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ITU NEWS

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Asia-Pacific markets Diverse and vibrant





ASIA-PACIFIC TELECOMMUNICATION/ICT INDICATORS 2008

Broadband in Asia-Pacific: too much, too little?

Launched at ITU TELECOM ASIA 2008

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**ITU TELECOM
ASIA2008**
Bangkok
2-5 September



**International
Telecommunication
Union**



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Editorial office/Advertising information
Tel.: +41 22 730 5234/6303
Fax: +41 22 730 5935
E-mail: itunews@itu.int
Mailing address: International Telecommunication Union
Place des Nations
CH-1211 Geneva 20 (Switzerland)
Subscriptions
Tel.: +41 22 730 6303
Fax: +41 22 730 5939
E-mail: itunews@itu.int

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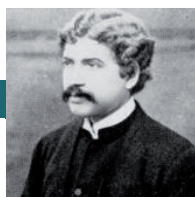


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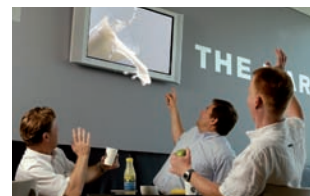
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Dr Hamadoun I. Touré

ITU Secretary-General



ITU's leadership in the domain of information and communication technologies (ICT) dates back more than 140 years. An enormous amount has changed in that time. Witness, for instance, the many aspects of our lives that are going digital. But although the tools and technologies may change, ITU remains steadfast in its commitment to connecting the world.

ITU TELECOM events are an important component in achieving this objective, as we bring stakeholders together from across the industry to discover the latest and greatest advances, and to form new partnerships to meet the ever-changing demands of the modern world. Providing people with the means to communicate expands their creativity, capability and development. And the progress that will be made towards this goal at ITU TELECOM ASIA 2008 will enhance connectivity for the greater good of all.

Regional ITU TELECOM events are designed to address the specific needs of various parts of the world. The Asia-Pacific region is extremely dynamic and there is a wealth of opportunity for perceptive and responsive players. The theme of this year's event, "New Generation, New Values", stresses how new users of ICT are pushing the sector forward into new territory, in an environment of new market drivers, new rules, and innovative business models. In the midst of the region, Thailand serves as a hub that has access to both leading-edge innovators and rapidly developing emerging markets.

Our hope is that, at the Forum and Exhibition, participants will capitalize on its many networking, business and investment opportunities, and so help to further advance the ICT sector in the Asia-Pacific. I am confident that ITU TELECOM ASIA 2008 will be a rich and inspiring experience for all!



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Mun Patanotai

Minister of Information and Communication Technology of Thailand



On behalf of the Royal Thai Government, I would like to extend a warm welcome to participants in ITU TELECOM ASIA 2008. The Ministry of Information and Communication Technology is proud of the fact that Thailand was selected as the venue for ITU TELECOM ASIA 2008, which is taking place in Bangkok from 2 to 5 September 2008.

The theme of this year's event is "New Generation, New Values". Comprising a high-calibre exhibition, a Forum and much more, ITU TELECOM ASIA 2008 provides a major networking platform for sharing ideas from all sectors of the industry — on policy, regulatory, economic, and development issues — to meet the challenge of strengthening and expanding information and communication technologies (ICT) in the Asia-Pacific region. The event will also feature a Youth Forum that will bring together young people from across the region for a programme of discussion and debate, and a Telecommunication Development Symposium, as well as a host of networking opportunities for meeting and conducting business.

Asia spans some of the world's most sophisticated telecommunication and ICT markets, with the highest levels of ICT penetration. Exciting new technologies, such as wireless or next-generation mobile, are gaining ground across the region, and these have the potential to reach out to huge numbers of new users. The combination of all these factors makes it a truly exciting region to explore.

In line with the regional trend, Thailand's ICT and telecommunication sector has itself entered a strong growth phase. Fast-changing technology, competitive prices and the entry of strong, new financial players have intensified the competition in Thailand's telecommunication market.

Again, welcome to Bangkok and to ITU TELECOM ASIA 2008! I hope that you will take this opportunity to create and strengthen relationships and open doors to greater influence and exciting partnerships. And of course, I hope that you will have a great stay in Bangkok.



ITU TELECOM ASIA 2008 New generation, new values

The Exhibition

The exhibition at TELECOM

ASIA 2008 will comprise a vibrant show floor with the region's latest innovations in ICT, from broadband services to mobile and wireless technologies; from next-generation networks to satellites, and much more. Exhibitors include companies from around the world:

Australia, Canada, China, the Czech Republic, Germany, France, Hong Kong (China), the Netherlands, India, the Republic of Korea, Israel, Japan, Malaysia, the Russian Federation, Switzerland, Thailand, the United Arab Emirates, the United Kingdom, and the United States.

ITU TELECOM ASIA 2008 is a key networking platform for Asia's top names in information and communication technologies (ICT), as well as international players, to come together and focus on core issues affecting the industry and society as a whole. An exhibition will showcase advances in ICT. And at the Forum, high-level government officials, industry executives and key stakeholders will gather for dialogues on the sector's most important innovations and most significant issues.

ITU TELECOM ASIA 2008 takes place from 2 to 5 September at the IMPACT Exhibition and Convention Centre in Bangkok, hosted by the Government of Thailand.

The Forum

In the vast and diverse region that is the Asia-Pacific, ICT are constantly evolving. The great majority of people making use of innovations are the young, while new and sustainable business models are increasingly coming to the fore. These trends are reflected in the theme of ITU TELECOM ASIA 2008, which is "New Generation, New Values". Discussions on the theme will examine three broad topics, covering the interests of youth, business, and society.

The connected generation

The Asia-Pacific region includes markets spanning every stage of economic development. But what they have in common is the enthusiasm of younger people in particular to embrace the future brought by ICT. Under the heading of "the connected generation", Forum participants will look at the speed with which Internet connectivity is spreading across the continent, fuelled by demand from a growing population of the young. This new generation will never have known a time without mobile phones, easy communication, and access to an apparently limitless online world. Their expectations for ever better devices will present enormous challenges and opportunities for industry.

One session at the Forum will be devoted to "the broadband generation". It will look at what needs to be done to meet the requirements of new ICT users, within individual countries and across the region. What options will be available to create the infrastructure needed to match developments in content and applications? The discussion will be expanded in the following session on "the networked generation". Its topic is social networking, which has become an



© Jeremy Sutton-Hibber/Alamy

extremely popular part of youth culture, and the convergence between real and virtual worlds. This trend is revolutionizing how consumers interact with their communication devices, each other, and society around them. The implications are tremendous for the ICT industry and other businesses, as well as for media, policy-makers and society as a whole.

Next-generation business

Traditional business models must adapt to this new environment, and how they might do so will be examined under the theme “new business generation, new value”. Colliding industries, shortened product lifecycles, content-creating consumers, and diverse regional economies all point to the need to build new and flexible business models. Those who understand how to tie together technology, markets, and consumers will reap the new value generated by the new generation of business.

“New business models” will be discussed at a Forum session that examines how access to ICT has become “democratized” as more and more people use it. There is growing demand for personalization of devices and services. Rather than accepting what-

ever is available, users expect to receive the product they want, when and where they want it. Furthermore, the functional boundaries between provider and customer are being blurred by open-source initiatives and user-created content. They are also being blurred by the new experiences of virtual worlds and ubiquitous connectivity. This will be explored at a session on user interfaces with ICT.

Despite the global nature of the Internet, location-based services are also a core element of the Asian media experience. These provide new business opportunities that will be debated in the session on “next-generation value-added services”. Meanwhile, in order to deliver connectivity to all — including residents of remote areas — successful funding models need to be found that encourage investment by the private sector. They will be discussed at a session on “innovative financing for sustainability”.

Meeting the needs of society

Communication systems are so important for modern societies that they must be the subject of public policy which is carefully thought out. The Forum will consider aspects of policy such as regulation, which



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Also at TELECOM

Alongside the main Forum, the following events will take place at TELECOM ASIA.

Youth Forum

These special youth-driven sessions are held at each TELECOM event around the world. Youth Fellows are selected from among talented university-level students in ITU Member States in the region, and in Bangkok, they will have the opportunity to meet and share ideas on ICT issues with leaders of government and industry.

Telecommunication Development Symposium

The Symposium is a global programme managed by ITU as part of its mission to extend the benefits of ICT to all the world's inhabitants. Member States in the Asia-Pacific region are invited to nominate middle-level managers in charge of telecommunication policy, regulation, planning or operations. The participants are able to acquire first-hand knowledge of the latest developments, and to discover how they could be applied to their own development plans.

must be fit for purpose in 21st century communications. It can create the environment needed to promote universal access, as governments and industry work together to turn gaps in infrastructure into fresh opportunities for business.

Regulatory impact of next-generation networks


Current regulatory models relate to legacy telecommunication networks, but rapid investment in next-generation networks (NGN) calls for a change in approach. NGN are based on the Internet Protocol (IP) and can deliver a wide range of services over a single network, from broadband to broadcasting. The right policy and regulations are needed to facilitate migration to NGN, and a workshop at the Forum will consider the issues. These include cost-based pricing; how "rate shock" for customers can be avoided as they migrate to NGN, and the effects of uncertainty about access regulations. The workshop will also review the variety of policy models on offer to ensure universal access to NGN, and whether existing regulatory models for universal service will work in an NGN environment.

