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In the foreground of the cover page is the award-winning Hong Kong Convention and Exhibition Centre (HKCEC), the venue for ITU TELECOM ASIA 2000. HKCEC is located on the waterfront of the Hong Kong Island in the Wanchai district. Photos used in the cover design are by courtesy of HKCEC and the Office of the Telecommunications Authority (OFTA).

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A word from the Secretary-General

(ITU 991201)

On behalf of the ITU and its 189 Member States, it gives me very great pleasure to welcome you to the ITU TELECOM ASIA 2000 event. From 4 to 9 December, in the Special Administrative Region (SAR) of Hong Kong, we are organizing the first major exhibition and forum to be held by ITU in the People's Republic of China, an event which is kindly being hosted by the Government of that great nation.

I personally am very optimistic about ASIA 2000. Taking place as it does in the world's biggest potential market-place, it will reflect the spectacular changes affecting our industry, and particularly the extraordinary growth of mobile cellular telephony and the increasingly rapid uptake of the Internet.

It is particularly gratifying to witness the developments that have occurred since the last ASIA TELECOM event was held in the region, just three years ago. Since then, telecommunications have changed dramatically, and both the industry and individual governments have met the challenges of liberalization, privatization and deregulation. Furthermore, international investment in the region has led to greatly increased access to telecommunications; one of the primary mandates of the ITU.

ASIA 2000 is ITU's 23rd TELECOM event, and its fifth in the Asia-Pacific region. Once again this event will be actively contributing to telecommunications development. Visitors to the Exhibition will be able to see the latest products and services shown by companies coming from all the sectors of the converging communications environment, while delegates will use the Forum for debates and deliberations on regional issues. High on the agenda are likely to be discussions around the deployment of third generation mobile systems, made possible by ITU's groundbreaking work in IMT-2000, as well as other ways of narrowing the digital divide.

More than ever before, ITU TELECOM events are used as the platform for announcing new alliances and launching new products and services. With exhibitors this year focusing particularly on the possibilities for continued growth in the Asia-Pacific region, ASIA 2000 brings to life the telecommunications environment of the future, where mobile communication services will link people not places, and where switched broadband services will remove the barriers between broadcasting and traditional telecommunications.

Participants from around the region and across the world will make this event the most important of its kind in Asia, allowing us all to focus on the exciting future of the region's telecommunications.

I wish you a successful and enjoyable ASIA 2000, and I look forward to seeing you there.

Yoshio Utsumi

Yoshio Utsumi
Secretary-General
International Telecommunication Union

Photo: OFTA (UIT 000069)

ITU TELECOM ASIA 2000

It is our honour to host TELECOM ASIA 2000, the first major ITU event to be held in the People's Republic of China.

Hong Kong has one of the most open telecommunication markets in the world. We are well positioned as a telecommunications, Internet and broadcasting hub in the region with our excellent telecommunications infrastructure. We now have a total of ten local fixed telecommunication network operators, of which five use wireless technologies. Our broadband networks have already covered all commercial buildings and 90 per cent of households.

The 11 mobile networks of Hong Kong have reached a penetration rate of 70 per cent (as at July 2000), meaning that over 4.7 million people in Hong Kong are mobile phone users.

IDD rates in Hong Kong are among the lowest in the world. Early this year, we opened up the external fixed telecommunication markets and the emergence of new operators is expected to bring in substantial additional infrastructure.

We also intend to invite applications for 3G licences around the end of this year, thereby making Hong Kong one of the first Asian cities to press ahead on this crucial agenda for wireless technologies and mobile commerce.

All these contribute to making Hong Kong an attractive place to do business.

Turning to mainland China, no one will fail to notice that the Chinese Government has always attached great importance to the development of the telecommunications industry. Rapid changes have been introduced in the past two decades since China adopted the reform and opening-up policy. The Chinese Government has formulated a series of policies that are favourable to telecommunications development, which is vital for the continued growth in national economy.

Years of effort have come to fruition in the form of tangible achievements reflected in the capacity, technology and service quality of the national telecommunications network. A high speed and high capacity transmission network now covers the entire country, with fibre-optic cable as the major transmission medium complemented by satellite and microwave systems. Based on this transmission network, integrated SPC telephone services, mobile telephone services, public data services and multimedia communication services are extended to both urban areas and remote rural regions.

Without having to go through the replacement of obsolete networks and hardware, as is done in other more developed countries, China has been able to leapfrog to the most

in Hong Kong

(ITU 000061)

Anthony S. K. Wong
Director-General
Office of the Telecommunications Authority (OFTA)
Hong Kong Special Administrative Region
The People's Republic of China

advanced technologies available. At present, over 99 per cent of the exchanges and transmission systems in China are SPC and digitized. By July 2000, the total telephone exchange capacity had reached 160 million lines, with 130 million fixed-line subscribers and 61 million mobile subscribers — the second highest in the world.

The first half of this year also witnessed a tremendous growth of Internet service in China — there are now 16.9 million users, representing a twofold year-on-year increase. More than 27 000 websites have been built to date and the total international bandwidth has reached 1234 Mbit/s. Broadband information services such as telemedicine, distance learning, video-conference, e-commerce and IP services are mushrooming in the major cities of China.

The growth of the telecommunications industry in China has played an important role in the national economic and social progress and has become a fundamental and pillar industry in China. With China's accession to the World Trade Organization (WTO), the pace of liberalization will quicken. We expect to see major changes and rapid growth in the field of telecommunications with respect to market access, foreign investments, liberalization and competition. This is undoubtedly an exciting opportunity for those who are ready to do business in this fast-growing market.

I invite everyone to come and see for themselves these great and fascinating changes in Hong Kong and China. I look forward to seeing you at ITU TELECOM ASIA 2000 this December. ■

ITU TELECOM ASIA 2000

The most important telecommunications event in the history of the Asia-Pacific region

ITU TELECOM ASIA 2000 is being staged in the Hong Kong Special Administrative Region (SAR) of the People's Republic of China, from 4 to 9 December. It will be the one place this year where the region's policy-makers, industry giants and innovators can meet and share with each other the progress they have made for the benefit of the world's people.

The venue for the ASIA 2000 event is the award-winning Hong Kong Convention and Exhibition Centre (HKCEC), located on the waterfront of the Hong Kong Island in the Wanchai district. The expanded Centre is one of the largest and most spectacular exhibition and convention facilities in the world. It features multi-functional facilities and has a first-class infrastructure with everything from restaurants to banking, postal facilities and on-site hotels.

Organized by ITU, ASIA 2000 is the only telecommunications event being hosted by the Government of the People's Republic of China this year. Taking place as it does in, and for, the world's biggest potential market-place, ASIA 2000 promises to be the most exciting telecommunications event yet to be held in the Asia-Pacific region. The event will be ITU's fifth for the Asia-Pacific region since its launch in 1985, and the first major ITU event to be held in China.

Source: HKCEC.

The Exhibition

By 20 September — and with a number of pavilion members still to be notified — a total of 388 exhibitors from 30 countries had taken 23 186 m^2 of net exhibition space, making it the largest regional TELECOM event the ITU has ever staged.

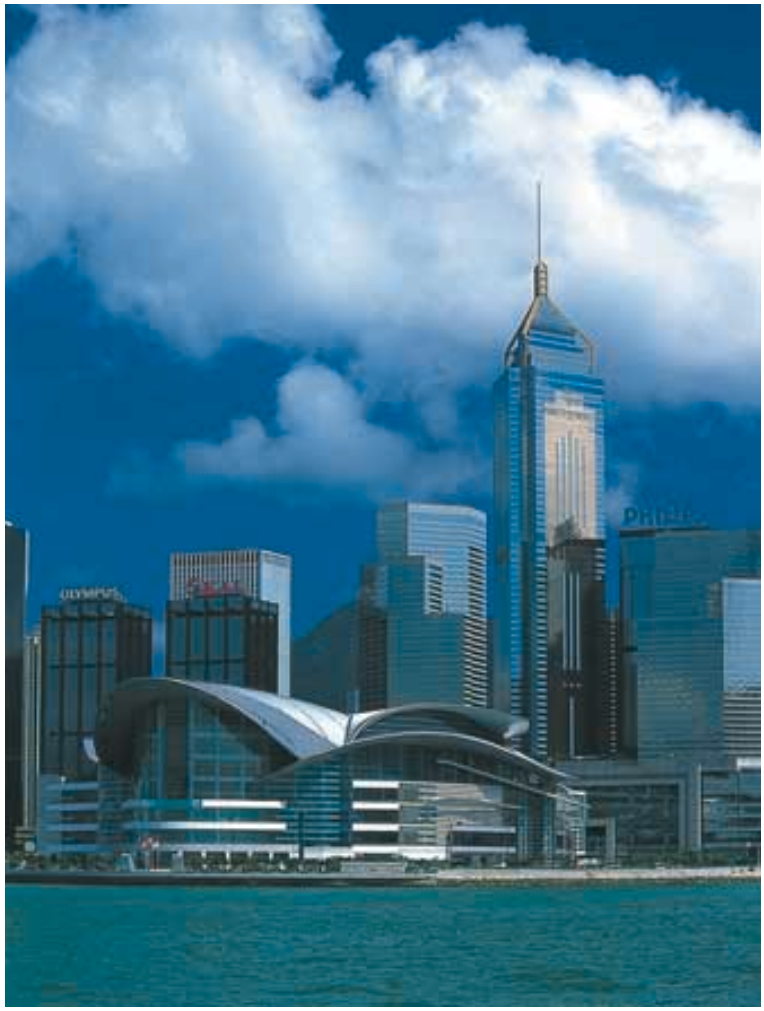
Major players from the global and regional info-communications marketplace will use the exhibition

as the venue to demonstrate the latest products and services and to do business on a scale never before seen at an ITU TELECOM regional event. See www.itu.int/ASIA2000/exhibition/index.html for the continuously updated list of exhibitors at ASIA 2000.

The Forum

At the ASIA 2000 Forum, government and industry leaders will share their vision of 21st century telecommunications for the dynamic Asia-Pacific region. It is the chance of a lifetime to network with the telecommunication ministers of the region and the captains of the world's infocommunication companies. The Forum programme (see page 6) is updated continuously and can be found at www.itu.int/ASIA2000/forum/programme_preview/programme_preview.html.

The Forum will encompass a "Policy and Development Summit" and an "Infrastructure Summit", running in parallel over five days, along with a series of special roundtables. The Policy and Development Summit will focus on Asia, its market, its different policies, its vision and the impact Asian infocommunication development will have on the global networked economy. The Infrastructure Summit will focus on mobility and the Internet. A full list of the sessions and speakers (which is continuously updated) can be found at www.itu.int/ASIA2000/forum/index.html.



Source: HKCEC.

The award-winning Hong Kong Convention and Exhibition Centre features everything, from restaurants to banking, postal facilities and on-site hotels (ITU 000062)

Statistics from past events

	1985	1989	1993	1997
Visitors	11 000	21 600	32 017	40 608
Exhibitors	108	135	371	476
Exhibition space (net m^2)	1 580	3 675	11 000	18 781
Forum participants	700	907	1 238	1 155
Accredited press	66	97	199	419

On-site and online services

ASIA 2000 will feature a number of special services for visitors, ranging from on-site television to an online exhibition catalogue.

ITU TELECOM TV will broadcast live each day from INM's purpose-built studio at the heart of the HKCEC. World news and international reports will be provided by INM's international news partner, CNN. ITU TELECOM TV will also be available online at www.telecomtv.itu.int, featuring both live and archived video streams.

Forum Programme overview (as at 8 September 2000)

Policy and Development + Infrastructure Summits

Morning sessions

	Monday, 4.12	Tuesday, 5.12	Wednesday, 6.12	Thursday, 7.12	Friday, 8.12	
09h30 12h30 including break	Forum opening	**POL+DEV. 2** Asian market access: gateway to opportunities	**POL+DEV. 4** Asian mobile/ electronic commerce: key success factors	**POL+DEV. 6** Asian e-government: framework and experiments	**INF. 11** IP-TDM mediation	Forum closing
		INF. 2 Mobile platforms in Asia	**INF. 5** Broadband access	**INF. 8** 3G wireless terminals	**INF. 12** Technologies for mobile Internet and 3G services	

Afternoon sessions

14h30 17h30 including break	**POL+DEV. 1** Asian markets:from regional competition to globalization	**POL+DEV. 3** Asian market transformation-modelling success	**POL+DEV. 5** Asian mobile/ electronic commerce: entrepreneurships	**POL+DEV. 7** Asian content: promoting cultural diversity	
	INF. 1 3G standardization in Asia	**INF. 3** Core network evolution	**INF. 6** Evolution of wireless IP networks	**INF. 9** Web technology management	
		INF. 4 Interactive digital broadcasting	**INF. 7** New applications for satellite-based platforms	**INF. 10** OSS and customer service	

Policy and Development + Infrastructure + TDS Roundtables

Morning sessions

	Monday, 4.12	Tuesday, 5.12	Wednesday, 6.12	Thursday, 7.12	Friday, 8.12	
09h30 12h30 including break		**INF. 2A** Wireless in the service of the community	**POL+DEV. 4A** IP telephony	**POL+DEV. 6A** Financing Internet and technology start-ups, venture capital to IPO	**POL+DEV. 8** Making money on the Net	**POL+DEV. 9** Gender issues

Afternoon sessions

14h30 17h30 including break	**POL+DEV. 1A** E-commerce	**TDS. 1*** Meeting the challenges of the new economy	**TDS. 2*** The role of the Internet in Asian development	**TDS. 3*** Mobile communications opportunities in Asia	
	POL+DEV. 1B* CEOs' roundtable				

POL Policy and Regulatory Summit
INF Infrastructure and Applications Summit
DEV Development
TDS Telecom Development Symposium
* By invitation only.

Source: HKCEC (ITU 000071)

Quick reference fact sheet for TELECOM ASIA 2000

Event: ITU TELECOM ASIA 2000.
Venue: Hong Kong Conference and Exhibition Centre.
Date: 4–9 December 2000.
Organizer: International Telecommunication Union (ITU), Place des Nations, CH-1211 Geneva, 20 (Switzerland). Tel.: +41 22 730 6161. Fax: +41 22 730 6444. www.itu.int/itutelecom.
Host: Government of the People's Republic of China.
Opening hours: Trade visitors: from Monday 4 to Saturday 9 December 2000, 10h00–18h00. General public: Friday 8 and Saturday 9 December 2000, 10h00–18h00.
Entrance: Pre-registration — HKD 100. On-site — HKD 200. Public days — HKD 100.
Visitor registration: Register online from October 2000 at www.itu.int/itutelecom.

Forum fees

Fees include attendance at all sessions for the complete duration of ASIA 2000, cost of associated documentation and permanent entrance to the Exhibition. All prices are quoted per person in Swiss francs (CHF).

Pre-registration (before 13 November 2000)

Global pass: CHF 800.

Registration (from 14 November 2000)

Global pass: CHF 1000.
Half-day pass: CHF 250 (registration on-site only).
Register online at www.itu.int/itutelecom.
For more information and registration, please contact "Jean-Claude Dufour (Tel.: +41 22 730 5063. Fax: +41 22 730 5926. E-mail: jean-claude.dufour@itu.int)" or "Claire Campin (Tel.: +41 22 730 5651. Fax: 41 22 730 5926. E-mail: claire.campin@itu.int)".

There will also be a daily newspaper on site, which will chart the most important events that have taken place in the telecommunications market in the last 24 hours. From November, the Official Online News site will also carry daily news updates on the Asian and global telecommunications industry.

Finally, full details of all exhibitors, including company profiles and products and services indexes, are contained in the exhibition catalogue for TELECOM ASIA 2000. This catalogue will be published both on the Web and on CD-ROM. A printed exhibition guide and a pocket-sized floor plan complement these digital catalogue products.

The Web-based catalogue (www.itu.int/ASIA2000/catalogue) will be launched in November 2000 and will be continually updated until the end of the event. During TELECOM ASIA 2000, the Web-based catalogue will be accessible from kiosks located on the exhibition floor. ■

IMT-2000 From vision to reality

The number of mergers, alliances, and new entrants in the mobile industry since ITU TELECOM ASIA was last staged in Singapore in 1997 is staggering. Stakeholders in this industry are all preparing for the new era of third generation (3G) mobile systems, known at the ITU as International Mobile Telecommunications-2000 (IMT-2000). A fundamental goal of IMT-2000 is to provide universal coverage and to enable seamless roaming between multiple networks. In this regard, IMT-2000 is far more than just an improved version of today's second-generation systems. The two landmark decisions that were taken by ITU Member States in Istanbul this year to formally approve IMT-2000 standards and identify additional spectrum for 3G systems have given the entire mobile industry clear signals to realize the dream of global wireless systems.

The licensing process, based on the initial IMT-2000 bands identified in 1992, is already gaining momentum in many countries across Asia, Europe and Latin America. Commercial operations in Asia and Europe are expected to commence between 2001 and 2002. More than 100 licences are expected to be awarded worldwide by 2002. In short, ITU's vision that people should be able to communicate anytime and anywhere is about to become a reality.

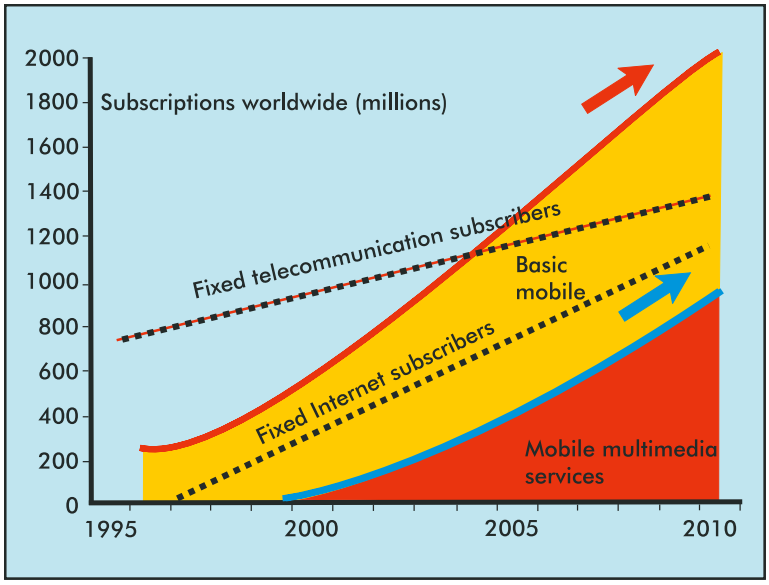
The market

Today, wireless access already exceeds wired access in a number of countries and is forecast to become one of the primary telecommunication enablers of the 21st century global information society. According to ITU estimates, the global mobile market at the beginning of this year had reached 470 million cellular users and the Internet some 260 million.

The UMTS Forum, an organization committed to the successful introduction of 3G mobile communication systems (IMT-2000/UMTS), estimates that by 2010, two billion people on this planet will be using mobile multimedia services provided by IMT-2000. "In the Asia-Pacific region alone, our key findings indicate that the physical mobile users in the terrestrial mobile services market will reach 149 million this year, rising to 400 million by 2005 and to 850 million by 2010", says Josef F. Huber, Vice-Chairman of the UMTS Forum.

