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ITU NEWS

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The optical world

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Sight lines to far horizons

Dr Hamadoun I. Touré
ITU Secretary-General



This edition of *ITU News* looks — both metaphorically and literally — at far horizons, starting with "The Optical World", a *Technology Watch* Report published by ITU in June 2011. The report provides an overview of the optical world, and surveys standards and ongoing research that will lead to a new generation of Internet and computing devices. Some of the challenges the world faces in energy, health and the environment may be solved with the help of optics and photonics. Today, optical technologies are the driving force behind the bandwidth growth of the Internet. These technologies have opened the way for new business models such as YouTube, allowing users to share video clips.

A Geneva Dialogue on m-health, held on 27 June 2011, highlighted the prospects of using mobile technology to advance public health in the developing world. Some basic approaches are needed to spread the benefits of m-health. These include anchoring e-heath and m-health in government priorities and strategies, and moving ahead with standardization in these areas.

On 30 June 2011, amateur climbers from ITU reached the summit of Mont Blanc, 4810 metres above sea level. The climbers immediately established radio contact with ITU's amateur radio station. They tell us how they faced up to such a great challenge. Each of us will draw our own lessons from this tale of teamwork and achievement. What it says to me is that we all can look for, and climb, our own Mont Blanc. Risk and achievement are part and parcel of our dynamic telecommunications world — take a moment to enjoy your team's summit achievement.

On independence and recognition by the United Nations General Assembly, a country can apply to ITU for a country code. On 14 July 2011, ITU officially assigned the international dialling code 211 to the world's newest nation, the Republic of South Sudan, following the country's formal recognition as a United Nations Member State.

On 24 July 2011, as planned, Japan switched off its analogue television network in all areas, except those worst hit by the March 11 earthquake and tsunami. Because of damage from the disaster, the Japanese government has postponed the move to digital terrestrial television in the prefectures of Iwate, Miyagi and Fukushima until the end of March 2012.

As we prepare for ITU Telecom World 2011, to be held in Geneva on 24–27 October, I encourage our members to register for the event, including the Technical Symposium, which will take an in-depth look at cutting-edge technological developments that are defining and influencing the future of networks and services in areas such as e-health, e-government, and next-generation wireless standardization and deployment. Participating delegates will also have the chance to be part of the high-level networking and knowledge-sharing taking place throughout the week in Geneva. Be there!



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Technology Watch

The optical world*

Optical technologies are the driving force behind the bandwidth growth of the Internet. Indeed, the Internet as we know it would not be feasible without optical technologies and the related networking standards. This is made clear in "The Optical World", a Technology Watch Report published in June 2011 by ITU's Telecommunication Standardization Sector (ITU–T). By enabling bandwidth hungry applications for video, optical technologies have opened the way for new business models such as YouTube, allowing users to share video clips.

ITU–T standards in optical transport networks have played a leading role in transforming the Internet's bandwidth capabilities. This work is led by ITU–T Study Group 15, which has developed a set of international standards (Recommendations) that defines the existing optical transport network (OTN) framework. ITU–T Study Group 15 is now working on future technologies (such as gigabit-capable and 10-gigabit-capable passive optical networks), anticipating unprecedented bandwidth demands from service providers and consumers.

Optics is the science of light and has a very long history. Optical networking, silicon photonics (light technology), nanotechnologies and non-linear optics are all

* *The ITU–T Technology Watch Function surveys the information and communication technology (ICT) landscape to capture new topics for standardization activities. Technology Watch Reports assess new technologies with regard to existing ITU–T and other standards, and the likely implications for future standardization. The Technology Watch Function is managed by the Policy and Technology Watch Division of ITU's Telecommunication Standardization Bureau. The report "The Optical World" and other Technology Watch Reports are available at http://www.itu.int/ITU-T/techwatch*

areas where breakthroughs could lead to major changes in the way computers, networks and data centres are designed. The new ITU–T Technology Watch Report provides an overview of the optical world, and surveys standards and ongoing research that will lead to a new generation of Internet and computing devices. Some of the challenges the world faces in energy, health and the environment may be solved with the help of optics and photonics.

Why optical technology?

Today, the most widely used optical technology is optical fibre for high-speed interconnections, such as in server racks, connecting offices, buildings and metropolitan networks — and even continents via submarine cables. Optical technology is also used in CD-ROM drives, laser printers, photocopiers and scanners. But there are always some conventional electronic circuits or components in these devices because, to date, high costs have prevented optical components from finding their way into computers.

Now that optical technology is maturing, prices are falling and optical alternatives are starting to be incorporated into computer systems. Compared with copper wire and electronics, optical equipment has many advantages for use in communication networks and computers: less power consumed; higher speeds; more compact; much lighter; cheaper to manufacture; higher storage capacity; immune to electromagnetic interference; free from short circuits; lower operational costs for service providers; and reduced carbon footprint for telecommunication.

Optical technology to meet broadband demand

The gradual incorporation of optical technology into the world of traditional electronics is paving the way for the era of the optical world. Industry experts see optical technology as the most feasible means of solving the bandwidth limitation of electronics. Photons have low-loss transmission and provide large bandwidth, offering multiplexing capacity for communicating several channels simultaneously without interference. In terms of speed, data travel through an electronic network at megabits per second (Mbit/s), as compared to terabits per second (Tbit/s) in photonic networks. The power requirement for an electronic switching component is about one microwatt, whereas the power requirement for a photonic switching component is measured in nanowatts.

The ever-increasing need for computational speed, coupled with the rapid increase in global demand for Internet access, television and video services, and next-generation broadband, has focused interest on optical computing technology. Service providers in the telecommunication sector have transformed their offerings into a new business model for triple-play services (combining voice, data and video) that rely on sufficient bandwidth to carry large amounts of data. As telecommunication networks expand on a global scale, optical communication will continue to be a strategic enabler for next-generation Internet services.

Because of its advantages over electrical transmission, optical fibre is rapidly replacing copper wire in core networks in the developed world and is key for developing countries in bridging the digital divide. The high frequency of the optical carrier enables significantly more information to be transmitted over a single channel

than is possible with a conventional radio or microwave systems.

Communication networks using optical fibre still need to convert the electrical signal into an optical one for transmission, and then back into electrical form at the receiving end. This means that the potential bandwidth of optical fibres is not being fully exploited. Future research and standardization work will focus on developing purely optical devices for communication networks.

Current and future standardization activities

Optical transport networks

Synchronous optical networking (SONET), adopted as the backbone of most fibre-optic telecommunication networks in the late 1990s, was originally designed for optical interfaces that used a single wavelength per fibre. As fibre-optic technology has advanced, it has become more economical to transmit multiple SONET signals over the same fibre. The optical transport network (OTN) architecture for this is specified in Recommendation ITU–T G.872.

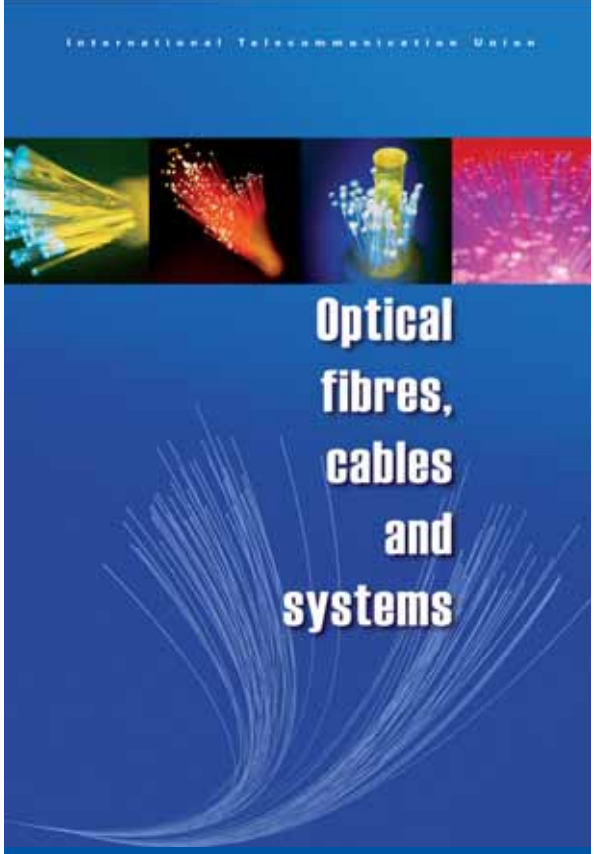
OTN is the only transport layer in the industry that can carry a full 10/40/100 Gbit/s Ethernet signal from Internet Protocol (IP)/Ethernet switches and routers at full bandwidth. It is composed of a set of optical network elements connected by optical fibre links. The OTN framework is based on a set of Recommendations with ITU–T G.709 "Interfaces for the Optical Transport Network (OTN)" at the heart.

Recommendation ITU–T G.709 describes a means of communicating data over an optical network. Revised in June 2010, it now provides a mapping of a recent next-generation high-rate Ethernet standard from the Institute of Electrical and Electronics Engineers (IEEE) into OTN. Collaboration between ITU–T Study Group 15 and the IEEE P802.3ba 40 Gbit/s and 100 Gbit/s Ethernet Task Force has ensured that these new Ethernet rates are transportable over optical transport networks. A manual on OTN highlights the applications of ITU–T Recommendations in this field.

Optical communication systems reaching terabit speeds could become the norm in the future. A breakthrough in terms of data transfer speed in optical communications was announced in the May 2011 issue of the Nature Photonics journal: researchers at Karlsruhe Institute of Technology established a record by transmitting 26 Tbit/s using a single laser. Optical

Optical transport networks: From time-division multiplexing (TDM) to packet

The ITU–T manual "Optical Transport Networks: from TDM to Packet", launched in February 2011, is based on the standards issued by ITU–T on optical transport networks. It covers synchronous digital hierarchy (SDH), optical transport network (OTN) and Ethernet over transport (EoT) Recommendations, which are now used in telecommunication networks. The manual describes the problems associated with implementing OTN structures, and shows how ITU–T Recommendations address these challenges. It offers practical help and guidance to operators, suppliers and management in planning and implementing OTN. The manual is available at http://www.itu.int/publ/T-HDB-IMPL.08-2010/en.



ITU–T has been active in the standardization of optical communication technology and the techniques for its optimal application within networks from the infancy of this industry. Since the first ITU–T Handbook related to optical fibres, "Optical Fibres for Telecommunications", published in 1984, several others have been produced over the years to keep pace with developments in the field.

The latest manual, "Optical fibres, cables and systems", was published in 2009. It aggregates the available information on ITU–T's work, and is intended as a guide for technologists, middle-level management and regulators. ITU–T also conducts tutorials for developing countries based on the manual, to provide an in-depth insight into the application of its Recommendations in this field.

The manual aims to assist in the installation of optical fibre-based systems, explaining how ITU–T Recommendations address the practical issues associated with the application of this technology. The manual can be downloaded free of charge at: http://www.itu.int/pub/T-HDB-OUT.10-2009-1/en.

communications at terabit speed would be highly beneficial to bandwidth-hungry applications such as cloud computing, three-dimensional television (3D TV), high-definition television (HDTV) and virtual reality. The breakthrough could pave the way for future standardization work in this area.

Automatically switched optical network

Backbone networks must offer quality of service and flexibility. The purpose of the automatically switched optical network (ASON) is to automate resource and connection management within the network to preserve quality of service. This will be a huge challenge because, according to the annual Cisco Visual Networking Index, global IP traffic was an estimated 242.2 exabytes (1 exabyte = 10^{18} bytes = 1 billion gigabytes) in 2010 and is projected to increase to 965.5 exabytes by 2015.

The main issue in the area of standardization for ASON has been the optical control plane. Work to define the standards for the optical control plane is being investigated by international standards bodies, including ITU–T, which is working on ASON architecture.

Controlling quality of service is one of the essential elements for managed IP networks. ITU–T recently achieved significant results, in cooperation with IEEE, in standardizing the operations, administration and maintenance functionality for Ethernet networks. This lies at the core of IP packet transmission platforms and is an essential technology for next-generation networks. A recent manual highlights ITU–T Recommendations in this field.

Passive optical networks

A passive optical network (PON) extends from an operator's central facility into individual homes, apartment buildings and businesses. One common application of PONs has been in providing broadband Internet access to homes for applications such as IP television.

The advantage of PONs is that they offer high reliability and high bandwidth at low cost. Some gigabit-capable PON products already include a power-saving mode, which reduces power consumption. The most recent standard, G.984 (GPON), represents a significant boost in total bandwidth and bandwidth efficiency, through the use of larger, variable-length packets. A GPON network delivers up to 2488 Mbit/s of downstream bandwidth, and 1244 Mbit/s upstream.

Optical exchanges

Peering of regular Internet traffic has led to switching-based Internet exchanges. Optical exchanges on the other hand will not require switching technology at peering locations. With the fall in cost of optical devices, they could become viable as components in Internet exchange points. An optical exchange is a peering location that allows traffic to pass from one provider to another in a connection-oriented manner. An example is NetherLight in Amsterdam.

The NetherLight Exchange Point is part of the Global Lambda Integrated Facility (GLIF) network. GLIF is an international organization that promotes optical networking using lambda switching, which can switch individual wavelengths of light onto separate paths for specific routing of information.GLIF uses optical multiplexing capabilities to provide the bandwidth needed for scientific research and collaboration on a global scale. Sites that form part of the GLIF network include CERNLight (Geneva), UKLight (London), MoscowLight (Moscow), and StarLight (Chicago).

Optical exchanges represent a new area of research for packet-based optical networks that could provide the backbone for grid computing.

Visible light communication

Visible light communication (VLC), using white light emitting diodes (LEDs), is emerging as a key technology for ubiquitous communication systems, because LEDs have the advantages of fast switching, long life expectancy, relatively low cost, and safety for the human body.

The signal would be generated in a room by slightly flickering all the lights in unison. People would not notice this, because the rate of modulation would be millions of times faster than a human eye can see. Since visible light cannot penetrate walls, there would be no interference from stray signals and reduced opportunity for outside hackers, thus making the system more secure than radio. In January 2010, Siemens researchers, in collaboration with the Heinrich Hertz Institute in Berlin, achieved a wireless data transfer rate of up to 500 Mbit/s using white LED light.