Cybersecurity

A Forum session will examine the challenge of cybersecurity. One of the major issues in the Asia-Pacific region today — as it is worldwide — is a growing and lucrative cybercriminal economy. And while huge in-

vestments have been made towards putting government services online, there are worries about aggregating massive amounts of personal data that could fall into the wrong hands. Participants will discuss how safeguards can be put in place to protect the rights and privacy of citizens, whilst keeping the convenience that electronic identity systems offer.

Emergency telecommunications and climate change

Emergency telecommunications and relief are another extremely important use of ICT that will be discussed at the Forum. It is a field of particular interest to the region, which has experienced such terrible natural disasters as the Indian Ocean tsunami in 2004, the Pakistan earthquake in 2005, and — just this year — a devastating cyclone in Myanmar and an earthquake in China. One cause of such disasters is climate change, which will feature in a Forum session on "going green". ICT can help to mitigate global warming by improving efficiency in all industrial sectors, including their own, and they are also invaluable in monitoring and studying climate change. What are some of the emerging climate-friendly technologies and business models? The Forum will look at how ICT vendors and providers can become more environmentally responsible, as well as at the role of governments and regulators. 

Leading the world

The Asia-Pacific's mobile and broadband future

/// The Asia-Pacific region is a world leader in telecommunications as well as in information and communication technologies (ICT), according to a new report by ITU. The *Asia-Pacific Telecommunication/ICT Indicators Report* was prepared specially for ITU TELECOM ASIA 2008, taking place in Bangkok, Thailand, on 2–5 September. It provides an overview of developments in a region that tops the list in many aspects of ICT.

In particular, the report focuses on an area in which the region stands out: the adoption of advanced technologies such as broadband Internet access and mobile data communications. And, “the report’s statistical information and analyses provide a comprehensive guide to the region’s ICT environment for policy-makers, as well as investors and market analysts,” points out Director of ITU’s Telecommunication Development Bureau Sami Al Basheer Al Morshid in the publication’s foreword.





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The big picture

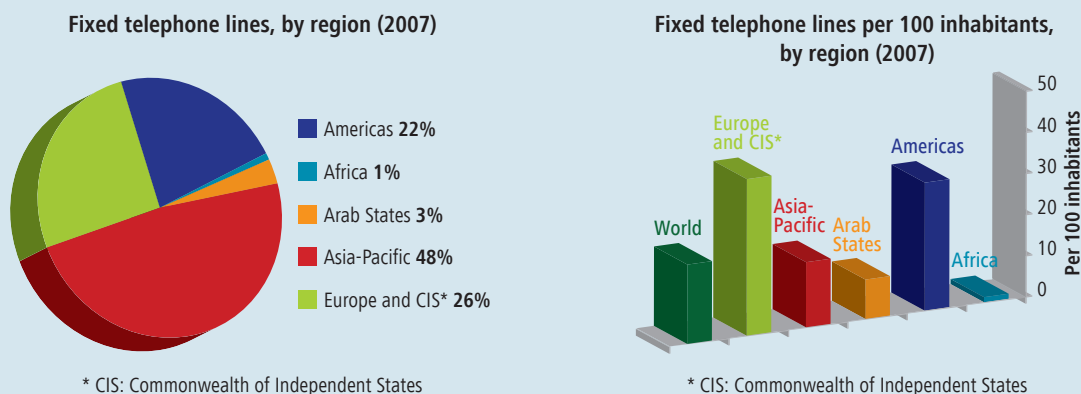
The Asia-Pacific region has almost half of the world's total fixed telephone lines (Figure 1, left) and China alone accounts for almost one third of these. With a penetration rate of 16 fixed phones for every 100 inhabitants, the region is just three points below the world average (Figure 1, right).

As elsewhere, mobile telephony has grown rapidly in the region. With 1.4 billion mobile phone subscribers, it had the largest share among world regions at the end of 2007. Much of this growth is occurring in China and India, which had over 600 million and 280 million mobile subscribers respectively by mid-2008, representing close

to a quarter of the world's total. China is the world's leader in terms of the number of mobile subscribers, with India, Indonesia, Japan and Pakistan all in the top ten.

Mobile phones are not only used for voice calls, but also (increasingly) for accessing the Internet through broadband connections. Mobile broadband makes a huge difference to the way in which the Internet can be used. A video clip, for example, can be downloaded via broadband in a matter of minutes or seconds, instead of taking an hour through a dial-up connection (Table 1).

Figure 1 — Fixed telephone lines by region



Source: ITU World Telecommunication/ICT Indicators database.

The Asia-Pacific region has 42 per cent of the world's Internet users, and their number continues to grow, reaching more than 500 million in 2007. Growth in low and lower-middle-income economies doubled in 2007, with China alone adding 73 million users. There is clearly a demand for high-speed Internet access and the services it can deliver. And in fact, the Asia-Pacific is the world's largest broadband market, with a 39-per-cent share at the end of 2007 (see Figure 2, left, on page 12). At that point, the region had 133 million subscribers to fixed broadband Internet access, typically provided through wired telephone connections

using digital subscriber line (DSL) technology, or through cable television networks.

"Broadband is increasingly recognized as a key development enabler, facilitating access to health and education services and contributing to economic productivity and competitiveness," says Mr Al Basheer. "A number of Asia-Pacific economies have implemented sound broadband policies and turned into thriving and highly competitive broadband markets."

The broadband industry is a significant business in its own right. The Asia-Pacific's top twenty broadband operators — accounting for some 80 per cent of the re-

ITU has defined fixed broadband as a minimum connection speed of 256 kbit/s. This definition has been accepted by the Partnership on Measuring ICT for Development, an international initiative with the mission to improve the availability, comparability and quality of ICT data and indicators. It is also in line with the broadband definition of the Organisation for Economic Co-operation and Development (OECD).

Table 1 — Download speeds compared

	Connection speed				
	56 Kbit/s	512 Kbit/s	2 Mbit/s	8 Mbit/s	24 Mbit/s
Download 250 kB webpage	36 seconds	4 seconds	1 second	0.3 second	0.1 second
Download 5 MB music track	12 minutes	1 minute 18 seconds	20 seconds	5 seconds	2 seconds
Download 25 MB video clip	1 hour	6 minutes 31 seconds	1 minute 40 seconds	25 seconds	8 seconds
Download low-quality movie (750 MB)	29+ hours	3 hours 15 minutes	50 minutes	12 minutes 30 seconds	4 minutes 10 seconds
Download DVD quality movie (4 GB)	6+ days	17 hours 22 minutes	4 hours 27 minutes	1 hour 7 minutes	22 minutes

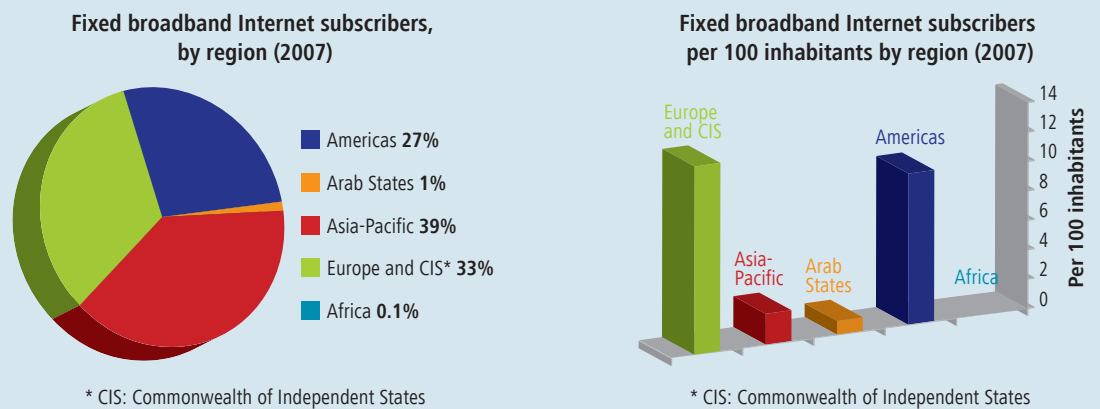
Source: Office of Communications, United Kingdom.



gion's total fixed broadband subscribers — earned over USD 25 billion from broadband access revenues in 2007 (Table 2). The industry also generates billions of dollars in equipment sales for fibre-optic cable, modems and switches. Broadband also creates a platform for generating revenues from voice and video applications. Among the world's top ten economies with household broadband access, five are from the Asia-Pacific region, with the Republic of Korea in the lead (Figure 3, left). With Hong Kong (China), it also features in the world's top ten economies in terms of fixed broadband subscribers per 100 inhabitants (Figure 3, right).

However, the report also highlights the significant divide between the region's high-income economies (where people are living the ultimate high-speed Internet experience), and the low and lower-middle-income economies, where progress towards fixed broadband is slow and Internet access is often limited and comes at a high cost. The report examines key barriers to broadband deployment and recommends a number of steps that governments can take to accelerate the deployment of broadband in countries with limited access.

Figure 2 — Fixed broadband by region



Source: ITU World Telecommunication/ICT Indicators database.