Mr Huber explains that in order to understand the role of next generation wireless services in the broader technology landscape, it is important to understand the current state of the Internet industry and other enabling technologies that shape its development. "The Internet is transitioning from an inexpensive medium for

Figure 1 — Mobile terminals become Internet enabled



Source: UMTS Forum, 2000.

advertising, marketing, and customer support to a common platform for transactions and business applications. At the same time, technological and commercial developments are melding together information, communications, commerce and entertainment into one large, consolidated industry", Mr Huber adds. Part of the reason for this evolution is that more consumers are accessing the Internet using multiple devices and over multiple communication networks (see Figure 1).

The changing landscape of wireless standards

Fundamental changes have taken place in the requirements for international wireless telecommunication standards development and in the environment in which international standards are developed. First- and second-generation (1G and 2G) commercial wireless standards were developed by national and regional standards organizations. As a result, the first generation systems tended to be national in scope and therefore incompatible with each other.

The second-generation commercial wireless systems tended to be more regional in scope. For example, specifications for the Global System for Mobile (GSM) communications were initially developed by the European Telecommunication Standards Institute (ETSI) for the European region. Later, these GSM standards were "exported" to other regions of the world including Asia, Africa and North America. Similar statements can be made about the 2G standards developed in North America such as CDMA and TDMA. These standards were developed from a North American perspective, but were later "exported" to other regions of the world. It is important to note that new local variants were often added to these standards (for example, PDC is an Asian market variant of IS-54 TDMA).

The IMT-2000 standards landscape

Collaboration between ITU and external organizations

"There is no more *local only* market-place, global focus is the driver. The standards process for commercial wireless has changed forever", says Stephen Blust, Director of Technology Strategy and Standards at BellSouth Cellular Corporation and Chairman of ITU–R Working Party 8F*.

In order to meet the very aggressive timescales demanded by the rapidly growing global wireless telecommunications industry, ITU's Radiocommunication Sector (ITU–R) successfully developed and used a new model to standardize IMT-2000. This model involved the use of new cooperative electronic working methods between ITU and all the national and regional standards-development organizations which make up the global IMT-2000 standards team. These include: the Third Generation Partnership Project (3GPP), the Third Generation Partnership Project 2 (3GPP2) and other industry representative groups (see Figure 2).

The 3GPP is made up of *China Wireless Telecommunication Standard Group* (CWTS), the

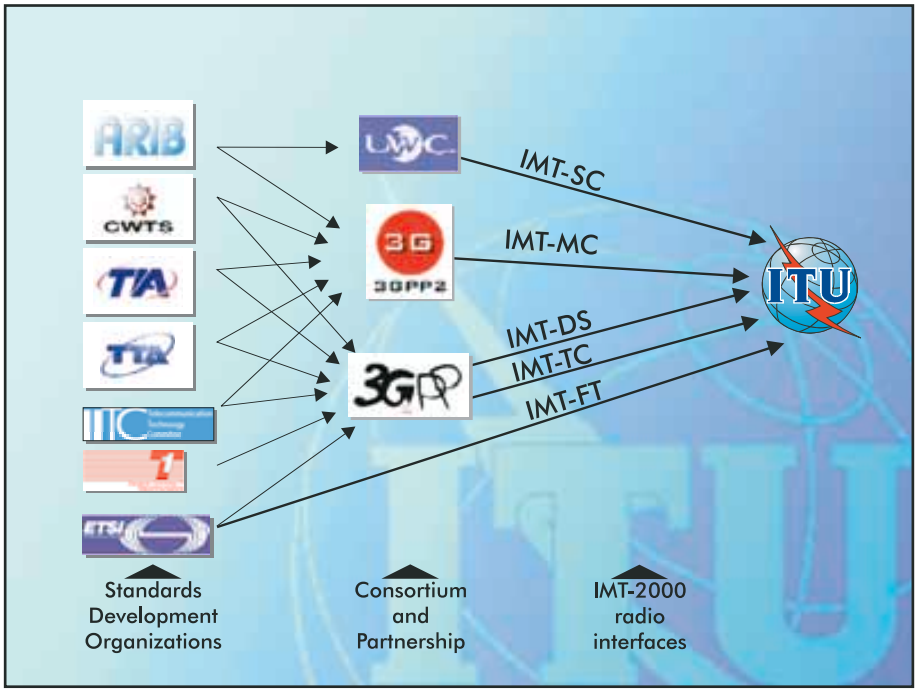
* Working Party 8F is the successor to Task Group 8/1, which previously held primary responsibility for the development of IMT-2000 and completed its activities in November 1999 with the successful adoption of the first release of the IMT-2000 radio interface standard.

Association of Radio Industries and Businesses (ARIB) and the *Telecommunications Technology Committee* (TTC) of Japan, the *Telecommunications Technology Association* (TTA) of the Republic of Korea, the Standards Committee T1 of the United States, and ETSI. The 3GPP2 was established by the United States' Telecommunications Industry Association (TIA) in collaboration with CWTS, ARIB, TTC and TTA to achieve international cooperation in the development of technical specifications based on cdma2000.

"ITU has responded positively to these new international wireless specifications development organizations by creating a win-win atmosphere in which there is a role for all of the national and regional standards bodies", remarks Mr Blust.

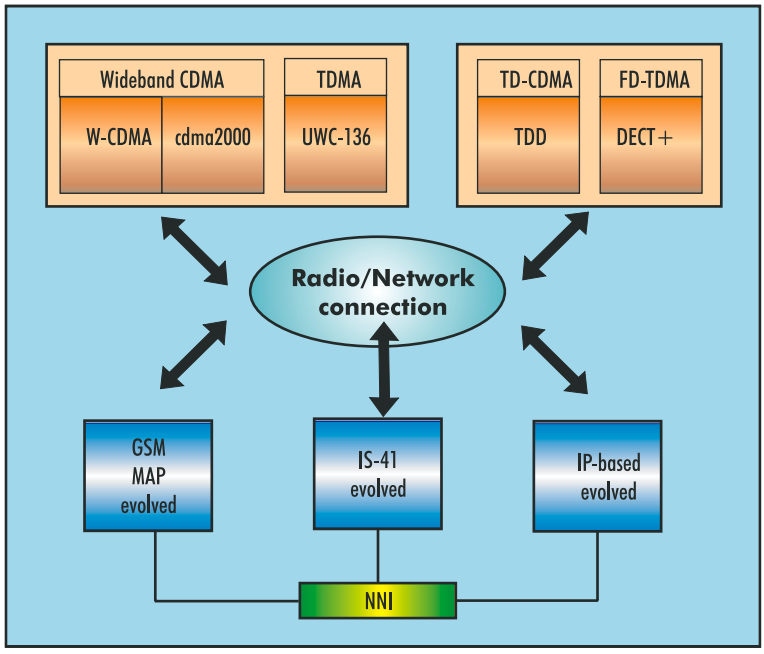
IMT-2000 standards development has, for many years, made full use of electronic working methods through a specially designed ITU website (www.itu.int/imt/). This approach was essential to the success of the development and evaluation stages of the radio specification process, where large amounts of documentation had to be rapidly circulated via the Internet to different groups around the world, allowing them to exchange and update these lengthy documents in real time.

Figure 2 — Collaboration between ITU and external organizations in the development of IMT-2000 radio interface specifications, approved in Istanbul as ITU–R Recommendation M.1457



Source: ITU, 2000.

Figure 3 — IMT-2000 terrestrial radio interfaces



Source: ITU, 2000.

In the Asia-Pacific, Japan has awarded 11 regional licences to three mobile operators per region and plans to be the first country in the world to launch commercial IMT-2000 services

The Istanbul legacy

The ITU Radiocommunication Assembly, held in Istanbul in May 2000, approved the detailed specifications of the radio interfaces for IMT-2000 in ITU–R Recommendation M.1457 (see Figure 3). This Recommendation may seem large, with its nearly 300 pages. But in reality, M.1457 is much larger than that because of the numerous references it contains to detailed specifications, which are available only in electronic form. The full text of M.1457 is readily accessible to ITU Members throughout the world via the ITU website (www.itu.int/itudoc/itu-r/rec/m/index.html).

In the Republic of Korea, bidders have been announced and licences are scheduled to be awarded by the end of 2000, with service to begin in time for the World Cup Football Games in June 2002

Another major milestone in Istanbul was the approval by ITU's World Radiocommunication Conference (WRC-2000) of additional spectrum requirements for IMT-2000. With this approval, the stage is now set for the terrestrial component of 3G systems to operate in the common spectrum identified on a worldwide basis to meet projected growth. This common spectrum includes: 800/900 MHz, 1.7, 2 and 2.5 GHz.

Furthermore, WRC-2000 decided that ITU–R should develop harmonized frequency arrangements which aim to achieve compatibility with existing frequency arrangements used by first- and second-generation systems. At the same time, studies on the future evolution of IMT-2000, including the provision of IP-based applications and the impact on spectrum resources, will be conducted by ITU–R in the next three years.

The successful results of Istanbul represent a real tribute to the exemplary preparatory technical work of ITU to identify spectrum requirements for IMT-2000 and candidate frequency bands for worldwide use. The same tribute must be paid to the efficient preparations carried out in the regions by organizations such as the Asia-Pacific Telecommunity (APT), the European Conference of Postal and Telecommunications Administrations (CEPT) and the Inter-American Telecommunication Commission (CITEL).

It is now important that regulators follow up on the commitments made by their governments at WRC-2000 and license the spectrum in the bands identified for IMT-2000 with great care, on the basis of expected demand by potential 3G operators in their countries. The spectrum identified for IMT-2000 is not prioritized and has no set timetable for use. The responsibility therefore falls on regulators to make sure that the situation of 1992 is not repeated where a sizeable 230 MHz of spectrum that had been globally identified for third-generation systems was auctioned for a host of services, including PCS (personal communication services) in the Americas, somewhat complicating the situation of deploying IMT-2000 in those bands today.

Table 1 — Status of IMT-2000 licensing in the Asia-Pacific region

Economy	Selection criteria	Licence status	Number of licences	Planned start of service	Remarks
Australia	Auction	Auction planned for January 2001	—	—	Australian licences in some urban regions in the 1800 MHz band are service independent, i.e. for use with 3G and/or 2G systems.
Hong Kong-China	Hybrid between auction and comparative selection	Expected before year-end 2000	4-6	2001	Candidates include CCT Telecoms + European Cellco, Hutchison Telecom, New World.
Japan	Comparative selection	Awarded in June 2000	3	May 2001	The Ministry of Posts and Telecommunications (MPT) issued three licences to NTT DoCoMo, Japan Telecom and KDD + IDO for test operations, with full services scheduled to start in 2001, dependent on test results and financial criteria. NTT DoCoMo intends to offer 3G services from May 2001, while J-Phone is readying for launches in key regions around December 2001.
Korea (Rep. of)	Comparative selection	To be awarded in December 2000	Up to 4	Early 2002	Bidders include Korea Telecom and mobile phone operators: SK Telecom, Shinsegi Telecom, Hansol PCS, KT Freetel and LG Telecom, as well as fixed-line carriers: Dacom, Onse Telecom and Hanaro Telecom.
Malaysia	Comparative selection likely	Selection process likely to begin before year-end 2000	—	—	Public consultation for Malaysian 3G licensing closed in October 2000.
New Zealand	Auction	Auction started in July 2000	4	—	Auction started in July 2000, with 2 x 15 MHz plus 5 MHz unpaired spectrum on offer per licensee, resulting in four licences to be awarded, with one licence reserved for Maori Trust. Only three bidders are currently participating: Telstra Saturn, Telecom New Zealand Limited and Vodafone.
Singapore	Comparative selection likely	Likely to be awarded before year-end 2000	Up to 6	—	The Infocomm Development Authority (IDA) released, during April 2000, a second consultation paper outlining Singapore's proposed licensing and spectrum allocation framework. The licensing method is undecided, with all interested players favouring beauty contest (comparative selection). StarHub plans to spend USD 290 million if it is awarded a licence.
Thailand	Comparative selection	Licences awarded	2, possibly more in the future	—	One licence has been awarded to the Telephone Organization of Thailand (TOT) and the Communications Authority of Thailand (CAT). However, commercial deployment is subject to the outcome of restructuring and related licensing actions.

Table 2 — Status of IMT-2000 licensing in other regions of the world
(as at 30 September 2000)

Country	Number of licences, methodology used and date of launch	Licensees or candidates	Price (USD)	How much spectrum (MHz)	
				Paired	Unpaired
Finland	4 Beauty contest, completed in March 1999 Commercial launch: 01.2002	Radiolinja Sonera Telia Mobile Finnish 3G Consortium	—	4 of 2 x 15	4 of 5
Spain	4 Beauty contest, completed on 13.3.2000 Commercial launch: 1.8.2001	Telefónica Airtel Amena (Retevisión) Xfera (Sonera/Vivendi/Orange)	477 million	—	—
United Kingdom	5 Auction, completed on 27.4.2000 Commercial launch: 1.1.2002	TIW Vodafone BT3G One2One Orange	6.2 billion 8.4 billion 5.7 billion 5.6 billion 5.7 billion	1 of 2 x 15 1 of 2 x 15 3 of 2 x 10	5 — 5
Netherlands	5 Auction, completed on 24.7.2000 Commercial launch: by 1.1.2002	Libertel (Vodafone's Dutch mobile unit) KPN Mobile (former Dutch national carrier) Dutchtone (France Télécom) Telfort (BT) 3G Blue consortium (Ben and Deutsche Telekom)	2.5 billion	3 of 2 x 10 2 of 2 x 15	3 of 5 —
Germany	6 Auction in 2 stages, with first stage completed on 17.8.2000 Commercial launch: 2002	T-Mobil (DeutscheTelekom) MobilCom (France Télécom) VIAG Interkom Group 3G (consortium including Sonera and Telefónica) Mannesmann Mobilfunk (Vodafone) E-Plus (KPN, Netherlands) Second stage auction completed on 18.8.2000 awarding an additional 1 x 5 MHz unpaired to all except VIAG	45.85 billion	12 blocks of spectrum, 2 have to be secured by operators	2 x 5 to six operators (1st auction stage) 1 x 5 (2nd auction stage)
France	4 Beauty contest, bidding opened in September 2000 Awards expected first half 2001 Commercial launch: 1.1.2002	—	Fixed cost at FRF 32.5 billion per licence	2 x 15	—
Italy	5 Auction, with pre-qualification Commercial launch: 2002	—	—	5 of 2 x 10	5 of 5
Venezuela	The Venezuelan regulator has announced that a licensing process for IMT-2000 will start in the first semester of 2001.				
Brazil	The Brazilian regulator announced on 21 June 2000 the decision of preserving the band 1.9/2.1 GHz for implementation of IMT-2000, as recommended by ITU, within a two- to three-year period.				

Licences awarded Licensing under process

IMT-2000 licensing worldwide

Licensing for 3G is being stimulated largely by the substantial progress made in ITU on system standards and frequency spectrum availability.

Tables 1 and 2 provide a non-exhaustive list of countries which have already licensed or will soon award licences for IMT-2000.

Following the early start made by Finland in 1999, Europe is now leading the licensing process with Spain, the United Kingdom, the Netherlands and Germany having already awarded licences to IMT-2000 operators, and many countries having called for bids or initiated the consultation phase.

Finland and Spain chose the method of comparative selection, often referred to as "beauty contest", for granting four licences each. In contrast, the United Kingdom, the Netherlands and Germany opted for auctioning the available spectrum in the 2 GHz IMT-2000 band and granted five to six licences to the winners of the auctions.

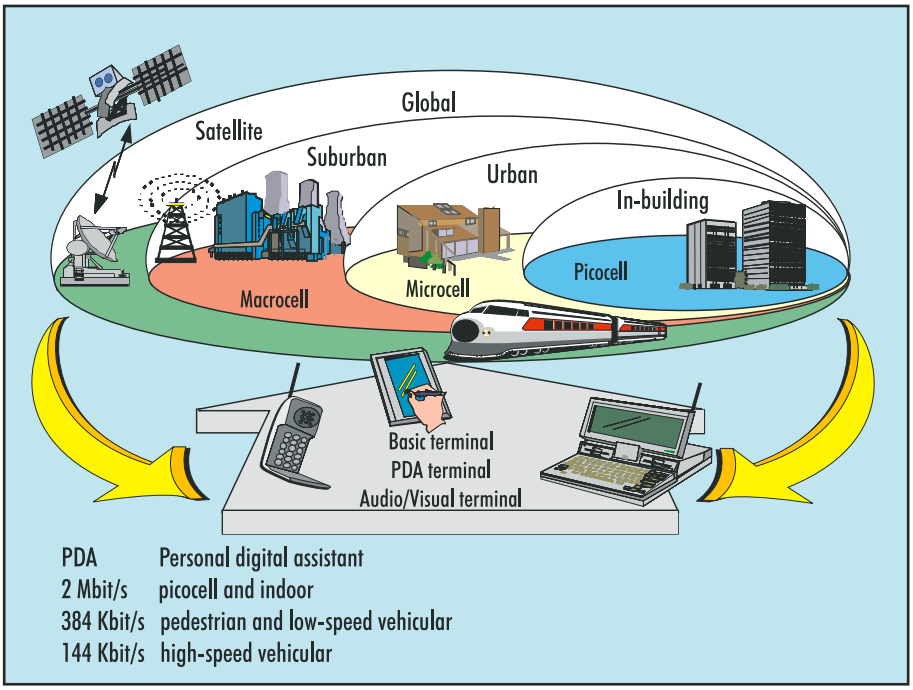
In the Asia-Pacific region, Thailand, the second country in the world to have issued IMT-2000 licences, awarded one licence and plans to award a second one later. In the Republic of Korea, bidders have been announced and licences are scheduled to be awarded by the end of 2000, with service to begin in time for the World Cup Football Games in June 2002.

Japan has awarded 11 regional licences to three mobile operators per region and plans to be the first country in the world to launch commercial IMT-2000 services. ITU analysts say that Japan's early experience and success with its proprietary *i-mode* system should give its vendors and service providers an advantage when the global 3G standard networks are introduced. *NTT DoCoMo* intends to be the first operator to launch 3G. It was granted an IMT-2000 licence in June 2000 and plans to start service in May 2001, some seven months earlier than the target date established by the European Union.

Other Asia-Pacific economies are at different stages in the IMT-2000 licensing process (see Table 1). New Zealand was in the midst of a spectrum auction in September 2000. New Zealand and Australia are the only two sure bets to use auctions as the way of awarding licences. Most of the remaining economies are leaning towards the so-called beauty contest which does not earn the government as much money as an auction but gives it more control over who wins the licences, allowing governments to favour domestic companies. Indeed, there is a perception that in most economies, existing mobile operators will be granted 3G licences. In the Republic of Korea, operators are already experimenting with 3G technologies before the government has even awarded licences. Most developing countries in the region have not yet announced 3G licensing plans.

In the Americas, Venezuela was the first country to announce plans to issue IMT-2000 licences for the beginning of 2001. This is pushing the other four countries of the Andean community

Figure 4 — IMT-2000, a flexible, multi-functional network



Source: European Commission.