Infrared light could also be used in visible light communication. The Infrared Data Association (IrDA) has been developing technical standards for infrared wireless communication and has recently announced the GigaIR standard for very short range line-of-sight infrared communication links operating at 1 Gbit/s. Speeds of more than 1 Gbit/s have been obtained with infrared light, according to research carried out by Penn State University.

The Visible Light Communications Consortium (VLCC) and IEEE 802.15 Task Group 7 have been active



Apple's Macbook Pro laptop that uses Intel's Thunderbolt, a high-speed computer connection technology formerly codenamed Light Peak. This new technology is said to move digital films and other data "blazingly fast"

in standardization work related to visible light communication. Major applications would be in private networks, home networks, sports broadcasts and live television interviews, and in optical beacons for collection of information in real time. In particular, applications could include use in restricted areas where secure access is important, the projection of high-definition images, and use in aircraft and medical facilities (because the optical system will not interfere with aircraft navigation or hospital systems). Visible light communication could also be used in global location positioning, to support intelligent transport systems.

Optical data transfer inside the computer

New data transfer technology based on optical fibres will lead to dramatic advances in the performance and design of computers. An example is Thunderbolt (originally codenamed Light Peak), a technology that has been developed by Intel to give ordinary personal computers the ability to connect with other devices using high-speed fibre-optic cables at 10 Gbit/s — twenty times faster than a standard, copper-based USB 2.0 cable. An optic cable can drive a high-definition (HD) display or transfer an HD movie in seconds. Thunderbolt has been implemented in 2011, for example, in the new line of Apple's MacBook Pro laptops.

Silicon photonics

The use of multi-core central processing units is one way of controlling power consumption in high-performance electronic circuits. And the low cost and high availability of silicon make it the material of choice for optoelectronic devices. Silicon photonics involves integrating optical and electronic circuits on silicon.

In August 2010, Intel announced the first complete photonic communication system developed from components fully integrated into silicon chips. Silicon photonic chips could, for instance, replace the electronic components between a computer memory and processor. They allow for the processor and memory to be further apart than is possible with copper wiring, and could change the way computer systems, laptops and data centres are designed.

The main challenge for silicon photonics is growing the laser on a silicon chip, because silicon is a poor laser material. In February 2011, however, researchers at the

University of California announced that they had overcome this problem by taking advantage of the properties of nanostructures and by carefully controlling the growth process. This is the first time that researchers have grown lasers from high-performance materials directly on silicon.

Optical bus

IBM announced in 2010 that it had successfully developed an optical data bus on a printed circuit board that uses optical links for data transfer between the processor and other external components such as memory and input/output ports. By avoiding the signal-loss and cross-talk problems associated with copper, an optical bus would make supercomputers much faster. IBM is planning to use the optical bus in supercomputers for optical data transfer between printed circuit boards.

IBM is also conducting research aimed at developing parallel optical interconnects, referred to as optochips, which will enable ultra-fast data transfer between the components on the printed circuit board. The optochips are transceivers that convert the signal from electrical to optical and back again. IBM expects that within five years, the optochips will find their way into the supercomputer, replacing copper wiring as the connection between processors and memory.

All-optical computers

Light can be used to transmit, record and process information, and researchers are attempting to develop entirely new methods of computing that are not physically possible with electronics.

The main building block of conventional computers is the electronic transistor. In order to build an optical computer, an equivalent optical transistor is required. Over short distances, photons consume more energy than electrons in information processing and transmission. To overcome that challenge, researchers are exploring non-linear optical technology.

Another emerging field of research involves silicon nanowires, which can guide light like optical fibres. Because of their low power consumption and size, nanowires are expected to be used in areas such as implantable medical monitors that must be small and where fast processing is not needed.

Research on developing an all-optical computer is a multidisciplinary arena, involving topics such as biophotonics and nanophotonics. A new paradigm is needed for packaging all-optical components. Until this process is standardized so that the optical transistor equivalent can be mass produced, the optical computer will remain a dream.

The way forward

Standardization work in ITU is already engaged in the evolution towards an all-optical core network for Internet and other telecommunication services. A workshop is proposed to showcase the developments made and outline the future evolution of the optical network.

As optical devices become more commonplace, security will need to evolve into the optical domain, with firewalls and intrusion prevention systems. Along with the all-optical computer, a new area of study will be the energy-efficient optical network, because of its importance in reducing the carbon footprint of telecommunication and in protecting the environment.



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Register now for the Technical Symposium at ITU Telecom World 2011

A Technical Symposium, to be held during ITU Telecom World 2011 being staged in Geneva on 24–27 October, will take an in-depth look at cutting-edge technological developments that are defining and influencing the future of networks and services in areas such as e-health, e-government, and next-generation wireless standardization and deployment.

Co-sponsored by the Communications Society (ComSoc) of the Institute of Electrical and Electronics Engineers (IEEE), the symposium will focus on the trends shaping tomorrow's information and communication technology (ICT) industry, featuring insights direct from research and development organizations. Designed for engineers and technical specialists, the event will be free of marketing hype.

Twelve themes will be discussed: Security Issues in Future Networks; Green Solutions for Sustainable Growth; Innovations in Broadband; Improving Healthcare through eHealth Services; New Concepts for Future Networks; Efficiency Challenges of eGovernment; LTE Deployment Challenges; Broadband Networks for Rural Service Delivery; Small Cells in Future Wireless Networks; Standardization in Practice; Cognitive Management of Spectrum; and Dependability of Emerging Economies on ICT.

To ensure a high-calibre, wholly original programme, presentations will be selected via peer review by a panel of experts drawn from technical committees and study groups of influential organizations such as IEEE and ITU–T (ITU's Telecommunication Standardization Sector).

Delegate registration for ITU Telecom World 2011 is now open. Participating delegates also have the chance to be part of the high-level networking and knowledge-sharing taking place throughout the week in Geneva. Delegates registering before mid-September will benefit from "early bird" discounts.

The full programme of the ITU Telecom Technical Symposium, including session timings and speakers is available at: http://world2011.itu.int/sites/default/files/Event_Calendar.pdf.



AFP

Celebrating independence in the world's newest nation

Country code 211 assigned to South Sudan

On 14 July 2011, ITU announced that the world's newest nation, the Republic of South Sudan, has officially been assigned the international dialling code 211, following the country's formal recognition as a United Nations Member State.

The fledgling South Sudan Ministry of Telecommunications and Postal Services welcomed the new code, which has particular resonance for South Sudan's citizens as representing the year in which South Sudan gained independence (2011), the date of its referendum (which took place in the first day of the first month of 2011), and a symbol of good fortune. The number had been specifically requested following a special Council of Ministers Resolution.

On independence and recognition by the United Nations General Assembly, a country can apply to ITU for a country code. In this case, ITU officials had been in contact with South Sudanese officials since January 2011 to explain the procedures in the case of independence, which meant the country code could be pre-allocated and assigned as soon as the UN General Assembly gave South Sudan recognition.

The global country code numbering system is defined in an ITU standard known as ITU–T Recommendation E.164. ITU communicates this information to other Member States and the world's telecommunication operators in a publication called the ITU Operational Bulletin. In addition to the country code, the Government of the Republic of South Sudan will be assigned a mobile country code and a signalling area/network code, which facilitates all telephone calls by indicating how they should be routed.

ITU's message to global climate change conference

Ahead of the 17th Conference of the Parties to the United Nations Framework Convention on Climate Change (COP17), which will take place in Durban, South Africa, from 28 November to 9 December 2011, participants in the ITU Symposium on ICT and Climate Change, held in Accra, Ghana, on 7–8 July 2011 renewed calls for global leaders to recognize the power of information and communication technologies (ICT) to mitigate and adapt to the effects of climate change.

An outcome document calls on ITU, as the UN specialized agency for ICT, to lead a coalition urging COP-17 delegates to look to the enormous potential of ICT to cut emissions across all sectors. The document advocates a "closed loop" approach to manufacturing and recycling, in order to reduce the need to extract and process raw materials. It also emphasizes the value of ICT in monitoring deforestation, crop patterns and other environmental phenomena.

Specific mention of ICT in the COP-17 negotiating text as an element of national adaptation or mitigation plans, along with the adoption of an agreed method for measuring the carbon footprint of ICT equipment, would provide an incentive to the ICT industry to invest in developing countries, help reduce the digital divide, and at the same time contribute to fighting climate change — a win-win scenario. ITU is already actively developing a method that could serve as a reliable global benchmark for assessing the carbon footprint of a wide range of ICT equipment.

ITU Secretary-General Hamadoun I. Touré stressed the Union's commitment to providing the technical know-how to mitigate and adapt to climate change. "It is now clear to most observers that ICT have a very important role to play here. Recognition of this at the international level will provide countries with a solid argument to roll out climate change strategies with a strong ICT element," he stated.

Speaking at the opening of the Ghana symposium, Malcolm Johnson, Director of ITU's Telecommunication Standardization Bureau, said: "Today, a world without ICT is unthinkable. ICT are integrated into almost all parts of our society and economy. Yet while the increasingly widespread use of ICT has changed people's lives dramatically and boosted economic growth, the success of technology means it is itself a growing contributor to greenhouse gas emissions. On the other hand, ICT probably provide the most significant opportunity to reduce greenhouse gas emissions in the major high emissions industries of energy generation, waste disposal, building and transport. This is a message we must carry to COP-17."

ITU launches a project on ICT and climate change in Ghana

During the event, ITU launched a project on ICT and climate change in Ghana, which will be based on two pillars. The first will look at how ICT can be used to help Ghana adapt to the effects of climate change, and will be led by the Ministry of Communications and sponsored by Research in Motion (RIM). The second, which will be led by Ghana's Environment Protection Agency with sponsorship from Vodafone Ghana, will look at how telecommunications in that country can reduce their own greenhouse gas emissions. This project will be the first test of the ITU's assessment method, as set out in Environmental Assessment for the ICT Sector.

The Ghana event was the sixth ITU symposium on ICT, the environment and climate change. It followed successful events in Kyoto, London, Quito, Seoul and Cairo, beginning in 2008. It was the first to address the broader issue of sustainable development, identifying a number of possible recommendations from the ICT sector that could be presented to the 2012 United Nations Conference on Sustainable Development (UNCSD 2012 or Rio+20). It was opened by John Dramani Mahama, Vice-President of the Republic of Ghana, and welcomed more than 350 delegates from around the world, as well as some 40 people participating remotely.

Further information about ITU´s activities on climate change is available at www.itu.int/climate.

New ITU App Challenge calls for IPTV creativity

ITU's latest global Application Challenge encourages developers around the world to create innovative Internet Protocol television (IPTV) apps running on ITU standards.

Applicants are encouraged to think creatively about the IPTV platform and the opportunities it offers. The best app submitted by an individual or small and medium-sized enterprise (SME) will be awarded USD 10 000, thanks to sponsors Sumitomo Electric Networks, Inc. and Dentsu Inc. There is a separate category for corporate entries. Winners will receive their awards at a special event at the ITU Telecom World 2011 show in Geneva in October.

While highlighting the rapidly expanding range of the IPTV ecosystem, this latest ITU App Challenge is designed to stimulate ground-breaking ideas from all corners of the globe. "ITU has pioneered a raft of standards for IPTV, which are set to transform global viewing habits. Global standards such as these will be key to take-up," said Dr Hamadoun I. Touré, Secretary-General, ITU. "With this technology we have all the advantages of traditional "linear" television combined with the flexibility that the Internet offers."

IPTV represents a major new business opportunity for telecommunication companies, content providers and existing broadcasters. ITU's IPTV standards cover a wide range of topics including interactive services, content location, terminal specifications, metadata and quality of service (QoS).

Companies from Brazil, China, Japan, the Republic of Korea, France, and elsewhere have already incorporated ITU's IPTV standards in commercial television and set-top-box products. In China and Japan, ITU IPTV is already deployed with several million subscribers. And a test service is being conducted in Singapore.

ITU App Challenge entrants are encouraged to be creative in areas such as:

- linear (channel service) broadcast television, electronic programme guide and video on demand
- games
- e-government, e-publishing, e-commerce, e-learning and e-health services
- photo albums
- user-generated content
- fixed-mobile convergence.

The deadline for registering for the competition is 16 September 2011, and entries must be submitted by 23 September. Full details are available at www.itu.int/challenges/iptv.



ITU teams up with leading Asian standards organizations to bring new technologies to market more quickly and at lower cost

ITU has signed an agreement with key Asian standards developers that will mean new technologies come to market quicker and at lower cost. Japan's Association of Radio Industries and Businesses (ARIB); China Communications Standardization Association (CCSA); the Republic of Korea's Telecommunications Technology Association (TTA); and Japan's Telecommunication Technology Committee (TTC) have signed a Memorandum of Understanding (MoU) with ITU recognizing ITU as the pre-eminent global ICT standards body. The agreement seeks to smooth the way for regional standards, developed in these four key regional bodies, to be internationally recognized. This will enable product manufacturers to more efficiently incorporate globally standardized solutions in their products, leading to greater economies of scale and lower costs to consumers.

The agreement will bring better access for ARIB, CCSA, TTA and TTC to international standards-making activities, allowing all partners to profit from information sharing on the standardization aspects of nascent technologies. The MoU will also encourage the identification of topics for joint work programmes in order to avoid duplication.

"China, Japan and the Republic of Korea have been at the forefront of the development of many of the technologies that underpin the information society. At the same time, all three countries have shown a commitment to the development of the international standards that provide the interoperability needed to seamlessly connect the world. This agreement cements the relationship between ITU and four premier standards organizations in the region", said ITU Secretary-General Hamadoun I. Touré.

Masayoshi Wakao, Secretary General of ARIB considers that "This MoU presents an enormous range of benefits to the ICT industry. While our joint efforts will benefit all participating organizations, the real winners will be industry and ultimately consumers. More efficient and effective global standardization activities will facilitate an open global market for systems, lowering costs and providing for global interoperability."

