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Gearing up to WRC-15

Houlin Zhao, ITU Secretary-General

This edition of *ITU News* covers the preparations underway by ITU membership for the World Radiocommunication Conference (WRC-15), which will be convened in Geneva, Switzerland, throughout the month of November. WRC-15 will review, and, if necessary, revise the Radio Regulations, the international treaty governing the use of the radio-frequency spectrum and satellite orbits. The Radio Regulations provide a unique international regulatory framework to guarantee all spectrum users the interference-free operations that are essential to all wireless applications and services.

WRC-15 will address the spectrum requirements for all radiocommunication systems and the necessary trade-offs between all stakeholders to ensure that these requirements are met. One of the main items will relate to additional spectrum to facilitate the development of International Mobile Telecommunications (IMT) — both terrestrial and satellite — highlighting the importance ITU's membership places on the role of wireless in making broadband accessible to all.

A large part of the work now being done by the ITU Radiocommunication Sector (ITU–R) is focused directly on laying the vital groundwork for the Conference, with all ITU Member States and industry working together to build consensus nationally and regionally and ensure that the consequences of their deliberations and decisions are fully understood and supported. There is a packed schedule of preparatory meetings and workshops geared to improving awareness of the issues and offering the opportunity to debate them ahead of the Conference. WRC-15 is a major opportunity to achieve the harmony which is one of my priorities for ITU's work, and it is my hope that the Conference will achieve key consensual and harmonious outcomes, to the benefit of all.

The ITU–R also carries out many other important activities. On 13 February 2015, ITU welcomed the World Radio Day celebrations to ITU Headquarters in Geneva. Participants and attendees benefited from a range of different viewpoints and perspectives on the past, present and future of radio. Panelists agreed that radio is anything but a legacy technology: according to ITU data, radio still remains the communications medium with the greatest reach in terms of population coverage. This edition of *ITU News* also charts the progress of different regions towards the digital switchover, according to the timetable agreed by the 2006 ITU Regional Radiocommunication Conference in Geneva (RRC-06).

Further training in adapting ICT regulation to the very latest industry and societal developments will be on offer to ITU membership at the Global Symposium for Regulators (GSR-15), in Gabon, from 9 to 11 June 2015. This event promises an exciting line-up of speakers and a packed schedule, hearing from some key public and private sector experts, and contributing to the publication of ITU's *"Trends in Telecommunication Reform 2015"* report. This edition of *ITU News* includes a preview of upcoming events (such as GSR and Girls in ICT Day), as well as a review of the Broadband Commission meeting which took place in Paris from 26 to 27 February 2015.

Looking ahead, ITU will be launching a new work programme later in the year aimed at helping ICT-related young innovators and entrepreneurs, innovative small- and medium-sized enterprises (SMEs), start-ups and technology hubs — with a special focus on developing countries, where increased connectivity is most needed and will deliver the greatest benefits.

Special Report on the Digital Switchover

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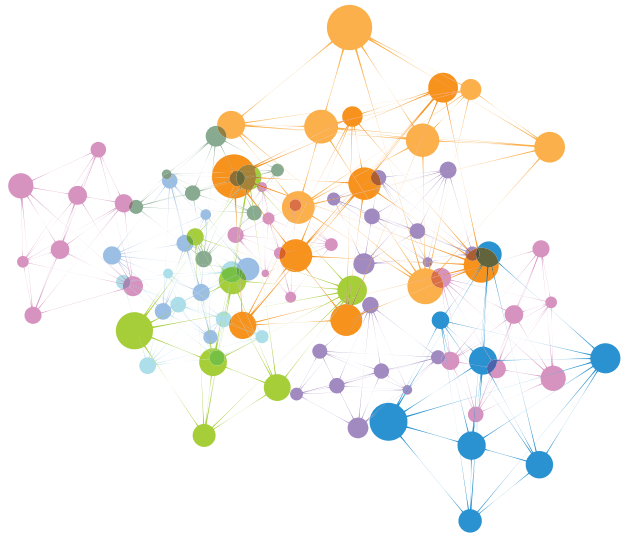


Looking Ahead: April—June 2015

The coming months will see a flurry of activity at ITU, with a number of key events coming up. April will see celebrations of Girls in ICT Day around the world, aimed at encouraging girls and women to experience Information and communication technologies (ICTs) first-hand, to develop ICT skills and to consider the exciting opportunities on offer with a career in ICT. This year, Girls in ICT Day will be held on 23 April — see our separate article at: www.itunews.itu.int.

The 2015 Session of Council will convene on 12–22 May to review the outcomes of the recent 2014 Plenipotentiary Conference in Busan, Republic of Korea. The ITU Council acts as the Union's governing body in the interval between Plenipotentiary Conferences. ITU Council also prepares a report on the ITU's policy and strategic planning. And of course, ITU's 150th celebrations on 17 May 2015 during ITU Council will mark the 150th anniversary of the founding of ITU and the signing of the first International Telegraph Convention in Paris on 17 May 1865. A number of special guests will join us in Geneva for a special awards ceremony and an exciting programme of events. National celebrations and activities are currently being planned in more than 30 countries (as of March) and new activities can be submitted for mapping in our online portal until the end of 2015. To find out more, visit the ITU's 150th Anniversary website at www.itu150.org.

The month of May closes with the WSIS Forum 2015 on 25–29 May, organized by an impressive coalition of UN agencies and international organizations on the theme, *"Innovating Together: Enabling ICTs for Sustainable Development"*. The WSIS Forum unites the ICT community to provide structured opportunities to network, learn and participate in multi-stakeholder discussions and consultations on WSIS implementation. The Forum will build upon two tracks: the *High-Level Track* (consisting of policy statements, the WSIS prize ceremony, and a Ministerial Round Table) and the *Forum Track,* that will offer participants a series of high-level dialogues, Action Line facilitation meetings, country workshops, thematic workshops and knowledge exchanges, as well as an exhibition addressing issues that are critical to WSIS implementation and follow-up in multi-stakeholder settings. See our separate article online at: www.itunews.itu.int.

June will see the ITU's annual Global Symposium for Regulators (GSR-15) organized on the theme, "Mind the Digital Gap", generously hosted by Gabon and organized by ITU in collaboration with the *Gabonese Autorité de Regulation des Communications Electriques et des Postes* (ARCEP). The Global Symposium for Regulators is ITU's major meeting of the global ICT regulatory community and convenes between 130–140 of the world's 164 independent regulatory authorities each year. Regulators, policy-makers, industry leaders and other key ICT stakeholders will share their views, engage in interactive discussions and identify best practices moving forward. GSR-15 will be held in Libreville, Gabon, from 9–11 June, to explore ways to ensure that all the world's citizens can benefit from the social and economic opportunities brought by the digital economy. What kind of regulation is needed to close the digital gap? GSR-2015 will debate investment strategies, m-payments, business models, the impact of taxation, the Internet of Everything, interoperability in the digital ecosystem, e-accessibility, and the impact of regulation on broadband. All in all, the next quarter looks set to be an exciting one — stay tuned!

ITU World and Regional Radiocommunication Seminars

ITU hosted the **World Radiocommunication Seminar 2014** (WRS-14) in Geneva on 8–12 December 2014 offering training focusing on the application of the ITU Radio Regulations and regulatory aspects of the use of the radio-frequency spectrum and satellite orbits. More than 400 participants attended from over 90 countries.

ITU organizes world seminars on spectrum management every two years, as well as regional seminars aimed in particular at addressing the needs of developing countries. In his opening remarks, François Rancy, Director of the Radiocommunication Bureau (BR), noted that "radiocommunications are undergoing constant changes as a result of technological improvements, which need to be reflected in the international regulations on spectrum. These changes need to be reflected in the World Radiocommunication Conferences, ITU Radiocommunication Sector (ITU–R) Recommendations, best practices on spectrum use and the software tools that ITU uses to process the thousands of notices we receive every week reliably and efficiently".

The first two days were dedicated to international frequency management and the use of the radio-frequency spectrum and satellite orbits, as well as the application of the ITU Radio Regulations for terrestrial and space services. Participants were also briefed on the ITU–R study groups and publications; National Spectrum Management; the Radio Regulations Board; outcomes of the ITU World Radiocommunication Conference (WRC-12) and agenda for WRC-15; and the ITU Spectrum Management Training Programme (SMTP).

The final three days comprised workshops on space and terrestrial services. Attendees gained hands-on practical experience with ITU notification procedures, as well as with BR software and electronic publications for Member State Administrations and ITU–R membership. Participants were able to plan their personal schedule based on their own interests and needs. A survey was conducted after WRS-14 to seek participants' feedback: members agreed that the seminars offered useful and relevant content, and offered some suggestions for improvements. Future world radiocommunication seminars will take this feedback onboard in their design and implementation.

BR also holds regular regional seminars to cover all ITU Regions equitably as another opportunity to gain deeper insight into the Radio Regulations.