(Colombia, Peru, Ecuador, and Bolivia) to follow the same track and multilateral studies are being conducted to come up soon with a sub-regional agreement for a coordinated implementation of IMT-2000. It is also worth mentioning the decision by Brazil to reserve the 2 GHz IMT-2000 spectrum for near future implementation.

The UMTS Forum Chairman, Bernd Eylert, drew comparisons with the success of the Japanese i-mode mobile Internet service that has already attracted over 10 million customers. "Only three years ago, mobile multimedia was an industry vision — now it is becoming a reality." Furthermore, he noted that the high sums raised in the German and United Kingdom auctions (see Table 2) may accelerate the roll-out of 3G networks rather than delay them. "With an investment of this scale, operators will be focused on generating the swiftest possible return", Mr Eylert stated, adding that "with Japan already committed to launching services as soon as 2001: we can be sure that Europe will not be far behind".

With the world's largest mobile market and the first planned launch of 3G networks, the Asia-Pacific region is poised to become a mobile powerhouse. The trick will be to translate these advantages by using mobile to enhance communication availability to the millions of the region's inhabitants that currently have no access.

Beyond IMT-2000

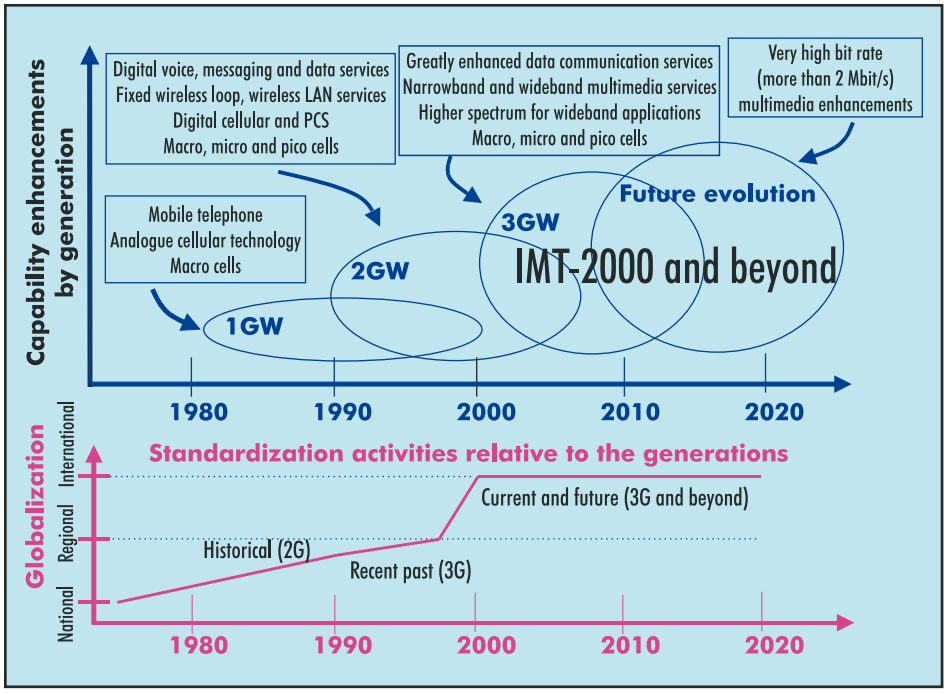
As IMT-2000 has been conceived from the ground up as a system to meet the real needs of users globally, and as the licensing process accelerates across the different regions of the world, the next challenge is to refine standards that will deliver the vision of affordable access to wireless multimedia services for mobile users everywhere (see Figure 4). Above all, this work must mirror the real needs and constraints of the market-place. The current collaborative partnership is expected to make a significant contribution to hastening the global success of IMT-2000 systems.

Mr Blust says that going forward into systems beyond 3G, the standards community must start with an international perspective in all aspects: from market-place requirements to the technology development cycle, including considerations of common global frequency bands and uniform international regulations. Having an international perspective at the start is important from the viewpoint of end users, service providers, and manufacturers.

ITU–R is currently developing a framework for the orderly growth and ongoing technology deployment. The emphasis of work will be on developing enhancements for IMT-2000 systems and beyond (see Figure 5).

Some of the enhancements that are expected include: higher speeds (more than 10 Mbit/s), greater spectral efficiencies, use of a common

Figure 5 — Generations of terrestrial commercial wireless systems



Source: ITU, 2000.

frequency band worldwide and moving from a circuit-switched domain to a packet-switched domain. For radio access, improvements will include: adaptive antennas, software-defined radio, multi-user detection, multiple access techniques, as well as better compression techniques, better quality of service, better CODECS, higher capacity, interference mitigation techniques and innovative services.

According to Mr Blust, we should view the future standards landscape for IMT-2000 as four sides of a pyramid: market-place, spectrum, regulatory, and technology. "Moving from the base to the tip on each of the four sides provides a national to regional to international perspective. The common meeting point for three of these four faces of the pyramid is the ITU. The three interrelated factors that come together globally only at the ITU are the spectrum (the natural resource of wireless), the regulatory (the authorization to use the natural resource), and the technology (the mechanism to put the natural resource to work)", Mr Blust explains.

Working Party 8F is committed to the vision of IMT and the development of the requisite requirements and standards needed as that future vision leaps towards reality...

Photo: OFTA (ITU 000077)

With regard to the marketplace and technology, IMT-2000 standards must be evolved in an efficient manner such that the rapidly changing needs of the market-place are met in both the near term and throughout the longer term future vision.

The timetable for this process will be driven by market considerations and technology advances. Two of the most important roles of ITU–R are: to provide a global forum to support this process and to continue to extend the IMT-2000 vision to ensure that the goals of harmonization, convergence and reduction in the number of technology options are retained.

"A major driver is that development of very complex systems with severe time to market challenges can no longer be completed by any single organization, entity or company. The ITU has fundamentally altered the standards landscape in pioneering this collaborative solution. This foundation and intermeshing of factors is the cornerstone of the future advancements of IMT-2000. Working Party 8F is committed to the vision of IMT and the development of the requisite requirements and standards needed as that future vision marches towards reality. The international community as users of these standards expect and deserve nothing less", concludes Mr Blust. ■

... The international community as users of these standards expect and deserve nothing less

Photo: OFTA (ITU 000076)

EASTERN RESURGENCE

ASIA-PACIFIC TELECOMMUNICATION MARKETS

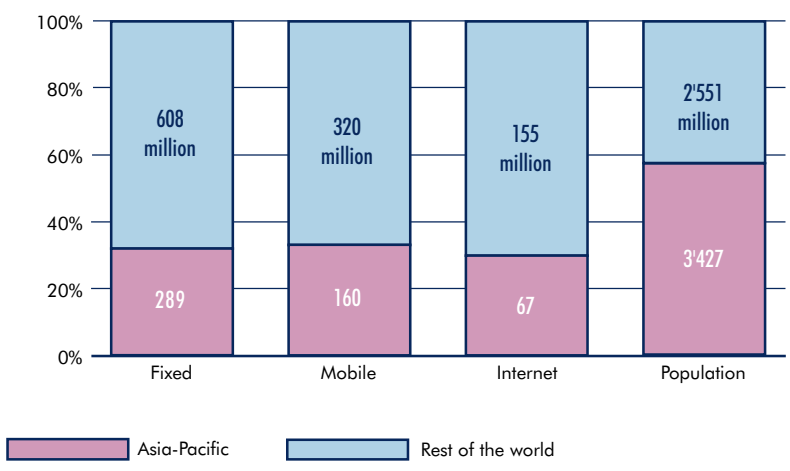
The Asia region was adversely affected by the economic crisis that struck in mid-1997. Economic output declined sharply in many East and South East Asian economies. Recent data suggest that the region has overcome this setback and is poised to regain its position as the pre-eminent telecommunication market in the world. Trends in Asia-Pacific telecommunication markets presented here are extracted from the fourth edition of ITU's *Asia-Pacific Telecommunication Indicators*, prepared for ASIA TELECOM 2000 taking place in the Special Administrative Region (SAR) of Hong Kong from 4 to 9 December 2000.

Around one-third of the world's telecommunication market – measured by subscribers and users of fixed telephone, mobile cellular and Internet networks – is located in the Asia-Pacific region. The region has considerable potential as it accounts for almost 60 per cent of the world's population. Despite flat economic growth in 1997 and 1998, the telecommunication networks of the region's developing countries continued to grow. The most resilient were the Internet and mobile sectors. Five of the top ten Internet markets in the world are now in the Asia-Pacific region. In terms of subscribers in the mobile arena, China and Japan hold the second and third ranking in the world respectively. Fixed-line networks have also grown, albeit much slower than the Internet or mobile.

There is still much room for improvement among the region's developing countries. Overall, the fixed-line density for developing countries in the region was just above five main lines per 100 inhabitants at year-end 1999, with four nations yet to reach one line per 100 people. Some six million people are on waiting lists for the fixed-telephone service and many more have not signed up because they cannot afford the service now. Less than one-fifth of households in the region's developing countries have their own telephone service.

Wireless technology holds much promise for promoting communication access in the region. There are already more mobile than fixed-telephone subscribers in Hong Kong SAR, Japan, the Republic of Korea, Singapore and Taiwan-China. Among the Asia-Pacific developing countries, there were 1.8 mobile phone subscribers per 100 inhabitants at year-end 1999. In this group, only Cambodia has made the more mobile than fixed-line service crossover and two other nations are on the verge of doing the same: the Philippines and Malaysia. One of the factors driving cellular growth in the Philippines is the popularity of pre-paid plans. At the end of 1999, over 70 per cent of Filipino mobile subscribers were using these plans. As pre-paid programmes get more established in the region, mobile subscriptions should rise.

Distribution of fixed and mobile telephone subscribers, Internet users and population in the Asia-Pacific region and the rest of the world (1999)



Source: ITU, 2000.

ASIA-PACIFIC TELECOMMUNICATION INDICATORS

	Population	GDP per capita	Main telephone lines		Mobile cellular subscribers		Internet users	
	Total (000s)	*USD*	*Total (000s)*	*Per 100 people*	*(000s)*	*Per 100 people*	*Total (000s)*	*% of population*
Economy	*1999*	*1999*	*1999*	*1999*	*1999*	*1999*	*Dec. 1999*	*1999*
Afghanistan	21'923	…	29	0.13	-	-	…	…
Bangladesh [2]	126'947	281	433	0.34	149	0.12	30	0.0%
Bhutan	657	*624*	12	1.80	-	-	0.5	0.1%
Cambodia	10'945	286	28	0.25	89	0.81	4	0.03%
China	1'266'838	782	108'716	8.58	43'296	3.42	8'900	0.7%
D.P.R. Korea	23'702	…	1'100	4.64	-	-	…	…
Fiji	806	*2'002*	*77*	*9.76*	23	2.90	8	0.9%
India [1]	998'056	*435*	26'511	2.66	1'884	0.19	2'800	0.3%
Indonesia	209'255	675	6'080	2.91	2'221	1.06	900	0.4%
Iran (I.R.) [3]	66'796	3'885	8'371	12.53	490	0.73	100	0.1%
Kiribati	82	545	*3*	*3.44*	0.3	0.35	1	1.2%
Lao P.D.R.	5'297	*250*	34	0.65	9	0.17	2	0.0%
Malaysia	21'830	3'607	4'431	20.30	2'990	13.70	1'500	6.9%
Maldives	278	*680*	22	7.97	3	1.05	3	1.1%
Micronesia	116	*1'950*	*9*	*7.99*	-	-	2	1.7%
Mongolia	2'621	*416*	103	3.95	35	1.32	6	0.2%
Myanmar	45'059	5'504	249	0.55	11	0.03	1	0.0%
Nepal [4]	22'370	222	247	1.11	-	-	35	0.2%
Pakistan [2]	134'510	458	2'986	2.22	279	0.21	80	0.1%
Papua New Guinea	4'702	*768*	*47*	*1.14*	*6*	0.13	2	0.04%
Philippines	74'454	1'030	2'940	3.95	2'724	3.66	500	0.7%
Samoa	177	*1'255*	*8*	*4.87*	*3*	1.72	1	0.3%
Solomon Islands [1]	430	*901*	*8*	*1.89*	*1*	0.17	3	0.5%
Sri Lanka	18'639	846	679	3.64	228	1.22	65	0.3%
Thailand [5]	60'856	2'038	5'216	8.57	2'339	3.84	800	1.3%
Tonga	98	*1'589*	*8*	*7.90*	0.2	0.20	1	1.0%
Vanuatu	186	*1'273*	*5*	*2.84*	*0.3*	0.17	3	1.6%
Viet Nam	78'705	312	2'106	2.68	329	0.42	100	0.1%
Developing	3'196'335	799	170'459	5.33	57'104	1.79	15'845	0.5%
Brunei Darussalam	322	17'556	*78*	*24.68*	*49*	15.60	25	7.8%
French Polynesia	231	*16'601*	52	22.62	22	9.49	5	2.2%
Guam	164	*19'598*	*75*	*46.62*	*20*	12.16	5	3.0%
Hongkong SAR [1]	6'721	23'593	3'869	57.57	4'275	63.61	2'430	36.2%
Korea (Rep.)	46'480	8'755	20'518	44.14	23'443	50.44	10'860	23.4%
Macau SAR	437	14'079	178	40.79	89	20.24	40	9.1%
New Caledonia	210	…	51	24.09	25	12.11	5	2.4%
Singapore [1]	3'894	21'881	1'877	48.20	1'631	41.88	950	24.4%
Taiwan-China	22'092	13'169	12'044	54.52	11'541	52.24	4'540	20.6%
High-income	80'551	11'951	38'741	48.10	41'095	51.01	18'860	23.4%
Australia [2]	18'911	*18'979*	9'857	52.12	6'501	34.38	5'600	29.6%
Japan [1]	126'505	34'377	70'530	55.75	56'846	44.94	27'060	21.4%
New Zealand [1]	3'828	*13'905*	1'877	49.03	881	23.01	700	18.3%
Developed	149'244	31'918	82'264	55.12	64'228	43.03	33'360	22.3%
ASIA-PACIFIC	3'426'130	2'446	291'464	8.51	162'412	4.75	68'065	2.0%

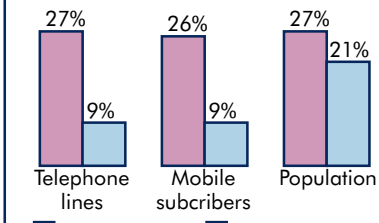
Notes: Data in italics are estimates or refer to earlier year. Year ending 31 December except:
[1] Beginning 01.04
[2] Ending 30.06
[3] Beginning 22.03
[4] Ending 15.07
[5] Ending 30.09.

Source: ITU, 2000.

CHINA ASCENDANT

The People's Republic of China was barely affected by the Asian financial crisis. Its currency held firm and economic growth remained positive. China's telecommunication sector has prospered and emerged as one of the largest in the world. This is not surprising considering that the nation has the planet's largest population. It is interesting to note that China's share of telephone lines and mobile subscribers in developing nations matches its share of population. One operator, China Telecom, provides fixed-line communications while mobile communications are provided by two operators: China Mobile and China Unicom – Chinese telecommunication companies are now the world's largest in terms of subscribers.

China's share among developing countries and the rest of the world

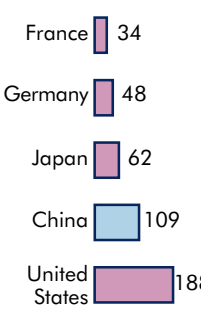


Source: ITU, 2000.

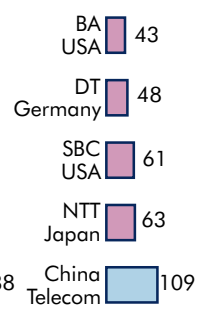
FIXED LINES

At the end of 1999, China had the second largest fixed telephone line network in the world with 109 million subscribers. China has had the highest average annual growth rate among the top 10 largest countries in terms of main telephone lines since 1996 at 26 per cent. In 1999, Brazil had a slightly higher growth rate – partly attributed to the introduction of competition – at 25 per cent compared to China's 24.2 per cent. China's teledensity stood at 8.6 telephone lines per 100 inhabitants at the end of 1999. China Telecom is the world's largest fixed telephone line operator.

Top 5 countries by telephone lines, 1999 (millions)



Top 5 operators by telephone lines, 1999 (millions)

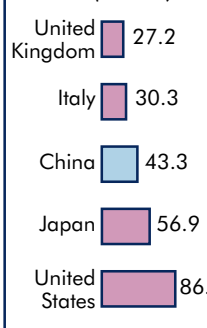


Source: ITU, 2000.

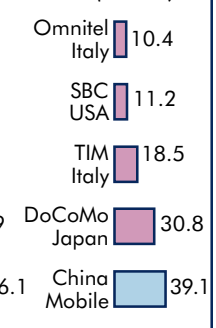
MOBILE CELLULAR

At the end of 1999, China had the world's third largest mobile cellular market with a little over 43 million subscribers. The number of Chinese mobile subscribers grew at an average annual rate of 85 per cent between 1996 and 1999. Mobile pre-paid cards were only introduced in the country towards the end of 1999 and will undoubtedly add to mobile growth. China's mobile penetration stood at 3.42 per 100 inhabitants at the end of 1999. China Mobile is the largest mobile operator in the world measured by the number of subscribers.

Top 5 countries by mobile subscribers, 1999 (millions)



Top 5 operators by mobile subscribers, 1999 (millions)

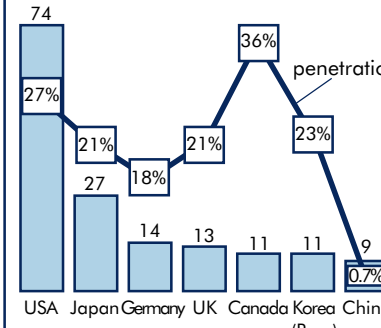


Source: ITU, 2000.

INTERNET

With some nine million Internet users at the end of 1999, China was the world's seventh largest market and one of three Asian nations among the top seven. This is a significant achievement considering the difficulty of adapting content to the Chinese language character set and the relatively low level of computer penetration in the country. Though Internet penetration was less than one per cent of the population, many analysts predict this will grow sharply in the years to come.

Top 7 countries by Internet users, 1999 (millions)



Source: ITU, 2000.

STATISTICS-FRIENDLY REGULATORS

Two of the most statistics-friendly regulators in the Asia-Pacific region are the Infocomm Development Authority of Singapore (IDA) and the Office of the Telecommunications Authority (OFTA) of Hong Kong SAR. Both publish a range of monthly telecommunication statistics on their websites. IDA also compiles indices such as penetration rates while OFTA provides its annual ITU statistical questionnaire on a Web page. The Ministry of Posts and Telecommunications of Japan has monthly cellular statistics on its website while the Telecommunication Carrier Association provides more detail, including subscribers by operator. Few national statistical agencies in the region compile telecommunication statistics. One that does is Taiwan-China's statistics office which provides monthly telecommunication statistics on its website. Australia's Bureau of Statistics makes regular household Internet surveys and also provides some telecommunication-related information from other surveys.