Zemin Yang, Secretary-General of CCSA, confirms that "ITU is the globally recognized leader in international ICT standards. CCSA is a long-time contributor to and supporter of the ITU standards process. We welcome the opportunity to join with regional partners to improve efficiency and underline this relationship."

Keun-Hyeob Lee, President of TTA also welcomed the MoU as the foundation for further strengthening the relationship among the five organizations. "TTA believes that this MoU will create the momentum for moving forward with international standardization of newly emerging ICT technologies", he said. Yoichi Maeda, CEO of TTC added that the MoU leverages expertise in some of the most technologically innovative minds in the world today. "This is a sign of visionary and constructive thinking", he commented.



UN Photo/Evan Schneider

Opening ceremony of the Fourth United Nations Conference on the Least Developed Countries, Istanbul, Turkey

Least developed countries

A decade of growth, but challenges remain

ITU contributed two major reports* to the Fourth United Nations Conference on the Least Developed Countries (UNLDC-IV), held in Istanbul, Turkey, on 9–13 May 2011. One of these reports, "ICT and Telecommunications in Least Developed Countries: Review of progress made during the decade 2000–2010", presents projects and actions that ITU has undertaken to help least developed countries (LDCs) join the knowledge economy through the deployment and use of information and communication technologies (ICT).

The other report, "The Role of ICT in Advancing Growth in Least Developed Countries: Trends, Challenges and Opportunities", on which this article is largely based, examines some of the emerging trends and current challenges faced by LDCs on their road to poverty alleviation. It considers changes in the political, economic and social environment of LDCs, their concerns regarding access to financial resources, the infrastructural obstacles they face — in particular those in the telecommunication sector — and the additional risks that arise as a result of climate change and natural disasters. Climate change is a critical factor, given that eleven of the LDCs are also small island developing States. These islands are particularly vulnerable to natural disasters, and have a limited capacity to respond and recover.

UNLDC-IV coincided with a critical point in the achievement of the Millennium Development Goals, with only five more years to meet the targets set for 2015. The ITU reports highlight the important catalytic role that ITU plays in increasing connectivity in LDCs, and provide case study evidence showing how some of these countries have indeed managed to use connectivity successfully to enhance socio-economic development.

* *Both reports were prepared by the Programme for Least Developed Countries, Countries in Special Need, Emergency Telecommunications and Climate Change Adaptation Division within the ITU Telecommunication Development Bureau. The team was led by Cosmas Zavazava.*

Zacarias Albano Da Costa, Minister of Foreign Affairs of Timor-Leste with Houlin Zhao, ITU Deputy Secretary-General during a High-Level Meeting on Investment and Partnership at the Fourth United Nations Conference on the Least Developed Countries, Istanbul, Turkey



Suvi Lindén, Finland's Minister of Communications with Brahima Sanou, Director of the ITU Telecommunication Development Bureau during an ITU Special event "Exploring Business models and public-private partnerships", following the Fourth United Nations Conference on the Least Developed Countries, Istanbul, Turkey



Special support for vulnerable countries

As a way of providing special support to its most vulnerable members, the United Nations General Assembly in 1971 created the category of "Least Developed Country" to cover low-income economies that face severe structural impediments to growth. Since then, 50 countries have been categorized as LDCs, but only three have ever graduated to developing country status: Botswana in 1994, Cape Verde in 2007 and Maldives in 2011 (see article on Maldives on pages 22–26). As part of socio-economic progress, joining the knowledge economy is a key factor in moving up the development ladder.

To foster growth and sustainable development, LDCs get special support in the areas of trade and official development assistance — including development financing and technical cooperation. But the process of graduation from LDC status has proved challenging.

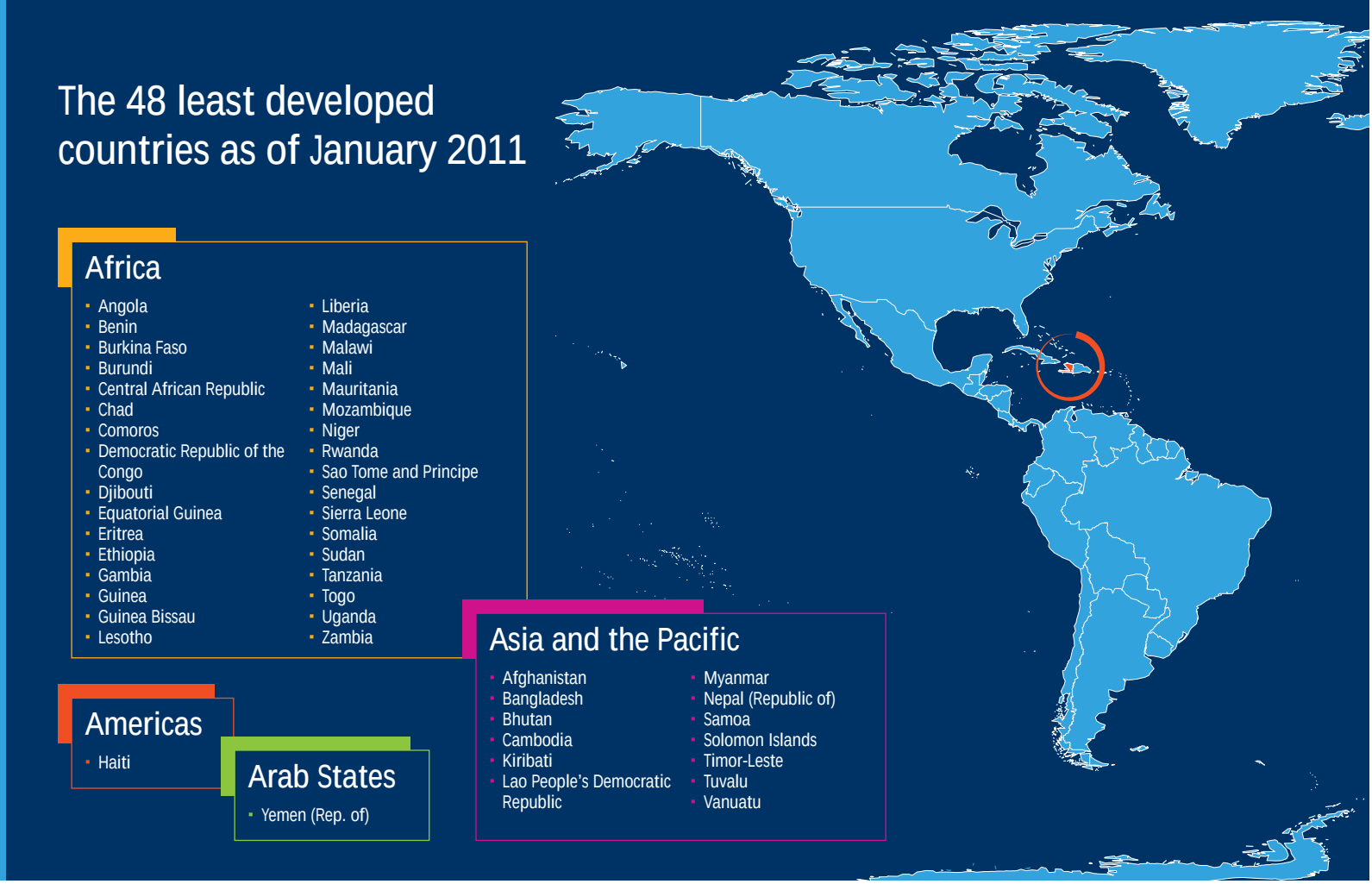
Of the 48 LDCs today (see map), 33 are in Africa, 13 in Asia and the Pacific, one in the Americas (Haiti) and one in the Arab States region (Yemen). About 12 per cent of the world's population (855 million people) live in LDCs.

ITU's passionate commitment to the world's least developed countries dates back to 1971 when this category was established. And since the Third United Nations Conference on the Least Developed Countries in 2001, ITU World Telecommunication Development Conferences and ITU Plenipotentiary Conferences have adopted specific resolutions in favour of LDCs, landlocked developing countries and small island developing States.

Through its Special Programme for Least Developed Countries, the ITU Telecommunication Development Bureau (BDT) has undertaken diverse activities and provided concentrated assistance to LDCs to help them develop infrastructure, improve rural telecommunications, introduce new technologies and services, and build human capacity.

Criteria for LDC status

The criteria for categorizing a country as an LDC have been refined over time. Every three years, the Committee for Development Policy (CDP), a subsidiary body of the United Nations Economic and Social Council (ECOSOC), reviews the socio-economic conditions of all low-income economies to determine whether a country should be added to — or recommended for graduation from — the LDC category. During its most recent review (in 2009), CDP used the following three criteria to identify LDCs and to determine eligibility for graduation:

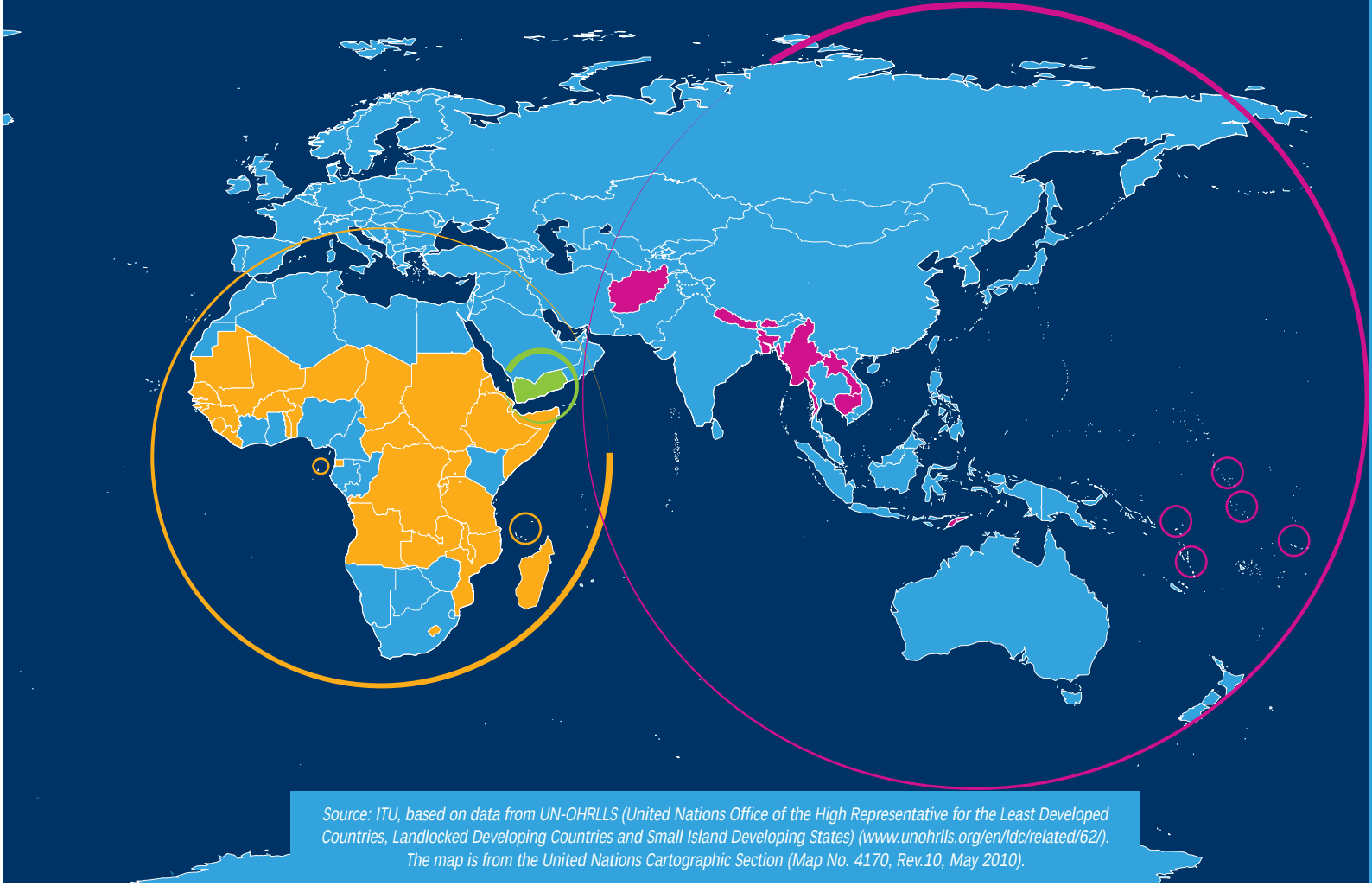


- Low income: a three-year average estimate of gross national income per capita (less than USD 905 for inclusion, more than USD 1086 for graduation).
- Human capital: a composite Human Assets Index based on such indicators as: nutrition (percentage of population undernourished); health (mortality rate for children aged five years or less); education (gross secondary school enrolment ratio); and adult literacy rate.
- Economic vulnerability: a composite Economic Vulnerability Index based on such indicators as: population size; remoteness; merchandise export concentration; share of agriculture, forestry and fisheries in gross domestic product; homelessness owing to natural disasters; instability of agricultural production; and instability of exports of goods and services.

Based on these criteria, CDP recommended adding Equatorial Guinea to the list of countries eligible for graduation. ECOSOC endorsed that recommendation in July 2009, but the General Assembly did not confirm it. Samoa was also to be added to that list. But taking account of the economic and financial crisis in 2008 and the Pacific Ocean tsunami that devastated that country in September 2009, the General Assembly deferred Samoa's graduation from LDC status for an additional three years, to 1 January 2014. Meanwhile, following a similar, postponement because of the Indian Ocean tsunami of 2004, the Maldives graduated in January 2011.

By design, the thresholds for graduation are set higher than those for inclusion. This is to ensure that only countries that are able to maintain improved economic performance are considered for graduation.

Countries can decline the opportunity of being added to the LDC list, but their approval is not sought with regard to graduating from LDC status. Only Ghana, Papua New Guinea and Zimbabwe have ever refused to accept the CDP's recommendation for inclusion in the LDC list, asserting that the analysis of their particular socio-economic conditions did not reflect reality.



Source: ITU, based on data from UN-OHRLLS (United Nations Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and Small Island Developing States) (www.unohrlls.org/en/ldc/related/62/). The map is from the United Nations Cartographic Section (Map No. 4170, Rev.10, May 2010).