Two ITU regional radiocommunication seminars were held in 2014:

- 26–30 May 2014 — RRS-14-Asia, Hanoi, Viet Nam;
- 14–18 July 2014 — RRS-14-Americas, Island of Tobago, Trinidad and Tobago.

Further ITU Regional Radiocommunication Seminars (RRS) are currently foreseen for 2015 to respond to requests and expressions of interest in training opportunities from ITU membership:

- 2–6 March 2015 — ITU RRS-15-Eastern Europe and the CIS, Bishkek, Kyrgyzstan.

The following seminars have been planned, with dates and venues yet to be confirmed:

- 20–24 April 2015 — ITU RRS-15-Africa;
- 18–22 May 2015 — ITU RRS-15-Asia, Manila, Philippines;
- 15 July 2015 (date to be confirmed) — ITU RRS-15-Americas, El Salvador.

For more information, please contact BR or see the webpage for ITU's World and Regional Radiocommunication Seminars at www.itu.int/go/ITU-R/seminars/.

Conference Preparatory Meeting for WRC-15

The **Conference Preparatory Meeting** (CPM) is responsible for preparing a report to the World Radiocommunication Conference (WRC) on the regulatory, technical, operational and procedural studies of ITU Radiocommunication Sector (ITU–R) on the issues on the WRC agenda. The CPM Report provides useful information to ITU Member States for their preparation of proposals to the WRC.

The first session of the CPM for WRC-15 (CPM15-1) was held in Geneva on 20–21 February 2012, immediately after WRC-12. It coordinated the work programmes of the relevant ITU radiocommunication study groups and prepared a draft structure for the CPM Report to WRC-15, based on the agenda for WRC-15 and the next WRC, and any directives from the previous WRC-12 (see Administrative Circular CA/201 of the ITU Radiocommunication Bureau).

As a result of ITU–R preparatory studies described in the draft CPM Report to WRC-15, the forthcoming CPM15-2 (second session of the CPM) will be held in Geneva from 23 March to 2 April 2015. CPM15-2 is tasked to prepare the consolidated CPM Report to WRC-15, including possible solutions to the issues on the WRC-15 agenda, which will be used as information in support for the preparation of that conference.

In addition to the draft CPM Report to WRC-15, CPM15-2 will consider contributions from Administrations of ITU Member States and Radiocommunication Sector Members, the Report from the Special Committee on Regulatory/Procedural matters and other relevant information from the Director of the Radiocommunication Bureau. It will aim at the inclusion, to the extent possible, of reconciled differences in approaches as contained in the source material, or, in the case where the approaches cannot be reconciled, the inclusion of the differing views and their justification.

The second session of the CPM for WRC-12 was held in 2011 and attended by more than 1100 participants from 109 ITU Member States and 69 Radiocommunication Sector Members. (Source: Press release "Preparatory meeting finalizes Report to 2012 World Radiocommunication Conference"). It is expected that over a thousand participants will attend the forthcoming second session of the CPM for WRC-15. For further information, please see: www.itu.int/go/ITU-R/CPM/.

World Radiocommunication Conference 2015

The **World Radiocommunication Conference 2015** (WRC-15) will be held in Geneva, Switzerland, from 2 to 27 November 2015. WRCs are held every three to four years. The mandate of the WRC is to review, and, where necessary, revise the Radio Regulations, the international treaty governing the use of the radio-frequency spectrum and the geostationary-satellite and non-geostationary-satellite orbits. Revisions are made on the basis of an agenda determined by the ITU Council, which takes into account recommendations made by previous World Radiocommunication Conferences. The WRC-15 agenda will also include an item on the spectrum requirements for global flight tracking for civil aviation, as requested by the ITU Plenipotentiary Conference 2014 (PP-14).

WRC-15 will consider the results of the studies on options to improve the international spectrum regulatory framework based on the effectiveness, appropriateness and impact of the Radio Regulations with respect to the evolution of existing, emerging and future applications, systems and technologies. Decisions will also be made on the most profitable and efficient ways to exploit the limited resource of radio frequency spectrum and manage satellite orbits, both of which are critical and increasingly valuable for the development of the global economy in the 21st Century.

The Conference will also address any radiocommunication matter of worldwide character, instruct the Radio Regulations Board and the Radiocommunication Bureau, and review their activities, determine the Questions for study by radiocommunication assemblies and the study groups in preparation for future radiocommunication conferences.

Preparatory process for WRC-15

The WRC is preceded by a long and rigorous preparatory process to lay the groundwork and ensure that delegates are informed on all the issues and understand the implications of the different options under discussion. The preparatory meetings leading up to and preparing for WRC-15 are as follows:

Conference Preparatory Meetings (CPMs)

- *The first session of CPM for WRC-15 (CPM15-1) was held in Geneva on 20–21 February 2012.*
- *The second session of CPM for WRC-15 (CPM15-2) will be held in Geneva from 23 March to 2 April 2015.*

ITU Inter-regional workshops on WRC-15 preparation

- *The first ITU Inter-regional Workshop on WRC-15 Preparation took place in Geneva, Switzerland, on 4–5 December 2013.*
- *The second ITU Inter-regional Workshop on WRC-15 Preparation took place in Geneva, Switzerland, on 12–13 November 2014.*

For further information, please see: www.itu.int/ITU-R/go/WRC.

Scan this code to view our WRD 2015 video.

World Radio Day at ITU headquarters

On 13 February, International Telecommunication Union (ITU) hosted this year's World Radio Day 2015 celebrations, co-organized by the United Nations Educational, Scientific and Cultural Organization (UNESCO), the European Broadcasting Union (EBU), the United Nations Office in Geneva, and the ITU to celebrate the power of radio and look ahead to new and innovative means to connect the world, under the theme "Youth and Innovation". World Radio Day was celebrated with a live global broadcast of panel discussions, call-ins from radio journalists covering breaking news of the day and radio features, as well as a jazz concert. In addition, a 24-hour Radio Hackathon brought together technology buffs working on coding, hacking, building and breaking, while demos and technical discussions focused on future innovations in radio.

The celebrations began with a message from UN Secretary-General Ban Ki-moon: "This year's World Radio Day highlights the importance of radio to the world's 1.8 billion young women and men. As the international community shapes new sustainable development goals and a new global agreement on climate change, we need to hear the voices of young women and men — loudly, strongly and urgently."

François Rancy, Director of ITU's Radiocommunication Bureau, highlighted the valuable contribution of ITU's work on radio: "The ITU World Radiocommunication Conference (WRC), and ITU assignment and allotment plans and procedures ensure that spectrum is available for radio in every country. The ITU study groups develop the global standards that ensure the lowest costs through economies of scale and the most efficient use of spectrum for the sustainable development of radio in the future, in particular to reach the one billion people who still do not have access to radio today".

A high-level debate on "The Future of Radio" was anchored by BBC correspondent Imogen Foulkes and featured Michael Møller, Director General of the UN Office in Geneva; Getachew Engida, Deputy Director General of UNESCO; Annika Nyberg-Frankenhaeuser, Media Director of EBU, speaking on behalf of Ingrid Deltenre, Director General of EBU; and Houlin Zhao, Secretary-General of ITU.

During the high-level debate, Houlin Zhao, ITU Secretary-General, emphasized the vital role of radio in connecting people, especially those in remote communities and the most vulnerable. He spoke about the strong role radio plays in emergency communications and disaster relief, or in providing access to vital information in the fight against diseases such as Ebola. Michael Møller, Director General of the UN Office in Geneva, also highlighted the role of radio for humanitarian missions, peacekeeping operations, health interventions, or in helping manage flows of refugees. He went even further, by describing radio as "a societal glue".

Getachew Engida, Deputy Director General of UNESCO, agreed that today, radio is probably still by far the best medium to reach the unreachable (see Figure 1), and plays a significant role in the development and dissemination of information. Freedom of expression can anchor societies in a democratic manner, and contribute significantly to building peaceful, democratic and sustainable societies.

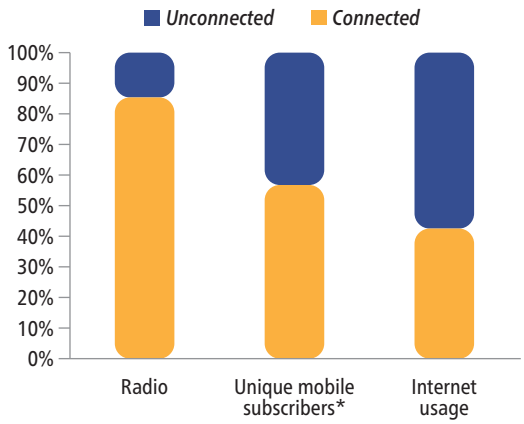
Annika Nyberg-Frankenhaeuser, Media Director of EBU, questioned the image of radio as a "legacy technology". She disagreed with suggestions that the development of new communication mediums necessarily means the death of old mediums (see next article by Dr David Wood). Rather, each new medium has added a new dimension, rather than supplanting old mediums. She pointed out that radio continues to play a vital role in people's lives today, and radio actually has a very bright future — partly because broadcast radio often still works when other technologies do not (such as in disaster areas, or after a catastrophe has occurred), but also in our everyday lives, when people can listen to radio while doing other things — radio can be complementary and very attractive to young audiences in many different countries.

