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Data protection and privacy in the cloud

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■ Outlook for 2013

A busy year ahead

**Dr Hamadoun I. Touré,
ITU Secretary-General**



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ITU got off to a dynamic start in 2013, which promises to be just as busy and exciting as last year. Looking ahead, we will build on the extensive work done in 2012, which culminated in the World Conference on International Telecommunications, WCIT-12, held in Dubai from 3 to 14 December.

At WCIT-12 we saw a new divide opening up between members. This is not a divide about issues within ITU, however, and we are therefore confident that in the true spirit of the Union we will continue to work together to bridge that divide. All members have expressed their desire to continue participating actively in ITU's ongoing work, and we fully appreciate their confidence and support.

As reported in the December 2012 issue of *ITU News*, the newly revised International Telecommunication Regulations (ITRs) treaty coming out of WCIT-12 contains many gains and achievements, including increased transparency in international mobile roaming charges and competition — an extremely important win for consumers.

A total of 89 Member States signed the revised ITRs in Dubai in December, and many others will accede to the treaty after they have gone through national consultations, ahead of the treaty coming into force at the beginning of January 2015.

The new treaty charts a globally agreed road map that promises to bring the digital era within reach of the 700 million people around the world who still do not have mobile phone network coverage and the 4.5 billion people not yet online.

That is what WCIT-12 was really all about: creating the right environment for telecommunication infrastructure investment and roll-out — because connecting the unconnected is at the heart of what ITU does.

Thanks to WCIT-12, a healthy digital ecosystem — where everyone on the planet can participate — is now within our grasp, and all stakeholders, including governments and businesses, must do their utmost to ensure that we deliver on this promise.

As an institution, ITU has successfully been an influential but neutral global convener throughout its history, and we are firm believers that only open, transparent and inclusive processes will lead the way to successful policy-making. That is why we continue to act as a bridge builder, promoting a multi-stakeholder approach to dealing with telecommunications and information and communication technologies (ICT).

In this regard, I am very much looking forward to the fifth World Telecommunication/Information and Communication Technology Policy Forum (WTPF-13), which we are honoured to organize in Geneva from 14 to 16 May, providing a global platform for our members to examine international Internet-related public policy matters. The Forum will enable all stakeholders to contribute their unique perspective to the discussions and help the global community chart a common course forward. Just before WTPF-13, ITU will host a high-level Strategic Dialogue on 13 May to discuss the importance of investment in infrastructure and the changing nature of ICT regulation. The focus will be on broadband — the critical infrastructure essential for national competitiveness in today's global economy.

In another example of open consultation, ITU, the United Nations Educational, Scientific and Cultural Organization (UNESCO), the United Nations Conference on Trade and Development (UNCTAD), and the United Nations Development Programme (UNDP) will welcome all WSIS stakeholders to the WSIS Forum 2013, which is being held in Geneva from 13 to 17 May.

Meanwhile, we have started implementing the Union's operational plans for 2013–2016, which encompass the diverse priorities of its membership. For example, the operational plan for the Radiocommunication Sector (ITU-R) reflects the Radiocommunication Bureau's intensified cooperation and assistance to the membership, particularly in the areas of spectrum management, transition from analogue to digital broadcasting, and effective and efficient use of the digital dividend.

In addition to the traditionally strong areas of the Telecommunication Standardization Sector (ITU-T), such as optical transport, quality of service, numbering and addressing, economic and policy questions, and security, ITU-T's portfolio is being augmented by

new areas such as cloud computing, smart grids, home networks, intelligent transport systems, the Internet of Things and machine-to-machine communications, ICT and climate change, and telepresence technology.

In the Telecommunication Development Sector (ITU-D), the Telecommunication Development Bureau (BDT) is responding to the expectations and priorities expressed by the ITU-D membership regarding the Sector's transparent, efficient, accountable and results-based management. The operational plan for ITU-D thus encompasses all relevant information on resource requirements, expected results and key performance indicators.

This year will see ITU organize six regional preparatory meetings to prepare for the sixth World Telecommunication Development Conference (WTDC-14), which will take place in 2014 in Sharm el-Sheikh, Egypt. The first regional preparatory meeting took place in February in Chisinau, Moldova, for the Commonwealth of Independent States, with other meetings scheduled to follow for Asia-Pacific, the Americas, Africa, the Arab States and Europe.

ITU will also organize the 13th Global Symposium for Regulators (GSR), in Warsaw, Poland, from 3 to 5 July, under the theme "4th Generation regulation: driving digital communications ahead". GSR remains a unique venue for regulators and policymakers from both developed and developing countries to meet and exchange views and experiences.

The General Secretariat's operational plan specifies the way forward for achieving effectiveness and efficiency in the planning, management, coordination and delivery of services to support ITU's entire membership, ensuring the implementation of the financial and strategic plans of the Union, and coordinating intersectoral activities.



Increased transparency in international mobile roaming charges will be an important win for consumers, thanks to the new treaty

All of these operational plans were approved by the ITU Council session last year, which this year will run from 11 to 21 June and will focus on the budget for 2014–2015 and on preparations for the Plenipotentiary Conference, to be held in 2014, in Busan, in the Republic of Korea.

In September, ITU will be organizing the Global Youth Summit, to be hosted in Costa Rica under the patronage of President Laura Chinchilla, the Patron of ITU's Child Online Protection initiative. The summit will bring together young people to create solutions for social good, enabled through widespread access to ICT.

Wrapping up the year in our calendar of global events is ITU Telecom World 2013, which will be held in Bangkok, Thailand,

from 18 to 21 November. The event will take place under the central theme of embracing change in a digital world. I invite all our members to join us in 2013 "to continue the conversation that matters".

With ever-increasing connectivity, and with data in the cloud, on search engines, on social networking sites and transmitted through online commerce, I believe that "big data" will be one of the next drivers of social and economic progress. We can use the power and scale of the cloud to bring virtually unlimited processing power and data storage capacity to everyone — wherever they live and whatever their circumstances. But we do also need to consider data protection and privacy — subjects that are dealt with in this issue of *ITU News*.



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Data protection and privacy in the cloud

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A busy year ahead

Dr Hamadoun I. Touré, ITU Secretary-General

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TRENDS IN
TELECOMMUNICATION
REFORM
2013
TRANSNATIONAL
ASPECTS
OF REGULATION
IN A NETWORKED
SOCIETY





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■ **Data protection and privacy in the cloud**

Whose cloud is it anyway?

An individual may choose to give away or trade personal data in the cloud, but it should be an informed choice. One task of an effective regulator (whether for information and communication technologies — ICT — or for data protection) is to facilitate the education of consumers on the risks to privacy and to their personal data when using cloud services. Can policy-makers, regulators and business work together to promote cloud literacy?

What if an individual has knowingly provided personal data, and no longer expects the information to remain private?

Should policy-makers step in to protect such personal data?

Questions such as these are raised in ITU's latest report *Trends in Telecommunication Reform 2013* in a chapter entitled "The Cloud: Data Protection and Privacy — Whose cloud is it anyway?", authored by Stephanie Liston, Senior Counsel, Charles Russell LLP. The chapter discusses cloud services and their economic and social benefits, current privacy and data protection regulation as applied to cloud services, and the effectiveness of current regulation and enforcement to preserve privacy.

It goes on to recommend the development of a fit-for-purpose regulatory model that balances commercial needs and opportunities, technological reality and a citizen's reasonable expectation of privacy in an international digital ecosystem. This article is adapted from that chapter.

How to strike a balance?

The financial benefits that cloud services offer to governments, businesses, citizens and consumers must be balanced against the risks that such services may

pose to an individual's privacy or personal data.

Yet there is increasing confusion as to who has the duty to protect personal data.

Freely putting personal information in the cloud has perhaps desensitized individuals to the idea of private information. Do consumers know how these data might be used or understand the possible risks to data security? What is the intrinsic value of personal data, which are being referred to as "the new oil" from a commercial perspective? And should consumers have an economic right to benefit from trading these data?

To answer the questions of privacy and data protection that arise in the cloud, individual attitudes need to be explored and taken into account. After all, whose personal data are we trying to protect?

According to the 2011 Special Eurobarometer survey on individual attitudes to privacy, 74 per cent of respondents considered online disclosure of information an increasing part of daily life. A majority expressed concerns over the recording of their behaviour via mobile phones, payment cards and mobile Internet, but 58 per cent saw no alternative to disclosure of personal information if they wanted to obtain products and services.

Consumer groups tend to take a more active role than individual consumers in trying to protect personal information. Promoting cloud literacy is key to ensuring that consumers understand the real value of personal information.

Trends in Telecommunication Reform 2013 reviews existing privacy and data protection frameworks in the European Union (EU), as well as from a diverse group of countries representing the developed and developing world. Many countries that have adopted or are considering the adoption of data protection regulation have followed the European model, so the review treats Europe in the greatest depth. The European model also usefully illustrates the problems presented to business and the economy by the lack of clear and consistent laws implemented seamlessly across international borders.

At a regional level, the European Union Data Protection Directive (more simply referred to as the European Directive) was enacted in 1995. Under the European Directive, data protection obligations are generally imposed upon data controllers, while data processors are subject only to specified security requirements. But differing definitions used in different European countries, along with the blurred categorization of a cloud service provider as a controller or processor, lead to ambiguity.

The client is often responsible for the full burden of data protection obligations and compliance, despite having little control over the actions of the provider or movement of the data. Cloud clients are required to exercise due diligence with respect to choosing a provider who offers sufficient guarantees of reliability, competence and security safeguards to be compliant with relevant laws.

What about the transborder flow of data?

Under the European Directive, personal data must not be transferred to countries outside the European Economic Area that are judged to have inadequate personal data protection measures. Amazon, for example, has created a European Cloud to provide customers with confidence that data will not cross borders in breach of the Directive. The United States Safe Harbor Scheme is also accepted as adequate for the purposes of transferring certain personal data, subject to some notable exceptions and to specific due diligence.

Cloud computing, however, is typically conducted without a stable location and providers are unlikely to be based only in specified countries. The customer may not be able to ascertain the real-time location of data that are being processed or stored. Regulators face the same problem, which renders restrictions on transborder data flows difficult to enforce.

If transfers need to be made to countries outside those that have "adequate" laws, standard contractual clauses may be required. These clauses contain non-negotiable provisions that set out transfer and security measures deemed adequate under the European Directive.

International businesses can adopt binding corporate rules for the regular transfer of data throughout their corporate networks.



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Transborder flow of data

Accountability is key to ensuring compliance and thus audit rights are becoming increasingly important to clients. However, the granting of these rights presents a practical problem for providers who use shared infrastructure for their clients. Granting access may itself compromise the confidentiality and security of data belonging to other clients.

What laws apply in the cloud?

There is no universally binding privacy legislation covering all countries of the world. Of the 89 countries that have adopted privacy or data protection laws, many regulate international data flows as a mechanism for protecting

individual privacy and enforcing national policies.

The European Union's e-Privacy Directive targets public communication network providers and states that personal data should only be accessed by authorized personnel for legally authorized purposes, and that stored or transmitted personal data should be protected against accidental or unlawful destruction, accidental loss or alteration, and against unauthorized or unlawful storage, processing, access or disclosure. Personal data are defined broadly as "any information relating to an identified or identifiable natural person".