The next triennial review of the LDC list will take place in 2012. In preparation for this, CDP took another look at the criteria and indicators for identifying LDCs at a meeting in March 2011. While confirming the reliability of the current criteria, CDP has proposed refinements to the indicators, in particular to better reflect the structural vulnerability of countries to climate change.

Moving out of the vulnerable category

Unsurprisingly, countries recommended for graduation are often reluctant to be removed from the list of LDCs, because of the potential economic effects of the end of preferential treatment. To facilitate the graduation process, CDP gives States a three-year grace period (from the time they are first recommended for graduation) to coordinate with their development and trade partners regarding the phasing out of preferential treatment and special support.

Key findings on the ICT front

Fixed and mobile telephony

There are signs of an upturn in the growth of ICT in LDCs over the period 2000–2010. Mobile communications have emerged as a key technology to bridge the digital divide, and as a means to open up access to governmental, health and environmental information.

In least developed countries, the mobile penetration rate was an estimated 29 per cent, at the end of 2010, according to ITU estimates, suggesting that mobile telephony has been able to at least partially tackle the infrastructure barrier and bring communication networks to the previously unconnected (see Figure 1). In stark contrast, LDCs have an extremely low penetration rate for fixed telephone (slightly more than one per cent at the end of 2010).

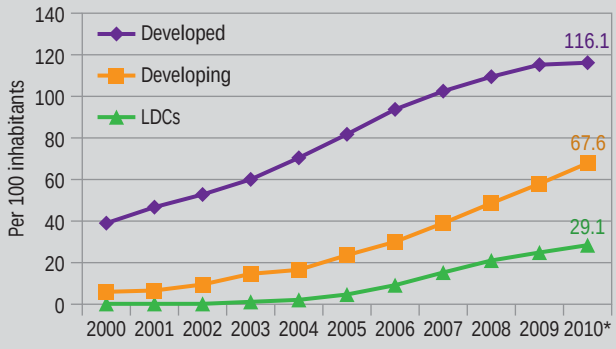
In many developed countries, mobile networks provide an additional communication network, sometimes replacing the fixed-line network. In LDCs, mobile networks are often the main network, and this is particularly true in rural areas. For example, in Bangladesh, Burkina Faso, the Democratic Republic of the Congo, Djibouti, Eritrea and Lao People's Democratic Republic more than 90 per cent of all fixed-telephone lines are in urban areas, whereas most rural areas have no fixed-line infrastructure.

By the end of 2010, just 62 per cent of the population living in LDCs were covered by a mobile cellular signal. This coverage is relatively low compared to the world average of 90 per cent, suggesting that governments in LDCs need to ensure that mobile operators extend their networks to reach more people.

While there are other factors, the introduction of competition has played an important role in making the mobile market the most dynamic ICT market over the past decade. Competition is an important factor in reducing prices and increasing service availability, leading to higher penetration rates. A number of the countries with penetration rates below 10 per cent, including Ethiopia, Eritrea and Myanmar, have not yet introduced competition.

Another reason that mobile telephony has been so successful and spread so rapidly is the growing number of applications, which has increased demand and usage. Non-voice mobile phone applications are proliferating, including in LDCs.

Figure 1 — *Mobile cellular subscriptions per 100 inhabitants, 2000–2010*



**Data for 2010 are estimates.*
Source: ITU World Telecommunication/ICT Indicators database.

Internet

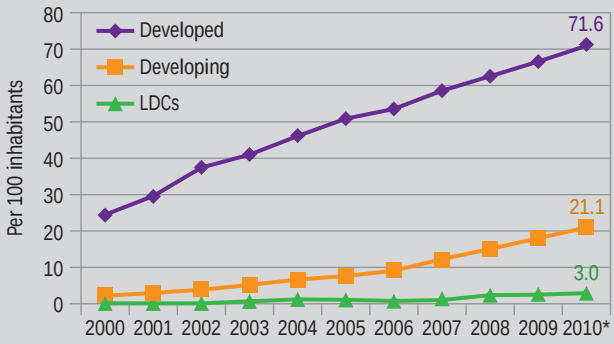
A comparison of Internet use in LDCs with that in developing countries as a whole, and with developed countries, shows that there are very large gaps between these groups. By the end of 2010, only about 3 out of 100 people in LDCs were online, while 21 out of 100 people in developing countries as a whole were online. In the developed world, Internet penetration had reached almost 72 per cent (see Figure 2). These data highlight the significant digital divide that separates the developed from the developing countries (and in particular LDCs), suggesting that much more must be done to bring people in developing regions online.

Internet penetration levels in LDCs range from less than 0.5 per cent in Timor-Leste, Myanmar, Bangladesh and Sierra Leone, to more than 15 per cent in Sao Tome and Principe.

Although there are various barriers to higher Internet and broadband penetration levels in LDCs — including the lack of infrastructure, limited international Internet bandwidth, and relatively low educational levels and literacy rates — high prices remain a major challenge. Fixed broadband Internet prices (which are tracked by ITU's ICT Price Basket) remain prohibitively high in most LDCs.

Because the availability of fixed broadband infrastructure is very limited in many rural areas of LDCs, mobile broadband technologies have a great potential to bring people online, at high speed. The number of mobile broadband subscriptions is

Figure 2 — *Internet users per 100 inhabitants, 2000–2010*



**Data for 2010 are estimates.*
Source: ITU World Telecommunication/ICT Indicators database.

growing fast across the world, and has actually overtaken the number of fixed broadband subscriptions, but remains limited in LDCs, with only 0.5 per 100 inhabitants. In the developed world, mobile broadband subscriptions reached more than 50 per cent penetration by the end of 2010.

One reason for the low mobile broadband uptake in LDCs is that by mid-2010 only 13 of these countries were offering 3G services commercially. Since then, several LDCs, including Senegal and Burkina Faso, have either launched services or have announced plans to allocate 3G licences in the near future. The introduction of mobile broadband services is not only expected to address infrastructure challenges, but also to bring down fixed broadband prices, as it will introduce inter-modal competition into the broadband market.

ITU's commitments in the Istanbul Programme of Action for LDCs for 2011–2020

In order to help countries better exploit ICT to drive development, ITU made five key commitments to the Fourth United Nations Conference on the Least Developed Countries. These commitments have been incorporated into the Istanbul Programme of Action for LDCs 2011–2020. In brief, they cover:

- actions to increase the average phone density in LDCs to 25 lines per 100 inhabitants and the number of Internet connections to 15 per 100 inhabitants by 2020;
- a comprehensive capacity building and digital inclusion programme;
- strategies to help LDCs maximize the selection and use of appropriate new technologies, such as broadband, digital broadcasting and next-generation networks;
- assistance in dealing with cybersecurity issues, and strategies to build trust and confidence in ICT networks;
- assistance in creating and maintaining a propitious environment for LDC development through an enabling policy and regulatory environment.

"The challenge of creating digital opportunities in least developed countries — including small island developing States and countries with special needs — remains. Achieving this goal will require reinforced efforts on the part of ITU to coordinate with all Member States, the private sector and development partners, so that, working in consonance to pool resources and muster partnerships, we can support LDCs in making the best use of the technological promise of ICT to promote economic growth," said Brahima Sanou, Director of the ITU Telecommunication Development Bureau.



AFP/HEMIS.FR

Maldives

Moving up the development ladder

*The Maldives was one of the 25 low-income economies accorded least developed country (LDC) status when the category was established in 1971. In January 2011, it became the third to graduate from the LDC list.**

Country profile

The Maldives is an archipelago in the Indian Ocean composed of 1191 islands, covering an area of 298 square kilometres. About one third of the country's 314 000 inhabitants live in the capital island, Male, with the remaining 62 per cent scattered around the country's 200 inhabited islands. The Maldives is classified as a small island developing State.

Economic growth has brought significant social progress, particularly in the area of education. Since 2002, the Maldives's primary and lower secondary school enrolment rate has neared 100 per cent. Literacy rates are among the highest in the region, with 94 per cent of its population aged 15 years and older being able to read and write.

The Maldives was governed as an Islamic sultanate under Dutch and then British protection until 1965, when it gained independence. Three years later in 1968, it became a republic.

In 2009, gross domestic product (GDP) was estimated at USD 1.4 billion, or about USD 4600 per capita. Nevertheless, 16 per cent of the population live below the poverty line.

The Maldives is a service-based economy, with services contributing 77 per cent of GDP, of which 27 per cent comes from

* *This article is largely based on the report "The Role of ICT in Advancing Growth in Least Developed Countries: Trends, Challenges and Opportunities".*

tourism and tourism-related activities. Fishing, a traditional economic activity of the country, contributes 7 per cent of GDP. The scarcity of arable land and water shortages mean that agriculture contributes just 2 per cent of GDP. Most food staples have to be imported. An ambitious tourism expansion plan has fuelled construction, and contributed to the deployment of telecommunication and transport infrastructure.

There is clearly a need for economic diversification. Dependency on tourism makes the economy of the Maldives particularly vulnerable to the effects of climate change, especially to the rise of sea water levels. The Maldives is prone to floods — 80 per cent of the territory is one metre or less above sea level. In 2004, a tsunami in the Indian Ocean devastated many islands, critically damaging the country's tourism, housing and fishing infrastructure.

Unsurprisingly, the government has been active at international discussions on climate change, attracting financial aid from the United States and other development partners to help it mitigate the consequences of global warming. The Alliance Manifesto, which guides President Mohamed Nasheed's administration, lists ICT and the environment as essential areas for achieving sustainable economic development. In 2010, the President's commitment to environmental protection was recognized by the United Nations with the "Champions of the Earth" environment award.

LDC status and factors contributing to graduation

The United Nations Committee for Development Policy (CDP) originally scheduled the Maldives to graduate from LDC status in December 2007. But just a few months after that decision, a tsunami devastated the island nation. The General Assembly recommended that the Maldives should be given time to recover from the economic impact of the tsunami, and postponed graduation until December 2010.

The Maldives engaged in a period of reconstruction, using the relief assistance provided by diverse development partners. Its tourism industry made a remarkable recovery. The recent financial and economic crisis, however, reduced the country's flow of tourism and related investments, as well as other net capital flows and exports. As a result, the economy shrunk by 3 per cent, and inflation rose to 4 per cent in 2009.

To deal with the increasing trade deficit and fiscal imbalances, the International Monetary Fund approved a USD 93 million loan for the Maldives, recommending a reduction in public expenditure. The government has committed to privatizing several State-owned enterprises, including telecommunications, electricity and water. The IMF expects that proceeds from privatization will help finance the deficit in the short term, while public finances recover.

To supplement the IMF support, the World Bank has invested more than USD 103 million in tourism, telecommunications and the financial sector, under its Country Assistance Strategy. The United States is also providing financial aid to address the effects of climate change and to improve the economy.

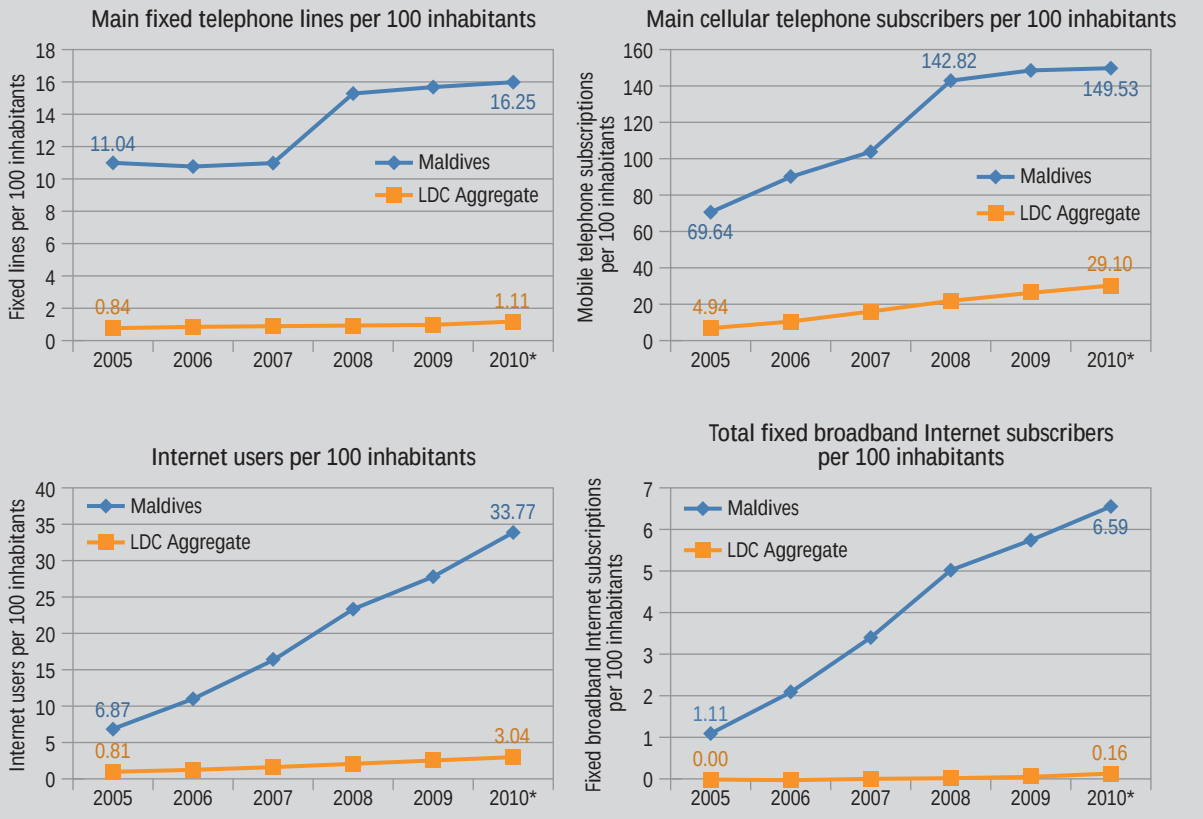
Connectivity now and then

Success in improving connectivity has made the Maldives an outlier in the LDC group of countries. This island nation first connected to the Internet in 1996, and Internet access was the first market segment to be liberalized. Following a tender, Focus InfoCom entered the market as a second Internet service provider in 2002. In 2004, the mobile market was opened to partial competition with the licensing of the mobile operator Wataniya Telecom, which started operations in 2006.