Mr Engida concurred, underlining the role of interesting and relevant content in making radio attractive to new audiences. Mr Møller also identified an important role for radio in educating listeners, as one way to help people speak on the basis of well-informed knowledge.

A technical session, coordinated by Christoph Dosch, Chairman of ITU Radiocommunication Sector (ITU–R) Study Group 6 (Broadcasting service), also examined new trends and innovations in radio, including hybrid interactive digital radio, traffic information on Digital Audio Broadcasting (DAB) radio, emergency radiocommunications and how personalized radio will transform the way people will listen to radio programmes. Participants included: Matthew Shotton, BBC; Matthias Stoll, Ampegon, Roger Miles and Mathias Coinchon from EBU; Fabian Sattler from IRT; Satoshi Oode from NHK; Nicole Winkler, Oliver Helbig and Olaf Korte from Fraunhofer IIS; Aldo Scotti from RaiWay; and Christian Wachter and Thomas Bögl from Rohde & Schwarz.

For more information and to access the webcast, see: www.itu.int/en/wrd15/Pages/default.aspx.

1 *Radio is the most widespread communications platform, start 2015*



Source: ITU.
**Approximate; source: GSMA.*

Radio — The soundtrack of our lives

Dr David Wood

Chair, ITU Radiocommunication Sector WP 6C

On 13 February 2015, in conjunction with the United Nations Educational, Scientific and Cultural Organization (UNESCO), ITU hosted World Radio Day at its Headquarters in Geneva, Switzerland, to celebrate radio and its value to society — past, present and future. Held on the anniversary of the first broadcast by UN Radio in 1946, World Radio Day aimed at raising awareness about the importance of radio, facilitating access to information through radio, and enhancing networking among broadcasters. This article by Dr David Wood, Chair of the ITU Radiocommunication Sector (ITU–R) Working Party 6C, charts the value of radio, and how it is continuing to evolve.

For many of us, radio is an old friend. Since the first mass broadcasts took to the air in the 1910s, radio has opened a door to entertainment and information for billions of people around the world. The first radio "frequency plans" were prepared in the 1920s, regulating the use of broadcast frequencies, and allowing listeners to enjoy broadcasts, while avoiding interference from radio stations in other countries. ITU has been continually involved with the evolution of radio, which still remains the world's most ubiquitous media. Radio continues to have new and continuing relevance in the modern era of smartphones and tablets.

Radio is a daily companion for many — we wake up to the radio and we drive listening to the radio. It is a lifeline for the old and lonely. It has been called "the theatre of the mind", because it exercises our imagination. Surveys reveal that it is the medium we trust most. In many countries, it is still the number one place we go for music. Production costs are low. And when there is a national or local disaster, time and time again, radio proves to be the most reliable way to find out what is happening, and what we need to do.

As new media forms have arrived — radio, cinema, television, and the Internet — not one has fallen out of use. Rather, each new medium has added a new dimension to our media experiences. And just like other media, radio is responding to the evolution of technology. Today, there is a host of technical options being actively explored in the future development of radio. Which technical options will make most sense for tomorrow's radio?

Digital radio: the next step

As for all media, radio can be digital. During the 1980s and 1990s, various digital radio broadcasting systems were developed. Today, the two most widely used are probably the Digital Audio Broadcasting (DAB) family (DAB/DAB+) and HD Radio, each of which has features suited to different markets. Other options include DRM (Digital Radio Mondiale). There has not been agreement on a unique technology for worldwide digital radio; however, specifications for all the major alternative digital radio systems are readily available from ITU.

Digital radio offers solid advantages over analogue: the sound quality can be superior and as a consequence, listeners can become more involved and immersed in what they are hearing; radio stations can be found more easily; the transmitter power per station can be lower; additional multimedia can be provided; and many more radio stations can be made available (a list of advantages similar to digital television, in fact). However, after many decades, the cost of analogue radio sets is negligible, and analogue radio is so ubiquitous that many national Administrations prefer to encourage, rather than enforce, a transition from analogue radio to digital. The transition from analogue to digital radio is proceeding more slowly than for television, but as for every item of consumer equipment, it looks inevitable that it will happen eventually — the question is more about the timescale — "when", rather than "if".

Moving to digital radio also makes it easier to provide visual services that complement the sound — the totality of which may be called "illustrated radio". If the radio set has a small screen, it can carry rolling collections of still or moving images or text about the announcer, the music, an advertisement, or anything else the broadcaster decides.

Radio services can also help people with disabilities. Along with the sound, a transcript can be broadcast of what is being said, which can be displayed on a small screen so that those with hearing difficulties can "read" and hence enjoy radio programmes. An ITU specification exists for the technology needed. Radio sets can also be arranged to help non-native language listeners or the elderly by "slowing down" the speed of conversations or spoken words, or by compressing the loudness range, making them easier to follow.

More advanced services giving traffic and travel information are also possible, and ITU specifications are available here too. These systems can work if needed in conjunction with the car's GPS system.

Radio stations can be, and are, provided by many means — via conventional stand-alone radio broadcasts, or included in digital multiplexes for television or, more recently, as part of an integrated broadcast broadband service. The Internet itself offers access to thousands of radio stations from around the world. Radio sets can

be designed to access the web, as well as radio stations. The set can seek out and bring up content from a website associated with the radio station. These sets can effectively offer a more advanced form of illustrated radio, or they can be used to provide other sound services. A rather neat feature is to be able to switch between a broadcast version and an Internet version of the radio station, according to which offers the better reception in real-time. In future, we can also expect mobile phone or tablet apps to be developed that make use of radio content.

Multichannel sound

If listeners are in the right place with the right equipment, radio can potentially provide "multi-dimensional sound" — sound that derives from any direction around us (as in real life). For example, if speakers were located around the interior of a car or a lounge, the broadcast can give listeners a sense of actually being present in a concert hall. ITU offers specifications for multichannel sound systems. Headphones (binaural sound) are another convenient way to experience multidimensional sound, without disturbing others.

A continuing need for radio for future generations

Today, many of us benefit from the constant companionship of a smartphone or tablet. If the content and variety and benefits of free-to-air radio are to be enjoyed by the smartphone and tablet generation, radio reception should be incorporated into these devices — this should be a rallying cry to all of us.

We know that many mobile phones have the capability for analogue radio (although in some countries, this capability is not "enabled" in mobile handsets). In countries such as India, where analogue radio reception is normal in mobile phones, there has been major growth in the number of radio stations. If the capability is designed into the handset, experience shows that it will be used.

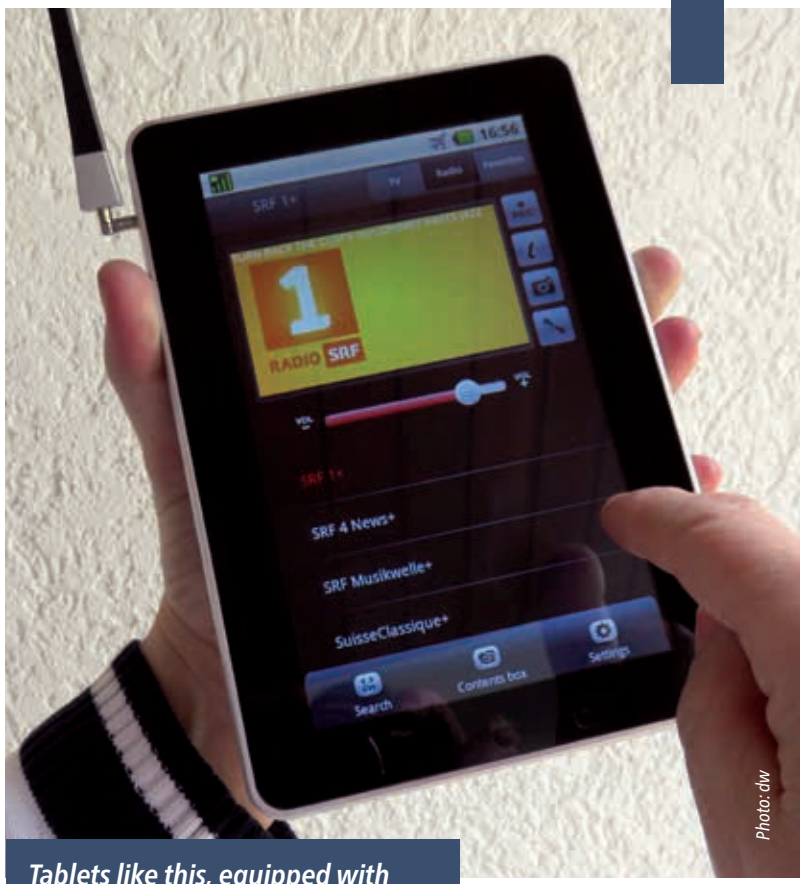


Photo: dw

Tablets like this, equipped with digital radio capability, should be a major part of the future of radio

Conversely, listening to a free-to-air-radio service via a smartphone or tablet could be perceived by some operators as taking away user time from the smartphone's paying data services, so network operators and manufacturers may need some convincing to include digital radio in all their smartphones or tablets. Digital radio capability should be seen as a complementary selling proposition for network operators, rather than competition — and innovative new apps may also help to do this.