On 25 January 2012, the European Commission published its proposed changes to the EU Data Protection Directive in an attempt to harmonize the current

"fragmented and outdated" data protection legislative framework. Proposed changes include the following:

- National regulatory authorities will have the power to take action against organizations in other Member States in certain circumstances and may issue fines of up to EUR 1 million or 2 per cent of a company's annual turnover in some cases.
- The definition of personal data will be expanded to cover any information relating to a data subject, and the regulations will require an individual's explicit consent to allow data capture.
- The regulations will apply beyond the EU, to include non-EU entities that process personal data relating to EU citizens.

- Organizations will be required to report data breaches without undue delay and, if feasible, within 24 hours of the breach.
- Data controllers will be required to carry out data protection impact assessments, appoint data protection officers and inform third parties of any breaches.
- Individuals will be given a new “right to be forgotten” under certain circumstances and will no longer be required to pay to access their data.
- International data transfers will be subject to a more detailed regulatory framework requiring safeguards to be put in place and authorities to undertake prior checks, while the derogations available to data controllers will be more restrictive.

The controversial nature of the proposed reforms has, however, provoked lobbying and debate. This could mean long delays before implementation.

Meanwhile, in the **United Kingdom**, for example, the courts have narrowed the meaning of personal data, stating that the data must be biographical in a significant sense, and must focus on the individual, rather than on some other person or transaction or event.

In France, the amended Data Processing, Data Files and Individual Liberties Act is regulated by the proactive National Commission on Computers and Liberties. The Commission has published guidance on the legal processing of personal data, imposing notification and cooperation requirements on data controllers, as well as requirements to keep personal data secure and, in certain circumstances, to obtain the Commission’s approval prior to processing.

In Germany, personal data are to be obtained directly from the data subject unless required by law for a genuine business purpose or if disproportionate effort would be required and there are no indications that the data subject’s interests would be affected. Further, the Federal Data Protection Act puts particular emphasis on designing data protection systems to process as little personal data as possible, for example by making the data subject anonymous or by using pseudonyms.

In the United States, legislation changed dramatically following the terrorist attacks of 11 September 2001 with the introduction of the US Patriot Act. The Act permits the sharing of personal data of anybody suspected of involvement with terrorism or money laundering activities. This has resulted in the possibility of broad access to — and sharing of — personal information.

The right to privacy has been recognized by the US Supreme Court based on the US Constitution, despite there being no such explicit constitutional right. Many states have privacy protections within their own constitutions. Only California has extended the protection of data from government interference into an obligation on the private sector.

In Canada, the Canadian Charter of Rights and Freedoms contains a right “to be secure from unreasonable search or seizure”, which the courts have extended to protect an individual’s “reasonable expectation of privacy”. Recent case law from the Court of Appeal in Ontario has also introduced a common law tort of invasion of privacy (“intrusion upon seclusion”). Canadian laws do not restrict international transfers of personal data, but any transfer remains the responsibility of the disclosing party.

Brazil has yet to implement specific data protection legislation although its Constitution does set out fundamental rights to both privacy and secrecy of correspondence. The Civil Code also provides that an individual may request relief from any threat to personality rights, and that the private life of an individual is inviolable. There are also broad protections within the Consumer Protection Code. These include consumer rights of access and correction to any recorded personal data.



South Africa has no specific data protection legislation, but a right to privacy is set out within its Constitution. There are also relevant personal information provisions contained within the Consumer Protection Act 2008 and the Electronic Communications and Transactions Act 2002. Compliance with the latter is voluntary and any adherence must be recorded in an agreement with the data subject. A new Protection of Personal Information Bill has been tabled in the South African Parliament.

Saudi Arabia has no specific data protection legislation, although a right to privacy is established in a number of its laws. In particular, Saudi Arabia's Basic Law of Governance sets out the overriding

principle that all correspondence and communications between parties should be kept strictly confidential and should not be disclosed.

If no legislation is applicable, the courts will apply sharia (Islamic law). The sharia principles establish a tort claim for damages for the wrongful disclosure of a person's personal information where that disclosure results in loss or harm to the individual.

The **United Arab Emirates** does not have any specific data protection legislation, although a right to privacy is set out within its Constitution and in various laws. The Constitution states that an individual enjoys "freedom of communication by post, telegraph or other means of

communication and the secrecy thereof shall be guaranteed in accordance with the law." In addition, the Penal Code establishes certain rights of privacy and the protection of personal data.

There is no specific constitutional right to privacy in India, although the Supreme Court has established that privacy should be included within the right to life and personal liberty. The collection and processing of personal data is regulated under the Information Technology Act 2000, which states that companies must maintain reasonable security practices while processing personal data, and that if obtained under a contract, such data must not be disclosed in breach of that contract without the data subject's consent.

As a member of Asia-Pacific Economic Cooperation (APEC), **Japan** subscribes to APEC's approach to privacy. The Act on Protection of Personal Information regulates the collection and use of personal data in Japan. Any form of data handling is covered, but the Act applies only to situations involving the personal information of 5000 or more individuals. The Act imposes common obligations of consent, security and providing information, alongside additional requirements to supervise employees and third parties who handle the personal data.

Recommendations for best practice

Is the current patchwork of regulation fit for purpose in the cloud? The short answer is no. National regulation with respect to privacy and data protection was established 20 to 30 years ago and did not foresee the advent of a global digital ecosystem. Existing regulations are now outdated.

To address the challenges raised by the cloud ecosystem, *Trends in Telecommunication Reform 2013* recommends steps that can be taken by policy-makers and regulators, some of which are highlighted here.

Facilitate cloud literacy: Regulators should assist consumers to make informed choices about what personal information they put in the cloud by enhancing their understanding of the commercial value and potential use of their data. Citizens need to know to whom to complain if their information is misused.

Develop expertise: Policy-makers and regulators should keep up to date with technical and social developments in the cloud, and with the views of all stakeholders, so as to be in a position to establish and enforce relevant laws.

Adopt laws that are fit for purpose:

International and national policy-makers should work together to develop efficient, effective, proportionate and enforceable laws to protect the individual's reasonable expectation of privacy. Responsibility should also be devolved to stakeholders to develop self-regulation.

Review existing laws: Policy-makers internationally should review existing laws to facilitate the national and international use of cloud services. The development of common standards and interoperability requirements will facilitate transborder information flows with appropriate security and privacy protections.

These recommendations were embraced by the 12th Global Symposium for Regulators (GSR-12) as part of the best practice guidelines on regulatory approaches to foster access to digital opportunities through cloud services (see www.itu.int/en/ITU-D/Regulatory-Market/Pages/bestpractices.aspx).

All articles about the "cloud" are extracts adapted from the upcoming Trends in Telecommunication Reform 2013, prepared and produced by the Regulatory and Market Environment Division of ITU's Telecommunication Development Bureau (BDT).



■ The cloud's economic clout

Personal data have huge commercial value, to the extent that they are now being talked about as “the new oil”. The ability to transfer personal data internationally is a vital component of the globalized economy, like international flows of capital and international trade, and should receive the same attention.

According to ITU's latest report *Trends in Telecommunication Reform 2013*, “The challenge for policy-makers is to balance the commercial need and individual desire for free flow of information with informed knowledge and effective control by individuals of their personal information. Clear and consistent policies need to be

developed based upon current and prospective technologies. The opportunities for growth and development should not be hindered by unnecessary regulatory barriers, administrative burdens or choice of law or applicable jurisdiction issues.”

This article (like the article on pages 7–12) is adapted from “The Cloud: Data Protection and Privacy — Whose cloud is it anyway?”, a chapter authored by Stephanie Liston, Senior Counsel, Charles Russell LLP and the chapter on, “Demystifying Regulation in the Cloud: Opportunities and Challenges for Cloud Computing”, by Professor Ian Walden, Queen Mary, University of London and Baker & McKenzie. Both are

part of *Trends in Telecommunication Reform 2013*.

In this article, we highlight the cloud's economic importance. But first we consider some definitions of the cloud.

What is the cloud?

Fast and resilient communication networks have made it possible to shift applications and data from personal computers onto remote servers. This trend in networked computing is loosely called “cloud computing” — an umbrella term used to describe a range of different technologies and market offers.

Cloud computing (or, more simply, the cloud) has been defined in various ways. ITU, for example, describes it as "A model for enabling service users to have ubiquitous, convenient and on-demand network access to a shared pool of configurable computing resources that can be rapidly provisioned and released with minimal management effort or service-provider interaction. Cloud computing enables cloud services."

Some people define the cloud as the use of virtual servers available on the Internet, others as anything consumed outside a firewall (including conventional outsourcing). And cloud computing has been compared to the supply of utilities such as gas and electricity. A definition that captures the essence of cloud computing is that it "provides flexible, location-independent access to computing resources that are quickly and seamlessly allocated or released in response to demand".

Services (especially infrastructure) are abstracted and typically virtualized, generally being allocated from a pool shared as a fungible resource with other customers. Charging is commonly on an access basis, often in proportion to the resources used.

Cloud service models

There are three primary types of cloud computing service models:

Infrastructure as a service (IaaS): A cloud-based virtual server providing networking and storage services and other infrastructure services. The customer does not manage or control the data centre but may have control over data or operating systems (for example, Amazon web service).

Platform as a service (PaaS): Where customers can use their own applications on the cloud service provider's infrastructure. The customer can control data, applications and part of the hosting environment.

Software as a service (SaaS): Customers access the cloud service provider's applications through the Internet. This is the most common form of cloud services, used by Facebook, webmail and other social-networking sites.

Existing service models have been described as private cloud, community cloud, public cloud or hybrid cloud.

Private cloud refers to infrastructure owned by or operated for the benefit of one (typically large) customer. It can be located on or off the customer's premises.

Community cloud refers to infrastructure owned by or operated for a number of organizations on a shared basis. It supports a limited group of users, such as governments, that have common interests.

Public cloud refers to infrastructure shared among a variety of users with no

particular set of interests. It is sometimes described as "multi-tenanted". The infrastructure is owned by the organization selling cloud services.

Hybrid cloud refers to infrastructure and services that incorporate two or more of the above. An example would be a bank operating a private cloud for sensitive data and putting other data into the public cloud to lower costs and extend capacity.

The benefits

The demand for data storage is expanding dramatically with the exponential growth in data production, digital stores, digital libraries, digital archives, and usage and retention requirements. The use of cloud services by individuals (webmail, social networking sites, e-commerce) is now part of everyday life in an increasing number of countries. Cloud services are used for wholesale or trade purposes, as well as for personal consumption.

In 2011, the market for IaaS was worth USD 1 billion, and is estimated to be worth about USD 7 billion in 2013. PaaS grew from USD 2 billion to around an estimated USD 8 billion, while SaaS was worth USD 15 billion and is estimated to reach USD 17.5 billion this year.

E-commerce brings people and businesses together internationally, and has the potential to drive economic growth. Governments can bring enormous social benefits to citizens through e-learning and e-health. Although there are infrastructure

challenges in the developing world, such as lack of broadband access as well as power shortages and outages, the potential to use cloud services to increase educational opportunities and spread health benefits is vast.

Cloud computing is a technology "game changer". European Commission Vice-President, Neelie Kroes, recognized cloud services, along with e-health and connected television, as offering huge benefits for citizens and businesses, and an overall boost to the European economy.

Cisco has produced a global cloud index. The company predicts that "Annual global cloud IP traffic will reach 1.6 zettabytes by the end of 2015" and that "Global cloud IP traffic will account for more than one-third (34 per cent) of total data centre traffic by 2015."