By 2007, the penetration of mobile cellular subscriptions in the Maldives had reached saturation and, just one year later, it was more than 140 per cent. This rapid growth largely results from the launch of prepaid subscriptions in 2001, the introduction of free SMS connections in 2002, competition in the sector, and growing per capita income. In 2007, an estimated 91 per cent of mobile cellular subscriptions were prepaid. By 2009, Wataniya had gained 27 per cent of the market. Both operators (Focus InfoCom and Wataniya) are now competing in the provision of 3G services.

Dhiraagu, the incumbent fixed telephone operator, used to be jointly owned by the government (55 per cent) and Cable & Wireless (45 per cent). In October 2009, the government sold

*Comparison of key connectivity indicators, Maldives and LDC aggregate, 2005–2010**



**Data for 2010 are estimates.*
Source: ITU World Telecommunication/ICT Indicators database.



A special vessel drops a submarine cable to the bottom of the sea off Sri Lanka's capital Colombo as part of a USD 20 million project linking Sri Lanka and the neighbouring Maldives. The cable, spanning 850 kilometres, provides the two countries with high-speed data and voice capabilities

AFP

some of its shares to Cable & Wireless, reducing its holding to 48 per cent.

The charts (see page 24) show that penetration and usage rates for telecommunication services in the Maldives have surpassed average rates for all other LDCs. Cheaper mobile cellular services have also boosted penetration. According to the ITU ICT Price Index, the cost of ICT services decreased between 2008 and 2009 by 12 per cent as a percentage of gross national income per capita. Even the relative price of fixed broadband services has decreased since 2008. This has contributed to a rapid increase in the number of Internet users — about one third of the population is now online.

Domestic connectivity across the atolls is provided via microwave and undersea cable links, while international communications take advantage of the Maldives' satellite links, the submarine cable Fiber-Optic Link Around the Globe (FLAG) and the Dhiraagu-SLT submarine cable system inaugurated in 2006 to link the Maldives and Sri Lanka. Dhiraagu was the only provider of leased line services until 2008, when Wataniya was granted permission to use its excess microwave capacity to provide leased line services.

Although the country does not have a universal access policy as such, Dhiraagu was obliged, as part of its licensing renewal process in 1995, to provide universal access to telephone services in the Maldives's 200 inhabited islands. This was understood to mean the installation of at least two payphones on each of these islands by 2000; Dhiraagu succeeded in achieving this goal in 1999.

Universal service obligations are funded through cross-subsidies between the operator's own services. The government has not established a specific universal access fund to support the advancement of universal access goals, but requires operators to provide mobile services and dial-up Internet connection at reduced rates for educational and health care activities.

The Telecom Authority of the Maldives was established in 2003 and regulates the sector under the Maldives Telecom Regulation of 2003. In 2006, the Ministry of Transport and Communications, the new policy-maker for the sector, introduced a policy seeking to limit dependence on satellite connectivity, and to promote connectivity through submarine cable and network development, the aim being to provide broadband services throughout the country.

President Nasheed has put priority on establishing "a national infrastructure capable of providing comprehensive telecommunication and ICT services throughout the country." Major goals include: strengthening the regulatory framework; promoting private investment and the provision of services on a commercial basis, with greater participation from civil society; setting up affordable and non-discriminatory rates to encourage adoption of ICT in education, health and environmental protection; and establishing an e-governance service platform for the provision of online services.

Connectivity as a driver of socio-economic development

Promoting the adoption of ICT in government activities to improve service delivery has been a goal of the Maldives' National Development Plans for several years. The use of ICT within ministries is widespread, and most government office workers have IT and Internet access. The majority of government agencies in Male are connected through a local area network.

The government plans to connect all educational institutions in the atolls to a wide area network. The Information Technology Development Project seeks to implement e-government through the Government Network of the Maldives, which will connect government and parastatal agencies in Male and 20 atolls.

The adoption of ICT in health care and environmental protection, as well as in education, is essential for the sustainable development of the Maldives. With the financial support of a development partner, the country is now working on the implementation of a national early warning system to help it mitigate the impact of environmental shocks, such as the 2004 tsunami.

The health sector has also benefited from increased connectivity by introducing telemedicine projects among the islands. In December 2010, Dhiraagu announced the donation of a telemedicine system to the Ministry of Health and Family that will facilitate the provision of telemedicine services between remote islands and the central hospital in Male. The system will also be used for training medical personal in remote locations. To facilitate its use across the country, Dhiraagu will cover the expense of technical support, software licensing fees and broadband connectivity charges for one year.

Challenges and goals going forward

As a graduated LDC, the Maldives faces many challenges. Achieving sustainable development will depend largely on the country's ability to diversify the economy, reinforce the private sector and keep public finances in check, while continuing on the path of promoting increased social participation. These steps will help the country advance towards its goal of reducing poverty in its population.



Sony

Switching to digital television

Japan turns off analogue television

Contributed by the Ministry of Internal Affairs and Communications, Government of Japan

On 24 July 2011, as planned, Japan switched off its analogue television network in all areas, except those worst hit by the March 11 earthquake and tsunami. Because of damage from the disaster, the Japanese government has postponed the move to digital terrestrial television in the prefectures of Iwate, Miyagi and Fukushima until the end of March 2012.

In Japan, the government, broadcasters, manufacturers and many other stakeholders have made great efforts to achieve the complete digitization of terrestrial television broadcasting.

Various types of digital terrestrial television technology are used around the world. Japan uses integrated services digital broadcasting — terrestrial (ISDB-T*).

Digital television allows for better picture and sound quality, as well as more choice of channels and programmes. Broadcasters can offer several programmes simultaneously, using the amount of spectrum required for only one analogue channel. Moreover, moving to digital technologies reduces greenhouse-gas emissions due to a massive — almost tenfold — reduction in the power consumption of broadcasting transmitters. The number of transmitters can also be reduced by transmitting several programmes in one frequency channel.

* *This standard is described as System C in Recommendation ITU–R BT.1306.*

In Japan, along with ISDB-T, a mobile broadcasting service called "One-Seg" offers a new viewing experience without any additional cost. The attractiveness of digital television broadcasting and the easy access to its advantages have won the trust of Japanese citizens.

Japan suffered serious damage from the unprecedented earthquake and tsunami on 11 March, just before the analogue switch-off date. Now the country is striving to reconstruct the damaged infrastructure, with the help of its friends from all over the world and by deploying an unbeatable national effort ("Ganbaro, Nippon!!"). Many lives were saved by informing people of the tsunami alert through One-Seg.

Despite the damage caused by the disaster, the digitization of terrestrial television broadcasting in Japan largely took place on the initial target date. By Sunday, 24 July 2011, Japan had completed the digitization of terrestrial television broadcasting by terminating analogue broadcasting (except in the regions that suffered massive damage caused by the earthquake and tsunami).

Tips for success

Digitization of terrestrial television broadcasting is a worldwide trend. In Japan, more than 120 million people, almost the entire population, watch television via terrestrial broadcasting. Japan is the first country in the world to implement such a large-scale analogue switch-off.

In this article, the country's Ministry of Internal Affairs and Communications share its tips for success.

Success Tip 1: Offer comprehensive advice to citizens (through the government, broadcasters, manufacturers and electricians working together)

Television broadcasting is a universal service and an important infrastructure, which most people rely on as an information source. It is therefore essential to make television accessible to people who are unfamiliar with digital technology, especially elderly people and people with low incomes. With this in mind, the Ministry of Internal Affairs and Communications in cooperation with broadcasters, manufacturers and electricians, put in place a total of 51 support centres (called Digi-Suppos) for digital terrestrial viewers. These support centres were located in every prefecture, allowing for easy access and enabling people to ask questions. In addition, just before the analogue switch-off, temporary booths were set up in cooperation with local governments to support people who had not yet switched to digital broadcasting. Volunteers also helped by calling elderly people to confirm that they had switched to digital.

Success Tip 2: Implement measures according to a schedule and a target date

In order to prepare transmission networks, a "master plan" was publicly announced setting out a schedule for starting digital broadcasting in each region. The master plan indicated that digital broadcasting would start in three metropolitan areas (Tokyo, Nagoya and Osaka) by 2003 and in mid-size cities by 2006. The starting dates for the other regions were also indicated in the plan.

When most of the transmission stations had been built, the Ministry of Internal Affairs and Communications turned its attention to preparing the social environment for digital broadcasting. The Digi-Suppos helped



Metropolitan train (Yamanote) promoting digitization

citizens to resolve any difficulties in reception, for example where signals are blocked by mountainous terrain or high-rise buildings.

In areas bordering on analogue broadcasting coverage, where the received signal level is very weak, additional measures were taken, such as installing shared receiving facilities or replacing antennas with high-gain antennas. Where these measures could not be implemented before the analogue switch-off, the Ministry of Internal Affairs and Communications and broadcasters delivered satellite networks as a temporary measure to broadcast terrestrial television programmes.

Success Tip 3: Increase the availability of digital receivers

Standardizing the minimum functional requirements for set-top boxes, added to efforts by manufacturers to improve the technology, have resulted in cheaper products and hence the spread of digital receivers. In addition, the government offered incentives for consumers to purchase and switch to digital televisions (called the "eco-point" programme). This accelerated the spread of digital receivers. As a result, there were 25 million shipments of flat panel televisions in 2010 (compared with 10 million shipments in 2009). Sales in November 2010 were more than 5 times higher than in November 2009, sparked by an announcement that half the eco-points would be closed.

As a safety network for people without digital receivers, set-top boxes have been distributed free of charge to low-income households since 2009.

Success Tip 4: Publicize the digital spread rate and the analogue switch-off date through the analogue broadcasting system

The government shared statistics on digitization via the media. These included the results of a survey on the spread of household digital receivers and a survey on viewer's awareness of the timing of the analogue switch-off. Reports on the use of shared receiving systems in apartment complexes were also published. Viewers were therefore aware that the change-over to digital television broadcasting was making steady progress.

Suzu city (with approximately 10 thousand households) in Ishikawa prefecture switched off analogue

broadcasting one year prior to the nationwide analogue switch-off date. This experience helped in preparing for the nationwide switch-off of analogue.

Broadcasters notified viewers via an analogue programme broadcast on all channels that analogue broadcasting would end on 24 July 2011. The word "analogue" on the screen informed viewers that they were watching an analogue programme. From 1 July 2011, in a final effort to raise awareness, broadcasters superimposed an image on the screen showing the number of days remaining until the analogue switch-off. These measures prevented confusion when analogue television broadcasting was switched off.

Success Tip 5: Promote the change-over to digital terrestrial television broadcasting using characters and personalities as part of the media strategy

The industry developed various campaigns and commercials using an animal mascot (see box) as well as celebrities in different age-groups to act as cheerleaders to promote the switch-over to digital television. Promotional clips were screened for fans at professional baseball and football stadiums, and at horse-racing tracks. These publicity campaigns created nationwide familiarity with the switch to digital terrestrial television broadcasting. Not only that, but also, the spin-off products based on the animal mascot were great hits!

CHIDEJIKA is the mascot for the terrestrial digital television campaign in Japan.

"CHIDEJI" means "terrestrial digital television" and "-KA" is the suffix for "-ization". "JIKA" also means "deer". So "CHIDEJI"+"JIKA"="CHIDEJIKA" is a play on words for the campaign symbolized by a deer. The horns of CHIDEJIKA are in the shape of antennas.





WORLD RADIOCOMMUNICATION CONFERENCE 2012

GENEVA, 23 JANUARY – 17 FEBRUARY 2012



AFP/JIJI PRESS

Charges for making public telephone calls have been suspended; and approximately 1500 new public telephones have been specially installed

Japan after the earthquake and tsunami

Update on the restoration of telecommunication and broadcasting services*

On 12 July 2011, almost three months after a magnitude 9.0 earthquake and giant tsunami struck eastern Japan, the number of deaths stood at 15 555, and 5344 people were still missing. The need for communication is as great as ever. Much of the damaged telecommunications infrastructure has been restored, largely through the concerted efforts of the government and telecommunication carriers, but work has been hampered in certain areas because damaged roads and tunnels have made it difficult to get access.

This update on telecommunication and broadcast infrastructure tracks efforts to restore disrupted services, and how much remains to be done. It also notes just a few examples of the hundreds of gestures of support by the private sector.

Needless to say, the Ministry of Internal Affairs and Communications is making every effort to overcome the devastation and the difficulties faced by the victims of the disaster, acting with the local authorities and supported by other public sector institutions. Again, just a few examples are given here of the many activities undertaken.

Status of telecommunications infrastructure

By the end of April, services had been restored at all disrupted fixed-line telephone exchanges operated by NTT East except in the restricted zone around the Fukushima nuclear power plant, and in other areas where damage to roads and tunnels makes it physically impossible to carry out restoration work. Approximately 12 000 fixed-line services (subscriber lines and

* *This article is based on contribution from the International Policy Division, Global ICT Strategy Bureau of Japan's Ministry of Internal Affairs and Communications*

the integrated services digital network — ISDN) are still out of service (as of 14 July 2011), mainly in coastal regions. In all, there are about three million telephone line subscriptions in the Tohoku region, and an estimated one million lines were disrupted by the disaster. Around 2300 fibre-to-the-home (FTTH) subscriber lines of FLET'S Hikari were disrupted, mainly in coastal regions.

By the end of April, except in a few areas, mobile phone coverage was back to pre-earthquake levels. The four carriers (NTT DoCoMo, KDDI, Softbank Mobile and eMobile) have a combined total of around 70 000 base stations in the Tohoku and Kanto regions, and the disaster put approximately 14 800 of them out of service. All of eMobile's base stations are operational. But around 329 base stations of the other operators are still out of service as follows: 241 for NTT DoCoMo, 25 for KDDI (au) and 63 for Softbank Mobile (as of 14 July 2011).

Status of broadcast infrastructure

By 14 July, only one of the 56 television relay stations in Miyagi prefecture remained out of operation. The number of affected households is relatively low.