Radio can cheer us up, inform us, and entertain us — and it is always there as a useful option when society or widespread or far-flung communities need to be informed quickly. In the digital era of smartphones and tablets, radio continues to be a steadfast and reliable friend for billions of people around the world, underpinned by ITU's valuable work.

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Digital switchover around the world

Moving from analogue to digital terrestrial television frees up scarce spectrum for other uses, especially mobile. All regions are keen to achieve digital switchover, and some countries have already managed to complete the process. The deadline of June 2015 set for the UHF band by the ITU Regional Radiocommunication Conference in Geneva in 2006 (RRC-06) for the migration from analogue terrestrial television to digital terrestrial television applies to Africa, the Middle East and Europe, as well as to the Islamic Republic of Iran. In Asia-Pacific and in the Americas, national Administrations have worked together on a bilateral and multilateral basis to develop spectrum plans for digital terrestrial television.

In North America, much of Europe and some parts of Asia, analogue switch-off has now been completed. Most countries in Latin America and Asia-Pacific have plans to complete the transition between 2015 and 2020.

The RRC-06 plan is based on frequency coordination for systems using the terrestrial digital video broadcasting (DVB-T) standard, although other systems can be used. Around the world, several standards have been developed for digital terrestrial television. The principal ones are the Advanced Television Systems Committee (ATSC) standard developed in North America, Integrated Services Broadcasting — Terrestrial (ISDB-T), developed in Japan and then adapted for use in Brazil and a number of other Latin American countries, and DVB-T (and its successor, DVB-T2). China also has its own standard called Digital Terrestrial Multimedia Broadcast (DTMB).

This series of articles in this issue of *ITU News* shows how different countries with different market conditions are facing — or have already dealt with — the challenges involved in the digital switchover.

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Digital switchover in Africa

Market conditions for digital terrestrial television in Africa vary. Some countries (for example, Nigeria) have high penetration rates of terrestrial television, while others (for example, Tanzania and Cameroon) have low penetration.

In large countries, where demand for terrestrial television is strong, digital switchover is a long and complex process. In such cases, it is important to involve stakeholders throughout the process, and to implement an information campaign promoting the availability of free-to-air digital terrestrial television. Ensuring that set-top boxes are available and affordable are also key factors in making sure that viewers are able to access the new services. The difficulty of the task may prevent some of these countries from meeting the 2015 deadline for analogue switch-off.

In Nigeria, involving stakeholders is helping to smooth the transition, making it possible to reduce the overall simulcast period — when digital and analogue free-to-air television signals are broadcast simultaneously — and decrease the associated costs. Also, the government has decided to subsidize set-top boxes in order to accelerate take-up.

In contrast, digital switchover can be implemented relatively quickly when the terrestrial television platform has more limited coverage and market share. The challenge is not so much in the management of the simulcast period or the switchover process, but rather in ensuring that the new digital terrestrial television platform is competitive and attractive against the other pay-television platforms in the country. The key success factor for digital terrestrial television in these cases is likely to be the richness of the content that the platform will offer, especially local content. An information campaign to promote the availability of free-to-air digital terrestrial television to viewers who may not currently use terrestrial television

is also crucial for the digital switchover process. This needs to be backed by strong government action to support digital switchover where market interest may be insufficient to justify the transition to digital broadcasting.

The cases of Nigeria, Tanzania and Cameroon outlined below highlight the need for strong policy-led approaches to digital switchover, and the involvement of industry.

Nigeria

The Nigerian government estimates that some 40 million households own a television set in Nigeria, of which around 3.3 million are pay-television subscribers using satellite and digital satellite services. The majority of people in the country watch free-to-air analogue television, making it the country with the highest terrestrial television viewership in sub-Saharan Africa. Analogue television in Nigeria carries more than 40 channels. This contrasts with some other countries in Africa, where as few as one or two over-the-air analogue channels are broadcast. Thus the digital switchover process in Nigeria is one of the most challenging in the sub-Saharan region.

DigiTeam Nigeria — the body responsible for managing digital switchover in Nigeria — has set a revised target of January 2015 for the digital migration to be completed across the country (the original target date was June 2012). DigiTeam Nigeria is made up of government and industry representatives. It is, in particular, responsible for developing the country's standard for manufacturing set-top boxes to receive digital signals, as well as for ensuring that adequate information is provided to viewers and that all switchover problems experienced by viewers are addressed.

Two broadcasting licences have been awarded to deliver digital broadcasting services. The first was awarded to NTA Star Times, a joint venture between the Nigeria Television Authority and the pay-television operator Star Times, which has been designated as the first national digital signal carrier for the country. The second licence was awarded to Pinnacle Communications in July 2014. DigiTeam Nigeria has indicated that the release of a third licence will be reviewed as the market develops. The second licensee will have to set up a separate entity that would be licensed by the National Broadcasting Commission if it wishes to provide content over its network. A single national digital multiplexing licence using the Digital Video Broadcasting — Second Generation Terrestrial (DVB-T2) technology was advertised earlier in 2014.

In June 2014, the pilot campaign for digital migration was launched in the city of Jos. The date for analogue switch-off in Jos has not yet been announced, but the campaign was designed to raise awareness of the digital migration deadline and will be followed by launches in other major Nigerian towns and cities, and then the rest of the country.

Alongside the public awareness campaign, an upcoming priority for the government is the tender for the manufacture and distribution of set-top boxes for the 40 million households with television sets in Nigeria. In June 2014, the government announced that not only was it looking into subsidizing the costs of set-top boxes, but that all set-top boxes were to be manufactured in Nigeria.

The government has also announced its intention to introduce content access fees, where viewers will have to pay a fee to access digital terrestrial television. It anticipates that this will be accompanied by a more effective fee collection process, and will provide the funds for Nigerian broadcasters to produce local content. The National Broadcasting Commission states that high-quality local content will be central to the success of digital television in Nigeria.

Tanzania

On 31 December 2012, Tanzania became the first country in mainland sub-Saharan Africa to commence the switch-off of its analogue terrestrial television signals. One key feature of Tanzania's market is that analogue terrestrial broadcasting has historically had only limited population coverage (around 24%), with many viewers using free-to-air satellite television instead.

In Tanzania, the migration to digital television has been largely policy-driven, rather than market-driven. Despite a number of challenges, Tanzania has managed to switch off its analogue television signals in most areas ahead of the agreed ITU deadline of June 2015. DVB-T2 has been chosen as the standard.

Tanzania's digital switchover has been tailored to provide digital coverage to viewers within the coverage area of the analogue television service. The analogue signal was first turned off in Tanzania's most populous city — Dar es Salaam. Smaller towns are now following. The digital migration project was nearing completion by the end of 2014. In June 2014, the government announced that 25% of the population was covered by digital terrestrial television.

Official estimates put the number of television sets in Tanzania at 6.4 million, out of around 10.3 million households. Given the size of the free-to-air satellite market and the cable television market, the digital switchover process was anticipated to affect just under half of all households with television: 2.7 million television sets receiving analogue terrestrial signal, clustered in and around 19 towns.

The supply chain and cost of set-top boxes have posed problems for Tanzania and many other countries. The initial average cost of a set-top box was from around USD 50 to USD 75, and 57% of Tanzanians surveyed by the Tanzania Communications Regulatory Authority stated that they felt the price was high. It indicated that it would develop a scheme to help low-income viewers; however, this had not been implemented by the time analogue switch-off in the capital city was completed. The government has nonetheless contributed to lowering the cost of set-top boxes by exempting them from value-added tax and import duty.

The digital switchover opportunity has been used in Tanzania to restructure the broadcasting market by licensing multiplex providers separately from broadcasters (the content providers). As part of this process, the State broadcaster was split into a multiplex provider and a content provider.

In 2010, three multiplex licences were issued: one to a joint venture between the Tanzanian Broadcasting Corporation and Star Times (an international pay-television provider), and two to private Tanzanian-owned companies.

Since the licences were granted, the high transmission fees imposed by multiplex operators on broadcasters have raised concerns. The Tanzania Communications Regulatory Authority has

had to intervene between multiplex operators and content service providers over service level agreements and fees, and content distribution rights. Following a consultation in 2012, the Regulatory Authority now annually reviews the content base fee charged for transmission to ensure that multiplex fees are cost-based.

The sustainability of the two smaller (privately owned) multiplexes has also proved a concern, compared to the Star Times-supported public multiplex. Providing incentives for all three multiplex operators to continue to build sufficient network in the five smaller service areas has been a challenge. A report on the migration from analogue to digital terrestrial broadcasting, published by the Tanzania Communications Regulatory Authority in May 2014, indicates that government subsidies will be available to multiplex operators to facilitate network expansion in the remaining areas yet to be switched over, which include some of the more sparsely populated areas of Tanzania.