Hopefully, in the future, additional regulators and national statistical agencies will follow the lead of these organizations by providing timely telecommunication indicators on their websites. This will add to greater transparency and improve analysis and understanding of the Asia-Pacific's dynamic telecommunication sector.

Organization	Website
IDA, Singapore	www.ida.gov.sg
OFTA, Hong Kong SAR	www.ofta.gov.hk
MPT, Japan	www.mpt.go.jp
TCA, Japan	www.tca.or.jp
Bureau of Statistics, Taiwan-China	www.stat.gov.tw
Australian Bureau of Statistics	www.abs.gov.au

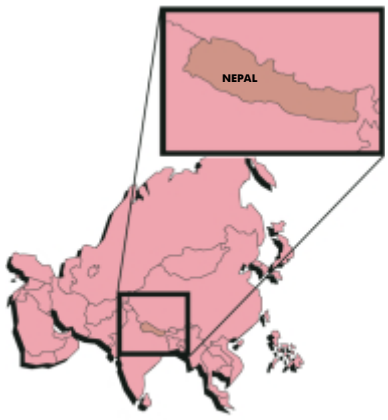
NEPAL COUNTRY PROFILE

The Kingdom of Nepal is situated in South Asia, on the southern slopes of the Himalayan mountain range, and lies between India and China. Eight of the world's ten tallest peaks, including the highest Mt. Everest, are located in Nepal. Administratively, Nepal is divided into 75 districts. The lowest administrative division is the Village Development Committee (VDC) of which there are some 4000.

The population of Nepal is estimated at around 23 million for mid-year 2000. Kathmandu, the capital, accounts for four per cent of the country's population. Around 90 per cent of Nepalese reside in rural areas. Nepal is a Hindu kingdom – the only officially Hindu country in the world. The official language is Nepali spoken by about half the population; more than a dozen other languages are also used. English is understood by business and government leaders and in tourist establishments.

Nepal is classified as a least developed country (LDC) with a per capita income, measured in purchasing price parity, of USD 1180 in 1998.

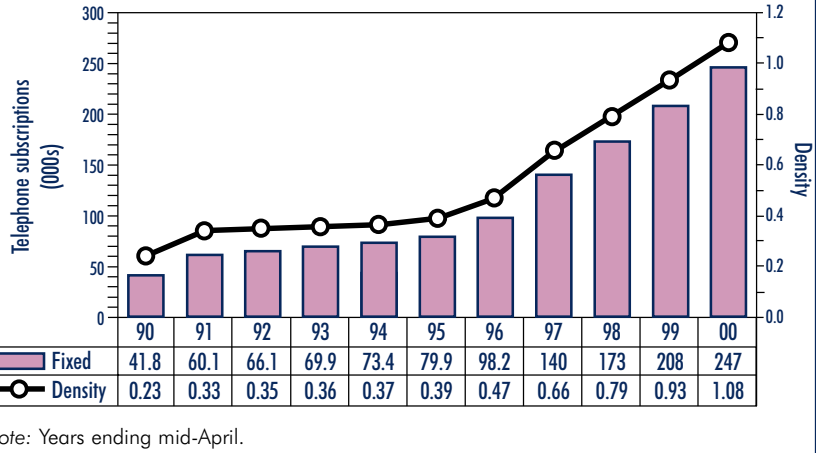
The history of telecommunications in Nepal is relatively recent. A line between Kathmandu and the Indian border was opened in 1914, but it was not until 1955 that the capacity of the local exchange in Kathmandu reached 300 lines. The first satellite earth station was installed in 1982. Major growth has occurred since 1995. The acceleration is mainly due to a World Bank loan, introducing transparent tendering which has increased the number of lines that can be purchased for the same price by threefold. In the latter half of the 1990s, Nepal has grown as fast, if not faster, than any other country in the South Asia region – despite the absence of foreign investment. An important milestone was reached in 1999 when teledensity reached one line per 100 inhabitants. Telephone service is available in all 75 districts, of which 65 have their own telephone exchange while the rest are served by satellite and other wireless technologies. There is still a large challenge to provide the telecommunication service in this mountainous and rural nation as around two-thirds of all telephones are in the Kathmandu area. There are more than 275 000 on the waiting list. Some 60 per cent of VDCs are waiting for telephone service.



Telecommunications in Nepal falls under the responsibility of the Ministry of Information and Communications and is regulated under the terms of the 1997 Telecommunications Act. The Act established a regulatory body, the Nepal Telecommunications Authority. The Nepal Telecommunications Corporation (NTC) is the incumbent public telecommunications operator and, until recently, held a monopoly over all aspects of telecommunications in the Kingdom. NTC is fully State-owned, though there are plans to privatize the company. It is also intended to license a wireless local loop operator. NTC started the GSM mobile service in May 1999 and had 6536 subscribers as of mid-June 2000. There are plans to license a second mobile operator.

Nepal's Internet market got a boost in mid-1999 when Internet Service Providers (ISP) were allowed to have their own international gateways. Prices dropped to the lowest level in the South Asia region. By January 2000, eight ISPs were serving some 9000 subscribers and an estimated 35 000 users. Nepal is one of the ITU Internet Case Studies. Additional information about this country can be found at www.itu.int/ti/casestudies . ■

FIXED TELEPHONE SUBSCRIPTIONS IN NEPAL



	90	91	92	93	94	95	96	97	98	99	00
Fixed	41.8	60.1	66.1	69.9	73.4	79.9	98.2	140	173	208	247
Density	0.23	0.33	0.35	0.36	0.37	0.39	0.47	0.66	0.79	0.93	1.08

Note: Years ending mid-April.

Source: ITU, adapted from NTC data.

For more information or comments on the UPDATE, please contact: ITU/BDT, Telecommunication Data and Statistics, Place des Nations, CH-1211 Geneva 20 (Switzerland). Tel.: +41 22 730 6090. Fax: +41 22 730 6449. E-mail: indicators@itu.int.

New initiatives

Fixed-mobile interconnection workshop
Chairman's report

At the invitation of ITU Secretary-General, Yoshio Utsumi, a workshop was held in Geneva (20-22 September 2000) to discuss the regulatory, economic and policy aspects of interconnection between fixed and mobile networks. The workshop was organized by the Strategies and Policy Unit (SPU) under the Secretary-General's New Initiatives Programme. Some 39 experts from 24 different ITU Member States participated in the meeting, representing a range of regulatory and policy-making agencies, fixed-line and mobile telecommunication operators, consultants, academic institutes, international and regional organizations and others. Those present at the meeting participated in an individual capacity. Rohan Samarajiva, visiting professor at the Delft University of Technology in the Netherlands and formerly Director-General of the Telecommunications Regulatory Commission in Sri Lanka, chaired the meeting.

One of the purposes of ITU, as stated in the Constitution, is to foster collaboration among its Members to achieve rates as low as possible, but still economically sustainable. This is closely related to another goal, which is to extend the benefits of telecommunication technologies to all the world's inhabitants. Some participants expressed the view that today's fixed-mobile interconnection rates might be viewed as somewhat inconsistent with these goals. The objective of the workshop was to serve as a forum for policy-makers, national regulators, and industry to exchange information and perspectives on the regulatory aspects of fixed-mobile interconnection and to benefit from international experience in the field. In addition to raising awareness about the importance of fixed-mobile interconnection, the workshop sought to identify critical issues in costing and pricing policy for mobile communications.

A briefing paper, along with a suggested list of questions, had been prepared in advance by the secretariat for discussion. In addition, a number of country case studies had been commissioned, covering China and the Special Administrative Region (SAR) of Hong Kong, Finland, India and Mexico*. All of these were presented, along with other country experiences. Other presentations and roundtables covered the regulatory context for fixed-mobile interconnection, cost-orientation, mobile Internet, the role of regulatory authorities in dispute resolution and interconnection, benchmarking principles and the potential role of ITU. The following account summarizes some of the main issues that arose from the discussion.

* All of the meeting documents are available on the ITU website at: www.itu.int/interconnect.

Market structure and competition

The mobile service can be viewed as a series of sub-markets in which there are varying levels of competition:

- Retail subscriptions.
- Retail call origination.
- Retail call termination in receiving party pays (RPP) markets.
- Interconnection call origination.
- Interconnection call termination.

The main focus of the meeting was on the service of interconnection call termination in calls between fixed and mobile networks, where competition is least effective. It is invariably the case that a single operator controls call termination to a specific address (a market of one user). Thus, a person making a call will normally have no choice concerning the operator that terminates the call. This creates a bottleneck service that is not subject to the same range of competitive pressures that may be present in other parts of the mobile market. In some instances, where the fixed-operator has been mandated to provide cost-oriented termination rates, this situation results in rates for mobile call termination which are not cost-oriented and which could be interpreted as an involuntary subsidy from fixed-line users to mobile users.

High mobile termination rates are a particular problem in calling party pays (CPP) environments. For instance, in Europe, some studies show that rates for termination on mobile networks average 21 US cents per minute. This shows a degree of asymmetry (mobile termination rates compared with fixed network termination rates) of around 16:1, which some studies suggest is out of line with the corresponding asymmetry in underlying costs.

The meeting spent less time considering environments. In part, this was due to the fact that few countries employ RPP and some, or all, have been changing to CPP from RPP (for example, Mexico and Argentina). More importantly, RPP environments often employ low and usually symmetrical mobile to fixed and fixed to mobile interconnection charges. The underlying asymmetry in cost is covered by the mobile party paying for receiving the call rather than by interconnect charges as in CPP. As a result, the concerns of market failure leading to unduly high fixed-mobile interconnection may be less of a concern. Although prices may vary, there should be little difference between the actual costs of termination in CPP and RPP environments. It was argued that rates in many CPP countries are excessive and out of line with costs, even in countries where the retail market is highly competitive. In some instances, neither party has incentives to negotiate lower prices, especially where there is vertical integration within the same company owning both fixed and mobile networks. Some interpreted this as evidence of market failure, though more study is required.

Rohan Samarajiva

Photo: A. de Ferron (ITU 000072)

A number of market-based solutions were proposed for increasing the level of competition in the market for call termination. These could include:

- Permitting more operators to enter the market, including virtual mobile network operators.
- Encouraging measures that facilitate customer choice and changing operators.

• Encouraging operators to advertise their retail call termination rates as a possible market advantage. Pricing comparisons should include impact on total retail end-to-end prices.

• Ensuring tariff transparency so that consumers and business users can compare rates between operators and between countries ("naming and shaming").

• Considering approaches adopted in individual Member States, such as the Finnish model, in which fixed and mobile operators charge their own segment directly to the customer. The access operator acts as a billing agency, in this way the customer receives only one bill.

A benchmarking approach is being used in Indonesia

However, there are some examples where a degree of regulatory intervention has been required and various approaches have been used:

• In the United Kingdom, for instance, an investigation by the Competition Commission has resulted in the imposition of a price cap on interconnect rates.

• Regulators may set a specific timetable and a set of framework conditions for the negotiation of interconnection rates, for instance by requiring cost-orientation. A number of studies carried out using cost models based on long run incremental cost (LRIC) methodologies were discussed. Cost studies should take into account the different costs of capital associated with different levels of perceived risk.

• In developing countries, where data availability is more restricted or simply not available, then simpler models may be more appropriate. For instance, an approach based on benchmarking of available rates might be adopted, bearing in mind that the input data may not always be cost-based. The Moroccan regulator reported that his country had used a benchmarking approach, as a first step before using interconnection models. A benchmarking approach is being used in Indonesia.

A hybrid of different approaches may be useful in setting the bounds within which negotiation can be conducted. For instance, a top-down cost-model could be used to generate a price ceiling for interconnect while a bottom-up approach could provide a floor. Regulators may consider establishing a specific linkage between interconnect prices and retail prices, given that competitive pressures are generally more effective in retail markets.

Regulatory aspects

The decision to pursue regulatory intervention should not be taken lightly and the timing would depend on a number of factors including:

• The degree of market power enjoyed by the different players and the overall degree of price competition in the market-place.

• The potential delays that would be incurred by reliance upon negotiation.

• The resources available to the regulator.

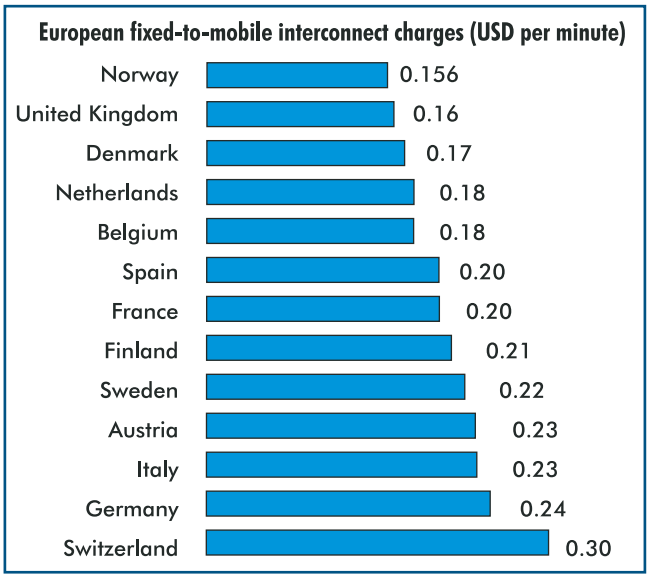
• The level of complaints concerning retail prices received from consumers and business groups.

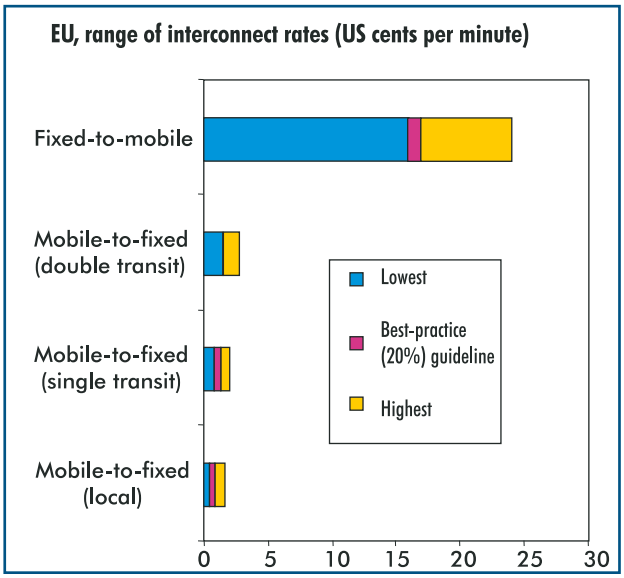
Regulatory agencies need to be able to count on reliable, comprehensive and up-to-date information concerning the level of interconnection and retail tariffs. In some circumstances, regulators may consider requiring the disclosure and, in others, publication of relevant information. Regulators would also benefit from the availability of appropriate benchmark information from other similar, comparable countries. The mobile market has proved to be very dynamic and, in an increasing number of countries, mobile subscribers now outnumber fixed-line ones. Consequently, the negotiation of interconnect arrangements should also be viewed as a dynamic process.

In some countries, the main concern is delays or obstruction in the provision of physical interconnect links by incumbent fixed-line operators and high mobile-to-fixed interconnect charges. For instance, incumbents, for various reasons, may seek to restrict the number of points of

Figure 1* — Interconnection rates in Europe under CPP (USD per minute)

	Fixed-to-mobile interconnect rate	Mobile-to-fixed interconnect rate (local)	Mobile-to-fixed interconnect rate (single transit)	Mobile-to-fixed interconnect rate (double transit)
Austria	0.23	0.017	0.017	0.022
Belgium	0.18	0.008	0.014	0.018
Denmark	0.17	0.008	0.011	0.016
Finland	0.21	0.013	0.013	0.024
France	0.20	0.006	0.012	0.018
Germany	0.24	0.008	0.017	0.021
Greece	n/a	0.018	0.018	0.025
Italy	0.23	0.009	0.015	0.021
Ireland	n/a	0.010	0.015	0.021
Luxembourg	n/a	0.015	0.015	0.015
Netherlands	0.18	0.009	0.013	0.016
Portugal	n/a	0.009	0.015	0.024
Spain	0.20	0.009	0.015	0.028
Sweden	0.22	0.008	0.011	0.015
United Kingdom	0.16	0.005	0.007	0.016
Switzerland	0.30	n/a	n/a	0.020
Norway	0.156	n/a	n/a	0.018
Average	0.21	0.010	0.014	0.020





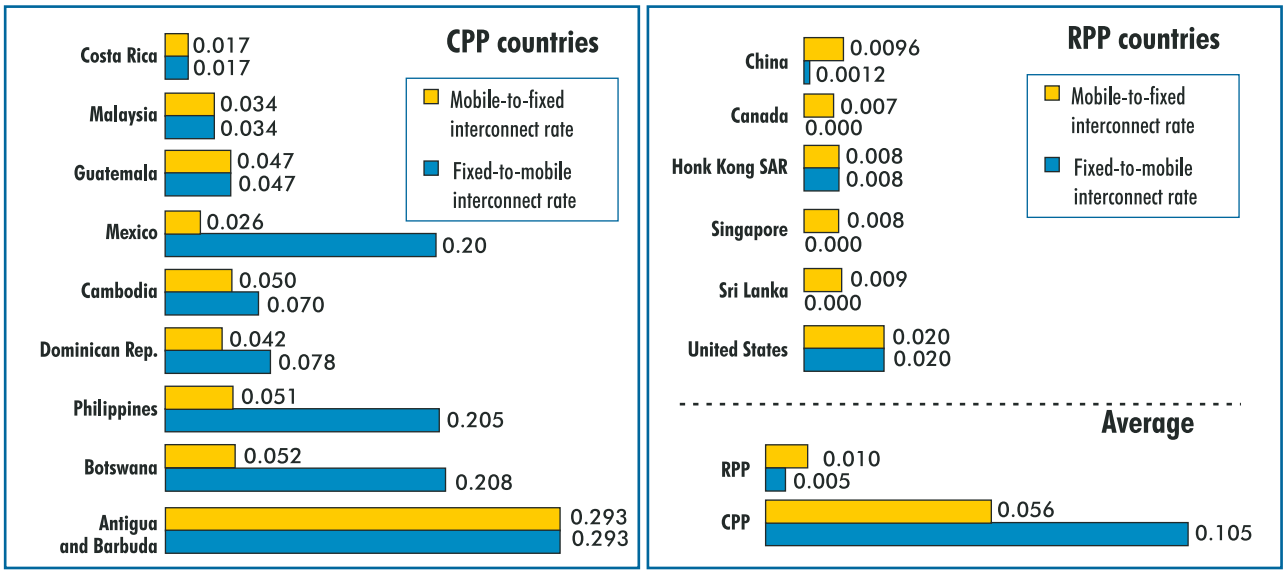
* Figures 1 and 2 have been extracted from *ITU Fixed-mobile Interconnection Briefing Paper* and are used here for illustrative purposes.