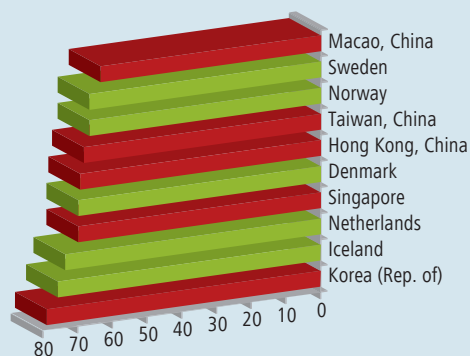
Table 2 — Top 20 fixed broadband operators in Asia-Pacific, ranked by number of subscribers (December 2007)

Rank		Fixed broadband subscribers			Broadband revenue (USD million)
		000s	Change 2006–2007 (%)	Market share (%)	
1	China Telecom	35 650	26	54	4114
2	China Netcom	19 768	31	30	1816
3	NT (Japan) ¹	12 960	19	47	7203
4	Korea Telecom	6516	3	44	2263
5	Softbank (Japan) ¹	5164	2	19	2243
6	Telstra (Australia)	4598	31	88	1718
7	CHT (Taiwan, China)	4243	5	81	1064
8	Hanaro (Republic of Korea)	3658	1	25	1183
9	KDDI (Japan)	2135	22	8	999
10	LG Powercom (Republic of Korea)	1721	43	12	770
11	BSNL (India)	1454	73	46	175
12	PCCW (Hong Kong, China)	1237	11	66	597
13	Telekom Malaysia	1000	36	81	310
14	Bezeq (Israel)	963	8	61	158
15	Optus (Australia)	893	23	17	310
16	Bharti (India)	751	37	13	90
17	TCNZ (New Zealand)	674	29	81	239
18	TRUE (Thailand)	548	24	60	141
19	MTNL (India)	514	10	16	60
20	Singapore Telecom	471	16	55	202
Top 20		104 918	21	81	25 655

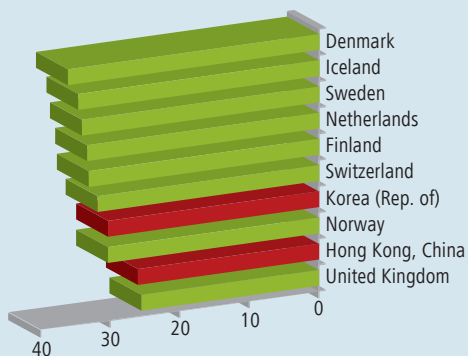
Note — Figures in italics are estimates. ¹ Revenue data refer to fiscal year beginning 1 April 2007. Source: ITU adapted from company reports.

Figure 3 — The world's top ten economies in household broadband access (left chart) and in subscribers per 100 people (right chart)

Percentage of households with fixed broadband, top ten economies (2007)



Fixed broadband penetration, top ten economies (2007)



Source: ITU World Telecommunication/ICT Indicators database.



Broadband access technologies

/// In the region's high-income economies, the increasing deployment of fibre-optic networks is improving access to fixed broadband. This is being driven by strong competition, particularly in markets such as Japan, the Republic of Korea, and Hong Kong (China), which lead the world in terms of the proportion of households with fibre-optic connections — a technology that is essential for supporting the next generation of ultra-high speed applications.

In most low and lower-middle-income economies in the Asia-Pacific region, fibre-optic deployment has mainly been limited to international or national backbone connectivity. Some economies are starting to roll out fibre-optic networks to premises in urban business districts, and China began offering fibre-to-the-home (FTTH) at the end of 2007. Sri Lanka Telecom has launched a fibre-to-the-building project in Colombo, laying some 75 kms of cable. In India, telecommunications operator Reliance is using

fibre-optic networks and Ethernet LANs to connect more than three-quarters of a million buildings in over 40 cities.

In some countries, operators have been launched that offer only fibre-optic connections. For example, in Indonesia, Biznet operates fibre-to-the-building and fibre-to-the-home to provide broadband access in major cities. Indonesian efforts to deploy next-generation networks (NGN) include the construction of high-speed backbone infrastructure through the Palapa Ring Project, connecting 440 districts and cities across Indonesia.

Satellite, Wi-Fi and WiMAX technologies can provide broadband Internet access to remote communities, offering new opportunities for business and online education. For example, satellites are being used in Australia to provide broadband access to rural areas. Over 40 satellite broadband providers served some 58 000 broadband subscribers in Australia at the end of 2007.



A 3G service was operated by China Mobile during the Olympic Games in Beijing

3G broadband

Third-generation (3G) mobile networks, such as wideband code division multiple access (W-CDMA) and evolution-data optimized (EVDO), have introduced broadband speeds to mobile phone services. (W-CDMA offers download speeds of up to 384 kbit/s, while CDMA 1X EVDO offers speeds up to 2.4 Mbit/s.) The Asia-Pacific region was the 3G mobile broadband pioneer, with Japan's NTT DoCoMo launching the world's first commercial W-CDMA network in October 2001. By the end of 2007, there were over 120 million mobile broadband subscribers in the region (see Figure 4 on page 18), with almost all (97 per cent) in upper-middle and high-income economies.

While most of the region's high-income economies have launched mobile broadband networks, few of the low and lower-middle-income economies have done so. At the end of 2007, only Indonesia, the Maldives, the Philippines and Sri Lanka had commercial W-CDMA networks.

The region's two largest mobile markets, China and India, have yet to launch mobile broadband. However, India has announced it will hold an auction for at least five 3G broadband mobile licences before the end of 2008. And in China, the government is planning to issue three 3G broadband licences following a restructuring of the sector. Meanwhile, a 3G service was operated by China Mobile during the 2008 summer Olympic Games in Beijing. It is based on the Chinese 3G standard known as TD-SCDMA (time division synchronous code division multiple access).

In Sri Lanka, high-speed Internet centres that use 3G technology are being set up in some remote areas. Connected through a W-CDMA variant, high-speed downlink packet access (HSDPA) network, the Internet centres (called Easy Seva) provide fast and affordable access as well as new business opportunities to local entrepreneurs.



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WiMAX connects a village in Viet Nam

A high-speed Internet connection has been provided to a remote village in Viet Nam by a public-private partnership involving Intel, the Vietnam Data Communication Company (part of the Vietnam Post and Telecommunication Group) and the United States Agency for International Development (USAID). Tourism is an important source of income for the villagers in Ta Van, but it had only two fixed-line phones and sparse mobile coverage. The project used a WiMAX base station to distribute a satellite signal that provides broadband links to computers and VoIP phones around the village. The school is connected, as well as the clinic, where staff use the Internet to find medical information. Guest houses too are online. Tourists now spend more time in Ta Van — and more money.

For users of mobile devices, 3G broadband speeds are particularly useful for data-intensive activities such as Internet browsing and video downloads. And in some economies, mobile broadband networks are beginning to have an impact on the overall market. Malaysia reported that there were 80 000 HSDPA subscriptions nationwide at the end of 2007, or six per cent of total fixed broadband subscriptions. In Australia, mobile wireless subscriptions to the Internet via data cards accounted for some nine per cent of broadband subscriptions in 2007. This suggests that 3G mobile broadband operators could emerge as viable competitors to fixed broadband operators.

WiMAX for rural areas

As well as the densely populated cities where broadband services are expanding fast, the Asia-Pacific region includes remote and rural areas that it may not be economic to serve through conventional fixed or 3G technologies. One solution is WiMAX (Worldwide Interoperability for Microwave Access) to connect people to the Internet wirelessly.

WiMAX is proving popular in Pacific island countries, for example, with operators in Fiji, Tonga and Vanuatu installing networks. In India, Tata Communications says that it has launched the largest WiMAX network in the world for business and retail

clients. By March 2008, the firm had more than 5000 enterprise and retail customers in ten cities. It aims to sign up 200 000 enterprises in more than 100 cities by March 2009. In Pakistan, Wateen Telecom had attracted over 10 000 subscribers just four months after launching WiMAX in December 2007. And WiMAX has been launched by several Internet service providers in Cambodia, where there are nearly 2000 wireless broadband subscribers.

These developments suggest that WiMAX could be a viable option for broadband Internet access, particularly as the technology matures. Another deciding factor will be whether governments move fast to award the needed radio-frequency spectrum and whether new operators (as well as incumbents) can create more competition in the broadband market.

The role of government

Governments have played an active role in the promotion of broadband at the national level in countries throughout the Asia-Pacific region. In high-income economies especially, its diffusion has been encouraged through national broadband plans. Policies include the opening of markets to new competitors in the leased-line market and for local service provision, as well as the liberalization of international gateways or of services such as voice over Internet protocol

(VoIP). The region's low and lower-middle-income economies are also increasingly taking a proactive approach, recognizing the importance of broadband for their economic development.

A number of countries have established specific broadband targets. In the Republic of Korea, for example, central and local governments are joining Korea Telecom to fund provision of broadband via satellite to the 240 000 households that are currently out of reach. The programme is due to be completed before the end of 2008. In its *Intelligent Nation 2015* (iN2015) plan, Singapore aims to connect 90 per cent of households to broadband through fibre-optic networks by 2015. The governments of India and Pakistan both published broadband policies in 2004. However, most other countries have not announced concrete plans to promote broadband, and many low-income economies remain focused on basic connectivity.

Another role for government concerns the degree of competition in the broadband market — which affects prices and the variety of services. In most cases, legal authorization to provide Internet access does not include the right for an Internet service provider to install its own infrastructure. Instead, it must obtain a facilities-based licence (which adds to costs) or lease the needed infrastructure from other operators.