Although one objective of the restructuring of the terrestrial television market was to ensure that broadcasters focus on content provision rather than signal transmission, production of local content has proved challenging. Content service providers have failed to meet the 60% local content requirement that the government stipulated. They give as reasons the weakness of infrastructure for producing local content and the high production costs. The pace of the switchover process has also caused problems, with some viewers losing television services for a while during the switchover.

The regional phasing of the switchover has meant that the Tanzanian government has been able to smooth the transition to digital switchover through simulcasting, despite the high satellite, utilities and human resources costs of simulcasting. These costs have been managed by limiting the period of simulcasting.

Despite the challenges that have been faced, Tanzania has successfully switched off analogue television in its most populous city and the government has made firm plans to complete digital switchover by the agreed ITU deadline. This success can largely be attributed to the government's will to progress with digital switchover. Reviews of the Tanzanian digital switchover project have emphasized the necessity for widespread marketing and viewer awareness of the availability of digital terrestrial television as a free-to-air platform, and for strong government leadership and timely decision-making.

Cameroon

To manage the transition to digital terrestrial television, Cameroon's government in 2012 created a body, called CAM-DTV, comprising ministers and the public broadcaster. CAM-DTV listens to and involves private broadcasters as well, because it understands that the success of the transition also depends on these stakeholders.

In Cameroon, terrestrial television has a very low penetration (12.5% of households) compared to unlicensed cable distribution (85% of households). The government aims to use the digital switchover process to reorganize the terrestrial television sector so that it regains its attractiveness to viewers. To reach this goal, the government has set three objectives: first, to promote local culture through the development of local production and the imposition of broadcasting obligations on channels; second, to diversify the television landscape to offer a wider choice of content by multiplying the number of theme channels; and third, to extend the coverage of digital terrestrial television to most of the population (in 2013, digital terrestrial television coverage was only around 40%). DVB-T2 has been selected as the standard.

CAM-DTV does not consider the price of set-top boxes as a barrier to switching from cable television to digital terrestrial television for terrestrial television consumers, since most consumers already pay monthly fees to cable operators.

In July 2014, the government signed a USD 306 million loan agreement with the World Bank to facilitate the migration to digital terrestrial television by the agreed ITU target date of 2015.

Digital switchover in Europe

Status of the 800 MHz and 700 MHz bands

The planning of the digital switchover of television in Europe began as long ago as 1997, when the European Conference of Postal and Telecommunications Administrations (CEPT) laid the foundations for the launch of digital terrestrial television. This resulted in a multilateral coordination agreement (referred to as the Chester-97 agreement) between CEPT countries to introduce digital terrestrial television using the Digital Video Broadcasting — Terrestrial (DVB-T) standard.

Certain countries in Europe were among the first in the world to implement digital terrestrial television — and to release digital dividend frequencies in the 800 MHz band. Many European countries are now looking to re-allocate further Ultra-High Frequency (UHF) spectrum from broadcasting to mobile use, and to make frequencies in the 700 MHz range available for mobile broadband, in addition to those already used in the 800 MHz band.

Digital broadcasting services were launched as early as 1998 in some European countries, such as the United Kingdom. However, since the Chester-97 agreement did not provide a new frequency plan for

digital terrestrial television, initial services were launched in spectrum formerly used for analogue television, and it was not until the ITU Regional Radiocommunication Conference in 2006 (RRC-06) that a new digital frequency plan for terrestrial broadcasting was produced.

European regulators moved quickly after RRC-06 to implement the new plan. Key to the coordination efforts within Europe (both in terms of switching off analogue television and releasing digital dividend frequencies) was the European Commission decision to harmonize the 800 MHz band, and the associated European Commission Recommendation to facilitate release of the digital dividend (Commission Decision of 6 May 2010 on harmonized technical conditions of use in the 790–862 MHz band in the European Union). The Recommendation urged European Union Member States to cease broadcasting analogue television signals by 1 January 2012, but a subsequent Decision of the European Parliament (243/2012/EU) set a 1 January 2013 deadline for European Union Member States to make the 800 MHz digital dividend spectrum available for electronic communications services. This deadline was met by ten Member States, plus Croatia, which joined the European Union on 1 July 2013 (see Figure 1).

Countries that did not meet the deadline invoked a derogation clause covering specific circumstances such as cross-border frequency coordination. The European Commission accepted 12 of these derogation requests, for periods of up to three years, on condition that continued use of the 800 MHz band for broadcasting or other purposes did not cause any problems for the development of wireless broadband in that band in neighbouring Member States where 800 MHz mobile broadband services were already in use.

Since 1 January 2013, the two countries that did not request derogation — Belgium and Estonia — as well as the two for which derogation requests were not granted — Slovenia and the Slovak Republic — have all assigned the 800 MHz band to mobile broadband. In addition, during 2013 and the first half of 2014, seven of those countries that were granted a derogation auctioned licences to use the 800 MHz band spectrum for mobile services, as shown in Figure 1.

Although not subject to the European Commission decision, countries such as Iceland, Norway, Switzerland and the Russian Federation have also conducted 800 MHz auctions, and that spectrum band is now in the hands of their respective mobile operators.

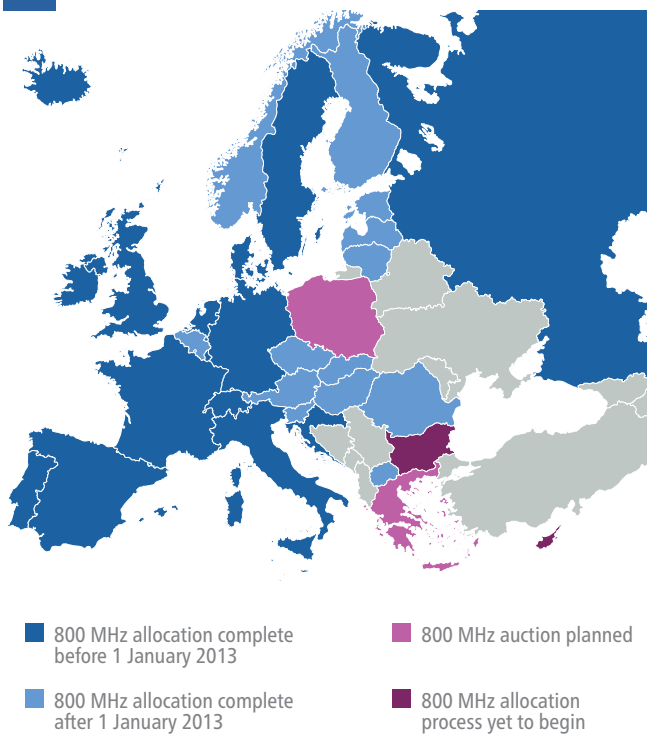
All of the European Union Member States that have completed the digital switchover have assigned their digital dividend spectrum through an auction. These auctions have been conducted either solely for the 800 MHz band or in conjunction with assignment or re-assignment of other bands for International Mobile Telecommunications (IMT), which in Europe are typically the 900 MHz, 1800 MHz and 2.6 GHz bands (as well as the 3.4 GHz band in some countries). The status across Europe (CEPT and European Union countries) as regards assignment of the 800 MHz band for mobile use as at July 2014 is illustrated in Figure 1.

More recently, Hungary completed allocation of the band, after its 29 September tender. On 14 October 2014, Greece's National Telecommunications and Post Commission (EETT) released results from its sale of frequencies in the 800 MHz (digital dividend) and 2600 MHz bands for fourth-generation (4G) mobile services. Cosmote, Vodafone and Wind Hellas acquired two paired 5 MHz blocks (2×10 MHz) in the 800 MHz band each, paying EUR 103 million, EUR 103.1 million and EUR 103.01 million respectively. Half of the 800 MHz spectrum was distributed in a preliminary stage at a fixed price of EUR 51.5 million per 2×5 MHz, with the remainder issued via a competitive second-round auction. The licences have a term of 15 years, effective from 28 February 2015.

In particular, Wind Hellas will use its new frequencies to support its plan to enter the 4G LTE segment against its two larger rivals, both of whom have well-established LTE operations. A statement from the company confirmed that the new spectrum will support the operator's 4G roll-out. The company will incorporate this new spectrum into its network modernization and the current roll-out of LTE services. "This is a significant investment in critical spectrum that will allow us to meet the growing consumer demand for 4G mobile broadband and provide consumers the fastest data service," the statement said.

In Poland, the original auction was planned for February 2014; however, this was cancelled as a technical glitch prevented operators from accessing auction documents. The Polish national regulatory authority, the Office of Electronic Communications (UKE),

1 *Status of the 800 MHz band in Europe at July 2014*



Source: Analysys Mason, 2014.

subsequently amended the auction approach in order to avoid monopolization of the market: for example, by modifying limits on the sharing of spectrum so that up to 30 MHz of spectrum holdings in the 800 MHz band can be shared, as well as removing restrictions on bidding based on operators' current spectrum holdings in the 900 MHz band. Due to these changes, a new consultation process had to be launched.