Notes:

Mobile-to-fixed interconnection rates are based on a three-minute call duration and are exclusive of value-added tax (VAT).
The Finnish rates assume a low volume of traffic.
In Finland, Austria, Greece and Luxembourg, the lowest interconnection charge covers interconnection at a local or tandem exchange. Thus, the "local rate" is the same as the "single transit rate".
Mobile-to-fixed charge for Switzerland refers to national fixed termination rates from the Federal Office of Communications (OFCOM) website (March 2000).
Fixed-to-mobile rates for Austria, Denmark, Switzerland and Norway are based on January 1999 data from Ovum and the Organisation for Economic Co-operation and Development (OECD).
The "best practice" guideline for fixed-rate interconnection is defined as the upper limit of the three lowest published rates (three being 20 per cent of the 15 European Union (EU) Member States).

Source: ITU, compiled from the European Competitive Telecommunications Association (ECTA)/Analysys, the EU Interconnection Tariffs in Member States, ITU Regulatory Survey 2000.

Figure 2* — Interconnection rates in selected non-European countries
Calling party pays versus receiving party pays (USD per minute)



* Figures 1 and 2 have been extracted from *ITU Fixed-mobile Interconnection Briefing Paper* and are used here for illustrative purposes.

Note: The average on the right-hand side refers to the average of countries responding to the ITU survey, as well as the European countries in Figure 1.

Source : ITU Regulatory Survey 2000.

interconnection. These strategies prevent the development of competition between fixed and mobile services and prevent achieving seamless interconnection between users. Regulatory agencies need the powers to be able to enforce interconnection requirements and competitive safeguards. Where necessary, a regulator may draw upon formal dispute resolution procedures or may encourage the use of alternative dispute mediation.

Pricing and costing

There was considerable debate and discussion over whether high, and highly asymmetric, interconnect rates for terminating fixed-line calls on a mobile network may be viewed as a subsidy from fixed-line to mobile networks. Some participants suggested that such a subsidy could be beneficial, for instance where the mobile network is at an early stage of development or to promote goals of faster network roll-out, more extensive geographical coverage, or investment in future generation mobile networks. However, above-cost mobile termination rates inevitably lead to high and inefficient retail prices, inefficient investment strategies, and may lead to traffic-routing distortions, such as mobile tromboning. Furthermore, high levels of non-transparent subsidies may prevent the development of inter-modal competition and convergence, between mobile and fixed networks. As both fixed and mobile operators strive to develop future broadband networks, the continuing practice of subsidies from one to the other may prevent the achievement of efficient solutions.

Future trends

Future mobile networks will supply a much wider capacity range for the development of innovative services. This may require different types of interconnect agreement (for instance, based on the use of network resources), which may need to distinguish between different services (for example, one-way or interactive; low or high bandwidth). It was noted that, consequently, future evolutions of existing networks and 3G mobile networks (for example, IMT-2000) might

In the rush towards the "mobile information society", the telecommunication sector is facing a number of growing pains...

... Although an increasing share of voice traffic is being routed from fixed to mobile networks and vice versa, the issue of establishing rates and regulation for interconnection between these networks is still a contentious one. Rates vary considerably across ITU Member States. Commercial rates range from zero in some countries to as much as 62 US cents per minute in others. Even in relatively liberalized economies, rates for mobile interconnection are often well above costs. The European Union has recently launched an investigation into the high termination rates being charged by mobile operators.

Many countries, including India, Morocco and the United Kingdom, have taken regulatory action to bring fixed-mobile interconnection rates in line with costs. However, there is little in the way of research or international benchmarking to assist countries in their costing exercises. No consensus has been reached on the costing methodology to be used. In many developing countries, the lack of resources and regulatory expertise can hinder efforts directed at cost-orientation.

Recent excitement over the launch of mobile Internet services makes fair and open interconnection an even more pressing issue. The viability of these new services will depend not only on the interoperability of standards but also on technically and economically sound interconnection arrangements. Addressing the major issues underlying fixed-mobile interconnection at an early stage will assist regulators and industry alike in this transition to an increasingly mobile world.

Case studies on fixed-mobile interconnection can be found at: www.itu.int/osg/sec/spu/ni/fmi/index.html.

require novel interconnection approaches. It is to be hoped that market negotiation can resolve most of these issues. Consequently, there is no immediate requirement for regulatory intervention. However, regulatory and anti-trust agencies will need to monitor the situation and to collect relevant data.

Role of ITU

A number of presentations pointed to the usefulness of comparative data on interconnect rates already available on the ITU website (www.itu.int/interconnect), especially for benchmarking purposes. It was considered that ITU could play an important role in encouraging information flow and helping to guide developing country regulators through the "policy maze". One way of doing this could be through training programmes for the telecommunications community and the dissemination of information. It was suggested that ITU could act as a clearing-house for interconnection rate data and in helping to interpret differences between rates that may arise because of differences in each country's market structure or level of economic development. ITU could also help in providing an "early warning system" for emerging policy issues.

A second possible role for ITU may lie in providing technical assistance to national regulatory authorities seeking to establish more effective fixed-mobile interconnection arrangements. ITU could also provide technical assistance to governments in formulating appropriate policies for the Sector. This could be done, for instance, by commissioning studies on costing methodologies, benchmarking, and cost-oriented retail and interconnect pricing in the context of packet-switched mobile networks. Costing studies could also be applied to the termination of international calls to mobiles. It may be appropriate to appoint a commission of experts to review such studies. These studies could complement training programmes for regulators, for instance, in alternative dispute resolution. ■

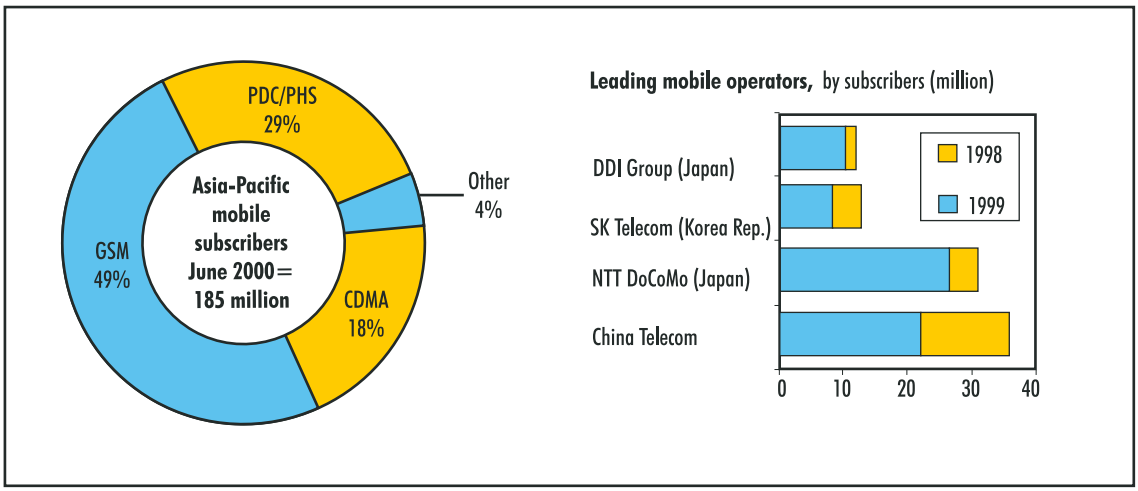
Asia-Pacific mobile markets
From handyphone to i-mode

Tim Kelly, Michael Minges and Ben Petrazzini
ITU telecommunication analysts

In the fast-growing field of mobile communications, it is often Western Europe that steals the headlines. Widespread adoption of the digital GSM standard has given that region an impressive lead in mobile communications. For example, several Nordic and southern European countries now have more mobile than conventional fixed-telephone subscribers and the cross-over point will come soon in some of the larger economies too. The European Union has pushed member countries to license third generation (3G) networks quickly in order to maintain this perceived lead, at both vendor and service provider levels. Many European countries have already conducted lucrative spectrum auctions and are planning to launch so-called 3G networks in 2002. However, there are a number of reasons to believe that Asia rather than Europe may be the real trendsetter for mobile communications:

• The sheer diversity of the region, its large market size and even larger market potential as well as its propensity for rapid technological adaptation suggest that Asia-Pacific could shape the future of mobile communications. The two largest mobile companies in the world by number of subscribers, *China Mobile* and *NTT DoCoMo*, are both from the region.

Figure 1 — Mobile technologies and mobile operators
Distribution of mobile cellular subscribers by technology and by leading operator in the Asia-Pacific



Note: "Other" refers to AMPS/DAMPS/TACS/NMT. Subscriber numbers by operator relate to financial year. For the two Japanese companies, this is 1 April to 31 March. For the other two companies, it is year ending 31 December.
Source: ITU, adapted from national statistics, CDG Group and GSM Association.

• One reflection of the diversity is the number of different mobile systems in use. Most regions have standardized around one or two core mobile technologies. In Europe it is the digital GSM standard while in the Americas, both digital AMPS and CDMA are in widespread use. But in the Asia-Pacific region, there are over half a dozen mobile technologies in operation, more than in any other region (see Figure 1). Asia-Pacific is home to the largest agglomeration of CDMA users (thanks to the Republic of Korea where it is the exclusive technology) as well as the second largest GSM region in the world. While diverse standards may hinder local manufacturers from developing regional economies of scale, they do nevertheless create a platform for research and development.

grew in 1998, adding only around 150 000 subscribers for a measly growth rate of some 16 per cent. Even though Indonesia's troubles are far from over, mobile growth soared more than 100 per cent in 1999 adding around one million new subscribers. It is projected that another million subscribers will be added in the year 2000. So if Indonesia, even under such dire circumstances can triple its number of mobile subscribers, imagine the potential in other countries with far fewer problems.

That potential is being realized first in the four "Tiger" economies — Hong Kong Special Administrative Region (SAR), the Republic of Korea, Singapore and Taiwan-China — along with Japan. In the last year, this "4 + 1" group passed the threshold of having more mobile than

Table 1 — More mobile economies
Fixed and mobile subscribers in selected Asia-Pacific economies, June 2000

Economy	Data mobile surpassed fixed	Subscribers		Mobile as % of total	Per 100 inhabitants		
		Mobile (000s)	Fixed (000s)		Mobile	Fixed	Total
Korea (Rep. Of)	Aug-99	26 570	21 250	55	56.2	45.7	101.9
Hong Kong (SAR)	Nov-99	4 647	3 911	54	68.5	57.7	126.2
Taiwan-China	Feb-00	14 303	12 262	54	64.5	55.3	119.8
Japan	Mar-00	56 846	55 446	51	44.9	43.8	88.8
Singapore	Jul-00	1 883	1 897	50	46.9	47.2	94.1

Note: This data does not include ISDN lines. Data for Japan includes PHS subscribers. Taiwan-China refers to May 2000. Japan refers to March 2000.
Source: ITU.

• The creative platform has helped NTT DoCoMo to amass some 11 million subscribers in just eighteen months for its innovative *i-mode* mobile Internet service. By contrast, the European equivalent, known as wireless application protocol (WAP), has been a relative disappointment.

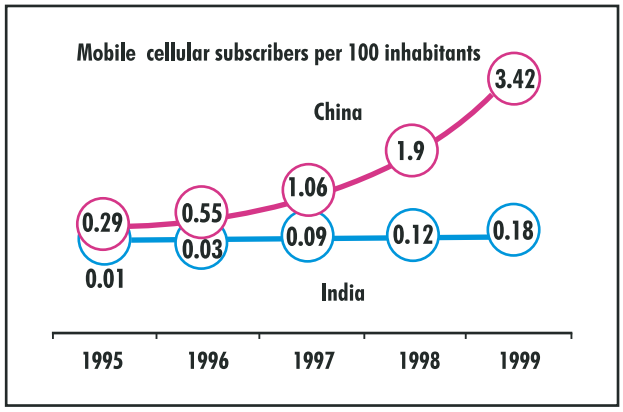
The Asian economic crisis that happened in 1997 adversely affected a number of East Asian economies but the effect on most mobile markets was minimal. By 1999, nearly all markets had recovered and mobile growth rates were back to pre-crisis levels. Take Indonesia, one of the countries most seriously affected by the economic crisis. The impact there was multiplied due to ethnic and social turmoil. The mobile market barely

fixed subscribers. This achievement is all the more significant in that it has not been replicated in the developed Commonwealth economies of Australia and New Zealand. This suggests that, in addition to policy changes, there may also be other factors driving market growth in these Asian economies. One reason may be that traffic congestion and long commuting times in the large metropolises of Asia favours mobile use. A second reason is the relatively young population of the Asian economies (though Japan is an exception here) and their eager adoption of new technologies.

Nevertheless, policy does matter as experience in the mobile markets of Taiwan-China and the Republic of Korea shows. Both have moved

to far more competitive mobile markets, which has had a dramatic impact on growth. Taiwan-China went from a monopoly to one of the most competitive mobile markets in Asia when five new operators started operations towards the end of 1997. The impact has been stunning with mobile density rising from seven at the end of 1997 to over 50 by the end of 1999. The Republic of Korea further opened its mobile market in 1997 going from a duopoly to a five-operator market. The Republic of Korea and Taiwan-China have joined Hong Kong SAR, long the competitive market leader, as being among the most open in the region. It is significant that these three economies were the first in the group to have more mobile than fixed telephone subscribers. Singapore, where mobile competition has been more restrained, was the last. A third mobile operator was launched in April 2000, spurring growth, and putting the country among economies that had passed the more mobile than fixed telephone subscribers threshold in July (see Table 1).

Figure 2 — Tale of two countries



Note: Data for India refers to year beginning 1 April except 1999 where it refers to October. The cellular service was launched in 1995 in India.

Source: ITU World Telecommunication Indicators Database.

But, although the news from the 4 + 1 group is exciting, some of the most interesting developments are elsewhere in the region. One of the most fascinating contrasts is between the region's two largest countries, China and India. While the Chinese market has been boiling — it became the region's largest market in the year 2000 and is pushing to topple the United States as the world's biggest — the Indian one has been tepid. In terms of market structure, it is the reverse of what would be expected. After all, China has just two mobile operators: China Mobile and *China Unicom*, while India has over thirty. However, the Indian market, like China's, is also a duopoly.

Unlike most other Asian markets, the Indian market is fragmented into regional licences. This prevents operators from achieving economies of scale and subsidizing rural areas from more lucrative urban operations. While licences in China are nationwide, the two operators have provincial subsidiaries. For example, China Mobile is a 25 per cent privatized subsidiary that operates mobile networks in six provinces. China Unicom also went private in June 2000, raising USD 5 billion in the largest Asian public offering ever, outside of Japan. It too is organized on a provincial basis. The advantage is that, in China, mobile operators have economies of scale from nationwide licences but are focused on regional markets through subsidiaries.

Other problems that have plagued the Indian market are high handset import taxes (in China, many of the handsets are manufactured there), high licence fees paid by operators, and relatively high tariffs. The Indian market has also been plagued by legal disputes between the operator, the regulatory agency and the incumbent, which still retains licensing powers. One effect of these disputes has been to delay the introduction of calling party pays (CPP). India's adoption of receiving party pays (RPP) has undoubtedly slowed subscriber and traffic growth. As a result, the Chinese market has pulled away from the Indian market (see Figure 2), with China adding more mobile subscribers every two weeks than India adds in a year. There are signs that India is addressing some of the problems and future growth looks promising. But a more thorough regulatory reform is required.

One of the most dynamic mobile markets has been the Philippines, which emerged as the largest of the Association of South East Asian Nations (ASEAN) mobile market in 1999. It has the region's largest pre-paid market with over 80 per cent of mobile cellular subscribers using air-

time call cards. *Globe Telecom* has been quick to seize on pre-paid and other services to make its *handyphone* brand the country's second largest in 1999. Globe Telecom's SMS (short message service) has been popular particularly with special features such as "mobile chat". Globe Telecom was also the first to launch WAP services. Globe Telecom is planning to merge with *Islacom*, part of the country's mobile market consolidation that began when the incumbent fixed-line operator, *PLDT*, acquired mobile operators *Piltel* and *Smart*.

Consolidation has also been ongoing in Malaysia where some have argued that there were too many mobile operators for the size of the market. Incumbent fixed-line operator *Telekom Malaysia* bought *Emartel*, a GSM operator and *Mobikom* (AMPS) to add to its existing analogue NMT network. *Telenor* has replaced *SwissCom* as an investor in *DiGi*, BT of the United Kingdom assumed a stake in *Maxis* and Time is looking for an investor. The government removed a cap on mobile subscription charges in the year 2000, allowing operators to reduce prices. This should add to the recovery experienced in 1999 where some three-quarters of a million new subscribers signed up for mobile.

Consolidation has also been ongoing in Malaysia where some have argued that there were too many mobile operators for the size of the market

Photo: Jean-Marie Micaud (ITU 990078)

Thailand, like Indonesia, suffered from the economic crisis with a fall in mobile subscribers in 1998. The mobile market is recovering with the number of subscribers above pre-crisis levels. One of the curiosities of the Thai market is why pre-paid, so successful elsewhere, has been so slow to take off. It seems this is partly due to lack of marketing and pricing innovation. The domestic fixed-line incumbent, the *Telephone Organization of Thailand* (TOT), has not been permitted to change its prices by the Cabinet (Government) for the past twenty-four years and consequently has a lack of experience in pricing both existing and new service packages.

The potential of mobile as a substitute for fixed-line communications was first identified in Cambodia, which was the first country in the world to have more mobile than fixed subscribers, way back in 1993. However, this potential has not extended to new ASEAN members such as Lao P.D.R. and Myanmar. Both Lao P.D.R. and Myanmar have only one operator and growth has been sluggish. In Viet Nam, things are progressing further. The two GSM operators managed to achieve one of the highest growth rates in the region in 1999, pushing mobile subscribers over the 300 000 mark.

While East Asian economies are exhibiting strong mobile growth, India's mobile ailments are symptomatic of an illness affecting other South Asian countries. For example, Pakistan has been plagued by sluggish growth despite being one of the first countries in the region, along

with Sri Lanka, to introduce the mobile service. It has a competitive market with three operators. However, networks are antiquated (only one is digital) and operators have complained about losing money and unfair interconnect arrangements with the incumbent fixed-line operator. Until this is remedied, the situation will most likely worsen. The incumbent plans to launch its own GSM service soon, which may help subscriber growth but will not necessarily contribute to a more level playing field for competition. High taxes on handsets and restrictions on sales by vendors other than mobile operators has led the regulator itself to conclude that the "cellular industry has not been growing as fast as it should".

Asia-Pacific is home to the largest agglomeration of CDMA users as well as the second largest GSM region in the world
Photo: INFOCOMMS Forum, Asia-Pacific, June 2000 (ITU 000078)

In Bangladesh the mobile market was opened to three new operators in 1996. They managed to gain over 100 000 subscribers by the end of 1999, about 25 per cent of all telephone subscribers. This is no mean feat in Bangladesh where incomes are among the world's lowest and the government has been slow to promote mobile cellular as a solution to universal access. Indeed the State-owned incumbent fixed-line operator, *BTTB*, has not been overly responsive to interconnection so that there are around 28 000 "mobile-to-mobile only" subscribers. One analyst claims that this is not only against national policy, but is also a violation of human rights since subscribers cannot call emergency services. Despite these obstacles, Bangladeshi mobile operator *Grameen* has been pushing ahead with its vision to extend mobile access to rural areas and its village phone scheme has been a big hit. Presently, *GrameenPhone* has coverage in some 27 districts including all six divisional headquarters. Plans are in place to expand the coverage to 40 districts.