In terms of revenue, the global cloud computing market is forecast to grow 22 per cent annually to USD 241 billion by 2020.

The International Data Corporation (IDC) predicts that the amount of information and content created and stored

digitally will grow from 1.8 zettabytes in 2011 to over 7 zettabytes by 2015. Cloud computing is just the latest technological development driven by this expansion.

The commercial advantages of cloud services include lower costs of providing information technology services, access to a wide range of applications (without having to download or install anything), availability of access anytime and anywhere, and flexibility to accommodate changing demand because customers only pay for the services they take.





■ Regulation in the cloud

Given the potential economic and social impact of cloud computing, policy-makers are considering how to embrace and harness the cloud. The general principle is to ensure that what occurs in the cloud does not fall outside existing legal rules and controls.

This article draws on the chapter “Demystifying Regulation in the Cloud: Opportunities and Challenges for Cloud Computing”, by Professor Ian Walden, Queen Mary, University of London and Baker & McKenzie, which examines trends in the regulatory treatment of cloud computing. The chapter is part of ITU’s report *Trends in Telecommunications Reform 2013*.

Competition or control?

Consumer concerns about data portability may reflect broader worries about the competitive nature of the cloud market. For example, provider “lock-in” may occur within any segment of the cloud market — software as a service (SaaS); platform as a service (PaaS) or infrastructure as a service (IaaS). This can inhibit the movement of data, applications or services.

Anti-competitive effects may also arise from a lack of industry standards or from a *de facto* standard attributable to a market leader. Restrictive licence conditions may also undermine competition. For example, in April 2010, under its licence agreements

with independent developers, Apple imposed the exclusive use of its own programming tools and approved languages for the development of iPhone Apps. The European Commission took the view that imposing such restrictions could do harm to competition, and in September 2010 Apple voluntarily removed the restrictions.

Public procurement practices may be another source of anti-competitive behaviour. One example is the case of Google versus the United States Department of the Interior. In October 2010, Google filed a claim against the United States Department of the Interior alleging that its public procurement practices relating to

a USD 59 million contract for ICT services illegally distorted competition by requiring messaging technologies to be based on Microsoft Business Productivity Online Suite, thereby excluding Google from public procurements and restricting competition. The court granted an interim injunction in favour of Google. The judgement did not find bad faith or wrongdoing by Microsoft, but it in effect brought to a halt the deployment of Microsoft's Business Productivity Online Services cloud computing solution and e-mail system at the United States Department of the Interior. The decision was intended to avoid lock-in effects and harm to competition.

Environmental concerns

Cloud services enable cloud users to achieve efficiencies in equipment and real estate. But large data centres consume vast amounts of energy, raising environmental concerns. A recent report by MusicTank, for example, argues that close-to-consumer cloud storage may be needed to reduce the environmental impact of online music streaming services. The report suggests that YouTube alone accounted for 0.1 per cent of global energy consumption.

Steps have already been taken to encourage the operators of cloud data centres to minimize energy use. In 2009, for example, the European Commission issued a Code of Conduct on Data Centres Energy Efficiency. This set of voluntary measures

targets efficiencies in the design and operation of data centres.

Mechanisms for reducing energy costs include building data centres where natural and passive cooling is available. Distributed storage techniques mean that data processing loads can be shifted to geographical zones where power is cheap. Similarly, the flexible architecture of cloud enables redundancy to be minimized.

Security standards

Ensuring that cloud computing occurs in a secure environment is a concern not only for users, but also for governments trying to facilitate the take-up of cloud. Cloud service providers could use existing security standards, such as ISO/IEC 27001 for information security systems or SAS70, both of which provide for external auditing and certification.

Various cloud-specific standardization initiatives are being pursued. For example, the Cloud Security Alliance is developing the CloudTrust protocol to promulgate best practice in the industry and transparency for cloud users. Within ITU's Telecommunication Standardization Sector, Study Group 17 has been working on cloud security since April 2010, developing guidelines and requirements in a number of areas, including identity management.

A third source of cloud security standards is the public sector. In some countries, public authorities are beginning to adopt cloud computing solutions offered by the

private sector, but only where those services have been externally accredited as offering sufficient levels of assurance. Given the scale of public procurement of information technology products and services, such government-led security standards are likely to influence market developments. If these standards are over-specified, they risk undermining the cost-benefits of cloud computing by imposing unnecessarily stringent requirements.

The subject of data protection and privacy in the cloud is dealt with in a separate article (see pages 7–12).

Facilitating cloud services

What measures should governments take to facilitate the provision and adoption of cloud computing? Some general approaches have been suggested. For example in May 2012, the European Parliament published a study identifying ways that policy-makers should facilitate cloud computing. These include addressing legislation-related gaps; improving terms and conditions for all users; dealing with stakeholder-security concerns; encouraging the public sector cloud; and promoting further research and development in cloud computing.

The Business Software Alliance has published a survey of 24 countries to identify their level of "cloud readiness". Each country was given a score based on an index of seven policy areas: privacy

protection; information security; cyber-crime measures; protecting intellectual property; ensuring data portability; liberalized trade rules; and the necessary information technology infrastructure.

The survey identified a sharp divide in cloud readiness between advanced economies (Japan is considered the leader) and developing countries. Obstacles to adopting the cloud include poor progress towards a national broadband network, restrictive policy on Internet content, a discriminatory approach to foreign technology companies, and the lack of an appropriate framework for the development of ICT standards.

A study in Africa produced a cloud readiness index based on factors such as Internet penetration, literacy rates and value lost as a result of electrical outages. South Africa ranked top, Zimbabwe, Sudan, Senegal and Kenya also in the top five.

An ITU study on cloud computing in Africa, published in April 2012, recommended the following measures to facilitate cloud computing:

- Regulatory progress to address data protection and security concerns;

- Ensuring that States are aware of regulatory best practice;
- Careful preparation of cloud computing outsourcing contracts, including robust clauses on data security and availability;
- Ensuring that cloud contracts reflect regulatory requirements;
- Establishing data centres in Africa to reduce the cost of bandwidth and increase speed of access;
- Ensuring that data centres are service orientated, agile, automated, well protected and ecologically sound;
- Introducing or upgrading regulations such as data protection laws;
- Launching training programmes;
- Ensuring cross-border standardization and regulation by participating in cloud standardization initiatives.

A cloud readiness index for Asia evaluated 10 key attributes across 14 countries, including international connectivity, power grid quality, business efficiency and global risk (such as the presence of earthquake fault lines). It found that Japan led the region, with Hong Kong (China), the Republic

of Korea and Singapore following closely behind.

Hong Kong's international connectivity and many data centres gave it the potential to become a data hub for north Asia, while the Republic of Korea benefits from an ambitious cloud strategy involving government funding of up to USD 2 billion by 2014.

Looking ahead

The widespread adoption of appropriate cloud standards is required to address a range of concerns among cloud providers and users, including the integration of legacy systems with cloud interfaces, and data and application portability and security.

Regulation can facilitate the adoption of cloud computing by establishing an environment in which both providers and users have certainty and trust.



Thinkstock

■ *Funding universal broadband*

Public-private partnerships show the way

An ITU report entitled “Developing successful public-private partnerships to foster investment in universal broadband networks”, provides practical guidance on how to improve access to broadband in unserved and underserved locations. Released as part of ITU’s series of broadband thematic reports, it draws on studies of 13 projects that rely on various forms of public-private partnerships (see map). It also indicates how governments can use such partnerships to develop applications and services as a way of stimulating broadband take-up.

The projects provide insights from both emerging and developed markets, highlighting the use of a wide variety of technologies, investment models and funding sources.

Funding models for public-private partnerships

There are a number of models for funding public-private partnerships.

In the “**bottom-up**” or **local community model**, a group of end users, such as residents or businesses, form a jointly owned organizational group (frequently a cooperative), which oversees the network building contract. The public sector has no role in owning or running the infrastructure.

In the **private design, build and operate model**, a private-sector company receives public funding (often a grant) to assist it in deploying a network that offers open wholesale access. Again, the public sector has no role in owning or running the network. Where sufficient funding is available to attract interest from operators to work in rural areas, and where the operations of the network can be effectively transferred to an operator with little ongoing control from the managing authority, this model is more appropriate for larger-scale investments than the bottom-up model.

In the **public outsourcing model**, a single contract is awarded to a private-sector organization covering all aspects of the design or construction of the network. The infrastructure is built and operated by the private sector, but the public sector retains ownership and some control. This model is appropriate for widespread deployments where the managing authority requires a high level of control over the network, and where the private operator prefers greater financial stability — albeit with a potentially lower return — than that offered by the private design, build and operate model.

In the **joint venture (partnering) model**, a private-sector organization builds and operates the network, while the public sector manages all aspects of deployment and operation. Of the 13 projects studied for the report, only “The East African Marine System” (TEAMS) follows this

model. The TEAMS project aims to deploy a 1.28 Terabits per second submarine optical fibre cable between Fujairah (United Arab Emirates) and Mombasa (Kenya) to provide access to international bandwidth.

The **public design, build and operate model** is appropriate when a managing authority needs to have absolute control over the operations of the network, or when it is confident that a targeted investment will inspire investment from other sources. An example is the “Qatar National Broadband Network” (Q.NBN), funded through government grants. The project will accelerate the deployment of fibre-to-the-home (FTTH) and deliver more than 95 per cent coverage by 2015. The network is wholly owned by the Qatari government and offers equal, non-discriminatory access, enabling any operator to use the infrastructure to deliver services.

Broadband projects and their sources of funding

Financing from universal service funds and government grants predominate among the projects highlighted in the report, with a small number relying partly or wholly on external funds.

Universal service funding

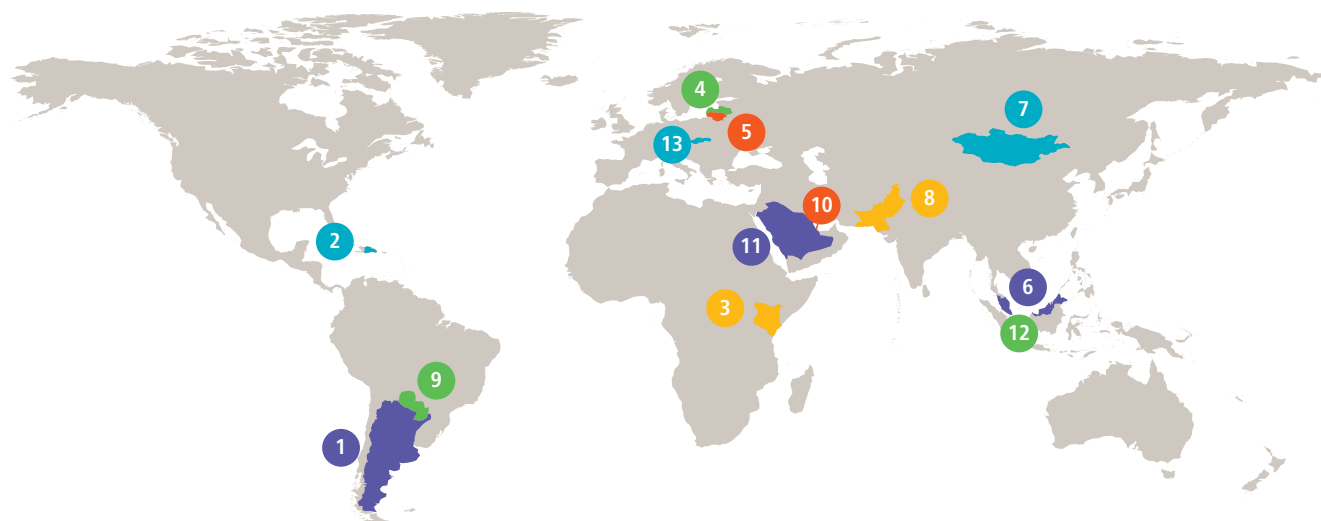
Four of the projects featured in the report use universal service funds to drive development. The Dominican Republic’s “Rural Broadband Connectivity” project will provide broadband access of at least

128 kbit/s to rural communities through asymmetric digital subscriber line (ADSL) and universal mobile telecommunication system (UMTS). A universal service fund was created to support this project, although the winning bidder, Codetel, chose to use some unassigned spectrum that was available for no fee instead of taking the available funding. Operators contribute 2 per cent of their gross income to the universal service fund.