Cyprus is still taking advantage of its derogation and the regulator has yet to make any announcements regarding the timeline for an 800 MHz allocation.

Bulgaria has notified the European Commission of its continued use of the 800 MHz band for public security and defence purposes, and it has therefore been given longer to complete digital switchover. There are provisional plans to assign the 800 MHz band to mobile in 2017.

Following completion of the first digital dividend auctions across much of the European Union, Member States are turning their attention towards the 700 MHz band (694–790 MHz). As for the 800 MHz band prior to digital switchover, this spectrum is currently occupied by digital terrestrial television services in most countries.

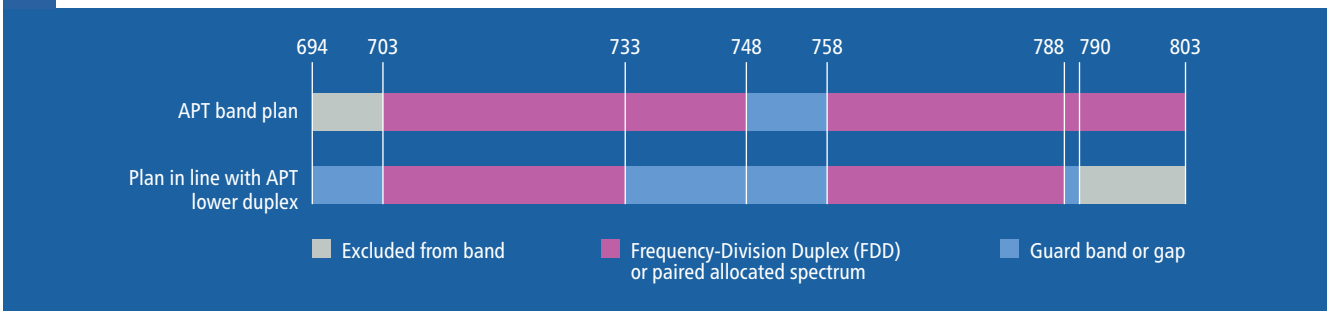
Finland has made particularly significant moves towards assigning the 700 MHz band, with the regulatory authority, FICORA, setting out its plans in January 2013 to release the 700 MHz band to mobile from 1 January 2017. The Finnish government has held discussions with its neighbour, the Russian Federation, over potential interference arising from this re-assignment in border areas between the two nations, and the Russian Federation is also considering re-allocating the 700 MHz band to mobile. The Russian Federation has had further discussions regarding such spectrum liberalization with the other members and observers of the Regional Commonwealth in the field of Communications (RCC), noting that it is considering a harmonized allocation of the spectrum band for mobile radio services.

The Swedish government has also issued a decision to reallocate the 700 MHz band for mobile use on 31 March 2017. In France, the principle of the reallocation has been announced and it is expected that an auction will occur this year in 2015. In Germany, the 700 MHz band is to be auctioned in conjunction with the 900 MHz, 1800 MHz and 1.5 GHz spectrum.

The Polish regulator has launched a consultation inviting views from industry players on possible future uses of the 700 MHz band. Options under discussion are the full reallocation of the band, and sharing between existing broadcasters and mobile operators (subject to conditions such as geographical separation). In the United Kingdom, Ofcom has started a consultation on mobile data strategy and potential future spectrum releases, which includes consideration of the future use of the 700 MHz band. ComReg in Ireland is also conducting a consultation into the future of the UHF spectrum, with particular focus on the 700 MHz band and preparation for the change of allocation that Ireland anticipates will happen at the World Radiocommunication Conference in 2015 (WRC-15).

At the 46th meeting of the CEPT Electronic Communications Committee Project Team 1, held in Luxembourg from 28 April

2 *Electronic Communications Committee (ECC) 700 MHz band plan based on the Asia-Pacific Telecommunity (APT) lower duplex*



Source: Analysys Mason, 2014.

to 2 May 2014, a provisional decision was made regarding the channelling arrangement to be adopted for the 700 MHz band in Europe. This involves a European harmonized approach to licensing the band using a 2×30 MHz channel arrangement (based on the "lower duplexer" of the 700 MHz band plan being implemented by a number of countries in Asia-Pacific, as shown in Figure 2), to allow Member States to take advantage of potential global economies of scale.

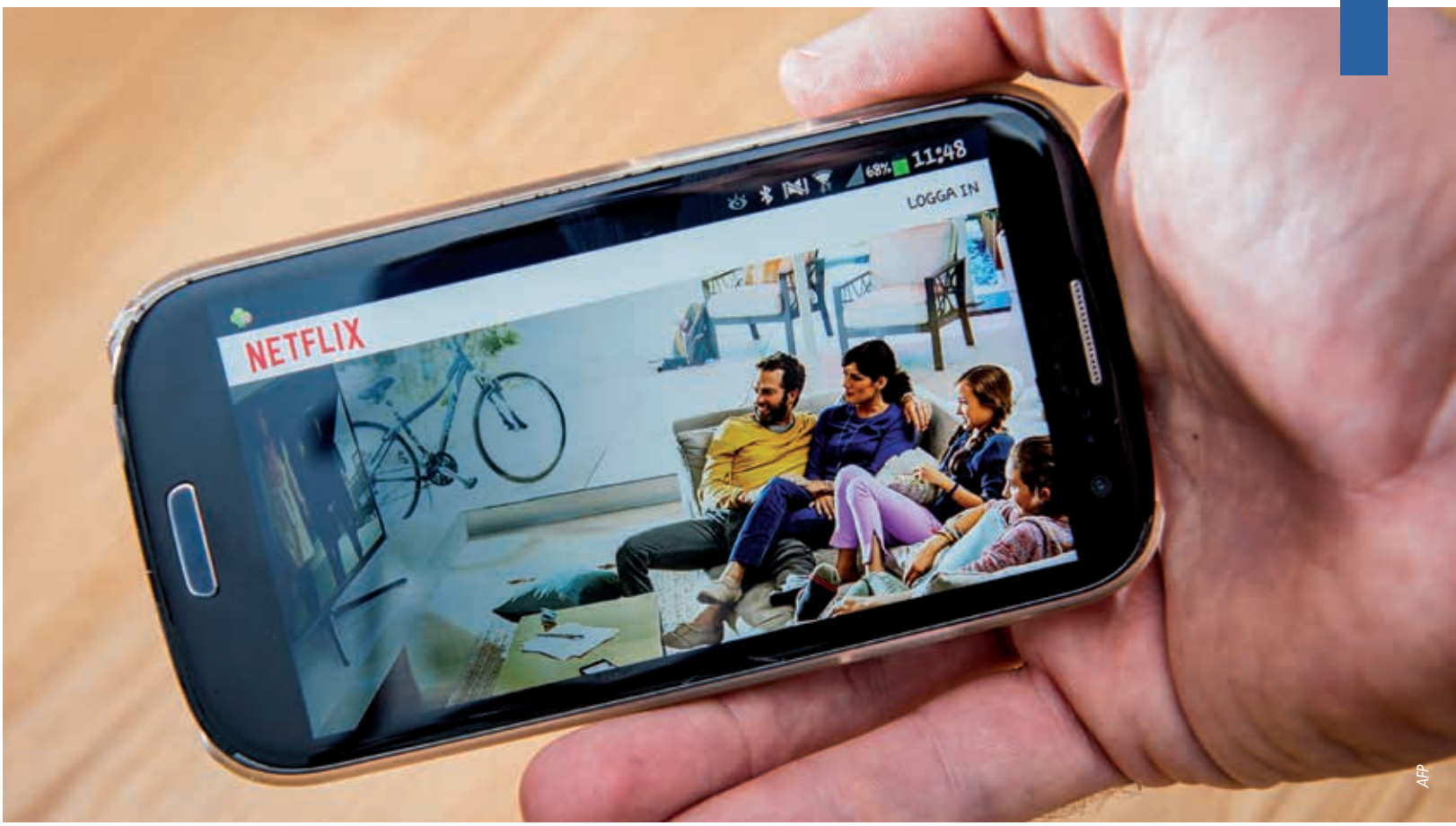
While the 800 MHz band has been largely assigned to mobile broadband across Europe and the 700 MHz band is likely to be ratified as a co-primary allocation between mobile and broadcasting at the upcoming WRC-15, the differing requirements of European countries in terms of amounts of spectrum needed for digital terrestrial television and mobile broadband have created a potential risk of fragmentation of allocations in the remaining UHF spectrum (470–698 MHz) in Europe.

Accordingly, the Electronic Communications Committee has set up a task group with the remit of identifying scenarios for long-term development and harmonization of the 470–694 MHz UHF band. A draft report, published for public consultation in June 2014, sets out alternative scenarios for future use of the UHF band, ranging from continued primary use of the 470–698 MHz band for broadcasting services to use of the entire UHF band by future communications technology.