In Nepal, the incumbent operator launched mobile services in May 1999 but had only managed to garner some 6500 subscribers a year later. The benefits of mobile cellular to boost communication access has not yet been realized in Nepal where over 250 000 people are waiting for telephone services. A second operator is to be licensed but under the terms of the proposed licence, it will be at a disadvantage compared to the incumbent. Delays in the introduction of competition in mobile contrasts with the situation in Internet service provision, where Nepal's competitive market has put it ahead of its neighbours.

The Maldives and Sri Lanka have done relatively better than other South Asian economies with mobile density above one in both. However, growth has recently slowed in Sri Lanka despite the presence of four mobile operators. One of the problems is that, like Pakistan, three of the mobile networks in Sri Lanka are analogue. When deciding to upgrade, operators with analogue networks must choose whether or not they should completely bypass second generation digital cellular and move straight into third generation networks.

Mobile Internet

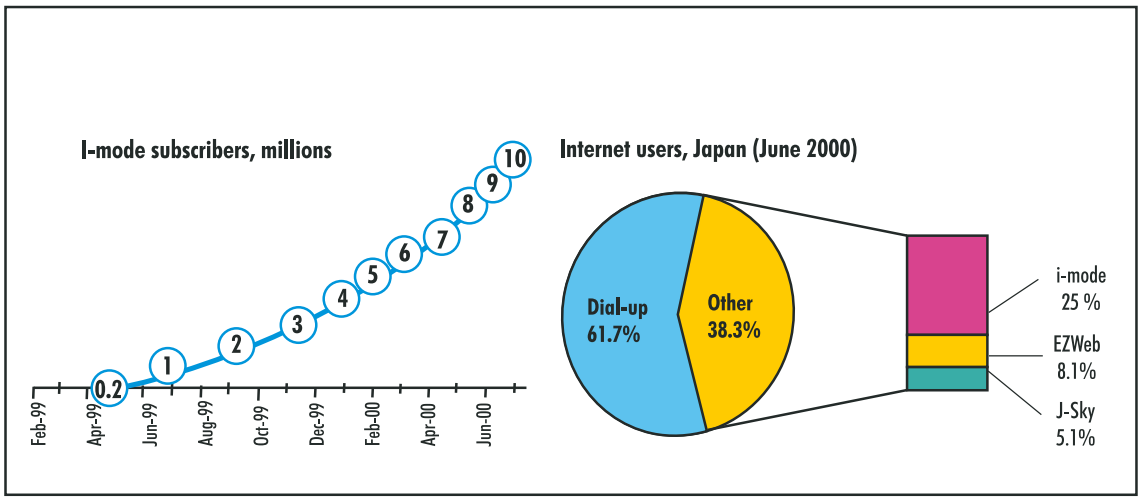
Mobile Internet services are gradually being introduced across the region. Most offerings have been based on the WAP standard. In Singapore, mobile operators are eagerly promoting WAP and have been actively recruiting content providers to their WAP portals. *StarHub* attracted 3000 WAP subscribers just three months after launching service in April 2000. Its *iPower* WAP portal offers about 60 services. *M1*, another mobile operator, claims to be the first in the world to have launched WAP roaming (with Hong Kong SAR). *SingTel*, which launched its *e-ideas* WAP portal

early in the year 2000, is also promoting mobile phones as a dial-up device for laptop computers and personal digital assistants (PDA) such as the popular *Palm Pilot*. It has about 20 000 subscribers to its mobile office service and announced a new service in September 2000, jacking mobile phone speed up to 38.4 kbit/s. In Hong Kong SAR, WAP users can use their phones for placing bets on horse races. *SK Telecom*, in the Republic of Korea, has a CDMA-based WAP service, *n.TOP*. Launched in December 1999, it offers banking, stock quotes and global positioning system (GPS) content. It had around 2.2 million users with some 1600 content providers by June 2000. Elsewhere in the region, Australia, Malaysia, New Zealand and Taiwan-China have launched WAP services while China, India, Indonesia and Thailand have been testing these services.

However, outside the Republic of Korea, WAP has not been considered a tremendous success. In Taiwan-China, where there were around 60 000 WAP users in August 2000, mobile Internet has been plagued with problems. The tepid acceptance of WAP contrasts markedly with Japan's mobile Internet experience.

Japan was the first country in the world to launch mobile Internet services when NTT DoCoMo started its i-mode service on 22 February 2000. In one year, there were five million subscribers and in six months, this had more than doubled. At the end of August 2000, some 11 million people were using i-mode. There are two other mobile Internet services in Japan, *EZWeb* and *J-Sky*, operated by NTT DoCoMo competitors (see Figure 3). The three services had 17.3 million subscribers between them in August 2000, with around forty per cent of all Japanese Internet surfers logging in from a mobile.

Figure 3 — i-madness
Number of NTT DoCoMo i-mode subscribers and number of Internet users by access mode, Japan



Source: NTT DoCoMo, TCA.

Indeed, NTT DoCoMo is now the world's second largest Internet service provider (ISP), after AOL with whom it may be planning a joint-venture. One of the attractions of i-mode is that, unlike WAP, HTML-based websites can be easily adapted. There are almost 600 sites on NTT DoCoMo's i-mode portal. In addition, there are some 18 000 i-mode compatible sites. Unlike WAP, where users are typically restricted to offerings from their provider's portal, i-mode users can access any compatible site by typing in the URL. Another i-mode success factor is that it is "always on" and is priced according to information retrieved and not usage time. By contrast in Europe, where fixed-mobile interconnection rates are so high, mobile companies are reluctant to forego this revenue stream. While much focus is on handset-based browser services such as WAP and i-mode, the real utility of the mobile phone may be as a wireless data port (see box page 30).

Browser or dial-up?

While much talk is about using the mobile handset as the window to the Web world, a more practical use might be as a dial-up telephone for connecting computers or personal digital assistants to the Internet. First of all, the screen on a mobile handset is small and not ideally suited to intensive Web surfing. Indeed WAP-based services do not allow access to non-compatible and non-portal websites. Secondly, improved access speeds for mobile phones make them as fast as, or even faster than, fixed-line dial-up. While conventional GSM cellular speed and even NTT DoCoMo's i-mode is limited to 9.6 kbit/s, useful only for e-mail, still photos, or the transmission of pictograms, there are a number of products that are dramatically increasing this speed. High-speed circuit switched data (HSCSD) multiplies GSM speed by three up to 38.4 kbit/s, roughly equivalent to the throughput of a dial-up fixed telephone line. General packet radio service (GPRS) offers a tenfold increase in data throughput to a theoretical 115 kbit/s. The next stepping stone towards 3G will be the implementation of EDGE, offering data services and applications at speeds up to 384 kbit/s essentially using existing infrastructure. While 3G mobile claims to offer speeds of up to 384 kbit/s in mobile mode and 2 Mbit/s in stationary mode, these speeds will not be available to all users straight away.

i-mode user, Yokohama (Japan) (ITU 000073)

Nevertheless, at these speeds — equivalent to current broadband offerings via ADSL or cable modem — the mobile handset becomes very interesting as a port to the global Internet. This is particularly relevant for developing countries where fixed lines are limited. A high-speed mobile user in Bangladesh would theoretically have more bandwidth locally on his/her mobile phone than the total international bandwidth of the country. The problem would be finding the PC or PDA to connect it to. At the end of 1999, there were almost twice as many mobile subscribers (57 million) as PCs (30 million) in developing Asia-Pacific countries. One possibility is shared access, with 2.5G and 3G mobile technologies used to connect cyber cafés to the Internet. For example, Grameen in Bangladesh would like to provide Internet access from its Village Phone Centres. The problem is convincing developing country policy-makers that mobile data technologies are relevant to them and having them adopt the appropriate licensing and regulatory framework. ■

Mobile phone connected to a Palm Pilot PDA via infrared being used to dial-up Internet (Singapore) (ITU 000074)

Spotlight on Asia-Pacific

Today, more than 150 countries around the world have introduced new telecommunication legislation or modified existing regulations and 96 separate telecommunication regulatory authorities have been established in ITU Member States, up from 30 in 1994. The Asia-Pacific region alone has more than a dozen separate telecommunication regulatory authorities.

In 1979, the Philippines became the first country in the region to establish a separate regulator. There was little regulatory activity in the region until 1992 when the Republic of Korea estabalished the Korean Communications Commission (KCC) and 1993 when Hong Kong (now part of China) set up the Office of the Telecommunications Authority (OFTA).

Ten more countries have since established separate regulators, with Mongolia and Pakistan leading the way in 1996, and Australia, India, Papua New Guinea and Sri Lanka following suit in 1997. Nepal established its regulator in 1998, and was followed by Bhutan, Malaysia and Singapore in 1999.

Twenty-six more countries, ten of which are from Asia and Australasia, plan to establish a separate regulator in the near future. Afghanistan, Bangladesh, Brunei Darussalam, Cambodia, Iran (Islamic Republic of), Israel, Kiribati, Lao P.D.R., Samoa and Thailand, have all indicated that they plan to establish separate regulators.

The succession of dramatic changes in the telecommunication sector is placing an enormous burden on regulators, says Jong-Soon Lee, Executive Director of the Asia-Pacific Telecommunity (APT) and Chairman of the Telecommunication Development Advisory Group of ITU's Telecommunication Development Sector (ITU–D). Now more than ever, regulators are facing major challenges in the areas of interconnection, universal service obligations, tariff rebalancing, licensing and spectrum issues, competition, and quality of service.

Speaking at the Asia-Pacific Symposium for Regulators, held in Bangkok in September 2000, Mr Lee declared: "with the very scarce regulatory resources in the region, sharing of experience and information is one of the best solutions for dealing with these challenges".

Earth station monitoring room in Bangkok

Photo: Jean-Marie Micaud (ITU 920101)

There is a growing trend towards the establishment, by national regulatory bodies, of regional regulatory organizations or councils to share experiences or develop regulatory guide-

World regulators to meet at ITU from 20 to 22 November 2000

A Development Symposium for Regulators is scheduled to take place in Geneva from 20 to 22 November 2000. This is a watershed event marking the first time that ITU has organized an event just for telecommunication regulators and policy-makers interested in establishing a regulatory body. Many of these fledgling agencies are striving to increase their knowledge base to become more effective regulators. At the same time, all regulators — from those that are well established to those that are brand new — are struggling to keep up with the technological changes that are revolutionizing the ICT industry. The Symposium aims to launch a free and frank dialogue in which all the world's regulators can share their experiences and views in order to learn from each other. Countries that have not yet created a separate regulator are invited to participate in a special workshop tailored to their needs.

The Symposium includes sessions exploring the rise of national regulators, the trend towards regional and regulatory organizations, interconnection, regulatory strategies to increase Internet connectivity, the impact of convergence, the institutional framework for establishing independent regulators, and initiatives for the future.

Looking to the future, as national regulators form regional groups to help bolster their knowledge base, the next logical step should be a global vehicle to assist regulators, perhaps in the form of a regulators' hotline. Such an initiative, agreed as part of the 1998 ITU Valletta Action Plan, requires the active participation of all the world's regulators. The Symposium will discuss this concept and other initiatives to build and strengthen regulatory bodies.

ITU will publish papers produced during the Symposium. Future ITU regulatory events will include participation by all sectors of the ICT industry.

For more information on the Development Symposium for Regulators, please contact Susan Schorr (susan.schorr@itu.int).

LDC Roundtable

The Telecommunication Development Bureau will be organizing a roundtable for least developed countries (LDC) in Geneva from 23 to 24 November 2000. For more information, please contact anna.bahr@itu.int

lines and principles. An example of this, within the region, is the Association of South East Asian Nations (ASEAN) where the ASEAN Telecommunications Regulators Council (ATRC) has been set up.

Elsewhere, the *Foro Latino americano de Entes Reguladores de Telecomunicaciones* (REGULATEL) and the Telecommunications Regulators Association of Southern Africa (TRASA) have been established. More recently, a group of Caribbean nations agreed to establish the Eastern Caribbean Telecommunications Authority (ECTEL) with the mandate to recommend a harmonized regime to participating national regulators.

The Bangkok Symposium came up with an Action Plan calling for: a regulatory compendium, regional regulatory coordination, regional contribution to global forums, assistance from APT and ITU in the development of regulatory frameworks in each APT member country.

Major regulatory developments in the region

Hong Kong-China

Deregulation in fixed services started in early 1990, moving to a full open market in 2000.

In 1998, a new policy body was created to deal with the new convergence and development in information and communications technology.

The new body has three executive arms, namely: telecommunication, information technology, and broadcasting authority.

In February 2000, a new Electronic Transaction Ordinance was enacted.

In July 2000, new broadcasting and telecommunication ordinances were issued.

The new telecommunication ordinance defines clear terms on interconnection and competition safeguards. It also addresses the issue of access to private premises by mobile-service operators.

Thailand

A new bill was passed in March 2000 and allows for the creation of two commissions: the National Telecommunications Commission and the National Broadcasting Commission to regulate telecommunications and broadcasting services, respectively. The two commissions are expected to be operational in 2001. Draft bills are being prepared through the Electronic Commerce Research Center (ECRC) to address electronic transactions, electronic signatures, universal access, electronic file transfer and data protection. A sub-committee on e-commerce policy has been set up to study the taxation payment system and other financial transactions.

A Joint Commission will also be established to handle convergence and radio spectrum issues.

The regulatory bodies are expected to issue a number of licences for different aspects of multiple services. The merger of telecommunications, broadcasting and computing is foreseen after 2000.

Problems are foreseen in supporting a competitive market in merged broadcasting and telecommunication services.

Papua New Guinea

Currently all telecommunication services, including the Internet, are provided by a monopoly carrier. The Telecommunication Act of 1996 granted a five-year monopoly to Telecom PNG.

Changes in the Act are needed to open the market. There are plans to formulate policy and regulation for an open market by December 2001.

Sri Lanka

The Telecommunications Regulatory Commission (TRC) has been established under the new amendment to the Telecommunications Act passed in 1996. The provision of telecommunication services has been privatized. A new telecommunication policy is expected to be in place by year-end 2000 and will include issues on Internet, interconnection, mobile services, basic services, consumer protection, and opening of international gateways. Radio spectrum assignment is handled by the TRC. Internet service providers (ISP) carrying international voice is an issue. There are pending court cases involving ISPs providing voice over the Internet protocol (VoIP).

Indonesia

The new telecommunication law was expected to come into force in September 2000.

Two government regulations are soon to be implemented, one governing telecommunication services and the other the use of the radio-frequency spectrum and satellite orbit.

Telephone exchange in Thailand

Photo: Jean-Marie Micaud (ITU 920096)

The new law will give more opportunity to operators and create more competition in the market.

No regulation has been established regarding the Internet.

Bangladesh

A new law on telecommunication regulation is in the process of being formulated.

A new commission is expected to be in place by year-end 2000 or at the beginning of 2001.

Australia

Limited competition through a duopoly was introduced in 1989 and moved to full competition in 1997. There are currently 47 licensed carriers. Internet service providers (ISP) and content service providers do not need a licence to operate but are governed by some regulations.

There are agreements in place governing interconnection among various operators. Qual-

ity of service (QoS) for various operators is monitored and published. Australia does not regulate the Internet QoS. Universal service obligation is limited to the provision of the basic telephone service plus 2.4 kbit/s data service. The previous incumbent shoulders the universal service obligation but the other carriers give that incumbent a portion of their revenues.

Singapore

The Infocomm Development Authority (IDA) was created on 1 December 1999 from the merger of the National Computer Board (NCB) and the Telecommunication Authority of Singapore (TAS). It is a statutory board under the Ministry of Communications and Information Technology (MCIT). In view of the growing convergence, IDA oversees the information technology and telecommunication industries, as well as the technical aspects of broadcasting regulation. Full market competition was introduced in April 2000.

IDA exercises licensing and regulatory functions in respect of the information and communication technologies industry. This includes licensing and regulating the management, allocation and use of satellite orbital slots, radiofrequency spectrum and numbering plans in Singapore.

In September 2000 IDA, in consultation with other government agencies, released a consultation paper inviting views from the industry and members of the public. Entitled "A Proposed Framework on Building Trust and Confidence in Electronic Commerce", the paper seeks comments on the proposed strategies and initiatives that will raise the level of trust and confidence among businesses and consumers so as to facilitate the growth of e-commerce.

The Republic of Korea

The Korea Communications Commission (KCC) was established to ensure fair competition and to protect consumer interests in the liberalized and privatized telecommunication markets in 1992, based on the Basic Telecommunications Act. In September 1998, the preview of the numbering plan and the examination of the business accounting report were transferred from the Ministry of Information and Communication to KCC, positioning it as a specialized regulatory agency for promoting fair competition. Several telecommunication laws and regulations have also been passed to meet the fast-growing convergence of information and communication technologies. They include: the Telecommunication Privacy Law (1993), the Software Promotion Law (2000) and the Computer Program Protection Law (2000).

India

Internet service providers need to secure a licence but the policy is very liberal. ISPs can now have 100 per cent foreign equity. However, 49 per cent of foreign equity capital is still required in the operation of international gateways on the ISP licence. Cyber law has been enacted recognizing the legality of electronic signatures. The Telecommunications Regulatory Authority of India (TRAI) has succeeded in reducing the bandwidth prices substantially. Appeals against TRAI's decisions on disputes can be made to the Telecommunication Disputes Settlement Appeal Tribunal (TDSAT). Telephony over the Internet is not permitted. ■

Technicians fixing a telephone line in Gulmarg, Kashmir

Photo: Christian Favre (ITU 940088)

ITU and its role in the Internet

Robert Shaw
ITU's Internet Strategy and Policy Adviser

It is sometimes surprising how myths can be created — and how long they take to die. One of the most enduring misconceptions which ITU deals with is that many people think it has nothing to do with the Internet. This can be explained, in part, by the confusion that the World Wide Web or particular Internet applications are synonymous with the Internet. But anyone with a basic grasp of layered network architecture understands that ITU standards (called recommendations) are used at almost all layers of the Internet.