Many of the building blocks for developing a broadband business are not fully liberalized. Among Asia-Pacific economies, only half report that international gateways are completely open to competition; fewer than half for the leased-line market, and fewer than a third for local services.

International bottlenecks

A major constraint on broadband connectivity in some Asia-Pacific economies is the lack of international Internet bandwidth. Extra capacity is needed to satisfy customers' faster connection speeds, especially when they access a large amount of content overseas. International bandwidth capacity in the region has grown significantly, from 65 gigabits in 2001 to 1000 gigabits at the end of 2007. But a very wide gap remains between economies with the most international bandwidth and those with the least. High-income economies have an average of almost 2000 bits per inhabitant — some seventeen times more than lower-middle-income economies and almost 70 times more than low-income economies (see Figure 5 on page 19).

Bandwidth bottlenecks are a particular problem in land-locked countries without direct access to international fibre-optic cables. They also affect economies in the Pacific Ocean, where only Australia, Fiji, Guam, and New Zealand have undersea

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Nokia



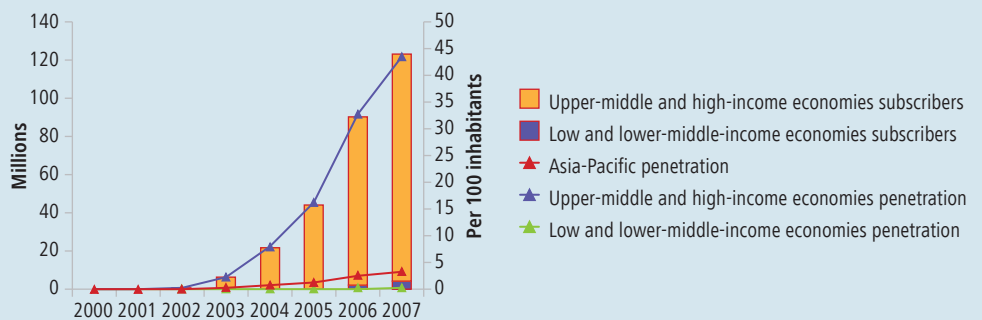
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fibre-optic connections, and even then, demand can outstrip supply. In New Zealand, for instance, Internet service providers report that the cost of international bandwidth through the country's single cable connection adds NZD 9 to the monthly price of broadband, or 18 to 30 per cent of a typical bill. Other economies in the Pacific have to rely solely on satellites for international Internet connectivity.

Efforts are being made to overcome such difficulties. The linking of Pacific island States by submarine fibre-optic cable is under consideration, and more cables are being laid right across the ocean. In June 2008,

for example, Tyco Telecommunications Inc, of the United States, and Japan's NEC Corporation began building the high-bandwidth "Unity" fibre-optic cable that will link the two countries. It is an interesting sign of the times that, as well as five telecommunication companies — from Japan, the United States, India, Malaysia, Singapore, and Hong Kong (China) — the consortium that owns the cable includes the Internet company Google. The expected growth in data and Internet traffic is the main reason for the new cable, which is due to come into use in early 2010.

Figure 4 — Mobile broadband subscribers, Asia-Pacific



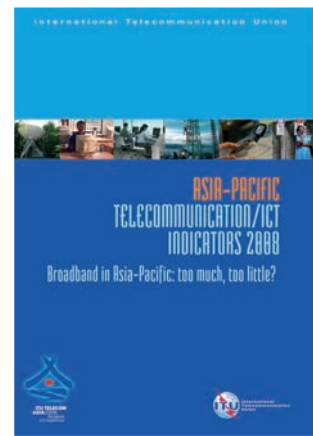
Note — Mobile broadband refers to CDMA 1X EVDO, W-CDMA and HSDPA.
Source: ITU World Telecommunication/ICT Indicators database.

Two scenarios in Asia

The figures suggest that there are two distinct scenarios in the development of new telecommunication technologies in the Asia-Pacific region. In high-income economies, ubiquitous Internet access is progressing, through a competitive race to provide ever faster fixed broadband speeds and the deployment of mobile broadband networks at ever lower prices. In the region's low and lower-middle-income economies, many Internet-based activities are being carried out over mobile phones with visits to community facilities or Internet cafés when higher speeds are required. Rather than making

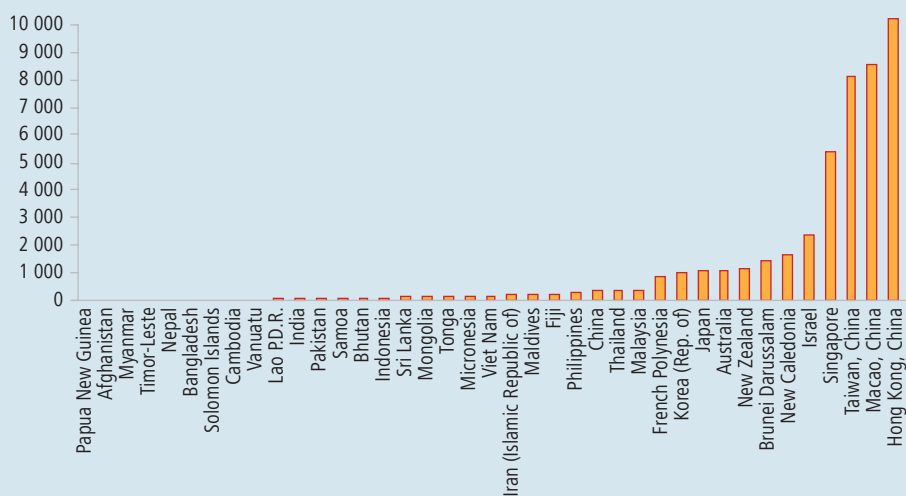
heavy investments in fixed broadband infrastructure, many of these economies are still concentrating on ensuring universal access to basic voice services or simple Internet connectivity.

Nevertheless, as incomes rise, people throughout the region will increasingly demand home-based broadband access. And broadband connectivity is crucial for many applications that have an important impact on development. Along with mobile services, it is the future growth area for telecommunications in the Asia-Pacific region, as elsewhere. /



The report was prepared by ITU's Market Information and Statistics Division. For more information, please visit: www.itu.int/ITU-D/ict/

Figure 5 — International Internet bandwidth, bits per inhabitant, selected Asia-Pacific economies (2007)



Source: ITU World Telecommunication/ICT Indicators database.



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Telecommunications in Thailand

/// The Kingdom of Thailand has a population of some 64 million. The country's first telephone line was installed in 1881, between the capital Bangkok and Samutprakarn. Today, the latest ITU figures show a teledensity of 11 fixed telephone lines per 100 inhabitants. In contrast, the number of mobile phone subscriptions represents more than 80 per cent of the population, or some 50 million people (See box).

Categorized as a newly industrialized nation, Thailand is a significant manufacturer of equipment for information and communication technologies (ICT). Its Ministry of Information and Communication Technology (MICT) was established in 2002 with the mission to "develop and support more comprehensive electronic processes for government, commerce, industry, business and education". This policy aims to incorporate ICT into every aspect of Thai society and, ultimately, transform the economy and the nation.

The background

The Telecommunications Business Act of 2001 laid the basis for deregulating the Thai telecommunication sector. An independent regulator, the National Telecommunications Commission (NTC), began work in 2004 and the market is partially liberalized. The private sector participates through build-transfer-operate (BTO) concessions from State-owned enterprises. Under this arrangement, concession holders build network infrastructure that is transferred to the State agencies. The operators have an exclusive right to use the assets during the term of the concession. Revenues are shared with the State agencies. The Act provides for the concession-based system to be changed eventually to one based on licences granted by NTC.

The first of Thailand's State-owned enterprises in this sector is TOT Public Company Limited, which provides the infrastructure for domestic fixed phone lines and was originally founded as the Telephone Organization of Thailand (TOT) in 1954. It has granted concessions to True Corporation

Public Company Ltd (established in 1990 as Telecom Asia), which offers fixed lines in the Bangkok metropolitan area, and to the Thai Telephone and Telecommunication Company (TT&T) that provides lines elsewhere.

Another State-owned business is CAT Telecom Public Company Limited, formerly known as the Communications Authority of Thailand (CAT). It owns Thailand's international telecommunication infrastructure, including connections to two satellite Earth stations and to the five submarine cables that link Thailand with Europe, the Middle East, Malaysia, Singapore, Indonesia, Hong Kong (China), the Philippines, Taiwan (China), the Republic of Korea, and Japan.

Competitive mobile telephony

Reflecting its booming growth, the mobile telephony market boasts an increasing number of private-sector enterprises. With almost all communities in Thailand covered by a mobile phone signal, competition among service providers has been intense.

Advanced Info Service Public Company Limited (or AIS) is the country's largest mobile firm and operates under a concession from TOT. The company with the second-largest number of mobile subscribers is Total Access Communication PLC (or DTAC), which has a concession from CAT. Other mobile phone operators include True Move, part of True Corporation Public Company Limited, and Hutch, a joint venture between CAT and Hutchison Telecommunications International Ltd.