Views on the best scenario for Europe are mixed. Some favour European-wide repurposing the 700 MHz band for wireless broadband by 2020, whereas others suggest the 700 MHz band should be repurposed for mobile use on a country-by-country basis. The broadcasting community has stressed that the band cannot be repurposed before 2020 without serious disruption to digital television services. The report stops short of making a firm recommendation on the future harmonized use of the band, although it is expected that, following WRC-15 and taking account of the decisions taken internationally at that time, European regulators will move to make further recommendations and decisions concerning longer-term use of UHF frequencies.

In September 2014, a report prepared by Pascal Lamy for the European Commission was published. Its proposed vision of the use of the UHF spectrum is a "2020–2025–2030" formula with the aim of enabling Europe to fulfill the Digital Agenda for Europe broadband targets in three steps, while giving broadcasting a clear path to invest and develop further. The report proposes that:

- The 700 MHz band (694–790 MHz), currently used by terrestrial broadcasting networks and wireless microphones, should be dedicated to wireless broadband across Europe by 2020, giving sufficient lead time to ensure a transition path to enable the proposed change in use;
- A review should be done by 2025 of UHF spectrum use to assess technology and market developments.
- Regulatory security and stability for terrestrial broadcasters in the remaining UHF spectrum below 700 MHz should be safeguarded until 2030.



AFP

Digital switchover in the United States and subsequent plans for a 600 MHz incentive auction

The transition to digital television in the United States took place in 2009. Rather than adopting an area-by-area approach to digital switchover, all analogue television stations ceased transmission simultaneously. This was facilitated by a pilot test in North Carolina, which took place a year before the full switchover date.

Digital switchover in the United States was enabled by the development and adoption of the Advanced Television Systems Committee's (ATSC) digital television standard. Like other digital terrestrial television standards, such as the Digital Video Broadcasting — Terrestrial (DVB-T) and Integrated Services Digital Broadcasting — Terrestrial (ISDB-T) standards, the ATSC standard enables digital television broadcasts to be provided using significantly less bandwidth than for analogue, allowing channels to be compressed into a smaller amount of spectrum. This produced a digital dividend for the United States — the 700 MHz band for mobile use.

Analogue switch-off

The original analogue switch-off date set by the United States Congress was at the end of 2006. However, as the condition of 85% of households having a digital tuner capable of receiving digital broadcasts was not met in time, the deadline was postponed to 2009.

Ahead of this, in 2008, the Federal Communications Commission (FCC) auctioned the digital dividend frequencies in the 700 MHz band. This process, officially known as Auction 73, commenced on 24 January 2008 and sold the rights to operate mobile networks in the 700 MHz band before the digital switchover was finalized on 17 February 2009.

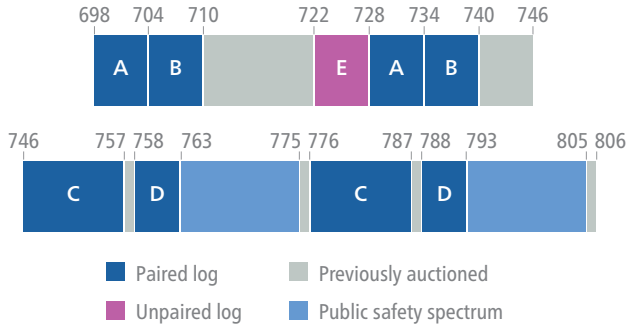
The early digital switchover in the United States can be attributed mainly to the relatively small number of homes that rely on antenna and terrestrial services to watch television (7% in 2013, down from 16% in 2003 and 9% in 2012). Instead, the majority of consumers subscribe to cable, Internet protocol television or satellite services, or increasingly consume television via Internet services such as Netflix or Hulu.

Awarding the digital dividend

Digital switchover in the United States initially freed up a total of 108 MHz of spectrum (698 MHz–806 MHz) for mobile use. It was planned that Auction 73 would assign a total of 2×28 MHz of paired spectrum and 6 MHz of unpaired spectrum for mobile use, while 2×12 MHz of spectrum was reserved for public safety (see Figure 1).

Block A and E licences were offered for each of the 176 larger areas referred to as economic areas, while those for Block B were offered for each of the 734 much smaller cellular market areas. The 2×11 MHz Block C was offered for each of ten regional economic area groupings. Six of the ten regional economic area groupings make up the continental United States, while the remaining four comprise Alaska, Hawaii and outlying United States territories. The 2×5 MHz D Block was offered in one national licence. The D Block spectrum was subject to significant constraints as all devices operating in the block must be supportive of spectrum sharing with public safety devices.

1 *Spectrum made available in the FCC's 700 MHz auction in 2008*



Source: Analysys Mason, 2014.

The auction concluded on 20 March 2008 with 1090 provisionally winning bids covering 1091 licences and totalling USD 19.6 billion, with the provisionally winning bids for the A, B, C and E Block licences exceeding the aggregate reserve prices for those blocks. However, as the provisionally winning bid for the D Block (public safety) licence did not achieve the reserve price, it remained unsold. As a result, 1090 licences were awarded to 101 bidders, and 9 licences remained in the hands of the FCC. As shown in the table, Auction 73 raised a total USD 19.0 billion in net winning bids.

The auction of the D Block spectrum was never rescheduled, and on 17 February 2012, the United States Congress agreed to administratively assign the full D Block to public safety in order to support the development of a mission-critical, nationwide public safety broadband network.

Subsequent mobile market developments

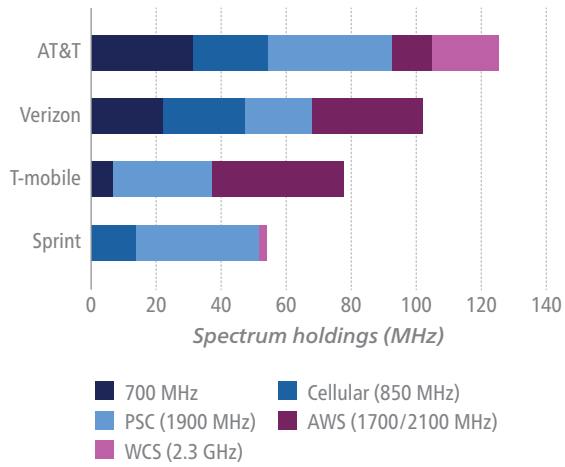
After the 700 MHz auction, and following a series of spectrum purchases and acquisitions between different wireless carriers in the United States market, mobile spectrum is now split relatively unequally across the major mobile service providers, as shown in Table 1 and Figure 2. There are also significant regional variations, as illustrated in Figure 3, resulting from the structure of FCC's auctions, in which licences are sold on a regional basis rather than nationally.

Table 1 — Results of the FCC's Auction 73

Block	Bandwidth	Number of licences	Winning bidders of significant amounts of spectrum		Net winning bids (USD billion)
A	2×6 MHz	176	•	Verizon: 25 licences	3.9
			•	US Cellular: 25 licences	
			•	Cavalier: 23 licences	
			•	CenturyTel: 21 licences	
B	2×6 MHz	734	•	AT&T: 227 licences (for USD 6.6 billion)	9.1
			•	Verizon: 77 licences	
			•	US Cellular: 127 licences	
C	2×11 MHz	10	•	Verizon: 7 licences (covering continental USA and Hawaii)	4.7
			•	Triad Broadcasting: 2 licences	
			•	Small ventures: 1 licence	
D	2×5 MHz	1	*Unsold*		*Not applicable*
E	6 MHz unpaired	176	•	EchoStar: 168 licences	1.3
			•	Verizon: 5 licences	

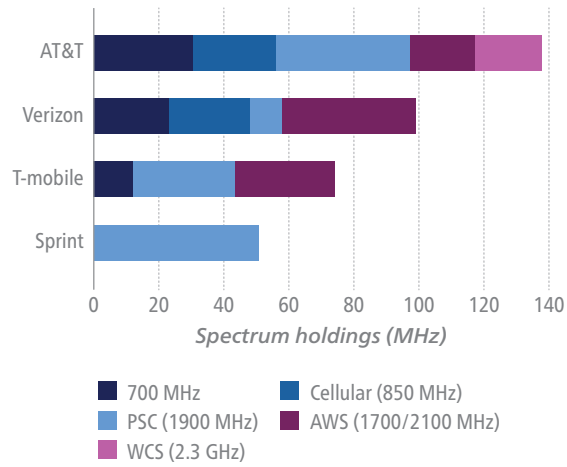
Source: Analysys Mason, 2014.

2 *United States operators' average spectrum holdings in the top 100 markets, up to 2.3 GHz*



Source: JP Morgan, 2014.

3 *United States operators' spectrum holdings in the City of Chicago (Cook County)*



Source: Analysys Mason, 2014.

Four years after the award of the 700 MHz spectrum, plans were announced to proceed with the replanning of further UHF television spectrum in the United States, below the 700 MHz band. It was proposed that this replanning would be achieved through the use of an innovative "incentive auction", enabling the transfer of spectrum between broadcasters and mobile operators during the auction.