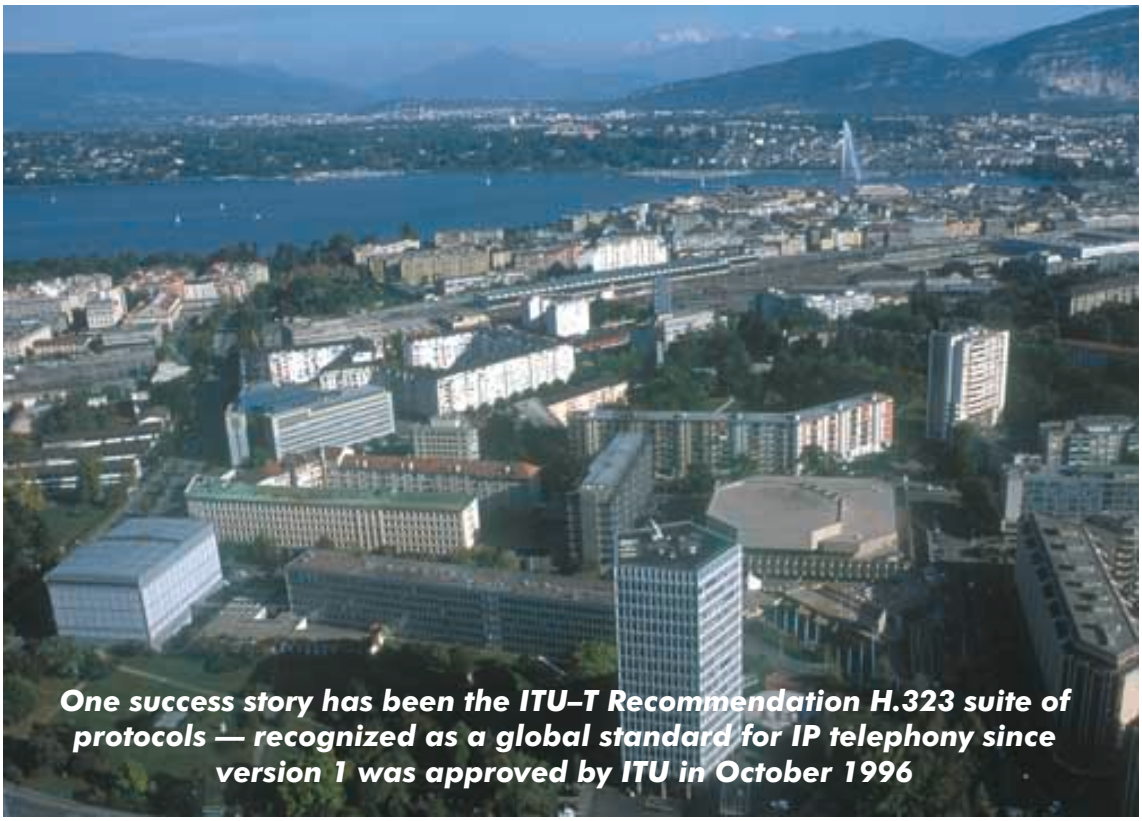
For example, the telecommunications industry clearly provides much of the underlying infrastructure for the Internet and other Internet protocol (IP)-based networks. Much of this infrastructure is based on ITU recommendations dealing with optical networks, ATM, frame relay, synchronous digital hierarchy (SDH) networks and other standards beneath the IP network layer. Likewise, in "last mile" networks, the public switched telephone network (PSTN) provides dial-up or digital subscriber line (DSL) access to the Internet for millions of users. All of this would not be possible without ITU–T recommendations, mainly the V-series on modems or the G-series on DSL technologies.

IP telephony technology allows for voice, fax and data to be transported through one network. ITU standards are used at almost all layers of the Internet.

Photo: Clarent Corporation (ITU 000066)

For example, building on the success of the now ubiquitous Recommendation V.90 for modems with data rates of up to 56 kbit/s, important enhancements were agreed this year in yet another ITU–T Recommendation: V.92. These enhancements include the ability to put the modem "on-hold" when a network indicates that an incoming call is waiting. Enhancements such as this will give significant benefits to modem users with improved access to interactive services, and the option to exploit voice response facilities associated with Internet browsing.

Pierre-André Probst, Chairman of ITU–T Study Group 16 responsible for multimedia services and systems, notes that "the important new features in V.92 will further improve the Internet users experience by reducing connect times and providing improved access to new Internet services".



One success story has been the ITU–T Recommendation H.323 suite of protocols — recognized as a global standard for IP telephony since version 1 was approved by ITU in October 1996

Photo: A. de Ferron (ITU 001012)

John Magill, Chairman of ITU–T Working Party 1/16 responsible for modem specifications, adds that while "much attention is going to DSL technologies these days, the voiceband modem will remain the predominant worldwide access technology for many years to come. These important new recommendations will help users to get the most from this technology".

Clearly, instead of representing a threat to ITU, the growth of the Internet and other infocommunication networks (such as third generation or 3G mobile data networks) really represent new opportunities for the Union to excel in its core competencies. The "net result" (no pun intended) is a rapid expansion in ITU's IP-related standardization work. A few trends provide concrete examples of this phenomenon.

The first is that demand for bandwidth and capacity is driving continuous innovation in access and transport networks. Some examples include leveraging of copper wire "last-mile" networks through ever-faster DSL technologies, re-architecturing of "broadcast" cable networks to support bi-directional IP services and new advances in optical networking techniques (e.g., running IP directly over optical networks). As a result, ITU–T Study Groups 9 and 15, which are directly involved in related standardization, have witnessed increased participation and interest in their activities.

A second trend is the ever-increasing popularity of wireless networks and mobile data services. Most analysts forecast that cellular systems will rapidly merge with handheld computers to become a (if not the) strategic IP services platform. Supporting this prediction, one of the world's first mobile Internet operators in Asia has attracted more than 11 million subscribers in less than 18 months — thereby becoming the world's second largest Internet service provider. Directly related is ITU's 3G mobile initiative, IMT-2000 (International Mobile Telecommunications-2000), which lays an important cornerstone of the emerging "mobile information society". IMT-2000 systems are expected to support minimum data speeds of 384 kbit/s to 2 Mbit/s, depending on the environment.

A third important trend to emerge is the "unification" and interoperability of IP-based and PSTN network services and applications. Differ-

ent protocols aim to perform different portions of the process of setting up, controlling, transmitting, and terminating a phone call over IP networks and between IP networks and the PSTN. One success story has been the ITU–T Recommendation H.323 suite of protocols — recognized as a global standard for IP telephony since version 1 was approved in October 1996.

The nuts and bolts of IP telephony are being hammered out at the global level in ITU–T study groups, as well as in regional and industry bodies such as the European Telecommunications Standards Institute (ETSI) and the Internet Engineering Task Force (IETF). An important milestone in this collaborative effort is ITU–T H.248, developed jointly by experts from ITU–T Study Group 16 and IETF's Megaco Working Group. H.248 is a "convergence" standard defining the control of gateway devices that can exchange voice, video, facsimile and data traffic between PSTN and IP networks. It received final approval from the ITU membership in June 2000, and will also be published as the Megaco protocol in the IETF.

"This is the next in a continuing series of technologies that are benefiting from the close cooperation of IETF and ITU–T in areas of common interest", says Scott Bradner, Transport Area Director in the IETF and Vice-President of Standards at the Internet Society (ISOC).

"While in itself neutral to the call signalling protocols used to control call set-up, H.248 is part of the efforts deployed by ITU to complete the now well established H.323 family of standards with added functionalities to respond to the market needs including real-time fax, mobility, security or text communications as well as improved ways of performing operations already supported in H.323", remarks Fabio Bigi, Deputy Director of ITU's Telecommunication Standardization Bureau.

"Use of packet-based networks for carrying voice and other multimedia traffic is expected to bring many new opportunities as users increasingly demand services based on the integration of voice, video, fax, data and Web services", Mr Probst commented.

Industry analysts estimate the total international telephone traffic over Internet gateways to be anywhere between 25 to 40 per cent of all traffic by 2004, with a market value of USD 19 billion. Some 60 per cent of major public telecommunication operators are said to believe that IP telephony is capable of becoming the main means of telecommunications by 2004 while 25 per cent reckon that the majority of their voice traffic will be carried over IP.

Since support for IP-related technologies is now a strategic element in the design, development and use of telecommunication networks, it is not surprising that most of ITU–T's study groups have now reoriented their work programmes towards IP. In fact, a brand new "Y-series" set of recommendations has been established to cover IP aspects of telecommunication networks such as architecture, access, transport, performance and signalling. This framework is coordinated by ITU–T Study Group 13, ITU–T's lead study group on IP.

Since mid-2000, ITU has been working on another interesting project called ENUM — a "convergence" protocol that will map ITU–T E.164 telephone numbers to the Internet's Domain Name System

For example, the Y.1310 standard on IP over ATM technology adopted earlier this year "is especially important as it is at the heart of the convergence between the IP and telecommunication worlds", notes Brian Moore, Chairman of Study Group 13.

In line with industry trends, ITU has continuously accelerated its standardization process. Y.1310 is one example of how ITU is now moving at "Internet speeds". From start to finish, the approval process for this recommendation took less than eight months. This has led some of ITU's project collaborators in the IETF to comment that the "ITU moves too fast!"

In addition to improvements over conventional telephone networks these are advances in accessing Internet services over cable networks. Study Group 9 has previously produced two recommendations, J.83 and J.112, related to providing IP-based services over cable networks.

Continuing this work, Study Group 9 has published J.120 on "webcasting" and created a new "IPCablecom" project that defines an architecture and protocol for real-time IP-based services over cable networks. In total, 14 recommendations from the IPCablecom project are planned.

In the field of electronic commerce, ITU has done important work through ITU–T Study Group 7 in establishing the technical standards necessary to ensure network security and consumer confidence. In April 2000, Study Group 7 adopted an improved version of its well-known X.509 standard, which is used in both symmetric and asymmetric authentication and encryption applications, including e-commerce transactions. This telecommunications standard has been universally adopted by the computing industry.

The new edition of the X.509 aims to improve the environment for B2B (business-to-business) transactions by setting out a framework for privilege management infrastructure as well as improved standards for attribute certificates, which define user access privileges. Study Group 7 also recently adopted two more new recommendations related to public key infrastructure (PKI) providers and digital signatures: X.842 and X.843.

Since mid-2000, ITU has been working on another interesting project called ENUM. ENUM is a "convergence" protocol from the IETF that will map ITU–T E.164 telephone numbers to the Internet's Domain Name System to look up resources associated with that number (using the linking language of the World Wide Web called Uniform Resource Identifiers). ENUM may emerge as a sort of "glue" protocol linking the PSTN with the Internet. ITU–T Study Group 2 is now actively collaborating with IETF's Internet Architecture Board on the operational, administration and delegation issues related to the deployment of ENUM protocol-based services. This will obviously require extensive consultation with administrators of resources derived from the international E.164 numbering plan, including national and integrated numbering plan administrators.

Recent key ITU events clearly indicate that its future standardization work will place much emphasis on the wireless world, where 3G mobile and wireless Internet have become the buzzwords. IMT-2000, which is standardized in a suite of interdependent ITU–R and ITU–T recommendations, is receiving much attention. To rapidly address the remaining challenges, the World Telecommunication Standardization Assembly, in October 2000, established a special study group known as IMT-2000 and Beyond. This new group has been endowed with more flexible working methods than other study groups.

IMT-2000, which is standardized in a suite of interdependent ITU–R and ITU–T recommendations, is receiving much attention. To rapidly address the remaining challenges, the World Telecommunication Standardization Assembly, in October 2000, established a special study group known as IMT-2000 and Beyond

To conclude, the myth that ITU has nothing to do with the Internet is clearly off the mark. In fact, as support for IP-based networks becomes more and more integrated into the global telecommunications framework, it is obviously going to be much harder to distinguish between ITU's telecommunication activities and its Internet or IP-based network activities. Indeed, most of ITU's standardization activities now have either explicit or tangential relationship with IP networks. Similarly, IMT-2000 is claimed by most analysts to be just as equally important for mobile Internet access as it is for voice. Likewise, services based on IP telephony, standardized in ITU–T recommendations, are very likely to become a common feature of the general telecommunications landscape — if for no better reason than the benefits of voice and data integration. For these reasons, the boundaries between the telecommunications world and the IP world, including the Internet, will increasingly only be shades of grey. ■

Photo: Clarent Corporation (ITU 000065)

Thailand country case study

This article is the second in a series to be published from ITU case studies on IP telephony

The introduction of the Internet protocol (IP) in many national and international networks over the past three years reflects a number of broad trends in the overall evolution of both global and national information infrastructures. One of these trends is the emergence of a much more vibrant market for long-distance and international calls. There is even a hint of the excitement and chaos of a real market-place with new buyers and sellers rapidly entering, new products and prices being offered monthly, if not daily.

Many countries ban IP telephony completely, yet IP calls can be made to almost any telephone in the world. Many public telecommunication operators (PTO) are establishing their own IP telephony services, and/or using IP-based networks as alternative transmission platforms. Whether all the traditional operators will be able to find a place in this new, "open-air" market, remains to be seen. However, the "early and rapid adapters" stand the best chance of sustaining themselves in this new environment while the "wait and see" group may gradually witness their customers exiting and their traditional markets eroding.

Internet development and the voice telephony market

Thailand, as a developing economy, provides an example of how traditional monopoly markets for long-distance and international calls are becoming contestable due to technological developments such as cellular mobile and more recently Internet telephony. According to the Telegraph and Telephone Act of 1934, the government has a statutory monopoly in the ownership and operation of a public telecommunications network. Thus, the two State-owned carriers namely, the *Communications Authority of Thailand* (CAT) and the *Telephone Organization of Thailand* (TOT) are monopolies in the local and international call services respectively.

During the rapid expansion of the Thai economy in the early 1990s, it became evident

Thailand: *IP Telephony and the Internet* forms part of a series of telecommunication case studies produced under the New Initiatives Programme of the General Secretariat of the International Telecommunication Union (ITU). This case study was prepared by K. K. Gunawardana and William Withers of the ITU Regional Office in Bangkok, and Somkiat Tangkitvanich, of the Thailand Development Research Institute and directed by Ben A. Petrazzini, Policy Adviser, ITU Strategies and Policy Unit (Ben.Petrazzini@itu.int). Other cases, including studies on IP telephony in China, Colombia and Peru, can be found at www.itu.int/iptel.

that TOT and CAT alone could not expand their services to meet the surge in demand. To circumvent legal restrictions, a number of build-transfer-operate (BTO) concessions were granted to private companies. These concessions allow the State agencies (as concession providers) and the private companies (as investors of network construction and service providers) to share monopoly benefits by revenue or profit-sharing schemes. These concessions have led to a limited competition in the telecommunications market. Currently, concessions have been granted to two fixed-line telephone operators, five mobile phone operators, 18 Internet service providers, and more than 25 pager, VSAT, and other value-added service providers.

Many countries ban IP telephony completely, yet IP calls can be made to almost any telephone in the world

Photo: Clarent Corporation (ITU 000064)

The State monopoly, together with the BTO scheme, constitutes a unique feature of the Thai telecommunication market. It is in this context that voice over the Internet protocol (VoIP) technologies offer a new dimension of competition.

CAT and TOT have both announced their intention to introduce IP-based voice services. In fact, CAT's new service, *phoneNet*, is competing with TOT's traditional international long-distance service. In turn, TOT's domestic VoIP service will compete with the domestic long-distance and international service offered by the two major cellular mobile operators: *Advanced Info Service Plc.* and *Total Access Communications*. Consequently, *de facto* rivalry has emerged in these two market segments in advance of them being formally liberalized in 2006, based on the World Trade Organization (WTO) commitments.

Present trends and future developments

The CAT proposal

Although being designated as having a monopoly in the provision of international telecommunication services, CAT has not been fully protected from competition. In recent years, CAT has seen its revenue eroded by competition from international call-back and substitution of fax and voice calls by e-mail, and other Internet-based services. To regain its falling revenue, CAT launched phoneNet as a low-priced alternative to its basic international telephone service. The State agency has subcontracted *Hatari Technology Co. Ltd.* to market the service. In return, Hatari will earn 10 per cent on sales of the service up to Thailand Baht (THB)* 40 million and 15 per cent on sales of THB 100 million for five years.

The service now covers about 75 countries. To access the phone-to-phone service, users must first buy a calling card that will give them a 12-digit access code. There are two types of calling cards: silver and gold. The cards cost THB 5000 and 10 000, respectively. With the cards, users can make an international call from any phone, including mobile and public telephones.

The TOT proposal

TOT officially launched its VoIP service in October 2000 under the name *Y-Tel 1234* to provide a cheap domestic long-distance call service. The service is part of the State agency's efforts to compete with mobile-phone services and is also in line with the government's policy of low-cost services in the provinces.

* THB 43.6 converts approximately to 1 USD at the exchange rate of 24 October 2000.

A policy strategy for developing countries?

While IP telephony presents an opportunity to bring lower prices for distance calling to those consumers already connected to the information infrastructure, it offers little to the unconnected. However, the technology has immense potential to provide access at an investment cost some five-fold to eightfold less than that of a PSTN line. Therefore, national policy-makers in developing economies must also consider the implications of IP telephony in the context of their plans and objectives for bringing universal access to those parts of their nations which remain either not served or under-served by their information infrastructure. The following elements of a policy strategy for developing countries should be considered in the context of addressing both the introduction of IP telephony, as it is currently offered, as well as the full liberalization of the international long-distance market:

- *Ensure accounting, settlement and collection rates are either closely representative of costs or that international operators have a defined plan for reaching cost-oriented price-levels for international services within the next two- to three-year period.*
- *Ensure that international operators are either employing or planning to employ the most efficient technology available for international voice services within the next three-year period.*
- *Require all international operators to ensure that settlement rates are essentially uniform from one route to another in order to limit the opportunities for arbitrage.*
- *Ensure any "sender-keeps-all" arrangements are discontinued or renegotiated to prevent the "dumping" of incoming traffic from such destinations.*
- *Negotiate with foreign operators to share the cost of international leased lines employed for Internet traffic.*
- *Ensure the policy for the international information infrastructure is comprehensive in that it addresses not only traditional IDD service but also IP telephony, call-back, country-direct, calling-cards, and simple resale as well as the general liberalization of the market segment.*

Users do not need cards or a subscription to use the service. All they have to do is to dial extra digits "1234" before dialling the destination number. The service is available to any telephone, including public telephones. Currently, however, only the TOT subscribers will be able to use the service.

Technically, the IP traffic will be passed to the public fixed-line network, unlike most VoIP services which use private networks. It appears that TOT is attempting to fully utilize its public line capacity. Concerning the quality of voice, TOT claims that the delay experienced by the users of Y-Tel 1234 is no more than 100 ms, a significant improvement over 250 ms delay of the satellite-based telephone service.

Conclusion and future prospects

While VoIP services are usually offered as lower priced calling packages by new entrants in a liberalized market, in Thailand the services are provided by incumbent State agencies to protect their falling revenues. The services are currently monopolized by the agencies, but the situation is about to change. In fact, the year 2000 is a year of changes for the Thai telecommunication market.

Firstly, the law to establish the National Telecommunications Committee (NTC), an independent regulatory body, became effective in March 2000. Once established (now expected by the second quarter of 2001), NTC will replace the State agencies as the regulator.

At this stage, however, it is too early to assess the degree of liberalization and the impact of the regulatory changes on the provision of VoIP and other long-distance and international services. The draft Telecommunication Act, approved by the Cabinet in the second quarter of 2000, provides little detail concerning the future market structure except that CAT and TOT will be able to continue to provide their existing services. The pace of liberalization, licensing conditions, and number of licences to be issued are all subject to regulation by NTC. How much and how soon the Thai people will fully benefit from entirely liberalized markets and ever-emerging technological innovations, such as VoIP services, remains to be seen. ■

The Asia-Pacific

Centre of Excellence

The ITU Centres of Excellence initiative, launched in 1997, is an innovative approach to train policy-makers and regulators in the development of national sector priorities and regulations conducive to private sector investment. These Centres are spread across all regions of the world. Two million Swiss francs were allocated from the TELECOM Surplus Fund to each Centre of Excellence as seed funding and form the nucleus on which further contributions are raised, in cash and in kind. Arthur Morse, Project Manager of the Asia-Pacific Centre of Excellence since January 1999, talks to *ITU News* about this unique project.