Mobile broadband

A study from market research firm Nielsen says that Thailand has the highest rate of mobile subscribers using the Internet among the Asia-Pacific economies that it surveyed. Some 10 per cent of mobile subscribers use their phones to access the Internet, equivalent to almost 40 per cent (or more than 5 million) of all Internet users in the country, according to the firm's report "Critical Mass: The Worldwide State of the Mobile Web", released in July 2008. Third-generation (3G) mobile networks improve the consumer experience by providing services at broadband speeds, and they are beginning to be developed in Thailand.

In May 2008 in the city of Chiang Mai, AIS launched a commercial trial of 3G mobile phone services using HSPA (high speed packet access) technology. The company plans to expand the service nationwide. DTAC also aims to provide a nationwide 3G service by the end of 2009.

WiMAX technology for mobile phones has also been tested by AIS, while TT&T Broadband has reportedly announced that from September 2008, it will offer WiMAX connections among 21 universities in Chiang Rai Province. The pilot project could lead to the company providing a WiMAX broadband network throughout Thailand.

The Bangkok Metropolitan Administration (BMA) is working with True Move to create a Wi-Fi network covering more than 400 square kms in the city. The BMA will issue half a million free Wi-Fi cards to the public as an incentive to use the Internet

*ICT in Thailand, 2007
(per 100 inhabitants)*

Fixed telephone lines

11.00

Mobile phone subscribers

80.42

Internet users

21.00

Broadband Internet subscribers

0.94

Population covered by mobile signal

97.00

*International Internet bandwidth
(Mbit/s)*

24 894

Source: ITU/ICT Eye.



as a substitute for travel, in order to create a greener capital city. True also recently launched a package combining flat-rate Internet access from its mobile network with Wi-Fi access in around 15 000 hot spots across the country.

In early August 2008, MICT put forward for government approval a plan by TOT to create a nationwide 3G network offering broadband services. The plan covers the years 2009 to 2011, for a network that TOT would lease to telecommunication providers. TOT is said to be aiming for at least four million 3G subscribers within five years.

Given the widespread use of mobile phones, it seems likely that they could become the means of broadband connectivity for most people in the years to come. Meanwhile, broadband access uses asymmetric digital subscriber line (ADSL) technology, while the majority of people continue to access the Internet through dial-up connections.

Internet access for all

The number of Internet users in Thailand rose from just 30 in 1991 to more than 13 million in 2007 (Table 1). Government policy has encouraged this development, through agencies such as the National Electronics and Computer Technology Centre (NECTEC). And State-owned TOT, for example, offers a special number (1222) through which its phone subscribers can connect to most Internet service providers by paying only for the local telephone call.

True Corporation offers a similar service to subscribers of its fixed telephone lines. In addition, TOT dramatically cut charges for broadband Internet access in 2002, sparking a corresponding fall in prices across the sector and a rise in demand.

Both TOT and CAT launched nationwide projects to establish public Internet booths at post offices and similar facilities. Another example of the country's push to expand connectivity can be seen in the programme for educational institutions. The SchoolNet project, begun by NECTEC in 1995, did

Table 1 — Internet users in Thailand

Year	Total
2007	13 416 000
2006	11 413 000
2005	9 909 000
2004	6 970 000
2003	6 000 000
2002	4 800 000
2001	3 500 000
2000	2 300 000
1999	1 500 000
1998	670 000
1997	220 000
1996	70 000
1995	45 000
1994	23 000
1993	8000
1992	200
1991	30

Source: NECTEC, Thailand.

much to stimulate provision of Internet access in schools. According to the Ministry of Education, all schools in Thailand are now connected to the Internet.

Connecting villages

ICT expansion is foreseen in other areas too. For example, the Agriculture Information Network serves the core industry in Thailand's countryside that is home to more than 60 per cent of the population. Under the Rural Telephone Project, TOT plans to provide public telephones in remote villages that are outside the public switched telephone network (PSTN) service areas (see also an article in *ITU News* of January-February 2008). A group of villages in Thailand is known as a "tambon", and there are some 7000 across the country. The Tambon Net initiative aims to provide Internet access to all tambon administrative offices, for their official work and to make services available to local residents.

Looking ahead

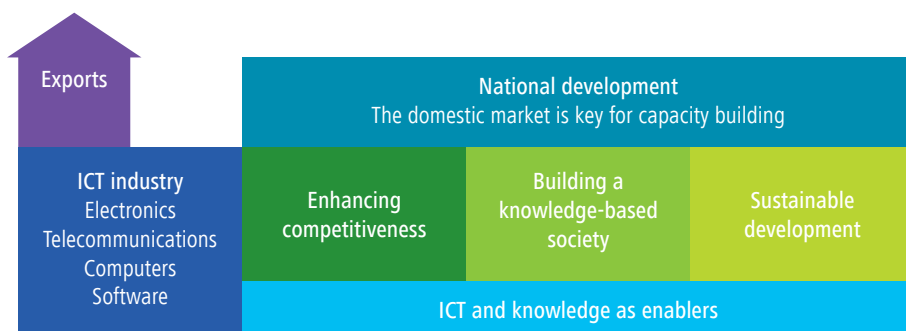
ICT has long been one of the items at the top of Thailand's policy agenda. Although progress was hampered by the Asian financial crisis of the late 1990s, the country is continuing the process of liberalizing and deregulating its telecommunication market.

The government backs a number of ICT initiatives, and an "IT 2010" policy was developed by the National IT Committee (NITC) in collaboration with the King Mongkut University of Technology Thonburi. MICT is undertaking steps to implement the plan, as well as looking to future decades. Through building human capital, promoting innovation and investing in ICT, the goal is to transform Thailand into a knowledge-based economy (Figure 1), and all citizens, in cities or rural areas, will be the beneficiaries. //



Telemedicine makes use of ICT connections to remote villages in the Thai countryside

Figure 1 — Objectives of Thailand's National ICT Plan



Source: NECTEC, Thailand.



Sean Sprague/Alamy

Village Asia

A mixed picture of ICT availability

It is not easy to make a fully accurate assessment of how many rural communities across Asia have access to information and communication technologies (ICT). Countries vary in the type of statistics they are able to compile, and in how they define the term “village” for example. However, ITU has recently released a report¹ that sheds light on the availability of ICT in rural areas of developing countries in South Asia, East Asia and the Pacific (see Table 1).

East Asia and the Pacific

This region ranges from Mongolia to Indonesia and the Pacific islands, and 56 per cent of its people live in rural areas, compared with a world average of 50 per cent. China’s large size affects the analysis, as it accounts for two-thirds of the region’s rural population.

Overall, in the countries included in the report, about 80 per cent of communities

have a fixed telephone link. However, the figure is below 5 per cent in Cambodia, Lao P.D.R. and Myanmar, for example. An average of 83 per cent of the region’s rural population are covered by mobile phone services, but this leaves some 184 million rural inhabitants outside the range of a mobile signal, including 22 million in Indonesia, 25 million in Viet Nam, almost 40 million in Myanmar and 57 million in China. Despite this large number in China, there is nonetheless over 90-per-cent coverage of its rural population. Malaysia and Thailand also have high rural coverage.

Broadcasting is an important element of ICT. More than half of rural households have a radio and 63 per cent have a television. An average of 10 per cent of rural homes have a fixed line telephone, but mobile phone penetration is almost three times higher at 28 per cent. The average availability of the Internet is very low at 3 per cent.

¹ *Measuring ICT availability in villages and rural areas*, prepared by ITU’s Market, Information and Statistics Division. The report can be read at: www.itu.int/ITU-D/ict/

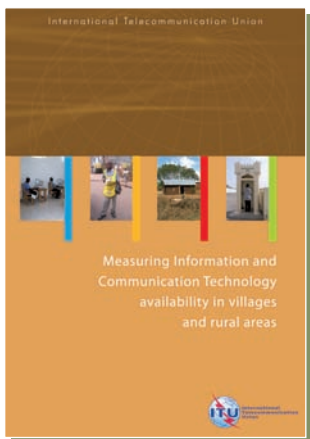


Table 1 — Economies covered in the report

East Asia and the Pacific		
American Samoa	Malaysia	Philippines
Cambodia	Marshall Islands	Samoa
China	Micronesia	Solomon Islands
Fiji	Mongolia	Thailand
Indonesia	Myanmar	Timor-Leste
Kiribati	Northern Mariana Islands	Tonga
Dem. People's Rep. of Korea	Palau	Vanuatu
Lao P.D.R.	Papua New Guinea	Viet Nam
South Asia		
Afghanistan	India	Pakistan
Bangladesh	Maldives	Sri Lanka
Bhutan	Nepal	

South Asia

In South Asia, 72 per cent of people live in rural areas. Approximately three-quarters of all communities have a telephone service, but again, the figures show a wide range. While India has connected 91 per cent of its some 600 000 villages with pay-phones, the availability of a fixed telephone service in communities in Afghanistan and Bhutan is estimated to be very low. On a household basis, an average of 11 per cent of rural homes in the region have a fixed telephone.

Just under half of the region's rural inhabitants are covered by a mobile phone signal. In India, the percentage is 44, but Bangladesh and the Maldives have more than 90-per-cent coverage of rural areas. On average, nearly a third of rural households have a mobile phone; however, the figure disguises great variations. For example, there is a mobile phone in one quarter

of rural Sri Lankan homes, but the corresponding figures for Bangladesh and Nepal are only 6 and 2 per cent respectively.