Within the 20-km restricted zone around the Fukushima No. 1 Nuclear Power Plant, one radio relay station (national public broadcaster NHK's Futaba medium-wave 1 repeater station



MIC/Japan



MIC/Japan



MIC/Japan

in Tomioka-machi, Futaba-gun) is out of operation. The number of television relay stations out of operation peaked at 120 after the disaster, in an area extending across Aomori, Iwate, Miyagi, Akita, Yamagata, Fukushima, Ibaraki, Tochigi, Chiba, Kanagawa and Nagano prefectures.

Only two radio relay stations went out of operation: one in Iwate prefecture and one in Fukushima prefecture. Operations have since been restored at both of these radio relay stations, and all AM and FM radio broadcasts are now operating as normal.

Relief efforts

In response to requests from local governments in areas affected by the disaster, the Ministry of Internal Affairs and Communications has supplied 353 satellite phone units and 1770 emergency-use portable communication facilities, including multi-channel access (MCA) and convenience radio, at no cost. At the request of NHK, the Ministry of Internal Affairs and Communications approved exemption from payment of receiver fees. No reminders or demands for unpaid spectrum fees are being sent to licensees living in the affected areas. A total of 10 000 portable radios have been distributed to regions affected by the disaster.

Emergency relief teams from overseas have been granted temporary licences for radio transmission systems. In response to requests from 24 local governments in the affected areas, the Ministry of Internal Affairs and Communications has also permitted the temporary establishment of disaster radio stations broadcasting on the FM band.

Telecommunication carriers have supplied 1151 units of mobile communication equipment and 938 satellite phone units at no cost. More than 100 portable power generators and 22 mobile base station trucks have also been provided. Charges for making public telephone calls have been suspended; and approximately 1500 new public telephones have been specially installed. Various dedicated services have been set up as part of the disaster relief effort, including a phone message service to help people get in contact with each other and a broadband message board. Free Internet connections have been set up at evacuation centres. Basic telephone rates have been reduced or waived altogether, and payment deadlines have been extended.

In cooperation with various manufacturers, NHK has installed 750 televisions and 760 radios in evacuation centres. Manufacturers, including Panasonic and Sony, have already supplied over 40 000 radios.

Assistance from the international community

Message from the Ministry of Internal Affairs and Communications of Japan

At this time of great crisis in Japan, we have received deeply-appreciated messages of condolence and assistance from ITU and other international organizations, as well as from many countries around the world.

ITU was one of the first organizations to offer practical assistance to Japan following the earthquake and tsunami disaster of 11 March 2011. That kind offer was immediately taken up, and ITU provided 153 units of satellite telecommunication equipment free of charge to Japan, which the Ministry of Internal Affairs and Communications received by 22 March. The Ministry immediately distributed these units to prefectural and local governments in the affected areas. The satellite telecommunication equipment is being used for relief and reconstruction activities, as well as to provide emergency humanitarian assistance.

At the same time, ITU called on its members to assist Japan. In response to that request, financial support was received via ITU from the governments of Australia, Canada and China, as well as from the Union's industry members. We gratefully acknowledge this financial support.

We would like to take this opportunity to thank Dr Hamadoun I. Touré, Secretary-General of ITU, who offered a deeply-appreciated message of condolence and assistance to Japan in the immediate aftermath of the disaster, as well as ITU staff, and all ITU members who have provided such wonderful support to us.

On behalf of the Government of Japan and the Japanese people, the Ministry of Internal Affairs and Communications would like to express our deepest gratitude for such generous assistance from all around the world.

Information sharing

The Nationwide Evacuee Data System registers details and addresses of evacuees, while the e-government portal e-Gov provides computer and mobile phone links (in Japanese and in other languages) to national and local government services. The Tohoku and Pacific Ocean Earthquake Learning Support Portal for Students tracks items required by students and the available relief supplies. The YouTube Personal Message Channel, set up with assistance from TBS Television and other operators, provides local information on the location of evacuation centres and emergency kitchens. NTT East and West, NTT DoCoMo, KDDI, Softbank Mobile, Google, NTT Resonant and others are providing emergency message board services. Google has also set up Person Finder, a register and search service for confirming the safety of loved ones. The Amazon Web Service Japan User Group provides information on the state of medical facilities, basic utilities, and the trajectories of radioactive materials.

Future disaster preparedness

In April, the Ministry of Internal Affairs and Communications set up a Task Force to examine ways of securing communication methods in the event of a major natural disaster or other emergency. The Task Force will examine, in particular, how to address congestion in communications infrastructure during emergencies, and how to secure communication methods when base stations and relay stations are damaged. Learning from the experiences of the recent disaster, the Task Force will consider the future of network infrastructure and how to make better use of the Internet.



AFP

Japan: what forces did the infrastructure have to face, and how did it stand up to the disaster?

Lessons learned

By Hideaki Kimura
NTT Access Network Service Systems Laboratories

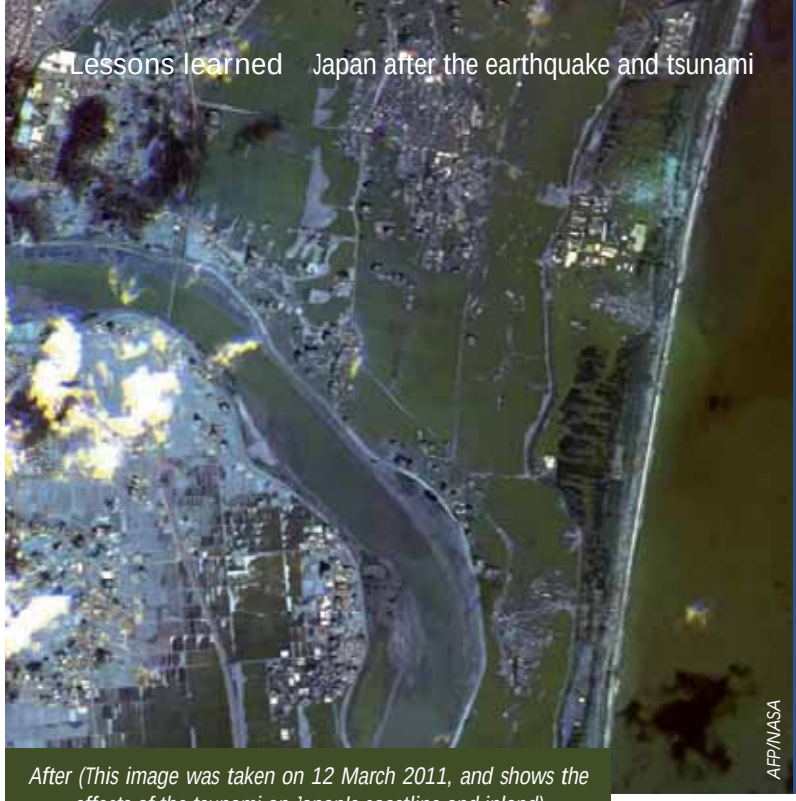
Urban planning aims to provide infrastructure that can withstand disaster or that can easily be restored if it is damaged during a disaster. Emergency communications are vital in providing disaster relief, so access infrastructure for telecommunication networks needs to be especially robust. At NTT Access Network Service Systems Laboratories, we think that it is important to co-operate with national and local government in building access systems for telecommunication networks because the capital investment in disaster-resistant infrastructure is huge.

Earthquake and tsunami

In Japan, infrastructure — and telecommunications infrastructure in particular — has been put to the test by the biggest earthquake ever recorded in the country's history that struck at 14:46 hours on 11 March 2011 off the eastern coast of Japan. The hypocentre was offshore from Sanriku at 38.1° north and 142.9° east, at a depth of about 24 km. The earthquake registered 9.0 on the Richter scale, seismic intensity decreasing with distance from the hypocentre. The seismic intensity was 7 in the northern part of Miyagi, up to 6 in southern and central Miyagi, Fukushima, and below 6 in southern Iwate and southern Gunma. And the earthquake triggered a huge tsunami, which swept



Before (5 September 2010)



After (This image was taken on 12 March 2011, and shows the effects of the tsunami on Japan's coastline and inland)

AFP/NASA

inland with a maximum height of about 38 metres, far exceeding any previous assumptions.

The direction of the pressure axis of this reverse fault earthquake was from west-northwest towards east-southeast. It was a plate borderline earthquake, generated by the Pacific plate and the boundary of the plate on the land. The maximum amount of land shift was about 25 metres, and the scale of the fault was about 200 kilometres in a north-south direction and about 500 kilometres in an east-west direction. The fault rupture expanded in the vicinity of the point where the destruction began, then progressed north and south, continuing for about three minutes.

Damage to general infrastructure

Cities, roads and communications infrastructure were damaged by the earthquake and tsunami. What forces did the infrastructure have to face, and how did it stand up to the disaster?

The scale of the disaster and its effects on infrastructure can easily be seen from the maps and photographs shown here.

The two images shown above, from the United States National Aeronautics and Space Administration (NASA), were taken before and after the disaster. The image on the right was taken on 12 March 2011, and shows how far the tsunami penetrated inland, having flooded Miyagi and Iwate. Photo 1 shows the damage caused by the ground liquidizing. This occurred in the Itako-shi, Ibaraki, area, and caused both subsidence and surfacing. Itako-shi, Ibaraki, suffered less damage than Miyagi and Iwate, but the effects were significant. Photo 2 shows damage caused by fill subsidence at the back of a bridge abutment, with two views of the broken bridge and a picture of the broken conduit. Photo 3 shows some of the other damage caused by the earthquake and tsunami. A widening of the gap between girders caused a bridge to fall. A dramatic landslip closed a road. Sometimes infrastructure was deformed rather than broken, for example the wavy road near the port or the undulating Hitachinaka Kaihin Railway.

Damage to communications infrastructure

The disaster caused water leaks in the communications cable tunnel. Pumping stopped because of loss of power, but the communications cable was not affected and remained usable. Concrete flaked off in the cable tunnel, but there was little damage. The reason for this is because the cable tunnel was built

using technology that is in accordance with standards for earthquake resistance.

It might be asked why there was not more earthquake-resistant infrastructure in Japan. The answer is depressingly simple — because of the high cost of applying these technologies in construction.

Access to communications infrastructure

The reliability of networks can be improved by means of:

- network design technology, including the distribution of data centres and the use of physically redundant transmission routes;
- network monitoring and control technologies;
- building physical networks using improved earthquake-resistant technologies.

As a telecommunications carrier and a public corporation, NTT is obliged to ensure the security of communications in the event of disaster, in accordance with the measures enshrined in law. This includes ensuring the security of access infrastructure, which is, of course, essential for supporting communication services.

Access infrastructure comprises equipment such as conduits, cable tunnels and manholes. In Japan, this infrastructure was all constructed after 1950. Access infrastructure accommodates and protects communication cables, such as metallic and optical fibre cables, and provides access via manholes, as shown in Photo 4.

There are about 620 000 kilometres of conduits carrying cables in Japan at present, along with about 650 kilometres of cable tunnels large enough to permit human access (see Photo 4).

Earthquake-resistant technologies

NTT has researched and developed various technologies that minimize the impact of earthquakes on communication services.

Photo 1 — Damage caused by land liquidizing

Inclination and subsidence of electrical pole



Surfacing of NTT's manhole



Photo 2 — Damage caused by subsidence

Broken bridge



Broken bridge (side view)



Photo 3 — Damage to road and railway

Deformed road



Deformed railway



Photo 4 — Access infrastructure equipment

Cable tunnel



Manhole



To counteract the tension along the axes of conduits or tunnels, caused by diastrophism resulting from an earthquake, NTT has developed a telescopic joint and duct sleeve, both of which can expand and contract.

To counteract equipment surfacing caused by ground liquidizing, NTT constructs gravel drains around manholes. The effectiveness of this technology was confirmed by a study of the effects of the earthquake that occurred in the southern part of Hyogo in 1995.

As a countermeasure to seismic ground motion at level 2 on the Richter scale, (the maximum within the range of assumptions), NTT has researched and developed various flexible technologies, such as a flexible building access conduit, a flexible excavation cable tunnel and a flexible shield shaft connection, to protect communication cables.

Ageing infrastructure

Much of the equipment now in use in Japan was constructed more than 30 years ago. About 75 per cent of cable tunnels and about 40 per cent of conduits are at least 30 years old. More than 80 per cent of manholes are more than 30 years old.

Everyone understands the importance of basic equipment, but there is almost no new construction because the capital cost is so huge, and investment is now focused on the operation and maintenance of equipment. Faced with the problem of controlling investment costs, national and local government have to make a choice between either spending money on the maintenance and management of existing access equipment or on constructing new earthquake-resistant infrastructure.

Future research and development

Continuing research and development to improve earthquake-resistant construction technologies is clearly important to

ensure access to network infrastructure in the event of disaster, so that telecommunications can be maintained. It is equally clear that future research and development needs to focus on lowering the cost of basic equipment.

Priorities will need to be set, taking into account the deterioration of equipment.

NTT is researching and developing "check and repair" technologies that can be used to monitor ageing equipment. Photo 5 shows two examples of non-destructive diagnosis technology, which use two different methods to assess the deterioration of concrete: the supersonic wave method; and the electromagnetic method. The supersonic wave method is a technology for assessing concrete thickness, the depth of cracks, the compressive strength of the material, and corrosion. The electromagnetic method is a technology for assessing the depth of cracks, along with deterioration factors such as salinity.

If infrastructure is found to be deteriorating dangerously, it must be repaired or replaced. Photo 6 shows technology that can be used to repair two different types of cable accommodation tube. Using this technology, it is possible to repair and reinforce conduits that carry cables. This technology offers a way of maintaining operations at low cost.

Learning from disaster

The earthquake and tsunami that struck Japan in March 2011 affected the access infrastructure essential to supporting communication systems. Technologies now exist that are earthquake-resistant but much current equipment is superannuated. A lot will undoubtedly be learned from analysing the damage caused by the March disaster. Meanwhile, NTT will continue to work on the technologies for access construction that it has developed to date to ensure that communications lifelines remain open. ■

Photos on pages 38–40 are by NTT/Japan.