The Saudi Arabia “Universal Service” project will deliver a minimum of 512 kbit/s broadband access to unserved and underserved locations using wireless technology. Saudi Arabia’s telecommunication regulator, the Communications and Information Technology Commission, established a universal access and service policy in 2006. Following consultation with industry, a universal service fund was created to fund this policy. The fund, into which operators pay 1 per cent of their revenues, is used to support operators in providing mobile voice and broadband Internet access to unserved or underserved communities.

A further example of universal service funding is the Mongolia “Information and Communication Technologies Infrastructure Development” project to provide broadband access in rural locations using a combination of Wi-Fi, very small aperture terminal satellite links and an already installed core optical fibre. Along with external financing from the Government of Japan and the World Bank, the Government of Mongolia established a universal service

Location of the public-private partnership projects considered in the ITU report "Developing successful public-private partnerships to foster investment in universal broadband networks"



- | | | |
|--|---|--|
| 1 Argentina Connected
Argentina | 6 National Broadband Initiative
Malaysia | 10 Qatar National Broadband Network (Q.NBN)
Qatar |
| 2 Rural Broadband Connectivity
Dominican Republic | 7 Information and Communication Technologies Infrastructure Development
Mongolia | 11 Universal Service
Saudi Arabia |
| 3 The East African Marine System (TEAMS)
Kenya | 8 Universal Service Fund Broadband Programme
Pakistan | 12 Next-Generation National Broadband Network
Singapore |
| 4 Next-Generation Network for Rural Areas
Latvia | 9 National Telecommunication Plan
Paraguay | 13 National Broadband
Slovakia |
| 5 Rural Area IT Network (RAIN)
Lithuania | | |

Source: Adapted from Analysys Mason.
(Map No. 4170 Rev. 13, United Nations, April 2012)

fund that takes 2 per cent of operators' annual taxable income. Between December 2006 and 2010, the fund accumulated USD 7.5 million.

Pakistan also created a universal service fund in 2006 to support its "Universal Service Broadband Programme" to improve broadband access (minimum 128 kbit/s). The government has provided grants from the fund to operators to deploy core broadband access to unserved urban areas and rural communities.

In Paraguay, the government uses the universal service fund to provide grants to operators to implement the "National Telecommunication Plan". The plan will provide broadband access at a minimum speed of 512 kbit/s to underserved and unserved areas by deploying core and backhaul optical fibre cable, ADSL and mobile technologies.

Government grants

Grants were used to support around half of the broadband projects studied for the report, often in tandem with universal service funds or external funding. The projects awarded government grants follow a variety of investment models: public outsourcing; public design; build and operate; joint venture; and private design, build and operate.

The "Argentina Connected" project will triple backbone optical fibre infrastructure by adding 30 000 km of optical fibre cable by 2015. It has relied on government grants to fund a core and backhaul fibre network

to provide regional connectivity and facilitate broadband access in unserved and underserved locations. Although Argentina created a universal service fund in 2007, with operators contributing 1 per cent of their revenues, the project has not drawn on the fund so far.

The Malaysia "National Broadband Initiative" relies on a mixed funding model. Government grants support FTTH technology to deliver high-speed broadband download speeds of between 10 Mbit/s and 100 Mbit/s to the main economic areas, while the universal service fund is being used to bring broadband to other areas using ADSL, wireless high-speed packet access (HSPA) and WiMAX.

Singapore's "Next-Generation National Broadband Network" project and Malaysia's "National Broadband Initiative", as well as Qatar's Q.NBN project, rely wholly on government grants.

Singapore is using USD 2 billion of government grants to fund the roll-out of its fibre-to-the-home network, through a private design, build and operate model. The network will connect 100 per cent of the population (homes, schools and businesses) by 2015 and is expected to deliver 1Gbit/s download and 500 Mbit/s upload speeds.

The Government of Malaysia is funding the "National Broadband Initiative" through a private design, build and operate model in conjunction with Telekom Malaysia to provide an open-access broadband

network on a commercially negotiated wholesale basis.

External funding

External funding provided by organizations such as the World Bank and the European Regional Development Fund (ERDF), or by foreign governments, has been used to finance a few of the broadband projects discussed in the report.

In Latvia, a "Next-Generation Network for Rural Areas" is being funded entirely by the ERDF, which will provide EUR 119 million by the end of 2018.

Lithuania's "Rural Area IT Network" (RAIN) project employs mixed funding, with government grants alongside funds from the European Bank for Reconstruction and Development. Using a public design, build and operate model, the project will deploy a nationwide backhaul and core network to improve the connectivity provided by existing access infrastructure and to improve broadband access.

Slovakia's "National Broadband" project to provide a backhaul/core network to serve rural and unserved areas is being jointly funded by the Government of Slovakia (EUR 11.32 million), the ERDF (EUR 96.22 million) and operators (EUR 5.66 million).

All three projects had to meet strict criteria in order to obtain State aid approval from the European Commission by demonstrating that public funds are being used appropriately.



Seven best practices for successful projects

To assist authorities tasked with managing public-private partnership projects for universal broadband, the report identifies seven best practices, which can be summarized as follows:

- conduct a public consultation;
- consider multiple investment models and funding;
- be technology-neutral;
- conduct pilot projects;
- provide funding in line with milestones and targets;
- ensure open access and monitor compliance;
- create initiatives to stimulate demand.

Conduct a public consultation

A managing authority should consult all potential stakeholders, including end users, telecommunication operators, other government agencies, local authorities and equipment vendors. Such consultation can provide critical information on matters such as requirements for broadband access, likely level of demand, consumers' willingness to pay for services, operators' interest in participating in broadband projects, and the most suitable technologies and investment models. The consultation can also consider other projects that the managing authority may initiate to stimulate demand for broadband access.

The Dominican Republic's "Rural Broadband Connectivity" project demonstrates the value of consultations by the managing authority. The regulator, Indotel, conducted a consultation with industry stakeholders and end users to determine the need for Internet services, assess willingness to pay, identify the telecommunication infrastructure available or planned, and discuss the challenges in deploying broadband infrastructure to rural locations.

Introducing a broadband plan without a proper consultation process may result in a lack of participation from operators, the use of an unsuitable mix of technologies, and limited take-up by the intended end users.

Consider multiple investment models and funding

A broadband project for backhaul/core and access networks, or for a mix of national, urban and rural deployments, may consider combining different investment models and sources of finance. For example, the use of funding from a universal service fund may not be appropriate for a project to develop national backhaul/core and access networks if other funding sources are available, but would be appropriate for the part of the project delivering broadband access to unserved rural locations. When no other sources of funding are available, managing authorities may consider using a universal service fund to fund any part of a broadband project. Using more than one investment model for different parts of a broadband project provides the managing authority with different levels of control over the network deployed.

An example from the projects under review is “Argentina Connected”, which employs a mixed investment model. The managing authority, ARSAT, is deploying and operating the national core network through a public design, build and operate model, but in large cities and regions where it does not have capability to deploy fibre, it subcontracts deployment via public outsourcing.

Be technology neutral

Unserved and underserved locations are often in rural or remote areas, posing a challenge for the delivery of broadband access. In such areas, deployment should not be limited to one type of technology, and the fastest technology may not always be the most appropriate. ADSL technology will not be appropriate in locations lacking last-mile copper access, so wireless technology may be needed. In remote locations, backhauling broadband traffic may be problematic, and the use of fixed or microwave backhaul technology may not be appropriate, so satellite hubbing may be required.

The use of multiple technologies should be encouraged to attract more bidders for broadband projects. An example where the authority has encouraged the deployment of multiple technologies for broadband access as part of the bidding process is Malaysia’s “National Broadband Initiative”. In this case, ADSL, WiMAX and UMTS were considered as options to provide broadband access to regions outside the major economic areas.

Conduct pilot projects

Pilot projects can be used by a managing authority to test the ability of the project to meet its objectives, and to identify risks and other issues that may arise. For example, in Saudi Arabia, the telecommunication regulator pilot-tested its “Universal Service” project. On successful completion of the pilot test, the regulator issued requests for proposal and awarded a number of contracts.

Provide funding in line with milestones and targets

The timing of payments to the organizations implementing the project should be based on achieving agreed milestones and targets. These include milestones in the roll-out plan, and targets for the take-up of wholesale services by operators and service providers, and access to services by end users. Using such a mix increases the likelihood of a successful project, not only in terms of physical roll-out, but also in terms of adoption by service providers and end users. The ultimate success of a broadband project depends not only on making sure that broadband is accessible to end users, but also that it is actually used by them.

An example of the use of milestones is the Pakistan “Universal Service Fund Broadband Programme”. An operator is required to obtain a predetermined number of broadband subscriber agreements (subscribers must be customers for at least 90 days). If the operator fails to deploy the network in time or achieve the agreed number of subscriptions, no payment is made.

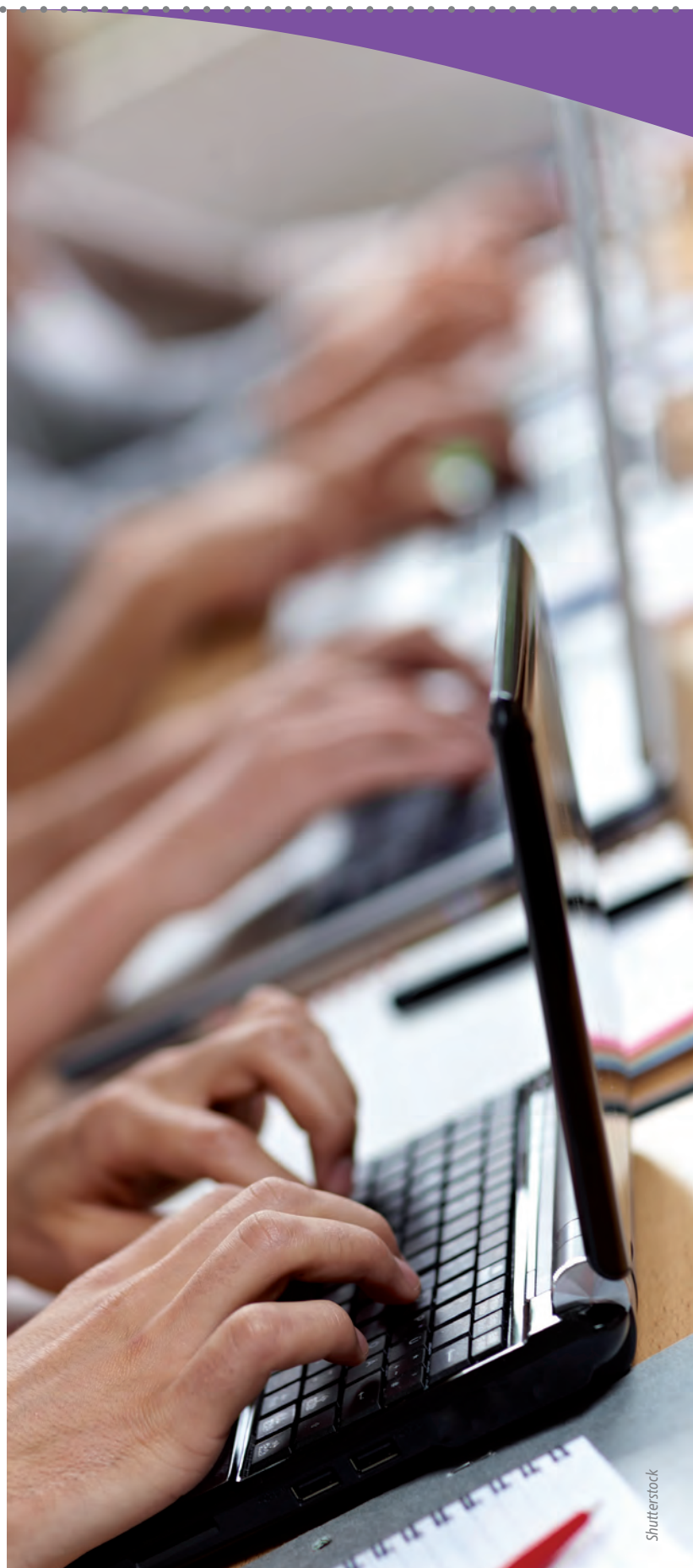
Ensure open access and monitor compliance