There are limited data on the number of households with Internet access. Among the countries that measure this, Internet availability in rural households in the Maldives is 2.5 per cent, compared with practically zero in Bangladesh. However, projects are being carried out to improve connectivity. In Bangladesh, Internet access via mobile phone is available (rather than through a computer at home), and Grameenphone started a project in 2006 to provide Internet access through community information centres, using its nationwide EDGE network. Some 500 centres have been established. With regard to television, an average of 43 per cent of village households in South Asia have a set. //



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“ In a world with large technological disparities between developing and developed countries and urban and rural communities, 3G wireless voice and data communications are proving to be technologies that can rapidly bridge this digital divide in Asia. ”

Jing Wang, Qualcomm

3G wireless technologies are transforming rural communities across Asia

Jing Wang, Executive Vice President,
Qualcomm Asia-Pacific and Middle East and Africa

Third-generation, or 3G, wireless communication networks are becoming critical infrastructure in developing countries across Asia, and these networks are now a major factor in driving substantial economic growth and socio-economic progress. Studies show that a one percentage point increase in mobile penetration in developing countries is correlated with an increase of 4.7 per cent of average per capita income. Also, a one percentage point increase in Internet penetration in developing countries is correlated with an increase of 10.5 per cent of average per capita income¹. 3G wireless communications have become particularly significant for rural communities throughout the region and are having a positive impact in empowering them to compete.

As industry leaders, we know that we can significantly contribute to the development of rural communities by joining forces with other organizations that are also com-

mitted to making a difference in the world. Together we can create sustainable projects that will empower these communities to enjoy an improved quality of life.

To fulfill that vision, in 2005 Qualcomm created the Wireless Reach™ initiative, through which we collaborate with creative and committed partnerships from both the public and private sectors to bring the benefits of 3G to underserved communities in Asia and across the world. Our Wireless Reach programmes are designed to facilitate access to voice and high-speed data networks, to enable the improved delivery of Internet connectivity and services such as health care and education.

We believe that 3G is the solution to creating a connected world where nobody is left behind. The following are examples of some of the programmes to which we have contributed.

¹ Telecommunications Management Group, Inc., 2007



Mrs Halimah, a village phone operator in Indonesia, uses her Uber ESIA phone outside her shop at Neglasari, a small village south of Bogor on the island of Java

Stimulating entrepreneurship in rural Indonesia

In Neglasari, a small village south of Bogor on the island of Java in Indonesia, Mrs Halimah serves her community as a Village Phone Operator at her small, local grocery store. Members of the community recognize Mrs Halimah and trust her to give them good mobile phone call rates. Previously, villagers might have had to travel 10 km or more to place an urgent phone call to relatives, but now they can simply make a trip to Mrs Halimah's store and instantly and affordably be connected to their loved ones.

Mrs Halimah's important role in connecting her neighbours with their families is part of another Wireless Reach project that has contributed to the globally known Village Phone Programme of Grameen Foundation. Mrs Halimah is one of a growing network of Village Phone Operators who are able to purchase a "business in a box" consisting of a wireless 3G CDMA-based phone and charger, marketing materials, tariff posters, business cards and training materials. These

entrepreneurs can operate their businesses in rural areas where telecommunication services did not previously exist, renting the use of their phones within their communities on a per-call basis.

As a result of this initiative, these rural communities are no longer isolated from easy access to communication and information, and, for the first time, are learning the tangible benefits of being connected to the world outside their villages. From communication with relatives, to updates on commodity prices, to political news, and to knowledge of new business opportunities, the information that the villagers now have available to them is having a very real impact on their lives.

This new connectivity not only empowers underserved communities in rural Indonesia by providing them with access to affordable telecommunications and information services, but it also enables Indonesia's rural entrepreneurs to build self-sustaining businesses that are instrumental in the socio-economic development of their wider communities.

A nurse in the isolated province of Mae Hong Son, Thailand, waits for her patient's test results to be completed. The data will then be sent via 3G to a hospital for further analysis and diagnosis



Improving rural health care in Thailand

In the southern province of Phang Nga, in Thailand, beautiful limestone rock formations jut out of the Andaman Sea. There, people have built floating villages, creating the habitable islands of Koh Panyee and Koh Yao Yai. But this beautiful and peaceful scene can easily become the backdrop for a difficult situation when villagers from this remote region face health emergencies that require assistance from the closest health clinic, which is at least 45 minutes away by boat.

The challenge of providing adequate health care to remote and rural areas of the population is an ideal example of how 3G technologies have proved to be effective. Koh Panyee and Koh Yao Yai have been equipped with EV-DO high-speed wireless services, in collaboration with Thailand's CAT Telecom. Two remote health clinics are now connected to the mainland hospital with telemedicine equipment, by which staff can send diagnostic data in graphs and images.

In northern Thailand, nestled in a deep valley hemmed in by high mountain ranges

and isolated from the outside world, Mae Hong Son province now has easier and faster access to medical services through 3G wireless broadband, thanks to another project developed by Wireless Reach. As part of this programme, several industry leaders worked in partnership to contribute to the development of the equipment and services that enable more effective communication between smaller clinics and more established ones, allowing an exchange of the latest medical intelligence and patient information.

Providing real-time information to fishermen in India

Real-time access to information is also of critical importance in improving public safety around the world. 3G wireless technology offers solutions that can facilitate the transmission of urgent data to authorities and hasten the delivery of important messages and information to the public.

In India, for instance, we have collaborated with partners from the technology and telecommunication sectors, as well as with non-governmental organizations (NGO), on the *Fisher Friend* project. This is a user-



Qualcomm



Qualcomm

For a fishing community in Tamil Nadu, on the southern tip of India, real-time information on market prices is available via mobile phone. The Fisher Friend project also allows people to find out quickly about dangerous weather conditions

friendly application that provides vital, real-time information to fishing communities at any time, anywhere, at the press of a button. Fishermen can now receive real-time access to weather and wind information, emergency alerts, and local market prices for fish. They can send a single-button request from their mobile phones to retrieve information and vital updates on opportunities and trading information, in their local language, from anywhere in the country.

This mobile application has improved the lives of members of fishing communities across India, providing them with the market information that can enable them to thrive in their businesses. It also allows them to learn about research and government policy changes that can have an impact on their communities, and most importantly, find urgent weather information that could save their lives in rough seas.

Connectivity and partnerships are key to bridging the digital divide

Through its Wireless Reach initiative, Qualcomm has succeeded in making a real difference in the lives of those in impoverished communities in Asia and around the

globe. Connectivity has been the crucial element driving this change.

From the most basic access to news and information on market prices, to the life-saving, urgent exchange of data between rural and urban health care providers, communication is the crucial building block that previously underserved communities need in order to learn, stimulate economic growth, and enhance public health and safety. Revolutionary 3G wireless technology has made this possible, and it is clear that it will continue to play an integral role in the development of communities and economies throughout Asia and the rest of the developing world.

The initiative is a good example of how industry partnerships can improve socio-economic conditions and empower people in developing countries. There is a substantial opportunity for industry leaders to work with other partners and governments to extend 3G infrastructure into their rural and remote communities to help bridge the digital divide. 



PFnet/DLCP

Connecting the Solomon Islands

/// The Solomon Islands, a country situated in the Pacific Ocean to the east of Papua New Guinea, is formed from an archipelago of hundreds of islands, covering thousands of square kilometres. With a population of about half a million scattered across this area — and speaking dozens of different languages — communication can be very difficult.

Teledensity is low. The operator Solomon Telekom is expanding its mobile services; but for now, community access facilities are likely to be the means by which most residents of low-income rural areas have contact with the wider world. Helping to build such facilities, a not-for-profit organization called People First Network, or PFnet, has set up projects that allow people to make contact through the Internet.

Narrowband network

PFnet was established in 2001 through a project of the United Nations Development Programme (UNDP) in partnership with the Solomon Islands' Ministry of Provincial

Government and Rural Development. It has received funding and technical support from the governments of Australia, China, Japan, New Zealand and the United Kingdom, as well as the European Union. PFnet uses an ultra low-cost model for creating facilities, which are all managed by their communities. It uses a grassroots approach, and the network grows as new groups come forward to request local connections.

"The PFnet system, offering basic e-mail services, seeks to improve connectivity while dramatically reducing the prices of communication, making it affordable for low-income users and sustainable over time," said PFnet Manager David Ma'ai. The network will help the citizens take charge of their country's development, he added, with particular attention being paid to improving gender equality and democratic governance. "This, in concrete terms, is what bridging the digital divide means to the Solomon Islands," Mr Ma'ai said.

The system centres on an Internet café in the capital, Honiara, that has connectiv-



A community e-mail station on the shores of an island in the country's Western Province

ity via a VSAT (very small aperture terminal) satellite ground station. The café serves as a training facility, as well as a popular place where people can surf the Web. It is also the hub for a network of some 30 community-run e-mail stations around the country. In each one, using solar power for a simple computer and a short-wave HF radio with a modem, operators help customers to send and receive e-mails at a nominal cost. The messages are sent by radio to Honiara, and thence distributed nationally and internationally.

The e-mail system is *WaveMail*, developed by Schuemperlin Engineering AG of Switzerland, which is optimized to use slow radio or satellite links efficiently, but has all the functions of a full e-mail service. "The system averages about 1 or 2 kbit/s on a good connection, but that is not the point. It allows e-mail connections in the most remote places where due to high costs, terrain and scattered small populations, VSAT and other means of broadband access are not sustainable," explained PFnet Technical Advisor David Leeming. Although the connection speed is very low, where other forms of communication do not exist or are prohibitively expensive, the e-mail stations are the best link with the outside world.