■ ***Why did the Asia-Pacific region opt for a Virtual Training Centre rather than a traditional bricks and mortar institute?***

The requirement for life-long learning in telecommunications and information technology is a real issue everywhere. Initially, the Centre of Excellence (CoE) concept was to introduce support for existing institutions and training centres around the world. The fundamental aim is to help train high-level policy-makers, who are grappling with the issues of establishing regulatory offices and policies, to cope with the new telecommunications environment. In view of the very diverse nature of the region and the large range of expertise that exists from Iran through the Pacific Islands, we considered, in association with our colleagues in Geneva, that such training might best be done in a virtual way without having a physical centre at one location.

We believe that the human capacity building process can be assisted in numerous ways, from guidance on how to access reference materials that would be suitable for individual and small group learning, to the formal provision of training courses, workshops and roundtable meetings as well as distance learning programmes.

Virtual training can be a challenging task. Luckily, we are assisted greatly by a Steering Committee comprising very eminent people from across the region: directors-general, regional organizations such as the Asia-Pacific Telecommunity (APT), the Asia-Pacific Economic Cooperation (APEC) and the Asia-Pacific Broadcasting Union (ABU), as well as by directors of research from private companies and training centres. All of these people help to guide the project.

■ ***What are the long-term objectives?***

In the long term it is expected that the Asia-Pacific Centre of Excellence will be a self-sustaining venture with a wide participation from a variety of partners and contributors, particularly

from government, industry and regional institutions. Already, partnerships are being forged with professional institutions so that resources can be shared and benefits brought to the widest possible audience using the Internet. Examples include the International Engineering Consortium, which offers over 90 tutorials on the most current technologies, and The Institution of Electrical Engineers (IEE) of the United Kingdom.

Partnerships are also being forged with training centres in the region, especially those that are developing distance learning as a means of increasing training to the least developed countries.

The Asia-Pacific CoE will serve as a test bed for new training courses and training delivery methods with the objective of identifying those that work best in the region and especially those that provide cost-effective solutions and meet the requirements of developing countries.

Any concrete results so far?

The Asia-Pacific CoE really got under way eighteen months ago. Already, the Centre has designed a series of capacity-development programmes. In the start-up phase of the project, we set up a virtual library providing access to reference material on topical issues of interest to the target audience. There are some great websites and ITU has its own Virtual Training Centre (VTC) with a library that has an extensive selection of materials and links to other websites. We are encouraging training course developers to access the virtual library to gain new knowledge that could help them to upgrade their training materials. The ITU Human Resources Management and Development Unit in Geneva has built up a comprehensive programme of training courses. Some of these materials can be accessed and downloaded via the VTC.

In addition, we have developed and run several specialized training courses in association with partners. Let me give you some examples. ITU produced a training of trainers' course in the techniques of designing distance-learning materials and made this available to the Asia-Pacific Institute for Broadcasting Development (AIBD).

ITU also developed a distance-learning training course on the management of the radio-frequency spectrum and made it available to the Asia-Pacific Broadcasting Union.

The Asia-Pacific CoE has sponsored projects under the Technical Cooperation among Developing Countries Programme as a way of encouraging collaboration in the region. Indonesia has been very successful in the application of software tools created by ITU for strategic network planning purposes and Viet Nam is now using the same software

Photo: Jean-Marie Micaud (ITU 990060)

In November this year, a Web-based seminar took place at the Institute of Vocational Education in Hong Kong (China) for a group of industry and academic leaders, who shared their experiences and exchanged views on the brain drain in information and communication technologies. The proceedings were recorded on video and will be edited and made available on the Asia-Pacific CoE website. The next stage of the Web-based conference is to set up a chat group on this website to continue the debate on the various aspects of the brain drain in the region.

A convergence workshop was held in Manila in October this year and brought together senior managers from engineering, planning, marketing and customer service departments of telecommunication operating companies. They discussed the development of customer-related strategies, network convergence, e-commerce and implications for telecommunication business and management in the new environment.

Strategic network planning

A number of training courses in strategic network planning and development have also been conducted to meet the needs of planners, design engineers and researchers working in the fields of switching, transmission, information technology (IT) and related fields.

The Asia-Pacific CoE has sponsored projects under the Technical Cooperation among Developing Countries (TCDC) Programme as a way of encouraging collaboration in the region. A good example of this is the cooperation between Indonesia and Viet Nam in the field of network planning. Indonesia has been very successful in the application of software tools created by ITU for strategic network planning purposes and Viet Nam is now using the same software.

Planning for the Asia-Pacific CoE project is to be coordinated using virtual conference software. Currently, over 20 contributors from 14 countries have agreed to par-

The TELECOM Surplus Fund and the Centres of Excellence

ITU TELECOM events are staged for the benefit of ITU Member States and Sector Members. Much of the surplus income, which these events generate, is used for telecommunication development projects primarily in the least developed countries of the world. A number of these projects are being implemented under the Special ITU-TELECOM Development Programme initiated in 1997 to complement the activities of the Union's Telecommunication Development Sector in the period 1997–2002. The programme has four components: human resource development, infrastructure development, assistance to countries in special need, and application of new technologies.

The human resources development component of the programme initially focused on the establishment of four Centres of Excellence, whose primary mandate is to train public officials in policy and regulatory issues. The Centres also have a number of other valuable functions, including the provision of training advice and information on the management of the radio-frequency spectrum. Ministers will be able to use the Centres to gather information and advice, particularly where large national and continental projects are concerned.

Two of the Centres are located in Africa, specifically in Dakar and Nairobi, where existing regional training institutions, the *Ecole supérieure multinationale des télécommunications* (ESMT) and the African Regional Advanced Level Telecommunication Training Institute (AFRALTI), are being transformed into Centres of Excellence. The Americas and Asia-Pacific regions have taken a somewhat different approach, in that a number of existing training and research institutes are being linked into a virtual network of Centres of Excellence.

A new Centre of Excellence was estabilised this year in the Arab States, with the goal to develop existing regional expertise and to create a network between training providers.

ticipate in the virtual planning group activities that will help to determine priorities, exchange information and initiate work in support of future development.

In October this year, the *Telephone Organization of Thailand* (TOT) hosted a workshop at its training centre in Bangkok, bringing together researchers, designers, forecasters and planners engaged in network planning activities in ministries and telecommunication operating companies. The course covered voice and non-voice services, as well as the Internet and intelligent network services and provided an opportunity for participants to learn more about PLANITU (the ITU network planning software).

On policy and regulation, a course has been initiated by the Asia-Pacific CoE project and is scheduled to begin in early 2001. This course will utilize face-to-face workshops as well as Internet for increasing the effectiveness of the learning process.

In Hong Kong, the Office of the Telecommunications Authority (OFTA) has taken the initiative together with the Asia-Pacific CoE project to search their archives, identify and organize materials into modules by topics. These modules are suitable for self-learning by downloading from the Internet.

A good example of combining face-to-face learning with distance support is possibly the Pacific Islands project "Telecommunications Sector Governance in Small Island Countries in the South Pacific", in which Asia-Pacific CoE is expected to provide an essential component of Web-based materials. This two-year project is funded by the United Nations Development Programme (UNDP), with significant inputs from the TELECOM Surplus Fund, the Australian Government, through its National Office of Information Economy, APT and the Pacific Islands Telecommunications Association. Its aim is to develop the national skills in the island countries needed to carry out the reform process. The distance-learning component contributes significantly by reducing cost, increasing effectiveness and ensuring continuity of the endeavour.

A good example of combining face-to-face learning with distance support is possibly the Pacific Islands project "Telecommunications Sector Governance in Small Island Countries in the South Pacific". This two-year project is funded by the United Nations Development Programme, with significant inputs from the TELECOM Surplus Fund

Photo: INFOCOMMS Forum, Asia-Pacific, June 2000 (ITU 000067)

■ ***What does the future hold for virtual training, given that the project is still using face-to-face meetings?***

The future looks promising. The project is still in its infancy and we have to use workshops at times, but the next step is to have truly virtual communications.

All the workshops mentioned in this article were videotaped with the intention of archiving the materials for future use as distance learning materials.

All in all, the Asia-Pacific Centre of Excellence has made a good start and future success will depend on how quickly we forge partnerships and identify win-win situations across the entire communications sector. ■

Transforming ITU into a dynamic, progressive and effective international organization

Malaysia's perspective

Tan Sri Nuraizah Abdul Hamid
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Need for a global policy framework

Rapid advancement of technology and the growing convergence of the telecommunications, broadcasting and online services has changed the landscape of the traditional telecommunications sector. Current developments have also underlined the urgency to put in place an effective global communications and multimedia policy framework which can facilitate and act as a catalyst for all Member countries of the International Telecommunication Union to transform their economy from a production-based to a knowledge-based economy. In addition to the traditional demands for an efficient and equitable spectrum assignment, global standards setting and coordination of policy initiatives, the converged environment has brought along new, diverse and complex challenges. These challenges include issues on cross-border transactions made via the Internet, network security and integrity, development of global and regional infocommunication infrastructure, a more equitable Internet charging mechanism as well as the need for harmonization of new, fast changing and different technologies introduced by network providers. Here lies the opportunity for ITU to take on a new role to meet the pressing needs of a global organization that could develop and coordinate policy requirements as well as set rules and regulations to address these issues and challenges.

Redefining the roles and functions of ITU

ITU was established in 1865 and became a specialized agency of the United Nations responsible for telecommunications in 1947. Throughout its long history, ITU had adjusted and adapted its role very well to meet the needs for the development of an orderly and efficient global telecommunications sector. However, the changing global communications and multimedia environment requires a new strategic approach that can successfully effect a major reform within ITU so that it will continue to be relevant and effective to assume its new role as the global body responsible for the development of this new sector.

Change is inevitable

The most complex of all challenges is often that of recognizing that change is due and necessary, how to proceed with change and how to direct that change to effect a desired vision. ITU currently faces this dilemma of providing reform from within, which, for an organization that has been in operation for over a century, is obviously not an easy task noting that the global scenario is not *ceteris paribus* whilst it designs and effects that change process. However, for ITU, change has not only become unavoidable but crucial if it is to be truly dynamic, competent and relevant.

The first step towards reform had been taken when the Plenipotentiary Conference (Minneapolis, 1998) invited the Council to establish an open working group of Member States and Sector Members to review the management, functioning and structure of the Union, as well as the rights and obligations of Member States and Sector Members. It also instructed the Secretary-General and the Directors of the Bureaux to report to Council on the further changes for improving the organization and working methods that are necessary to ensure that ITU is able to meet its objectives as set forth in the Constitution and developed in the strategic plan.

Parameters for change

Following on this recommendation, the parameters for change and reform have also been defined by the Reform Advisory Panel, or RAP. These recommendations focus on eight areas of change which cover the structure of the organization, its mission, its management of scarce resources with regard to policy development and coordination, working methods and the management of events including TELECOM exhibitions and related activities.

It is heartening to note that a Working Group on Reform has also been set in motion to address five basic challenges facing ITU as identified by the Secretary-General. These challenges arise from:

- growing market liberalization and the spread of competition;
- the phenomenal growth of the Internet;
- the convergence of the telecommunications sector with the computing and broadcasting sectors;
- the changing nature of the telecommunication development gap, which we now characterize as "digital divide";
- the accelerating pace of the above changes and the demands by Members on how ITU should organize its own work.

Having identified these challenges, however, the question before us now is where do we go from here?

Some suggestions for ITU's reform road-map

In order to ensure that the reform process will be more structured and organized, I believe that ITU should take into consideration the following suggestions when drawing up its road-map for reform.

■ There has to be a clear redefinition of the role and functions of ITU. Since there is already a general consensus for change and the rationale has been clearly expressed in various documents circulated to the membership, ITU must now redefine its vision, its mission and objectives and identify the specific areas, which are or should be its focus and areas of core business.

In identifying the core business, ITU needs to be guided by the challenges facing it, in particular:

● Parallel initiatives that are being spearheaded by other regional and global agencies.

● The rapid convergence of its core sector, telecommunications, with other sectors which requires that ITU develop new expertise in other component elements, such as content, network security and new value-added application services, that are currently not within ITU's competencies.

● The rise of the new mixed but increasingly liberalized market environment in which various systems such as monopolies, privatization and open competition coexist.

● The changing role of government in many countries as policy and industry regulator whilst leaving the responsibility of providing infrastructure and services to the private sector.

● The trend towards self-regulation by the industry players, especially in the Internet-based services, as a means to cope with the fast-changing environment arising from new products and rapid technological changes introduced in the market-place.

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Photo: A. de Ferron (ITU 981033)

- Emergence of cross-border issues particularly those related to the Internet-based services which, until today, have not been effectively addressed and resolved in any global forum, but are impacting the sector.

■ Based on the redefined roles and functions, the organizational structure as well as the management principles and practices of ITU have to be reviewed and refined. ITU's products and services currently face unprecedented competition from well-organized and high-level parallel initiatives on a regional and global basis on many fronts, including its core domain, the telecommunications sector. Indeed, ITU's very survival and continued existence hinges, to a large extent, on its ability to re-engineer its structure, working methods and practices, as well as decision-making process, to meet the demands of the new convergent environment. It must be emphasized that due to the rapid changes in technology, the new environment is extremely fluid and thus demands quick responses and when a decision is to be made, it must be made expeditiously. Therefore, there must be a review of ITU's current cumbersome bureaucracy. In the process, perhaps, some rather drastic actions may have to be taken after analysing the areas highlighted below:

- What ITU can and should do.
- What it must not do and steps to implement this.
- What are the necessary steps that it must take to carry out the redefined as well as the new functions and responsibilities.
- How to improve the current decision-making process. Should the practice of decision-making by consensus be modified or should this be applied only to those important policy proposals whilst empowering the Secretary-General to decide on operational issues?

■ A thorough, perhaps external review of the Constitution itself is imperative. To realize the new vision of ITU, additional enabling provisions or amendments to the Constitution may have to be

made for areas in which major changes to the functioning and operations of ITU are necessary. A strategic initiative in this direction should be undertaken immediately for consideration by the next Plenipotentiary Conference scheduled for 2002.

■ The on-going review of the current treaty-related issues of ITU needs to be carried out with greater urgency. In addition to the Constitution and Convention above, the review should also cover the following:

- International Telecommunication Regulations (ITR).
- The Radio Regulations.
- Activities with regulatory implications.
- The structure and working methods of the Radiocommunication Sector and the Telecommunication Development Sector.

It is pertinent to remind ourselves that for ITU to successfully complete the reform process, it requires the unwavering support of all

This important review must also take cognizance of the possible changes in the role and functions of ITU, as well as the need for proposed treaty-related changes to harmonize with the changing environment generated by convergence and the growing importance of the Internet.

■ There must be clear targets, deliverables and effective review mechanisms built into a concrete and comprehensive plan of action to ensure that the changes will be effected through a smooth transition. An incremental approach, as was the practice in the past, is no longer an option.

■ There must be a specific time line for the change process to take place. In view of the fast-changing market environment facing ITU, changes to be proposed must be implemented within the shortest time possible. Currently, several other Member States, including Malaysia, Australia and Singapore, have or are going through similar processes for change. Thus, if ITU is to be a leading authority and a benchmark for Member States, with the expertise, knowledge and capacity to advise and educate, ITU has to go through this reform process more rapidly, however painful or difficult it may be.

Conclusion

The proposals in this article are made based on the current realities, the trend towards privatization, liberalization and globalization which has led to a more competitive market environment, the changing role of public and private agencies, the convergence of technologies as well as the growing acceptance of the Internet and networked services. The proposals have also taken into account new initiatives undertaken by many Member countries. These initiatives include the establishment of independent and autonomous regulatory authorities and the introduction of new sets of regulatory provisions, and institutional changes to the policy-making body to manage and address the challenges under the new environment.

It is pertinent to remind ourselves that for ITU to successfully complete the reform process, it requires the unwavering support of all the Members. Unfortunately, in undertaking this exercise, the ITU has no benchmark as there is no other international organization that operates in such a fast-changing environment. Therefore, ITU might wish to seek the assistance of an external team of consultants who would be able to provide not only the expertise but, more importantly, the objectivity and neutrality that are essential elements in such an exercise.

ITU has already embarked on the right track with its move towards the reform process. One positive aspect of this move is the strong and resolute management commitment to take on reforms by the highest level of leadership within ITU, namely the Plenipotentiary Conference and the Council. If we really want ITU to be dynamic, competent and relevant to serve the global society, all the developed and the developing countries, all Member States and Sector Members should also be equally committed. I sincerely hope that all of us will provide the necessary support to the Secretary-General to expedite the reform exercise. Such support is necessary so that the required change and readjustments that all of us are looking forward to, could be materialized in the shortest time possible.

In short, ITU today has only one of two choices: to emerge as an even stronger benchmark for its core business or to fade away. ■

Egypt to host ITU TELECOM MIDDLE EAST and ARAB STATES 2001

On 22 September 2000, ITU Secretary-General, Yoshio Utsumi signed an agreement with Fayza Aboulnaga, Ambassador and Permanent Representative of Egypt to the United Nations and other international organizations in Geneva, to hold an international telecommunication exhibition and forum in Cairo from 7 to 10 May 2001.

Photo: A. de Ferron (ITU 001017)

At the signing ceremony Mr Utsumi said: "ITU is delighted to have the opportunity of staging a TELECOM event in Egypt in 2001. It will be the ideal opportunity for key players in the region, from both industry and government, to see the latest developments in the world of telecommunications and to meet and discuss the most pressing issues facing the telecommunications market-place today."

Ms Aboulnaga confirmed that the region offers a diverse range of business opportunities and tremendous scope for expanding both basic and advanced telecommunication services. "I feel sure that MIDDLE EAST and ARAB STATES 2001 will enhance prospects for all of us to develop telecommunications and to act as a catalyst to speed up our social and economic progress", she said.

ITU received invitations with very attractive conditions from a number of countries in the region to host MIDDLE EAST and ARAB STATES 2001. It was not therefore easy to decide on the venue. After many consultations and a series of negotiations, and taking into account the particular considerations of infrastructure, accommodation, transport, as well as conference and exhibition facilities, Mr Utsumi accepted the offer of the Government of the Arab Republic of Egypt to host the event at the Cairo International Conference Centre. The venue is ideally located and offers advanced exhibition and forum facilities. It was previously used by ITU to stage the highly successful AFRICA TELECOM 94 event.

Yoshio Utsumi and Ambassador Fayza Aboulnaga.
Photo: A. de Ferron (ITU 001016)

For more information, please contact: "ITU TELECOM Secretariat (Tel.: +41 22 730 6161. Fax: +41 22 730 6444)". You can also visit the Telecom website at www.itu.int/TELECOM. ■