Photo 5 — Non-destructive diagnostic technology to monitor concrete

Comprehensive supersonic wave method



Electromagnetic method



Photo 6 — Repair technology for cable accommodation tube

Segmented lining



Simple lining





S. Matter/NFSD

Geneva Dialogue on m-health

Using mobile technology to advance public health in the developing world

The potential of m-health for development

Mobile technologies and devices are increasingly being used in innovative ways to support medical and public health practice. This new field is loosely termed m-health (mobile health). Mobile phones, patient monitoring devices, personal digital assistants, and functionalities such as voice and short messaging services, general packet radio services, third and (soon) fourth generation mobile telecommunications (3G and 4G), global positioning systems and Bluetooth technology all have the potential to improve the delivery of health services in economically advanced countries. Can these advances benefit developing countries too?

Opening the Geneva Dialogue, organized jointly by ITU and the Novartis Foundation for Sustainable Development at the Graduate Institute in Geneva in Switzerland on 27 June 2011, ITU Secretary-General, Hamadoun I. Touré, cited the following figures, which give rise to hope. At the beginning of the millennium, around half of the people in the world's richest countries had a mobile phone, compared with less than 2 per cent in Africa. Today there are more than 5.3 billion mobile phone subscriptions globally, and penetration in Africa is more than 40 per cent. And more than half of households in some developing countries — even in rural and remote areas — have a mobile phone. At the beginning of the millennium, around 280 million people used the Internet worldwide. By the end of last year that figure had grown to over 2 billion.

Mobile technologies have great potential for overcoming health challenges in developing countries, says Klaus M. Leisinger, President and Managing Director of the Novartis Foundation, emphasizing the importance of gathering all stakeholders together in order to avoid

duplication of efforts and to coordinate public-private partnerships. Already, mobile phones are being used to store medical records, and to give patients better access to emergency services.

Both Dr Touré and Mr Leisinger believe that achieving the Millennium Development Goals (including those relating to health) is possible — but only if all the relevant actors contribute their fair share. Novartis and the Novartis Foundation for Sustainable Development have contributed by investing in developing countries, transferring technology, implementing numerous health projects in these countries and employing and training thousands of associates. Klaus Leisinger recalls that "Novartis has established extensive access-to-medicine programmes, thereby helping save millions of lives and improving quality of life for hundreds of millions of patients."

Looking to the future, Dr Touré says there will be a huge increase in the use of visualization technology, for example enabling a surgeon to practise on a three-dimensional model of a patient's heart before operating in reality or to see exactly where a brain is malfunctioning, without the need to open up the skull. Personal and home-based sensor devices will play an increasing role in the remote monitoring of patients. The machine-to-machine communication and the power demands of m-health will be supported by the Internet of Things and cloud computing.

Global perspectives

At present, m-health lacks a strong evidence base to verify its impact on health outcomes and health systems, so its cost-effectiveness needs to be evaluated to support policy decisions, according to a recent survey by the World Health Organization's Global Observatory for eHealth. The survey looked at 14 categories of m-health services: health call centres; emergency toll-free telephone services; managing emergencies and disasters; mobile telemedicine; appointment reminders; community mobilization and health promotion; treatment compliance; mobile patient records; information access; patient monitoring; health surveys and data collection; surveillance; health awareness raising; and decision support systems.

The survey shows that there is a groundswell of activity in m-health, which is already being applied in low-income countries to improve maternal and child health. Globally, 83 per cent of countries

have at least one m-health initiative in place. Strategies and policies that integrate e-health and m-health interoperability into health services would be wise, and there is thus a need for globally accepted standards and interoperable technologies, ideally using open architecture. As

Najeeb Al-Shorbaji, Director of Knowledge Management and Sharing at the World Health Organization, puts it: "If implemented strategically and systematically, m-health can revolutionize health outcomes, providing virtually anyone with a mobile phone medical expertise and knowledge in real-time."

Examples of m-health projects in Africa

Telemedicine in Ghana

The Novartis Foundation is cooperating with the Millennium Villages Project to use mobile and other information and communication technologies (ICT) to provide good quality primary health services that are



Paroma Basu/NFSD

affordable, sustainable and meet the needs of patients in Ghana. "The Millennium Villages Project involves the systematic delivery of a package of proven health and development interventions, with the aim of accelerating progress towards the Millennium Development Goals," says Eric Akosah, Health Coordinator of Ghana's Millennium Villages Project.

Remote areas of Ghana face a range of health challenges, from inadequately qualified human resources and limited health facilities, to a high disease burden, with high levels of child and maternal mortality. Access to health care is made even more difficult because road networks and other infrastructure are underdeveloped, adds Mr Akosah. The vision of the Ghana telemedicine project is to use ICT to provide health for all, anytime and anywhere. The project seeks to reduce unnecessary transport and strengthen the referral system. This will reduce congestion in bigger urban health facilities and patients' waiting time. The project also includes a monitoring component to evaluate the effects of telemedicine on the health system.

Since the start of the project in September 2010, the project team has established a teleconsultation centre and provided mobile phones to all health workers in Bonsaaso village in the Amansie west district of the Ashanti region of Ghana. A mobile phone application called "Childcount+" allows project staff to record and manage patient data, and to send health reports to a central database. Health workers can access the medical records of patients. The powerful messaging features of ChildCount+ facilitate communication between health workers, and an automated alert system helps reduce gaps in treatment. Five communication masts have been built and mobile operator Airtel has extended its services. Computers have been installed in all seven health clinics to store electronic medical records.

The results of the project so far seem promising. The next steps will be to train health workers in telemedicine. An assessment of the impact of telemedicine on child mortality rates, together with a cost-benefit analysis, will inform future telemedicine activities in Ghana.

Access to malaria treatment in rural Tanzania

An innovative mobile phone-based tool is being developed within the scope of a project called ACCESS,

which aims to improve access to effective malaria treatment and care in four rural districts in Tanzania, in particular for pregnant women and children under five years of age. ACCESS is being implemented by the Ifakara Health Institute, with scientific support from the Swiss Tropical Institute, as well as technical and financial support from the Novartis Foundation.

The Foundation is working with Vodafone on the development of a mobile phone-based tool to assess the quality of services in health facilities. Before the project, local health authorities carried out these assessments using paper□based questionnaires. Assessments were therefore costly in terms of the amount of paper copies needed and human resources required to enter and to analyse data. The mobile phone-based tool will allow for a more viable and efficient performance assessment approach, requiring less financial and human resources to be scalable for the rest of Tanzania. With this tool, data are stored in a secure environment and can be accessed easily.

Presenting the m-health tool, Alexander Schulze of Novartis Foundation for Sustainable Development, and Niklas Bergvall of Vodafone explained that there are two categories of users: assessors, who collect data by visiting individual health facilities and who give immediate feedback to health workers; and health authority managers, who use the data and statistical reports to identify quality gaps in health facilities, and who make informed decisions about how to allocate scarce resources.

Diagnosing and treating childhood illnesses through a mobile phone-based tool in Tanzania

The correct use of simple standards of care such as the Integrated Management of Childhood Illness (IMCI) protocols for classifying and treating common causes of death, for example, pneumonia, diarrhoea, malaria, measles and malnutrition could save many lives. However, despite a worldwide effort, the use of IMCI protocols remains limited because of the expense of training health workers and the tendency to follow protocols less rigorously over time.

D-Tree International has been working in the area of child health to improve the flexibility and use of these protocols through the development of an electronic version of IMCI (eIMCI) for use on mobile phones and other mobile devices. Initial results from a pilot e-IMCI project in rural Tanzania indicate that clinicians more closely adhere to the IMCI protocol when using e-IMCI than without it, and were enthusiastic about its use with patients. "The personal digital assistant makes its own decision, and will tell you if medicine is necessary and what the dosage is, so you can't make a mistake in treating a child", says one health worker.

The software guides health workers step-by-step through the full IMCI assessment, classification and treatment plan. It is easy to use and the training of clinicians to use the tool takes less than one hour. A large-scale study is under way to validate the initial finding that e-IMCI leads to improved adherence to the IMCI protocols compared to the conventional use of IMCI, and that e-IMCI can be used to improve the communication between health worker and child caretaker about how to treat the child and watch for danger signs. "In the past, the doctor used to write prescriptions on a



Nokia

piece of paper without asking us questions, but today we were asked questions. That is what was different", says one mother.

Lucy Fulgence Silas of D-Tree International observes that the "estimated shortage of almost 4.3 million doctors, midwives, nurses and support workers worldwide… is most severe in the poorest countries, especially in sub-Saharan Africa, where health workers are most needed." In addition to its work on IMCI protocols, D-Tree International is using mobile technology to store information about each child, including immunization records and growth history, and will prompt the health worker to offer preventative care.

How to scale up m-health in the future?

Some basic approaches are needed to spread the benefits of m-health. These include anchoring e-heath and m-health in government priorities and strategies and standardization. Most health systems are severely overburdened, and have to make difficult decisions about competing priorities. Countries will need to collaborate in developing global best practices so that data can move more effectively between systems and applications. Data security is a particularly important concern. Message transmission and data storage must be secure in order to protect personal information.

The greatest incentive to invest in m-health is to see the health dividend that m-health projects achieve. Building a publicly available repository of registered projects would showcase the projects that have already strengthened healthcare delivery. Such evidence would provide an incentive for ministries of health and other stakeholders to invest in m-health.

The summary of the presentations and discussion on "M-health: Using mobile technology to advance public health in the developing world." are available at the Novartis Foundation website: www.novartisfoundation.org.


ITU/P. Ticon

ITU/P. Ticon

Climbing Mont Blanc

On Thursday 30 June 2011, at 1234 hours local time, a team of ITU staff reached the summit of Mont Blanc, 4810 metres above sea level. Fittingly for the staff of the world's telecommunication agency, the climbers immediately established radio contact with ITU's amateur radio station. How did the team face up to such a great challenge?

Flying the ITU flag

An international team of three men and three women took part in the ITU Mont Blanc 2011 project. The objective of the project was to embark on a great human adventure that would enhance the enjoyment of combined effort, foster a spirit of solidarity among ITU staff, and — in line with ITU's mission to connect the world — establish radio contact from the roof of Europe.

The support of ITU's top management enabled the team to be properly prepared and equipped to face the dangers of the mountain. Dr Touré gave his full backing to this team-building project, which should pave the way for similar initiatives contributing to the spirit of one ITU.

In this article, the team shares their impressions of a splendid human adventure, involving the kind of activity that lays emphasis on cohesion, team spirit and transcending one's own capabilities. The team's ascent had everything to do with flying the ITU flag.

What inspired the ITU team?

Patrick Ticon, the initiator of the project and team leader had for years longed to climb Mont Blanc, the white mountain that — on a clear day — you can see from the cafeteria on the 15th floor of the ITU tower. Patrick says "My guiding lights in this



The Mont Blanc expedition team (from left to right): Marta Nury Munoz Echeverri; Patrick Ticon; Bernadette Maurissen; Karima Benkirane-Demlek; Michel Mbarga; and Kim Dong-Sik

ITU/S. Bazin

project were an enjoyment of effort and sense of shared pleasure. I know from experience that everyone's best is revealed through effort. It provides an opportunity to discover wonderful people through learning and succeeding together. Differences are a source of wealth that we sometimes need to cultivate."

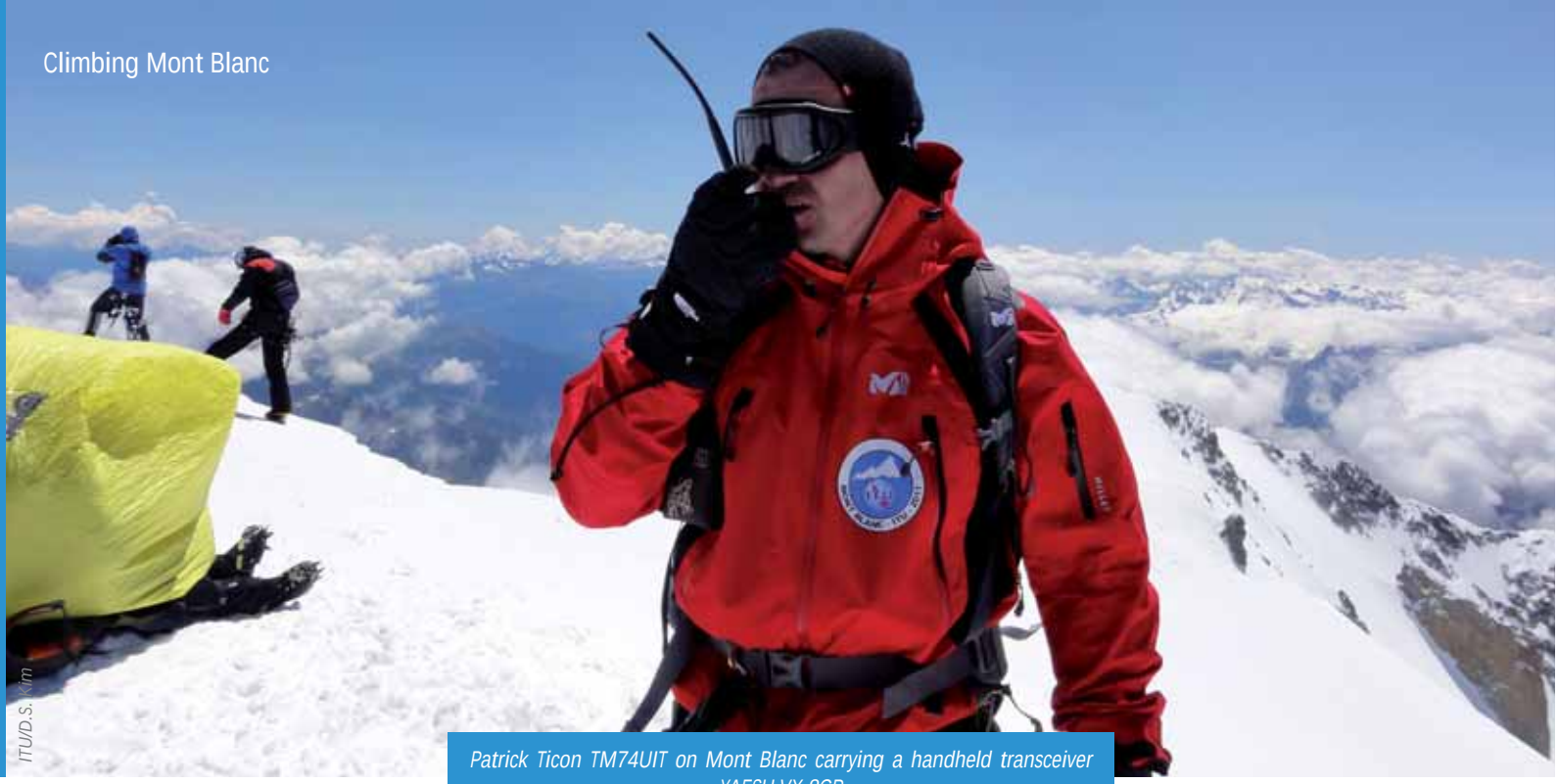
Michel Mbarga explains "This project is a way of demonstrating the kind of strength that gives ITU staff members the determination to carry out and accomplish their various missions."