Statistics show that most e-mails are sent within the Solomon Islands and for the purpose of contacting family members. PFnet is also used by small fishing, farming and other businesses to maintain contacts with clients, suppliers and shippers. And it is a vital link in emergency communications.

After a major earthquake in April 2007 near the New Georgia group of islands, an e-mail station on the island of Simbo sent the first report of a resulting tsunami to PFnet headquarters, where it was passed to the Pacific Tsunami Warning Centre in Hawaii within 30 minutes of the earthquake.

Another important use of the system is education. Students can attach their completed assignments to e-mails sent to teachers far away — and receive materials in the same way, at the rate of about 1 kilobyte per minute. In a project on the island of Choiseul, for example, 20 students were able to take part in a course from the University of the South Pacific. However, it is not possible to surf the Internet at e-mail stations. In order to expand the opportunities for online education across the Solomon Islands, in 2004 a programme began that uses the faster technology of broadband.

Broadband boost

The Distance Learning Centres Project has established facilities in each of the country's nine provinces, located in rural schools. The network has become known as the Solomon Islands SchoolNet. As well as helping schoolchildren, it can also provide training for their teachers. Adult residents can take part in academic and vocational courses. And at certain times of day, the centres are open to the public for use as Internet cafés.

In cooperation with Solomon Telekom, each centre has been equipped with a satellite link to Australia via VSAT to provide



It costs about USD 8000 to set up a PFnet e-mail station like this one in Isabel Province. But there are very low running costs and no per-minute charges for use. It is also simple to add stations on a modular basis. For example, a rural clinic, bank or tourist site could include a communication component in its project



PFNet/DLCP

The VSAT antenna brings broadband Internet access to the Distance Learning Centre on the island of Makira



PFNet/DLCP

Students learn how to use the PFnet e-mail facility at Vanga Rural Teacher Training College on the island of Kolombangara

high-speed broadband Internet access, as well as laptop computers, printers and scanners, and a short-wave radio. Everything is solar-powered. There is also a full-time supervisor, to help learners use the equipment and to follow online courses. Lectures can be sent live to all the centres simultaneously, and students can interact with their teachers in real time.

The project is implemented by PFnet and has been funded by the European Union. Based on the successful e-mail station model, the centres are managed under a partnership between the host schools and their communities, PFnet and the Ministry of Education.

Wireless expansion

Internet access via VSAT does not have to be limited to the building that houses a distance learning centre: it can easily be extended to surrounding sites using low-cost, terrestrial wireless solutions. PFnet has carried out a pilot project to achieve this around Marovo Lagoon, in the Western Province of the Solomon Islands.

The eastern part of the "Marovo Learning Network" comprises a solar-powered access point that has been operating since January 2008 at the top of an extinct volcano, Mount Mariu, on the island of Gatokae. This is connected to a VSAT at the distance learning centre in an island village, Bekabeka, via a 6-km, line-of-sight Wi-Fi link. There is a similar 30-km link to the vocational school at the village of Batuna, where a learning centre has been open since February 2008. Batuna

is a social and economic hub of the lagoon, with a secondary school and the area's main clinic. Wireless connectivity is thus expected to bring many benefits.


A second section of the Marovo Learning Network has been built as part of the *Rural Internet Connectivity System*, a programme of the regional intergovernmental organization, the Secretariat of the Pacific Community (SPC). It is intended to link up to 15 schools by wireless connections to a VSAT at the school in Patukae on Gatokae Island. Children there have also received their own computers through the One Laptop per Child (OLPC) organization (see box), which is a partner in ITU's *Connect the World* initiative.

Integrating communities

For many people, especially those who are illiterate or who do not have computer skills, listening to the radio is a major means of acquiring information in their own language. "FM radio broadcasting stations co-located with PFnet e-mail stations can work together effectively," said Mr Leeming. As well as live broadcasts, content can be downloaded via the Internet from national and overseas sources. In addition, text can be e-mailed to the station, then translated into the local language and broadcast. It is a two-way process, as listeners are encouraged to contribute to programmes too.

It is important to integrate the various elements of the Solomon Islands' communication infrastructure in this way, Mr Leeming stressed, and thus also help residents to in-

tegrate into local and national life. Through access to the Internet, better opportunities for e-government not only improve efficiency, they also improve transparency and the ability for people in rural areas to take part in the democratic process. PFnet wants to see communication infrastructure used to

consult Solomon Islanders while assisting in their development. At the same time, it can bring together diverse communities that have sometimes been in conflict. "It's an important part of peace building," said Mr Leeming. 

For more information visit:
www.peoplefirst.net.sb/general/pfnet.htm
www.schoolnet.net.sb



One Laptop per Child

A trial project for the One Laptop Per Child (OLPC) initiative was launched in the Solomon Islands in July 2008 by the Ministry of Education and the Pacific Community. First to benefit were children and teachers at Batuna and Patukae primary schools on the island of Gatokae, and another local school will soon have laptops too. In total, 75 will be provided, along with training. The schools were chosen because they can take advantage of the system of Internet access via VSAT that has been created in the Marovo Lagoon area.



The son of a deputy magistrate, Bose was born in Mymensingh, a district in the part of India's Bengal province that is now Bangladesh. After graduating from St Xavier's College in Calcutta, Bose pursued his studies in the United Kingdom, first at London University and then at Cambridge University. He received science degrees from both institutions in 1884.

Bose then became Professor of Physics at Presidency College — a founding institution of Calcutta University. It had no modern laboratory. Nevertheless, over the next decade Bose carried out ground-breaking investigations into radio, microwave technology and the use of semiconductors.



From Bose to Bose to boson
Among Bose's students at Presidency College was Satyendra Nath Bose (no relation), who became renowned for his work on quantum mechanics in the early 1920s, providing the foundation for Bose-Einstein statistics. The subatomic particle, the boson, was named in his honour.

A Bengali pioneer of science

Marking the 150th anniversary of J.C. Bose

█ The 150th anniversary of the birth of an eminent scientist and pioneer of radio will be marked on 30 November 2008. He was Jagadish Chandra Bose (1858–1937).

Dramatic demonstration

In 1895, in the town hall of Calcutta (now Kolkata), India, Bose showed how electromagnetic waves can be sent wirelessly through not only air, but also walls and even people's bodies. At a public meeting presided over by the Lieutenant Governor of Bengal Sir Alexander Mackenzie, Bose transmitted a wireless signal from a lecture hall through three intervening walls — and Mackenzie — to a room where it rang a bell and ignited some gunpowder.

It was the year before Alexander S. Popov transmitted radio waves between buildings at St Petersburg University in Russia, and two years before Guglielmo Marconi demonstrated radio signalling to officials of the United Kingdom government.

Microwave marvel

A pioneering feature of Bose's work was that it used ultra-high frequency (up to 60 GHz), millimetre waves of between 5 mm and 25 mm in wavelength. To carry out his studies, he devised novel equipment such as waveguides, horn antennas and

polarizers. Improvising with local materials, Bose constructed one of his polarizers from Bradshaw's Railway Timetable with sheets of tinfoil interleaved in the book's pages.

Bose's first paper, published in May 1895, covered the polarization of electric waves by double refraction, and it was the optical qualities of microwaves that interested him, rather than the wireless signalling potential of longer wavelengths. Other researchers did concentrate on this part of the spectrum, and microwaves were not to be studied seriously again for decades.

In 1897, Bose was invited by Lord Rayleigh (who had been one of his teachers at Cambridge) to lecture on his experiments at the Royal Institution in London. He demonstrated his work successfully, and — again ahead of his time — speculated on the existence of electromagnetic radiation from the sun, which was not discovered until 1942.

A better coherer

A year earlier, in 1896 Bose had followed up his demonstration in the town hall by sending a radio signal between two colleges in Calcutta University — a distance of nearly 5 kms. To detect the signal he used one of his inventions: "a mercury coherer with a telephone detector".

At this period, radio waves were detected with a “coherer”, invented in about 1890 by the Frenchman Edouard Branly (1844–1940). It worked because radio-frequency alternating current decreases the resistance of loose metal filings placed between two electrodes in a glass tube — causing them to clump together, or cohere. They had to be shaken loose again before another signal could be detected.

Bose produced a new coherer consisting of a metal cup containing mercury that was covered in a very thin insulating film of oil. Suspended above was an iron disc that touched the film of oil without breaking it. The film was broken, however, in the presence of a radio signal, so allowing an electrical current to pass through the device and operate a telephone receiver. The system restored itself automatically.

Bose announced the development in a paper presented to the Royal Society in London in 1899. Exactly the same principle was used by Marconi to receive the first transatlantic wireless signal in 1901, but he said that he had received the design from an Italian colleague.

The first patented semiconductor


Bose’s coherer was actually a semiconductor diode, and his work in this field led to the world’s first patent on solid-state diode detectors, granted in the United States in March 1904. It was for the “galena detector”, which Bose developed between 1894 and 1898 and demonstrated at the Royal Institution in London in 1900.

