service, to be used by emergency personnel, security authorities, air traffic controllers, and so on. This is just one area in which the demand for satellite navigation systems is growing rapidly. Other applications range widely from monitoring the speed of cars, to gathering geographic data, to helping find sailors lost at sea.

Consumers are expected to be able to switch back and forth between the Galileo and GPS systems using the same equipment. This will often be a mobile phone, and tracking these devices is likely to be a particularly important use of Galileo. It opens up many possibilities for "location-based services," such as telling users how to find the nearest station or restaurant. Emergency calls, too, will become easier to handle. The European Union estimates that of the 180 million or so distress calls made every year in Europe, about 6 million have a poorer than required response because of missing information about the caller's location.

Galileo, in conjunction with complementary satellite services and alongside the worldwide boom in mobile communications, should make an important contribution to the spread and improvement of location-based information. ■

Portrait by Justus Sustermans

Galileo Galilei (1564–1642) was one of the first people to turn a telescope onto the night sky. On 7 January 1610, he discovered four satellites of the planet Jupiter. He realized that their frequent eclipses could be used as a "clock" for navigators that is visible everywhere. Tables were published of the Jovian satellites' movements to help determine longitude at sea and on land. The name of "Giove" also celebrates this connection between Galileo and Jupiter — as well as with the science of global positioning



BT/Vismedia

Engineers make final adjustments to Telstar 1, the world's first active, direct relay communications satellite

The start of satellite communications

Last month, we looked at how the first-ever live television broadcast took place across an ocean. This time, we focus on the satellite that made it possible.

Telstar is a hit

In 1962, British music producer Joe Meek was inspired to compose a tune named "Telstar." But who made it into a hit record? We asked that question in the previous issue of *ITU News*, and the answer is the UK band, the Tornados, who took the instrumental to the top of the charts on either side of the Atlantic. The tune's popularity reflected the great excitement caused by the first live television broadcast to take place between the United States and Europe, on 10 July that year, by means of the satellite Telstar 1. Although nowadays, television viewers take for granted that they can watch live footage of important events on the other side of the world, 44 years ago it truly captured people's imaginations.

Telstar 1 was owned by AT&T of the United States, and developed there by Bell Telephone Laboratories. The project was also joined by the United States' National Aeronautics and Space Administration (NASA), the British General Post Office and the French National Post and Telecommunications Office. Telstar was the world's first active, direct relay communications satellite. According to one of its designers, John R. Pierce, the idea was to create a system of "between 50 and 120 simple active satellites in orbits about 7000 miles *(11 250 kilometres)* high." Global coverage would be achieved by eventually having "40 satellites in polar orbits and 15 in equatorial orbits *(that)* would provide service 99.9 per cent of the time between any two points on Earth."

NASA

A satellite pioneer
US engineer John R. Pierce (1910–2002) played a leading part in designing Echo 1 and Telstar 1. Like Arthur C. Clarke, he was also a writer of science fiction.

As the first step in this programme, Telstar 1 was launched from Cape Canaveral in the United States. The satellite weighed 77.5 kilograms and was some 88 centimetres in diameter. Solar cells provided a little under 15 watts of power. It could relay transatlantic signals for a maximum of 102 minutes per day, comprising either 500 telephone calls, or one television channel. That was used for the first live television picture beamed across the Atlantic: an image of an American flag at the Andover Earth

Echo 1 comprised a thin, metalized balloon of 30.5 metres in diameter. Signals were bounced off its surface, without amplification

Station that sent the transmission from the United States. As well as expressing national pride at the achievement, US President John F. Kennedy spoke of the need to "grasp the advantages presented to us by the communications satellite to use this medium wisely and effectively to ensure greater understanding among the peoples of the world."

Following an echo

Telstar was not, in fact, the first satellite to be used for communications. That honour goes to Echo 1, an experimental project by NASA developed in the late 1950s in conjunction with Bell Laboratories. Unlike Telstar, which amplified the signals it received before relaying them, Echo was a passive satellite; that is, signals were sent to it from Earth and simply bounced back off its surface to another point on the planet. It consisted of a large balloon of about 30.5 metres in diameter, made from 0.127-millimetre thick polyester film that had a shiny metal coating. It was launched on 12 August 1960 from Cape Canaveral, and redirected radio, television and telephone signals for eight years.