Many of the projects described in the report stipulate that an open-access model should apply to infrastructure. This helps to promote competition among multiple service providers, supports innovation in products and services, and minimizes market distortion. It is important to ensure that open access is defined in terms of access to specific services and products (for example, wholesale bandwidth, dark fibre or duct access), and that access should be provided to all products, all of the time, for the lifetime of the network.

A good example is the Latvian “Next-Generation Network for Rural Areas” project. The Latvia State Radio and Television Centre, a non-profit public enterprise, is obliged to provide wholesale services under equal access conditions on a non-discriminatory basis, and operators are able to access passive network infrastructure (ducts and fibre) and use space in cabinets to deploy their equipment.

Create initiatives to stimulate demand

Rolling out infrastructure alone does not ensure the success of a broadband project; this is achieved only when there is increased access to broadband services. To this end, it may be necessary to stimulate demand, for example by providing free or subsidized laptops or netbooks, by establishing community centres to educate people in the use of broadband, and by providing general ICT training. Such initiatives can easily be incorporated into broadband projects, and can be funded publicly, privately or through public-private partnerships.



For example, with the “Argentina Connected” project, netbooks were provided to 1.9 million students between 2010 and July 2012, and a digital literacy programme has been used to provide computers and Internet training to communities. In Pakistan, the “Universal Service Fund Broadband Programme” has increased demand by requiring participating operators to build community and educational broadband centres.

As well as making services available, it is essential to advertise them to the local people. With the roll-out of the “Next Generation National Broadband Network” in Singapore, the operator (OpenNet) informs households by letter that the fibre network is soon to reach their location.

Conclusion

There is no one-size-fits-all solution to building a successful partnership for broadband infrastructure projects. But by adopting the practices highlighted in the ITU report, such as holding public consultations to identify risks, setting milestones which operators need to achieve to be paid, and marketing new services to drive demand, managing authorities can be more confident of achieving the developmental aims of investing in broadband expansion.





■ Predictions for 2013

What does the year hold for the telecoms industry?

ITU News always looks ahead when updating you on the telecommunication and information and communication technology (ICT) environment, but this is the first time that we are publishing specific predictions from three well-known analysts: Analysys Mason, Deloitte, and Informa Telecoms & Media.

In a fast-moving industry, players need to know what will happen next. Yet predictions — even those based on expert knowledge and careful analysis, like those presented here — are simply best guesses

and can be evaluated at the end of the year to see how accurate they were.

As Deloitte comments at the beginning of its “Technology, Media & Telecommunications Predictions 2013”, the aim with its forecasts is to catalyze discussions around significant developments that may require companies or governments to respond. “We provide a view on what we think will happen, what will occur as a consequence, and what the implications are for various types of companies. We do not however presume that ours is the last word on

any given topic: our intent is to stoke the debate.”

Deloitte anticipates that a record one billion smartphones will be shipped in 2013, that mobile advertising will get split into two categories — tablets and smartphones — and that more than 90 per cent of user-generated passwords will be vulnerable to hacking in a matter of seconds. Deloitte also forecasts the start of preparations for the next generation of high-definition television, known as 4K.

Among its top predictions for 2013, Analysys Mason anticipates that the roll-out of long-term evolution (LTE) services will have limited immediate economic impact and that social media giants look set to stir up Internet Protocol (IP)-based messaging services. It is also expected that smartphone penetration growth rates will slow down considerably.

Informa Telecoms & Media predicts that 2013 will be another tough year for telecommunication operators and that over-the-top (OTT) players will not have it all their own way either. The company sees risks for those operators that do not invest properly in building wide-area networks that can deliver high-quality data services. When it comes to new services, there will

be continued usage migration to smartphones and tablets. But both established and new players are trying to figure out how best to monetize mobile usage.

Analysys Mason

Among its top predictions, Analysys Mason foresees the following in 2013:

LTE arrives, but with limited impact before 2014: In 2013 LTE will become a commercial reality in many more countries, but will have limited economic impact in the next 12 months. Some European countries and emerging markets in Latin America are set to launch LTE, as well as countries in South-East Asia via the Asia-Pacific band plan. Some developed markets such as the United States will also start to test LTE-Advanced and take advantage of features such as carrier aggregation to craft larger channels for higher-speed services.

However, the immediate economic impact of LTE will be limited in countries where it has been priced as a premium product and the economy remains sluggish (for example, Italy and Spain). The industry will also realize that consumers are

unwilling to pay a premium for LTE mobile broadband, and that this service will not compete with next-generation fixed access. It will provide a complement to fixed access, both in urban areas as part of bundled service solutions, and in rural areas where fixed access is not available.

Social media giants to further shake up IP-based messaging: In 2012, operators responded to short message service (SMS) cannibalization by launching rich communication suite-enhanced (RCS-e) services, followed by a number of over-the-top (OTT) services. In the next 12 months, competition will intensify as social media giants such as Facebook enter the market. Analysys Mason forecasts that European operator revenue from messaging will decline by 34 per cent in the next four years, from EUR 28 billion in 2011 to EUR 18.6 billion in 2017.

The voice-over-LTE investment case to come into the spotlight: The first voice-over-LTE (VoLTE) services came to the market in 2012. Though widespread commercial deployments are still some way off, operators will need to make some tough decisions about the future of their voice services. Potential cost savings are currently driving the Internet Protocol multimedia subsystem (IMS) investment case, but revenue implications are uncertain, and a clear vision for how voice services should evolve in an LTE world has yet to be articulated. HTML5/WebRTC will further stimulate the debate about whether "voice is just an application".

Smartphone penetration growth rate to slow markedly: The smartphone market will continue to grow, but the rate at which it grows will be markedly slower than in previous years. The number of

smartphone shipments worldwide will grow from 691 million in 2012 to 869 million in 2013. However, the rate of growth in the number of new smartphone connections will significantly decline. Having decreased from 39 per cent in 2011 to 29 per cent in 2012, this growth rate will decline further to 20 per cent in 2013.

There will be continued, incremental development in the market share of the smartphone operating system (OS). In the next 12 months, both Android and iOS are predicted to marginally grow their share of smartphone sales worldwide (from 56.4 per cent to 58.1 per cent, and from 21.5 per cent to 22 per cent, respectively). However, Symbian's market share for sales is projected to fall from 5.9 per cent to 2.7 per cent.

Traditional television will be under more pressure: OTT/connected television and non-linear television will continue to force broadcasters and pay-TV and telecommunication operators to rethink their strategies. The take-up of paid-for OTT video services in the United States and Canada will more than double to 53.1 million households between 2012 and 2017, representing 37.4 per cent of households.

In Europe, the take-up of paid-for OTT video services reached an estimated 2.3 million households in 2012, representing a mere 0.7 per cent of households and is expected to increase to 32.2 million, or 10 per cent of households, in 2017. Compared with the United States and Canada, growth in Europe will continue to be constrained by a lower propensity to pay for video services, because of the widespread availability of high-quality free content from public broadcasters.

Wi-Fi to the rescue: Small-cell/service-provider Wi-Fi solutions will address mobile operators' needs for dense urban wireless coverage and capacity, but limited backhaul availability, standards maturity and solution costs will blunt major deployments until late 2013 or early 2014. LTE 2600 will emerge as a key option for small-cell spectrum, and will gain network and device support to address the capacity needs of developed-market operators, complemented by growth in 5 GHz Wi-Fi



deployments, which will provide improved Wi-Fi performance.

Service-provider Wi-Fi solutions based on HotSpot 2.0 and devices supporting Passpoint 2.0 will come to market in late

2013, helping to bridge the gap between cellular networks and the emerging “carrier grade” Wi-Fi service. Operators will also start to look at providing various grades of service (cellular, service provider Wi-Fi and

“best effort” Wi-Fi) to help differentiate their service and brand, as well as support monetization of the wireless experience.

Deloitte

Deloitte’s ten predictions cover three converging industries — technology, media and telecommunications — and focus on how they will affect the market. Here we highlight the following:

There will be an upsurge in momentum behind LTE: 2013 will be the first year in which LTE thrives across multiple markets. The subscriber base will triple to 200 million by year end, and those on LTE tariffs will represent about 10 per cent of all service revenues. Usage of LTE will be evolutionary rather than revolutionary; the major benefits of subscribing to LTE from 3G are likely to be better performance from existing applications — from e-mail to updating social networks.

“Mobile advertising” will thrive, led by tablets, but smartphones will lag behind: “Mobile advertising” — a category including tablets, smartphones and feature phones — should grow by 50 per cent to reach USD 9 billion globally. The smartphone sector may generate USD 4.9 billion in revenues in 2013, while advertising on tablets may generate

USD 3.4 billion. Revenue per unit, however, will reveal a different dynamic: smartphone display advertisement revenues are forecast at USD 7 per tablet and USD 0.60 per smartphone.

A billion smartphones should ship for the first time ever. Smartphone usage, however, will become increasingly varied, with a growing number of smartphone owners (about 400 million out of an installed base of 1.9 billion by the end of the year) rarely or never connecting their devices to data.

The personal computer (PC) is not dead, but its success will be measured in usage not units: Of total sales of personal computers, tablets and smartphones in 2013, PCs will make up about one fifth. However, more than 80 per cent of Internet traffic measured in bits will continue to be generated on traditional PCs (desktops and laptops). And of the total time spent at home and at work on PCs, tablets and smartphones combined, more than 70 per cent will be on a PC.

The television industry will start preparing in earnest for 4K: This next iteration of high definition (HD) offers four times the resolution of the current highest standard HD television, but the full roll-out of 4K will take years. In 2013, 4K will be in very few living rooms and there will be no 4K broadcasts. There is little content so far. About 20 types of television sets will be available to those wishing to spend USD 15 000 — USD 25 000 on a set.