Marta Nury Munoz Echeverri, who loves mountains and has been climbing them for years, was keen to climb for ITU. "In the course of preparing for our ascent, we found ourselves dealing with and getting to know colleagues we had previously encountered here and there during working hours and with whom our only contact had ever been the briefest of greetings," she recalls.

Karima Benkirane-Demlek, who loves sports but not high-mountain trekking, says although she was apprehensive she didn't hesitate for one second to join the team. "The prospect of being part of a team representing the Union and of climbing one of the world's highest summits convinced me to accept the challenge and prepare myself as best I could."

Bernadette Maurissen saw climbing Mont Blanc as "a great sporting and human adventure." She enjoys her day job as a nurse, and was "proud to be able to represent ITU through this exceptional challenge".

Kim Dong-Sik saw the Mont Blanc challenge as "a real good opportunity to work together in an extreme environment", recalling that recent natural disasters had highlighted the importance of communication and the role of ITU.



ITU/D.S. Kim

Patrick Ticon TM74UIT on Mont Blanc carrying a handheld transceiver YAESU VX-8GR

Training

The team had to be strong both physically and mentally. This meant following a serious training programme. As a warm-up, on 5 March 2011, the team climbed Le Crêt de la Neige on snowshoes. The next stage involved some mid-level mountain expeditions: Le Reculet (1719 metres) on 2 April, Lac Jovet (2240 metres) on 15 April, and Col d'Anterne (2250 metres) on 28 April, as well as repeated ascents of Le Salève. Then it was time for some high-level mountain climbs, with the ascent of Le Buet (3096 metres) on 3 June, Le Reculet again on 4 June, and Le Buet once more on 12 June.

Karima recalls the arduous training schedule. "From our very first training expedition, I discovered something grandiose and magical about walking in the mountains, despite the difficulties and the physical ordeal that can be a part of it."

A schedule of progressive training is the way to reduce the risk associated with poor physical condition. Yet the effect of training went far beyond the mitigation of risk. During the training sessions, genuine bonds of friendship grew between the participants.

Facing the challenges

High-altitude mountaineering always involves risk, whether geographic, climatic, material, training, acclimatization or guidance. In 2010, there were 64 rescue missions on Mont Blanc and four climbers died.

The ITU plan to climb Mont Blanc scrupulously followed the recommended approaches to limiting risk: employing a competent high-mountain guide to provide training and accompany the climbers; ensuring that the team followed a sustained and rigorous training programme to be in good physical shape, and understood the climbing techniques and equipment that would be required; and being kitted out with suitable equipment.

Using amateur radio to keep in contact

When the project started to take shape, Attila Matas, a radio engineer, offered to track the expedition, and help train Patrick so that he could pass the exam necessary to obtain an amateur radio licence before the expedition set off for Mont Blanc.

The idea was for the climbers to transmit their position and altitude every five minutes so that Attila could track their progress from the 4U1ITU radio club at ITU headquarters.



Attila Matas at the ITU amateur club station 4U1ITU in Geneva in communication with the APRS server (http://aprs.fi) that collects global real-time position information from radio amateur stations

Keeping track of the ITU climbers

The Automatic Packet Reporting System (APRS) and FM communication channels were set up to track on-line the position of the mountaineers and maintain voice (FM) communication with the expedition using amateur radio communication equipment.
For the APRS communication on 144.800 MHz, the 4U1ITU amateur station used a Kenwood TH-D7A transceiver. For voice (FM) communication on 145.525 MHz, the 4U1ITU amateur station used a YAESU FT-736R transceiver.
Patrick Ticon F4GRZ/TM74UIT was carrying a YEASU VX-8GR handheld transceiver.
The radio amateur stations were able to maintain reliable APRS communication every five minutes and FM communication every hour. This amateur radio operation improved the safety of the ITU Mont Blanc 2011 expedition (through on-line tracking and voice contact) and showcased new online communication methods using modern portable amateur radiocommunication equipment.

But the usual equipment has a range of 30 kilometres, and the point-to-point distance from ITU headquarters to the summit of Mont Blanc is 75 km and distance to Italy (Grand Paradis) is 130 kilometres. Attila had to resort to some tricks to overcome the technical challenge. As he explains, "we used a 7 elements Yagi antenna normally used for amateur-satellite communication on the roof of the ITU and we turned it in the direction of Mont Blanc. Information from the handheld transmitter YEASU VX-8GR (beacon) carried by Patrick F4GRZ was processed at 4U1ITU radio club at ITU headquarters using the APRS* tracking system, and then channelled to Finland where there is a global amateur radio tracking server (http://aprs.fi). The server in Finland is open to the whole world, so anybody in the world could track the expedition on the web in real time. We used a similar radio also for FM voice communication. The ITU call sign was 4U1ITU, and the French Administration licensed the special call sign TM74UIT for the mountaineers."

* *APRS was developed by Bob Bruninga, WB4APR*

Satellite tracking step by step to the summit

By Sunday, 26 June 2011 (Day 1 of the expedition), the team was ready. The guide was waiting. The accommodation was booked. And special insurance coverage had been taken out. On that Sunday, the six members of the team met on the forecourt of the ITU tower, and set off in two cars for Argentière to pick up their mountaineering gear (helmets, harnesses, ice-axes and crampons), on their way to meet their guide, Serge Bazin, at Montenvers station in Chamonix. From there, they made their way to the ice school near the Mer de Glace (1908 metres) to spend the day familiarizing themselves with the equipment, returning to Chamonix to stay for the night.

On Day 2 (Monday 27 June), after a morning with Serge at the climbing school near Chamonix, the team travelled to Courmayeur in Italy, to spend the night at the Victor Emmanuel II refuge (2750 metres).

Day 3 (Tuesday, 28 June) saw the team leave the Victor Emmanuel II refuge at 0430 hours to climb the Grand Paradis (4067 metres), arriving at the summit at 0915 hours (first APRS tracking). After climbing down, with a stop at the Victor Emmanuel II refuge for lunch, the team returned to Chamonix for another night.

On Day 4 (Wednesday, 29 June), Serge and the team took the Houches-Bellevue cablecar and then the Mont Blanc tramway to the Mont Lachat station, at an altitude of 2077 metres. From there, they walked to the Nid d'Aigle and then on to the Tête Rousse refuge (3167 metres), where they spent the night.

Then came Day 5 (Thursday, 30 June) — the big day. Waking at 0400 hours, the team was pleased to find that the overnight rain had cleared and the weather conditions were favourable. Leaving the Tête Rousse refuge at 0445 hours, the excitement was tangible. Attila picks up the story: "I came to ITU headquarters ready to make contact with the team at 0430 hours. Looking towards Mont Blanc, I saw that it was raining, so I thought that the attempt would be called off. Then the APRS satellite tracking image started to move, and I made radio contact with Patrick, who said that he expected to be at the top of Mont Blanc at around 1230 hours."

The team needed to make an early start while the ice still held the rocks in place. Once the sun began to warm the mountain, the danger of rock-falls would increase. By 0800 hours, the team had made the icy and difficult climb to the refuge du Goûter (3817 metres).

Leaving the refuge du Goûter at 0830 hours, the climbers struggled upwards in the thin air, passing the Dôme du Goûter (4304 metres) and the Vallot refuge (4362 metres). At 1234 hours they reached the summit of Mont Blanc, and established VHF radio contact with ITU's amateur radio station. At ITU headquarters, the excitement exploded in a series of shrieks and cries "Wow! Perfect timing!" Attila contacted the climbers whose progress had been tracked in real time, "Hi Patrick, congratulations!"

Then the team had to make the long and exhausting climb back down, via the Goûter refuge and the notorious Couloir du Goûter, to spend the night at the Goûter refuge before heading back to Geneva on 1 July 2011.



ITU/S. Bazin

Planting the ITU flag on the summit of Mont Blanc

Enjoying the ITU team's success

"Facing the challenge of climbing Mont Blanc created great team spirit and deep friendship. Not everyone needs to climb a mountain, but just doing something sporty, like walking or swimming, is good for the mind as well as the body," says Bernadette.

"Everybody warned me. Watch out! You will see what the altitude does to you… they were right. I felt as if I had lost my full physical capacities, and all I had left was my will power and the one objective: to reach the summit. At one point I really asked myself what I was doing up there. Patrick kept encouraging me, you can do it, I know you can, keep going. We finally made it to the top, and it was amazing," recounts Michel. Kim Dong-Sik, who celebrated his 50th birthday on the first day of the expedition, also admits that "the climb was very hard, and I was surprised to be able to reach the summit".

Although they are all amateur climbers, they approached the challenge with professionalism, building up their strength individually and as a team, identifying and mitigating risks, and relying on the telecommunication expertise of their ITU colleagues to track their progress and keep in contact.

The modern APRS tracking system used by 4U1ITU radio club added to the security of the team and allowed the team's exploits to be followed throughout the world. On the mountain, news spread rapidly by word of mouth between the refuges. Other climbers saw the ITU logo on the jackets and backpacks of the ITU team, and asked about the Union and its work. News spread of a blind soldier who was making the climb, and the ITU team met him during their ascent.

Patrick concludes, "There is an interesting exchange at the human level, you discover your colleagues in a different way, you learn skills you did not necessarily think you had the capacity for, and then there is the effort side: helping each other, surpassing yourself. My thanks to all concerned for the energy devoted to this project and for the confidence shown by ITU."



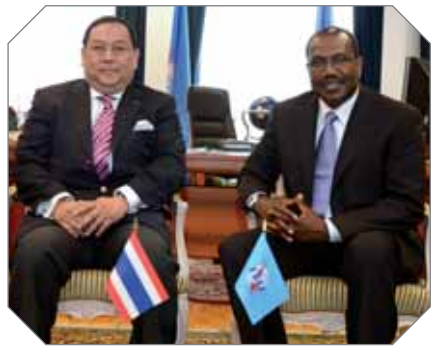
Official Visits

During the months of June and July 2011, 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.

June »



Othman Hashim, Ambassador of Malaysia



Chuti Krairiksh, Thailand's Minister of Information and Communication Technology



Tariq Alawadhi, Executive Director of Spectrum and International Affairs, United Arab Emirates



Roberto Flores Bermúdez, Ambassador of Honduras



Lawrence Atiase, Director-General of the African Union of Broadcasting (AUB)



Malcolm Johnson, Director of the ITU Telecommunication Standardization Bureau; Lynn St Amour, President and CEO of the Internet Society; and Dr Touré



Fabio Leite, Deputy to the Director of the ITU Radiocommunication Bureau; Mauricio Montalvo, Ambassador of Ecuador; and Dr Touré



John Ashe, Ambassador of Antigua and Barbuda; Dr Touré; and Ambassador Francis Lorenzo, Honorary President of South-South News



Alberto Navarro Brin, Ambassador of Panama



Baudelaire Ndong Ella, Ambassador of Gabon



Sandro Radicella, Head of the Aeronomy and Radiopropagation Laboratory at the Abdus Salam International Centre for Theoretical Physics (ICTP)



Roberto Flores Bermúdez, Ambassador of Honduras; Dr Touré; and Gelbin Ponce, Commissioner at the Honduras National Telecommunications Commission, the Comisión Nacional de Telecomunicaciones (CONATEL)



Fodé Seck, Ambassador of Senegal



Dragana Curcic, Deputy Director of ETV, Serbia; Dr Touré; and Momcilo Simic, Serbia



Annociate Sendazirasa, Burundi's Minister of Civil Service, Labour, and Social Security



Idriss Jazairy, Ambassador of Algeria



Magdalena Gaj,Poland's Deputy Minister of Infrastructure; and Houlin Zhao, ITU Deputy Secretary-General

July »



Augustín Santos Maraver, Ambassador of Spain



Jasna Matiæ, Serbia's Minister of Telecommunications and Information Society



Lazarus Kapambwe, Zambia's Permanent Representative to the United Nations in New York



Zelmar Rodríguez Crespo, General Manager of Panama's National Authority of Public Services (ASEP)



Esen Aydogdyev, Ambassador of Turkmenistan



Dr Babatunde Osotimehin, Executive Director of the United Nations Population Fund (UNFPA)



Fatou Ndiaye Diop Blondin, President of Senegal's Regulatory Authority



Séraphin Lissassi, Ambassador of Benin



François Rancy, Director of the ITU Radiocommunication Bureau; Houlin Zhao, ITU Deputy Secretary-General; Victor Hugo Barnica, Vice President of Honduras; Dr Touré; and Malcolm Johnson, Director of the ITU Telecommunication Standardization Bureau



Jean-Guy Carrier, Secretary General of the International Chamber of Commerce (ICC)



Catalin Marinescu, President of Romania's National Authority for Management and Regulation in Communications



Dr Hamed Al Rawahy, Chief Executive Officer of Oman's Telecommunications Regulatory Authority



Obaid Salem Saeed Al Zaabi, Ambassador of the United Arab Emirates



John W. Dick, Chairman of O3b Networks Limited and Board Member



Peter Gooderham, Ambassador of the United Kingdom

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