Echo 1 was visible to the naked eye all over the world. Arthur C. Clarke, who first wrote about the potential of communication satellites, later recalled how he used this visibility to impress some students in Sri Lanka. Following a lecture, he led the group outside, having calculated when Echo would appear. "We had waited only a few minutes when a brilliant star rose in the *west*, defying the astronomical wisdom of the ages," he wrote. "It moved at about the speed of a high-flying jet and took a few minutes to reach the meridian. Then it started to descend into the east — but long before it had reached the horizon, it suddenly began to fade. Within seconds, it was gone… I am sure that none of my youthful audience ever forgot their view of Echo 1, which was probably seen by more human eyes than any other artifact in the history of the world."*

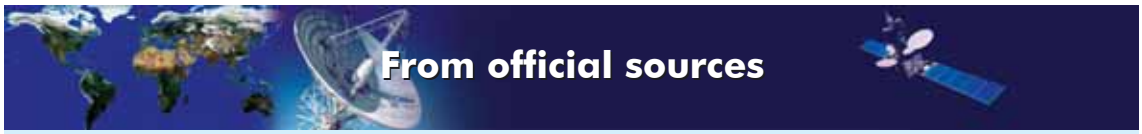
* "How the world was one", Arthur C. Clarke (New York 1992).

Music circles the world

On 25 June 1967, satellite communications were truly introduced to the masses with a two-hour television programme called "Our World" that used three satellites to share live broadcasts from countries around the globe. Among the performers to a worldwide audience of an estimated 600 million were the British rock group, the Beatles. They did not perform "Telstar." However, given the role in fostering international understanding that it was hoped satellite communications would play, the Beatles' choice of a song to première at the event was perhaps even more appropriate. Its title was "All you need is love." ■

A question for next time:

Who coined the word "television" and when? The answer can be found in next month's *Pioneers' Page*.



INSTRUMENTS AMENDING THE CONSTITUTION AND CONVENTION OF ITU (MARRAKESH, 2002)

The Government of the Confederation of Switzerland and the Government of Austria have ratified the above instruments amending the ITU Constitution and Convention. The instruments of ratification were deposited with the Secretary-General on 17 January and 27 January 2006, respectively. Both governments confirmed Reservations made at the time of signature.

FINAL ACTS OF THE WORLD RADIOCOMMUNICATION CONFERENCE (GENEVA, 1995 and1997; ISTANBUL, 2000)

The Government of Australia has ratified the Final Acts of the World Radiocommunication Conference (WRC), Geneva, 1995, and those revised and adopted by the WRCs of Geneva (1997), and Istanbul (2000). The instrument of ratification was deposited with the Secretary-General on 31 January 2006.

STRUCTURAL CHANGE

The *Public Services Regulatory Commission* of the **Republic of Armenia** has been established and will be responsible for regulating and supervising various aspects of public services, including communication.

NEW MEMBERS

Radiocommunication Sector

Willcom, Inc. (Tokyo, Japan) has been admitted to take part in the work of this Sector.

Telecommunication Standardization Sector

InterDigital Communications Corporation (King of Prussia, Pennsylvania, USA) has been admitted to take part in the work of this Sector.

Telecommunication Development Sector

Intel Corporation (Santa Clara, California, USA) and Nortel Networks (USA) (Richardson, Texas, USA) have been admitted to take part in the work of this Sector.

NEW ASSOCIATES

Radiocommunication Sector

Bezeq (Tel Aviv, Israel) has been admitted to take part in the work of Study Group 9, and *Gayacom (Ramat HaSharon, Israel)* has been admitted to take part in the work of Study Group 8.

Telecommunication Standardization Sector

Bezeq (Tel Aviv, Israel) has been admitted to take part in the work of Study Group 13.

CHANGE OF NAME

Cegetel and Neuf Telecom , Sector Members of ITU–T, have changed their names to *Neuf Cegetel (Boulogne Billancourt, France)*. CESKÉ RADIOKOMUNIKACE a.s., a Sector Member of ITU–R, has changed its name to *RADIOKOMUNIKACE a.s. (Prague, Czech Republic)*. Kencell Communications Ltd, a Sector Member of ITU–R, ITU–T and ITU–D has changed its name to *Celtel Kenya Ltd (Nairobi, Kenya)*. Pirelli Cavi Sistemi Telecom S.p.A., a Sector Member of ITU–T, has changed its name to *Prysmian Cavi e Sistemi Telecom s.r.l. (Rome, Italy)*. RETEVISIÓN I, S.A., a Sector Member of ITU–R, has changed its name to *ABERTIS TELECOM S.A. (Barcelona, Spain)*. Sprint Corporation, a Sector Member of ITU–T has changed its name to *Sprint Nextel Corporation (Overland Park, Kansas, USA)*.

2006

- 7–15 March (Doha, Qatar)
  World Telecommunication Development Conference (WTDC-06)
- 19–28 April (Geneva)
  ITU Council annual session
- 15 May–16 June (Geneva)
  Regional Radiocommunication Conference 2006 (RRC-06)
- 6–24 November (Antalya, Turkey)
  ITU Plenipotentiary Conference
- 4–8 December (Hong Kong, China)
  ITU TELECOM WORLD 2006 (Exhibition and Forum)

DIARY

*Lack of space in this issue prevents us from listing forthcoming meetings of ITU. However, updated details of meetings can be checked on the ITU website at http://www.itu.int/events/*index.asp