Companies may experiment with enterprise social networks and staff bringing their own computers: More than 90 per cent of Fortune 500 companies will have selectively or fully implemented an enterprise social network by the end of 2013; a 70 per cent increase over 2011. Of those who register, only a third will read content once a week or more, and just 40 per cent will make an enterprise social network post in the average month.



Very few additional companies will adopt a bring-your-own-computer policy where the employer pays for the PC. At the same time, 50 per cent of Fortune 500 companies will allow employees to

bring their own personally-owned and paid for computers.

The looming spectrum shortage will get worse before it gets better: The demand for wireless bandwidth continues to

grow, causing increased spectrum exhaustion — leading mainly to slower speeds, but sometimes an inability to access networks or dropped calls or data sessions.

..... **Informa Telecoms & Media**

Among the predictions made by Informa Telecoms & Media, we highlight the following:

Wi-Fi will become a victim of its own success: There will be a shift in operator sentiment away from public Wi-Fi as it becomes evident that the growing availability of free-to-end-user Wi-Fi

devalues the mobile-broadband business model. Mobile operators will respond by articulating the value of their cellular networks better, but others not affected by this trend will double down on their public Wi-Fi investments to continue to propel the deployment and monetization of Wi-Fi.

Digital services will need to show investors that they can make money: Investors will demand a clear path to revenue from investments into digital services before operators begin to feel any share-price benefit from initiatives. It will become apparent to many operators that material revenue streams that can increase

group-level revenues will be very hard to come by.

Content providers will continue to spend on infrastructure: Google, Netflix and others will continue to invest heavily in extending their infrastructure by bringing it closer to users in 2013. Operators should consider these proposals carefully and recognize where they are likely to gain more from reduced costs and increased network efficiency than lose out in terms of uncertain revenues from so-called two-sided business models.

Subsidies will come under the microscope, but not necessarily for the right reason: Handset-financing models were established in Europe in 2012 and will continue to spread globally in 2013. But a reduction in subsidies and changes

to traditional ways of retailing devices will come at a cost to operators. Physical and online retailers, such as Amazon, as well as device-platform owners, such as Apple or Google, will accelerate their own initiatives to disrupt traditional device distribution models. Every slip in the share of devices sold through operator channels will serve to further erode the balance of power between operators and Internet and platform owners at the negotiating table.

Shared network might mean shared pain: The logic of network-sharing will increasingly be questioned by the industry given the core strategic importance of a differentiated network platform. In Europe, especially, we expect more operators to forsake dividends and free cash-flow in order to ramp up investments into network

infrastructure in the hope of establishing a competitive advantage built upon network quality of experience. However, despite this reversal of attitude by some, network-sharing and operator consolidation will sweep through emerging markets, especially in Africa.

Voice over LTE: Boosted by a lack of any negative customer feedback about interim voice for LTE solutions (such as falling back to circuit-switched 2G and 3G networks), more operators will join Verizon Wireless and EE in pushing out their timelines for the commercial deployment of VoLTE. A business case that looks to be based solely on spectrum efficiency will struggle to gain enough executive support to justify a rushed investment plan.

■ Strengthening ITU's regional presence

Interview with Brahim Sanou, Director of the ITU Telecommunication Development Bureau (BDT)



Mr Sanou talks to *ITU News* about the Union's initiative to strengthen its regional presence.

ITU has twelve field offices, including regional offices in Addis Ababa (for Africa), Brasilia (for the Americas), Cairo (for the Arab States), Bangkok (for Asia and the Pacific) and Moscow (for Europe and the Commonwealth of Independent States). So, why the need to strengthen the Union's regional presence?

Brahima Sanou: Strengthening ITU's regional presence is a long and ambitious process, which involves far more than the number of offices. The need to support ITU's development work was recognized decades

ago, and heated debate on the subject took place in 1973 at the Plenipotentiary Conference in Malaga-Torremolinos (Spain).

Since then, and especially at the Plenipotentiary Conferences at Nairobi (Kenya) in 1982, and Nice (France) in 1989, the membership has kept on stressing the importance of strengthening the ITU regional presence as a means of delivering technical assistance to its Member States.

With the establishment of a third Sector in ITU, the Telecommunication Development Sector (ITU-D), and

the current network of offices covering various regions and subregions, the membership has continued to monitor progress towards an effective regional presence, the aim being to further enhance the timely delivery of high-quality services and products to the membership on the ground. At Kyoto (Japan), in 1994, the plenipotentiaries adopted Resolution 25 on strengthening regional presence. Subsequent plenipotentiary conferences have reviewed and revised this important resolution.

In 2010, at Guadalajara (Mexico), the plenipotentiaries took

account of a study by the United Nations Joint Inspection Unit on the effectiveness of regional presence and revised Resolution 25. The revised resolution goes beyond indicating the number of offices in the field, to encompass the actual organization and functioning of regional presence. It provides for a detailed and systematic approach to ITU's regional presence in the light of the principles of results-based management and results-based budgeting that are applied to all the Union's operations.

The Joint Inspection Unit pointed out in 2009 that the human resources allocated to the ITU field offices were not commensurate with the widening scope and complexity of their tasks and responsibilities. As BDT Director, and with the continuing support of the Secretary-General and my colleagues — the other elected officials — I have proposed the strengthening of the staffing of the field offices in order to enhance the output of coherent, well-planned and coordinated activities. Once the ITU management had approved the rationalization of the grade

Fundamentally, the initiative to strengthen ITU's regional presence is about "improving the information flow within ITU, and between ITU and its stakeholders, and directing more resources to the regions so that each day, we can serve the membership better than the day before".

structure for the field offices, I immediately redeployed existing posts, bearing in mind the need to combine flexibility, expertise and closeness to the membership. As a result, the number of staff in the field has increased from 51 to 58. This redeployment has been effected within the budget adopted for 2012–2013.

I have also taken a range of measures to empower ITU staff in the field. These measures include providing staff with adequate tools and relevant training, as well as strengthening cooperation between ITU and regional telecommunication organizations. All these actions are part of the complex and open-ended process aimed at improving membership satisfaction. The challenge is to continue coping effectively with the changing needs of the membership and the challenges of tomorrow.

How will this initiative enhance participation by developing countries in ITU activities?

Brahima Sanou: First of all, strengthening regional presence enables ITU to be as close as possible to its members — but this depends on the resources available. A regional presence creates a mutually reinforcing partnership, and changes the whole vision of the relationship between ITU members and the secretariat.

At a basic procedural level, we now have a much clearer operational plan, which links objectives, outputs and expected results in a much more transparent manner. Through an iterative process of consultations, the membership is leading the strategic planning process. With increased regional empowerment comes greater accountability, notably in terms of how the Union fulfills its responsibilities towards the

membership in implementing the operational plan, particularly those elements that comprise the regional initiatives. The newly redesigned Regional Development Forums, which started taking place in 2012 and which will continue annually in every region, are now giving Member States and Sector Members a much more direct opportunity to review and provide feedback on those ITU activities that are carried out in

the field under the leadership of the regional and area offices.

Second, we are increasing the resources devoted to activities in the regions. In particular, we are boosting the number of professional grade staff in the field offices. I would highlight here the strengthening of the area offices in Barbados, Cameroon, Chile, Honduras, Indonesia and Zimbabwe. As a result of this policy, the number



of staff in the field offices will eventually grow by 20 per cent. We are taking a carefully coordinated approach to the hiring of staff to ensure that their competencies across the regions are truly complementary.

Third, we are improving the way in which we share information with the membership about ITU activities. We need to improve the flow of information between ITU and the regional and subregional organizations, and develop closer ties with these organizations. There is clearly a virtuous circle linking strengthened ITU regional presence and improved regional cooperation. This involves upgrading regional presence on the ITU website, and training regional staff to communicate

more effectively with local media and local stakeholders. It also involves ensuring that staff at headquarters take proper account of regional information needs when disseminating our publications, and when organizing conferences and other meetings. The opportunities here are immense, and we are addressing them systematically.

Finally, let me reiterate a fundamental principle. The field offices are empowered to make good use of their resources, and we are also taking a more rigorous approach to spending. Hand in hand with their colleagues at headquarters, staff in the field offices are now working within a results-based management

framework. This basic principle applies to all our actions, including the coordinated hiring policy. We want more impact for each dollar we spend.

How would you summarize the initiative in a tweet?

Brahima Sanou: Fundamentally, the initiative to strengthen ITU's regional presence is about "improving the information flow within ITU, and between ITU and its stakeholders, and directing more resources to the regions so that each day, we can serve the membership better than the day before".

Editor's note: You can follow Brahima Sanou on Twitter at: ITU BDT Director.



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■ **How ITU can help develop future networks**

Martin Waldburger, from the University of Zurich, and Tatiana Kurakova, an ITU-T Study Group 13 Counsellor

Standardization demands resources, and in particular the precious time of experts, so it makes sense to direct standardization efforts towards future network technologies that are most likely to be successful. But how is it possible to predict the emerging winners? Study Group 13 of ITU's Telecommunication Standardization Sector (ITU-T) has been thinking about this and proposes some approaches in this article.

How will future networks be formed? Which technological innovations will thrive? The answers are impossible to consistently and reliably predict. Yet ITU-T needs to develop standards that will lead the world to seamless global

communications, ensuring interoperability of future networks.

ITU-T can take two approaches to future network standardization. First, it can gather its members and outline high-level objectives and design goals for future

networks. Second, it can help technology designers and standardization bodies anticipate whether or not a future network technology is likely to be successful.

ITU-T Study Group 13, and especially its Question 21 group on "Future Networks",

is working on both these approaches. The Question 21 group has successfully addressed the first by finalizing ITU-T Recommendation Y.3001, which identifies objectives and design goals for future networks. The group is now working on the second approach, focusing on methods to anticipate whether or not a future network technology is likely to be successful.

Which network technologies will be successful?

The key factor in predicting the adoption potential of future network technology is to assess whether the design of the technology takes socio-economic impact factors into account — in other words, whether the technology is designed with an awareness of the potential for vigorous struggles between conflicting interests (tussles).

Many technologies have failed to be deployed, to flourish, or to be sustainable, because of inadequate or inappropriate decisions by the architect or because of network limitations. The designs of failed technologies did not take account of the important socio-economic impacts that the technology would have on stakeholders.

With this in mind, the Question 21 group began in 2012 to collect, investigate, and recommend, useful methods for designing technology, with socio-economic awareness, and in an incentives-compatible

manner. This resulted in a draft recommendation, known provisionally as ITU-T Recommendation Y.FNsocioeconomic, which proposes tussle analysis as a method to address the socio-economic aspects of future network technology.

When a candidate technology is put forward, tussle analysis allows for:

- assessment, at the technology design phase, of the socio-economic impact of the technology, taking into account the relevant set of stakeholders, tussles among them, and the range of available choices;
- determining whether a stable and incentives-compatible outcome, or an unstable outcome, will result from deploying the technology;
- identification of any potentially unwanted spillover effects from the technology's primary functionality to another functionality.

Identifying stakeholders and their tussles

Tussle analysis consists of three main steps: step 1, identifying stakeholders; step 2, identifying tussles among these stakeholders; and step 3, assessing the impact and evolution of tussles. The draft recommendation documents these three steps and describes suitable methods to implement each one of them.