While studying the optical properties of electromagnetic waves, Bose discovered

that polarizing crystals have selective conductivity. One of these crystals was galena, the mineral form of lead sulfide. Bose made a pair of point contacts from galena and linked them in series with a voltage source and a galvanometer. As he said in his patent, he had made “a coherer or detector of electrical disturbances, Hertzian waves, light waves or other radiations”. Bose called his device “a universal radiometer,” one of whose uses could be to detect “signals in wireless or other telegraphy”.

Writing about the “History of semiconductor research” in 1955, the co-inventor of the transistor Walter H. Brattain acknowledged Bose’s priority in using a semiconducting crystal to detect radio waves. And according to Sir Nevill Mott, a British physicist who won a Nobel Prize in 1977 for his work in solid state electronics, “J.C. Bose was at least sixty years ahead of his time”.

As well as contributions to physics, Bose made important discoveries in plant physiology (see box). He was also the founder of India’s first facility for modern scientific work: the Bose Research Institute, opened in Calcutta in 1917. It included a large lecture theatre whose purpose, he said, was to disseminate knowledge of scientific advances to the widest possible public “without any academic limitations, henceforth to all races and languages, to both men and women alike, and for all time coming.”

Also in 1917 Bose was knighted, and in 1920 he was the first Indian scientist to become a Fellow of the Royal Society. He left a lasting legacy for science in Asia — and the world. 

Sensitive plants

As the 20th century began, Bose turned his attention to the electrical response of living things. He was the first to study how microwaves create changes in the cell membrane potential of plant tissues. And he discovered that not only in animal but also in vegetable tissues, responses to various stimuli are conducted electrically (rather than chemically) — but much more slowly in plants. In order to measure this, Bose invented the crescograph, which was sensitive enough to show tiny changes in a plant’s growth caused by, for example, the presence of a poison. At a demonstration of the device in London in 1919, Bose said it was “tantamount to magnifying the highest powers of a microscope a hundred thousand times,” reported the New York Times.

3D television will provide a new type of viewing experience



Philips

Looking at 3D television from every angle

A new Study Question is being examined in ITU-R

■ A new topic of study has been agreed for ITU — digital three-dimensional, or 3D, television. It is part of the work of Study Group 6 of ITU's Radiocommunication Sector (ITU-R), and the goal is to achieve a worldwide standard for this advance in broadcasting.

3D television is a general name for broadcasts that provide viewers with a sense of depth similar to what is experienced in real life. Each eye sees the world from a slightly different angle, and the brain merges these two inputs to create a central single image that has depth. This has been understood for more than 100 years, and several techniques have been developed for recreating the effect in still photographs and movies. For example, a film is shot from two different angles, and each of the viewer's eyes is presented with the image from one of those angles. This is called stereoscopy, and has featured in Hollywood movies.

Although this concept of 3D vision is simple to understand, it is difficult to achieve a technique that does not cause eye fatigue after a certain time. Most higher resolution systems need to be viewed through special eyeglasses, which can be uncomfortable. Digital alignment of their lenses can help to reduce eye fatigue, but is not the complete answer.

In addition, the 3D systems developed so far can only be seen properly from a limited range of positions. This problem could be overcome by "free viewpoint television" (FTV) systems that mean viewers can sit anywhere to enjoy the picture. These allow people to set their preferred viewpoint and change it continuously in a range determined by the number of cameras used to film a scene, and their allocation. In the longer-term, it is possible that new forms of "object wave recording" could be developed that permit 3D television images to be presented on new types of holographic display.



An early device illustrates the principle of stereoscopic 3D pictures



Vuzix

As well as its application in television and the cinema, 3D viewing technology is being used by players of video games through head-mounted displays, giving a fully immersive experience that is like being in the real world

Among the countries where 3D research has been carried out for many years are Canada, China, France, Germany, Italy, Japan, the Russian Federation, the United Kingdom and the United States. The Russian Federation made the proposal to ITU-R that the time was ripe for worldwide agreements to be created on 3D television. The resulting Study Question comes under Working Party 6C of ITU-R Study Group 6. It is calling for contributions from the ITU membership on 3D systems that include — but also go beyond — stereoscopy.

Digital 3D television broadcasting will be able to convey to the viewer a much greater sense of “being there” in the scene. The dawn of the technology will bring a new type of entertainment to the home. Pooling ideas at this early stage gives the best chance of developing a single, worldwide standard. The work of ITU in this field could have a profound impact on the experience of viewers in the years to come. ▀

The Study Group invites contributions on 3D television for its next meeting on 20–24 October 2008, (to be received by 13 October).

For more information, contact ITU-R by e-mail at rsg6@itu.int.



Chris Metcalfe

Modern versions of 3D films are proving popular at the cinema



From official sources

Instruments amending the Constitution and the Convention of ITU (Minneapolis, 1998; Marrakesh, 2002; and Antalya, 2006)

The Government of **Romania** has ratified the above-mentioned instruments and confirmed the declarations and reservations made at the time of signature. The instruments of ratification were deposited with the Secretary-General on 17 July 2008.

Instruments amending the Constitution and the Convention of ITU (Antalya, 2006)

The Government of the **Republic of Bulgaria** has ratified the above-mentioned instruments. The instrument of ratification was deposited with the Secretary-General on 7 July 2008.

Protocol revising certain parts of the Regional Agreement for the European Broadcasting Area (Stockholm, 1961) (RRC-06-Rev.ST61) (Geneva, 2006)

The Government of **Spain** has accepted the above-mentioned Protocol. The instrument of ratification was deposited with the Secretary-General on 11 July 2008.

New Sector Members

Radiocommunication Sector

TDF Group (Metz, France) has been admitted to take part in the work of this Sector.

Telecommunication Standardization Sector

Pictet Asset Management (Geneva, Confederation of Switzerland) has been admitted to take part in the work of this Sector.

Telecommunication Development Sector

Cybersecurity Malaysia (Seri Kembangan, Malaysia) has been admitted to take part in the work of this Sector.

New Associates

Radiocommunication Sector

Ericsson Canada, Inc. (Town of Mount Royal, Quebec, Canada) has been admitted to take part in the work of Study Group 5.

Telecommunication Standardization Sector

Guyane Téléphone Mobile (Cayenne, French Department of Guiana) has been admitted to take part in the work of Study Group 2.
Guadeloupe Téléphone Mobile (Baie Mahault, French Department of Guadeloupe) has been admitted to take part in the work of Study Group 11.
Martinique Téléphone Mobile (Fort de France, French Department of Martinique) has been admitted to take part in the work of Study Group 17.
Tejas Networks India Ltd (Bangalore, Republic of India) has been admitted to take part in the work of Study Group 15.

Apple, Inc. (Cupertino, California, United States) has been admitted to take part in the work of Study Group 16.

Telecommunication Development Sector

Guyane Téléphone Mobile (Cayenne, French Department of Guiana) has been admitted to take part in the work of Study Group 1.
Guadeloupe Téléphone Mobile (Baie Mahault, French Department of Guadeloupe) has been admitted to take part in the work of Study Group 1.
Martinique Téléphone Mobile (Fort de France, French Department of Martinique) has been admitted to take part in the work of Study Group 2.

New denomination

The official denomination is now **Republic of Nepal**, instead of Nepal.

Structural changes

In the **Russian Federation**, the *Ministry for Information Technologies and Communications* has become the *Ministry of Telecom and Mass Communication* of the Russian Federation.
 In the **Republic of Chad**, the *Ministry of Posts and New Communication Technologies (MPNTC)* has changed its name to *Ministry of Posts and Information and Communication Technologies (MPTIC)*.

Official Visits

During August 2008, courtesy visits were made to ITU Secretary-General Hamadoun I. Touré by the following ministers, ambassadors to the United Nations Office and other international organizations in Geneva, and other important guests.

In addition, representing Dr Touré, ITU Deputy Secretary-General Houlin Zhao also received official visitors.



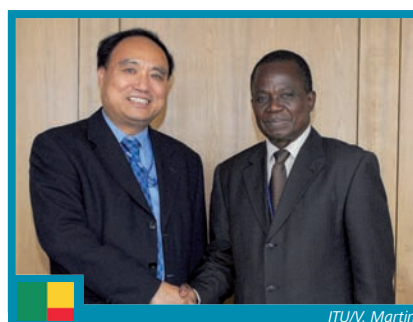
Ambassador of Rwanda
Venetia Sebudandi



Uganda's Minister for Information and Communications Technology
Dr Ham-Mukasa Mulira (right), and ITU Deputy Secretary-General Houlin Zhao (left)



Special Envoy of Mauritania
Zeine Ould Zeidane



Benin's Minister for Communication and New Technologies
Goundé Désiré Adadja



Ethiopia's Minister for Transport and Communications
David Ruach Tang



Equatorial Guinea's Minister of Transport, Technology, Posts and Telecommunications
Enrique Mercader Costa



*Guinea's
Minister for
Communication
and New
Information
Technologies
Tibou Kamara*



*Kyrgyzstan's
Minister for
Transport and
Communications
Nurlan
Sulaimanov*



*Ambassador
of Paraguay
Rigoberto Gauto*



*The Syrian
Arab Republic's
Minister of
Communications
and Technology
Dr Imad Sabouni*



*Thailand's
Permanent
Secretary in
the Ministry of
Information and
Communication
Technology
Sue Lo-Utai*



*Director of
the Food and
Agriculture
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Liaison Office in
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Manzoor Ahmad*

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