Step 1 involves identifying all primary stakeholders and their characteristics for

the functionality under investigation. It is important to identify as complete a set of stakeholders as possible, since all further steps in tussle analysis depend on the range of identified stakeholders. If a stakeholder is missing from the list, potential tussles involving that stakeholder cannot be captured in step 2, rendering the analysis incomplete, or leading to incorrect results in step 3.

Personal observation, interviews, and to a certain extent, role-playing simulations, are recommended methods for identifying a complete and relevant set of stakeholders.

Any person knowledgeable enough about the characteristics of future network technology is assumed to be able — from personal observation — to determine an *a priori* complete and relevant set of candidate stakeholder roles. Personal observation in this context is understood to cover not only personal experience and knowledge, but also study of the relevant literature.

Personal observation and interview methods are especially effective when combined. While personal observation is recommended to determine an *a priori* candidate stakeholder role list, interviews can be used to validate a stakeholder's involvement (relevance) and to identify other relevant stakeholders that were not included in the *a priori* stakeholder role list (completeness). Role-playing simulation methods (for example, the Delphi method



and focus groups) are a recommended alternative provided that participants are selected to be representative.

Step 2 in the tussle analysis consists of identifying tussles among identified stakeholders. Step 2 depends on a successful step 1 (stakeholder identification) and it provides input to step 3 (tussle impact and evolution). Any method chosen to implement step 2 has to achieve a high level of completeness and relevance with respect to stakeholder incentives, conflicts and available choices. This is not always easy to determine because information may be considered confidential (from a business perspective), or there may be a hidden agenda.

In the context of step 2, relevance is even more important than completeness. Tussles tend to vary in terms of complexity (for example, involvement of more than two stakeholders, with incentives that are difficult to assess). It is therefore important to identify as many tussles as possible, but it is even more important to rank the tussles according to their relevance. Assessment of the impact on stakeholders (step 3) is applied only to relevant tussles.

A variety of methods are recommended for identifying a complete and relevant set of tussles. These are role-playing simulation, personal observation, risk management, the MACTOR (matrix of alliances and conflicts: tactics, objectives and recommendations) method and, to a certain extent, SWOT (strengths, weaknesses,

opportunities and threats) analysis and interviews.

Assuming that participants are selected carefully, the most recommended method is role-playing simulation (such as the Delphi method or focus groups) because it is a group-based rather than an individual approach. Bringing several motivated and knowledgeable experts into a group (a focus group, for example) greatly increases the likelihood of relevant tussles being identified through confrontational, debate-oriented, and direct (but moderated) interaction among participants.

Individual approaches, such as personal observation, risk management and the MACTOR method are also recommended, especially when personal observation is combined with risk management or with

the MACTOR method. The focus of risk management on identifying factors that may have a negative effect on a system is very helpful in identifying tussles, whether the effect is evaluated quantitatively or qualitatively, and even if the evaluation is based on the opinions of individuals rather than of a group of experts. Equally, the MACTOR method can be used to identify tussles thanks to its capacity for giving an overview of possible alliances and conflicts in a business ecosystem.

Assessing the impact of technologies on stakeholders

Tussle analysis is about anticipating the impact of a candidate technology (and its anticipated functionality) by considering the potential tussles that may emerge among stakeholders.

Step 3 in tussle analysis consists of assessing, for each identified tussle, the impact for each stakeholder and any potential spillovers. Anticipation of tussles needs to be based on reasonable and traceable grounds. In contrast to steps 1 and 2, where the goals are completeness and relevance, in step 3 the focus is on ensuring that each and every step in the predicted evolution of a tussle is plausible. The best methods are formal (producing reproducible results), risk-oriented (dealing with uncertainty and probability), and dynamic (comprising complex system modelling with feedback cycles). The recommended

methods for assessing tussle impact and evolution are game theory, risk management, system dynamics, role-playing simulations and, to a certain extent, interviews, the MACTOR method and SWOT analysis. Appendix I of ITU-T Recommendation Y.FNsocioeconomic provides an overview of these methods.

Game theory is the recommended method when a single tussle with well-known incentive structures can be modelled and played out in a formal and quantified manner. Where strategy candidates are available, game theory modelling is best adopted for tussles that derive from multi-party interactions. Risk management allows for a qualitative and quantitative evaluation of previously identified factors. Game theory and risk management are, however, less suitable for assessing evolution over time.

System dynamics is the best method to cope with simulations of various outcomes when multiple stakeholders interact over a longer modelling horizon. By focusing on actions and counter-actions in an interactive, complex system, system dynamics is the primary recommended method for step 3 in tussle analysis — with the trade-off that it needs a major modelling effort.

Where a non-quantified method is acceptable, role-playing simulations, in particular focus groups, are recommended. By providing an opportunity to observe stakeholder behaviour, focus groups offer a unique understanding of the dynamics of major tussles.

Interviews, the MACTOR method, and SWOT analysis may also be valid complementary instruments for validating results originating from the use of the other recommended methods.

Looking ahead to a standard on future network technology

When ITU-T Recommendation Y.FNsocioeconomic is finalized — most likely during 2013 — its recommendations on the socio-economically aware design of future network technology will become an official ITU-T standard. What will be the consequences of these recommendations, and how will they be implemented?

All the stakeholders in ITU-T, which brings together administrations, industry players (such as equipment manufacturers or network operators) and academia, or in ITU's Telecommunication Standardization Bureau (TSB), which provides ITU-T with logistical and operational support, might be affected in different ways by the recommendations. For instance, because any standardization organization has limited resources, it makes sense to prioritize standardization activities. In the case of ITU-T, the various hierarchical levels — question groups, working parties, and study groups — might apply recommended socio-economic measures as a strategic instrument to decide which technologies to standardize.

If the new recommendations on future network technology incorporate a section on socio-economic assessment of the standardized technology, TSB could prepare the necessary template documents, and support rapporteurs and editors in organizing meetings to produce such assessments. For example, TSB might help by setting up a focus group, or by providing training.

In current and future work related to the socio-economically aware design of future network technology, the Question 21 group (and its new Question 16/13 on “Environmental and socio-economic sustainability in future networks and early realization of FN” in the study period 2013–2016) will have to identify the type of cases for which the new ITU–T Recommendation Y.FNsocioeconomic would be useful,

whether within the question group, working party, study group, or even ITU–T as a whole. There are many risks and uncertainties associated with new technologies, but one certainty is that there is a need for ITU to help technology designers and standardization bodies anticipate whether or not a future network technology is likely to be successful.





Mobile monitoring and direction-finding stations can be used during world sporting championships

■ Mobile monitoring and direction-finding station

An ITU-compliant solution

D. Brückner, H. Kranich, U. Trautwein MEDAV GmbH, Uttenreuth, Germany

Spectrum monitoring can help government authorities ensure public security. With this in mind, the German authority for spectrum regulation and monitoring — *Bundesnetzagentur* — published a tender for the procurement of a mobile monitoring and direction-finding system for temporary and event-related use, for example during world sporting championships.

The tender specified a shelter containing equipment for direction finding in the very high frequency/ultra-high frequency (VHF/UHF) band from 20 to 3000 MHz and monitoring capabilities for the extended VHF/UHF frequency range (9 kHz to 6000 MHz). The operational requirements included rapid deployment and flexible remote-control access. The technical

requirements specified extremely accurate direction finding, and reliable detection and direction finding of short-term emitters.

This article describes the solution delivered by MEDAV GmbH, namely ITU-compliant VHF/UHF monitoring and direction-finding equipment housed in a container that can be moved to different locations

**Container with retractable antenna mast.
The container is of a standard type, 15 feet long
and approximately 2.5 tonnes in weight**

using a standard container truck or vessel. The system — called the “MDF 300-5m mobile shelter solution” — can be assembled and disassembled rapidly without any tools.

Because the system is based on the concept of software defined intelligence architecture, it can be upgraded with additional functionalities simply by installing additional software. With a completely or partially retracted mast, the system can be operated in vehicles or vessels in motion. The system supports different operating modes, making it possible to save power, and it is designed to support connections to a central station with very low transfer rates.

Mechanical and operational aspects

The container is equipped with monitoring and direction-finding devices in the frequency range from 9 kHz to 6 GHz for monitoring, and 20 MHz to 3 GHz for direction finding. The system can be operated by remote control using techniques based on the Global System for Mobile Communications (GSM), the Universal Mobile Telecommunications System (UMTS), fixed-line wide area network (WAN) or INMARSAT BGAN. The antennas are easy to assemble and have excellent direction-finding accuracy and sensitivity because of their wide aperture and separation.

The container has cooling, heating and ventilation and is equipped with remote control for monitoring and shutdown, and has a burglar alarm and a video surveillance system. The antenna mast can be retracted in an emergency.

The monitoring and direction-finding antennas are mounted on top of a mast of a total height of 13 metres, giving a total antenna height of 15 metres. The combined antenna plus mast are designed to withstand a maximum wind speed of 140 km/hour and 3 cm of ice.

The system is normally powered by a 230 VAC 50 Hz power supply, but can be operated using an internal battery if the external power supply fails. Air conditioning and heating guarantee a temperature of 22°C inside the container. The system can be operated in four different modes:



Top of the mast with direction-finding antennas

General operation mode: All measurement equipment runs in remote or manual (local) mode. The monitor scans and searches for emitters of interest. Emitters can be demodulated (analogue and digital) and analysed. The direction finder calculates the line of bearing of emitters. The monitor and direction finder can run independently. Wideband and narrow-band recordings can be made for subsequent offline demodulation, analysis and documentation. All results are stored in a database. Line of bearing results come from two or more direction-finding sensors, which are used for localization. The calculated positions are drawn on a map.

Intercept mode: This mode is used to save energy. Only the monitor runs, while the direction finder and other functionalities are switched off. The monitor checks frequencies or frequency ranges for activities. If an active emitter is detected, the system powers up completely.

Direction finding mode: This mode is used to save energy. Only the direction finder is operating, while monitoring and other functionalities are switched off. The direction finder can be controlled remotely, using triggers for automated recording.

Standby mode: All measuring equipment is switched off. Only the remote control communication system is running. All personal computers are in stand-by mode.

In the event of technical problems, the system falls into failure mode. For example,

failure mode will be activated automatically by failure of the power supply or by over-heating. Only the communication system keeps running for status requests and restart activities.

The measurement system

Software defined intelligence architecture (SDIA) technology ensures a state-of-the-art system with software upgrades throughout the lifetime of the monitors and direction finders. Processing is carried out on virtual devices running on standard information technology equipment, such as servers, workstations and notebooks using the newest versions of Linux or Windows operating systems. Only a small



MEDAV GmbH

Calibration environment and set-up

amount of specialized hardware — mainly antennas and tuners — is used, so the system can be updated easily.

The specialized hardware uses standard interfaces, and so can easily be replaced by newer devices.

In the multifunctional communication sensor's front-end, the synchronized tuners work in parallel without any signal loss. Growth potential and flexibility in the design of software upgrades over the life-cycle allow for the system characteristics to be continuously adapted to current needs. Functions can be added, for example beam forming or special modes for special signals.

The DF-A0038 is a portable wideband direction-finding antenna suitable for fixed and mobile mast-mounted applications. This antenna covers a frequency range from 20 MHz to 3.0 GHz. An integrated monitoring antenna provides a sensitive omnidirectional signal on the same axis as the direction-finding antenna, without interference between them.

One of the most important steps of building an interferometer-based direction finder is the calibration of the direction-finding antenna. There should be no interfering transmitter in the surroundings of the test field. All instruments and cables have to be calibrated separately to achieve a precise and reproducible result. MEDAV calibrates all antennas in a remote test area in South Africa.

The direction-finding receiver box comprises five receivers. Each tuner is connected to the appropriate antenna element, so no commutation or other switches are required. This enables the direction finder to detect and process very short bursts (1 millisecond) which are used by frequency hopper radios.

A separate antenna matrix and an intercept receiver are used for monitoring purposes and provide listen-in functionality.



■ **An e-agriculture application in Japan**

Fujitsu tests ICT approach to boost vineyard and sweetcorn cultivation

With increasing demand for the use of information and communication technologies (ICT) in the agricultural industry in Japan and in other countries, Fujitsu has unveiled the results from a series of trials to collect data through sensor networks deployed in vineyards and on farmland. The data collected by the company on temperature and humidity can be used to choose optimum harvesting times for crops and to fight pests and disease. The trials were carried out by Fujitsu as part of Question 10-3/2 on telecommunications and ICT for rural and remote areas. Question 10-3/2 falls under the purview of Study Group 2 of ITU's Telecommunication Development Sector (ITU-D).

Traditionally, wireless sensor networks have been used in greenhouses and plant factories to monitor lighting, temperature and humidity and to provide a controlled environment for the growth of vegetable

and fruit. But Fujitsu's approach is innovative in using sensors for outdoor farms. This is rare because farmers prefer to depend on know-how and knowledge handed down for generations.

Fujitsu believes that it can bring real benefits to farmers through the use of its sensor network. By putting sensors on farmland, the company says it is possible to decide on the optimum timing for

planting and harvesting, and to employ counter measures against harmful insects and diseases. "We can not only reduce the workload but also improve the quality of agricultural products," says Akira Muranishi, Vice President of Fujitsu's Network Business Innovation Center.

Pilot project launched in vineyard

In Japan, companies like Fujitsu have been experimenting for some time with research and development projects using

ICT with a view to making the agricultural industry more competitive. At the same time, in developing countries, ICT is being used as a tool to increase agricultural productivity, and to assist with marketing and logistics to support the commercial development of the agricultural industry.

Fujitsu launched its pilot project in June 2011 to collect and analyse field data for four months using sensors in vineyards near Koshu City, in Yamanashi Prefecture. "We installed three sets of sensor boxes with temperature sensors and a simple camera at two vineyards linked to an

administration office on the farm," explains Shinji Sawane, Manager of Fujitsu's Network Business Innovation Center.

Fujitsu launched its pilot project in June 2011 to collect and analyse field data for four months using sensors in vineyards near Koshu City, in Yamanashi Prefecture



For winemakers, it is important to decide on the date of the grape harvest and to ascertain the sugar content and the pigment of the grape. In the past, temperature data to assist with this process were brought back by hand from temperature recorders at vineyards.

"This time, we collected the temperature data at the vineyard using a sensor box and a special low-power radio network," says Masakazu Nakamura, President, Okunota Winery, explaining that the low frequency wireless network used to transmit data does not need a licence under Japanese regulations. "Using the system, we were able to decide on the best time for the grape harvest, ascertain the pigment of grapes, and forecast the occurrence of harmful insects and diseases without visiting the vineyards."

Sweetcorn cultivation trial

Fujitsu's second field trial, which began in March 2012, was for sweetcorn cultivation using a farm-information sensing network. Sensor boxes with temperature and humidity sensors and a simple camera were placed in the sweetcorn fields to collect temperature and humidity data on the interior of vinyl row covers and to also indicate, with the aid of cameras, whether the vinyl row covers were open or closed.

Regulating temperature and humidity by opening and closing row covers can be tricky, and data collected from the sensor network make it possible to visualize the relationship between the timing of air ventilation inside the row covers and temperature and humidity conditions.

The sensor boxes collecting the data are equipped with batteries and solar panels, obviating the need to change batteries and allowing for accurate surveys to be conducted efficiently, without human intervention. As with the vineyard system, the wireless network used to transmit the data uses a special low-power radio that allows for data to be collected with no communication charges.

Future deployment

The cost of each sensor is still too expensive to put sensors on every farm and it is too expensive to use the public network to connect the sensors in the fields to the administration centres. But using a low-cost network such as wireless local area network (LAN) may allow for the technology to be scaled up.

According to Mr Sawane, it should be possible for the local academic institutions or enterprises to integrate and maintain such network systems with government support. "Using a special low-power radio network or wireless LAN, we can develop sensor networks with existing technologies at a low cost. We need to investigate less expensive, less power consumptive technology, along with the use of energy harvesting technology."

If the use of energy harvesting technology to produce electricity, for example through photovoltaic cells, can be harnessed to the sensor network system, the company believes that the approach can be applied beyond agriculture.

"We should investigate expanding its use or application to the other fields of infrastructure, such as environment protection, disaster management and crime prevention," says Mr Muranishi.



Child Online Protection

Safer Internet Day 2013 focuses on online rights and responsibilities

Our children are our future. This, coupled with the younger generation's particular vulnerability in an online environment, makes it essential to promote safer and more responsible use of the Internet and of information and communication technologies (ICT) among children and young people around the world. Facing up to this challenge, Safer Internet Day and ITU have taken important steps to educate, empower and protect children online.

Celebrating Safer Internet Day

The 10th annual Safer Internet Day took place on 5 February 2013 with the theme "Online rights and responsibilities". The focus was on empowering children and youth, while online, to navigate safely — and with respect for one another — across every ICT platform, enabling them to use these technologies to help in achieving their future aspirations. This year, Safer Internet Day brought together governments, the private sector, civil society and international organizations to promote a

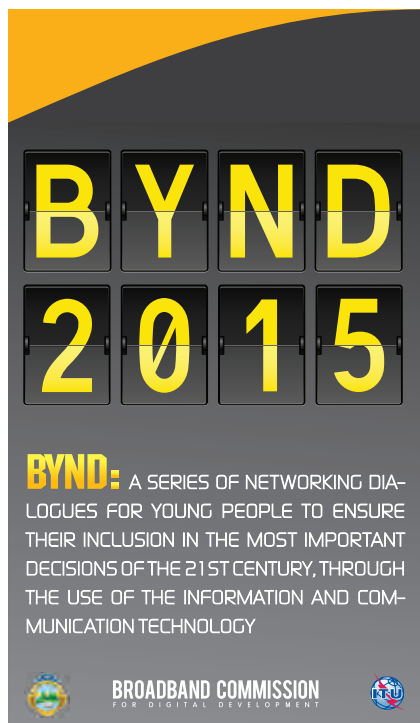
safer and more responsible use of online technology and mobile phones, especially by children and young people.

Over the years, Safer Internet Day has become a landmark event in the online safety calendar. Starting as an initiative of the European Union's Safe Borders project in 2004 and taken up by the Insafe network as one of its earliest actions in 2005, Safer Internet Day has grown beyond its traditional geographic zone and is now celebrated in more than 90 countries worldwide, and across six of the world's seven continents.

Marking Safer Internet Day 2013, ITU Secretary-General Dr Hamadoun I. Touré spoke of the fundamental role that ICT have played in driving social and economic progress, as well as in opening new frontiers and opportunities for young people, enabling them to cultivate their inherent creativity, innovation and dynamism in a digital environment.

The Secretary-General also talked passionately about the dramatic changes associated with the proliferation of ICT, which along with progress and opportunities also potentially brings with it new threats and risks to the safety and security of children — the most vulnerable members of society.

The President of Costa Rica, Laura Chinchilla, Patron of ITU's Child Online Protection (COP) global initiative, during her video message marking Safer Internet Day, highlighted her country's efforts in implementing COP, through the appointment of a National Commission on Cybersecurity. With her commitment, Costa Rica has been working hard — jointly with ITU — to create and develop a national model to promote online protection. The model involves not only government, but also private sector partners, non-governmental organizations, schools and parents — a broad cross-section of stakeholders — across Costa Rica. "I hope we can serve as a role model for other countries", said President Chinchilla.



Miss Deborah Taylor Tate, ITU COP Special Envoy, also speaking on Safer Internet Day, highlighted how COP is empowering children to navigate safely — respecting one another — to achieve their own dreams. "Children need guidance in the online world, as they need it in the offline world", said Miss Tate. ITU launched the Child Online Protection initiative in 2008, as part of its Global Cybersecurity Agenda.

Global Youth Summit

In September 2013, ITU will be organizing the Global Youth Summit, which will be hosted in Costa Rica under the patronage of President Chinchilla.

The Global Youth Summit will provide a global platform to bring youth together to join forces and create solutions for social good, enabled through widespread access to ICT.

This will be a unique occasion for youth to advocate their online rights and demonstrate how ICT are empowering them to fulfil their own dreams and careers.

International cooperation

ITU, as the leading United Nations agency for ICT, sees every day that the present generation of children live in a connected online world and thus need to be protected. ITU stands ready to assist all countries to develop child online protection policies, build capacity, and foster international cooperation.

Official Visits

During January 2013, courtesy visits were made to ITU Secretary-General Dr Hamadoun I. Touré by the following ministers, ambassadors to the United Nations Office and other international organizations in Geneva, and other important guests.



Dr Hamadoun I. Touré, Secretary-General of ITU and Takashi Okada, Ambassador of Japan



From left to right: Dr Hamadoun I. Touré, Secretary-General of ITU; Ann Tutwiler, Special Representative of the Director-General of the Food and Agriculture Organization of the United Nations (FAO); and Eduardo Rojas-Briales, Assistant Director-General of the Forestry Department of FAO



Francis Gurry, Director-General of the World Intellectual Property Organization (WIPO)



Israhyananda Dhalladoo, Ambassador of Mauritius



Bekele Geleta, Secretary General of the International Federation of Red Cross and Red Crescent Societies

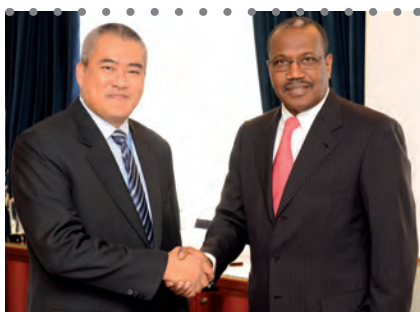
All photos are by Rowan Farrell/ITU.



From left to right: Alison Little, Head of the Joint Foreign and Commonwealth Office (FCO)/ Cabinet Office Cyber Team, United Kingdom; Chris Lomax, Ambassador of the United Kingdom; Dr Hamadoun I. Touré, Secretary-General of ITU; Jamie Saunders, Foreign and Commonwealth Office (FCO) Director of International Cyber Policy, United Kingdom; Malcolm Johnson, Director of the ITU Telecommunication Standardization Bureau; and Doreen Bogdan-Martin, Chief of the ITU Strategic Planning and Membership Department



Mohamed Ali Alhakim, Ambassador of Iraq



Abu Sufian Haji Ali, new Ambassador of Brunei Darussalam



Abdul Hannan, Ambassador of Bangladesh and Houlin Zhao, Deputy Secretary-General of ITU



Richard Beaird, Senior Deputy Coordinator for International Communications and Information Policy in the United States Department of State



Thani Thongphakdi, Ambassador of Thailand



From left to right: Houlin Zhao, Deputy Secretary-General of ITU; Bishar Hussein, Director General of the Universal Postal Union; Dr Hamadoun I. Touré, Secretary-General of ITU; and Malcolm Johnson, Director of the ITU Telecommunication Standardization Bureau

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