In February 2012, the United States Congress authorized the FCC to begin preparations for an auction of broadcast television spectrum in the 600 MHz band. The incentive auction is designed to be a voluntary mechanism that encourages broadcasters to relinquish their spectrum usage rights in exchange for a share of the proceeds of the auction. The FCC has stated that it expects a number of broadcasters to be interested in participating, particularly in geographical areas where terrestrial distribution is expensive relative to the revenue that it generates.

As involvement in the auction is voluntary, it is not guaranteed that all current UHF spectrum licence holders will take part, while some licence holders may wish to relinquish only part of their licensed spectrum. Hence the FCC has the authority to change the frequencies covered by the broadcasting licences that remain in place after the auction, in order that the spectrum blocks that are released through the auction are in a contiguous form suitable for mobile use.

Provisional award plans for the 600 MHz band

On 2 June 2014, FCC released the text of its Incentive Auction Report and Order, adopted on 15 May 2014, including the provisional rules for implementation of the auction. The FCC anticipates accepting applications for the auction in the fall of 2015 and starting the auction in early 2016.

The prices offered to participating broadcasters will vary based on factors such as location, potential for interference and the populations within the area that the spectrum covers. Prices will then be adjusted downward, with broadcasters allowed to drop out at any price, until there is no excess supply of bidding stations. This drop-out price determines the minimum payments that mobile operators are required to pay. If they choose to participate in the auction, broadcasters will have a number of options, involving either relinquishing frequencies or moving to alternative channels.

Due to the voluntary nature of broadcaster participation, it will not be possible for the FCC to set out a band plan until the reverse auction has been completed. The only constraint on the resulting band plan is that channel 37 (608–614 MHz), used for wireless medical telemetry services and radio astronomy service purposes, is not to be relocated. Provisionally, FCC has stated that it plans to convert the 6 MHz broadcasting channels into 5 MHz building blocks, to be used in the creation of mobile paired uplink and downlink spectrum blocks.

Once this band plan has been finalized, the forward auction (for mobile operators bidding on the newly released spectrum) will take place. This will include an ascending clock format, in which prices start low and are adjusted upward, and operators bid for generic spectrum blocks. If the final bids submitted in the forward auction (where there is no excess demand for licences) are sufficient to cover the incentive payments to the broadcasters, then the incentive auction will close. After the completion of this forward auction, an assignment round will be held, allowing bidders to select specific spectrum blocks.

After the finalization of the auction and the payment of broadcasters, those broadcasters that have chosen to go off-air or to share a channel will have three months to clear their channels, while those broadcasters opting to relinquish their current channel and move to alternative frequencies will have 39 months to complete the transition and cease operation on their original channel. These repackaged channels will be eligible for a share of a USD 1.75 billion reallocation fund, to cover up to 80% of reallocation costs for commercial operators and multichannel video programming distributors, and 90% for non-commercial stations.

Through this planned auction, it is expected that a further portion of the UHF spectrum, below 700 MHz, will be released for mobile use in the United States, starting immediately below the current 700 MHz band and potentially extending down to below 600 MHz.

Digital switchover in Latin America

Some Latin American countries are well-advanced in deploying digital terrestrial television. This article focuses on two countries in the region that are at the forefront of the digital switchover — Brazil and Mexico. The two cases illustrate some of the challenges of migrating to digital terrestrial television.

Brazil and Mexico are market leaders for the digital switchover in Latin America and are the countries closest to completing the process. Although they have chosen different technologies for digital terrestrial television, they both demonstrate that actively involving the broadcasting industry is key to success, and that the government also has to promote digital switchover and help the poorest citizens acquire digitally compliant devices.

Digital switchover can be a lengthy process in large countries that rely on terrestrial television as their main television platform. This has regional consequences, because countries at an advanced stage of digital switchover cannot easily re-allocate digital dividend frequencies for mobile use while neighbouring countries are still using these frequencies for broadcasting.

The main challenges that Latin American countries face concern the management of the simulcast period (which has lasted for more than six years in São Paolo, for example) and the switch-off process. The best-practice examples of Brazil and Mexico could, however, benefit other countries in the region in terms of identifying the network parameters that will best meet market demand, involving stakeholders, and carrying out pilot tests. Digital switchover calls for strong government support and action to tackle challenges as they arise.

Brazil, Brasilia: Digital TV tower by Oscar Niemeyer

Brazil

Brazil leads the market in South America in the deployment of digital terrestrial television. Brazil started deploying its digital network in 2007 and by the end of 2013 had seen six full years of digital transmission, at a time when other countries in the region were just embarking on the planning of digital switchover.

But the transition period has been lengthy: although digital terrestrial television was initiated in 1999, final analogue switch-off will not occur until 2016. The National Telecommunications Agency initiated digital television transmission to assess the technological and economical parameters, as a basis for the government to decide on full digital switchover, analogue switch-off and release of a digital dividend.

In contrast to Mexico, Brazil has chosen to use the Integrated Services Digital Broadcasting — Terrestrial (ISDB-T) standard, originally developed in Japan, although with a different video compression. Brazil has renamed its standard the Brazilian Digital Television System (*Sistema Brasileiro de Televisão Digital* — SBTVD). Following Brazil's lead, many other South American countries have chosen SBTVD for their digital terrestrial television networks. Only Panama, Colombia, Suriname and Guyana have adopted Digital Video Broadcasting — Terrestrial (DVB-T), the standard used in most European countries.

In the early 2000s, the National Telecommunications Agency conducted studies (together with universities and broadcasters) on possible approaches to digital switchover. Bringing all of these stakeholders into the process and maintaining their engagement throughout is a key factor in the success of the Brazilian digital switchover.

Almost all (98%) of Brazilian households had a television set at end of 2013, which means around 60 million households. But just 31% of these households subscribe to a pay-television service — one of the lowest rates in South America. Thus 70% of the population will be affected by the digital switchover.

The government considers that no Brazilian should be without television at home but, as in many other countries in the region, Brazil has a high proportion of low-income households for which new digital television sets or set top boxes are unaffordable. Accordingly, it is helping around 20 million households to purchase such devices through the *Minha Casa Melhor* ("My House Best") scheme, set up in 2013, which grants a low-interest (0.4%) loan to the poorest households to finance their in-house appliances. This loan from the Bank of Brazil can finance a digital terrestrial television set costing up to BRL 1400 (around USD 600).

The switch-off needs to be staggered to allow time to ensure a sufficient supply of digital television sets and set-top boxes. The government thus plans to shut down analogue signals progressively, starting with the largest cities. Digital signals were first broadcast in big cities such as São Paolo, Rio de Janeiro and Brasilia, and these cities can also be pilot schemes for analogue switch-off. Once analogue switch-off is completed in the bigger cities, the process will continue from 2015 to 2018 in smaller cities.

Brazil is widely regarded in South America as providing an example of well-managed digital switchover, which has succeeded by keeping all stakeholders involved, conducting pilot projects in big cities, adapting timelines for each region and city, and helping the whole population to acquire digital devices.

Mexico

Mexico started to deploy digital terrestrial television in 2004. Although the digital switchover process has not yet been completed, it is expected that — on 31 December 2015 — Mexico will be the first Latin American country to fully switch off analogue terrestrial television signals.

To implement digital terrestrial television, the Mexican government chose the same digital terrestrial television technology standard as that used in the United States, for two principal reasons. First, the United States had completed its digital switchover a few years previously, and the Mexican population living in border areas was already using set-top boxes or television sets compliant with the Advanced Television Systems Committee (ATSC) standard adopted in the United States. Second, Mexico is one of the world's largest producers of television sets and it mainly exports its digital television sets to the United States, so having the same standard facilitates production for the export market.

Today, 97% of the 30 million households in Mexico have a television set, and 46% of these subscribe to a pay-television service. Analogue switch-off will therefore affect 15.5 million households, leaving them without a television service unless they switch to digital. In fact, because "must carry" content obligations for pay-television have only recently been mandated, all 30 million households could be affected.

Before launching the country-wide digital switchover process, the Mexican government decided to conduct a pilot project in Tijuana. Although some initial reports were negative, the project was ultimately viewed as a success. It achieved analogue switch-off on 18 July 2013, freeing up 48 MHz of spectrum in the 700 MHz band. The analogue switch-off process is now in progress in the rest of the country, making use of the experience gained through the pilot scheme.

Following the structure of the analogue terrestrial television market, the government has allocated a digital licence to each broadcaster. While avoiding the need for market restructuring to create a separate transmission company for digital terrestrial television, this approach appears to be less efficient in terms of the digital dividend spectrum.

The government has allocated an ATSC multiplex to each broadcaster. With the ATSC standard, however, a multiplex of 6 MHz cannot contain more than two high-definition channels or six standard-definition channels. This means that more rather than less spectrum is needed in Mexico to accommodate the digital terrestrial television services. In contrast, in the United States, a digital dividend resulted from the digital switchover.

To ensure the success of the digital switchover in Mexico despite the large proportion of the population having a low income, the government decided early in 2014 to offer almost 14 million high-definition television sets to the poorest households. Subsidizing these households to gain access to digital terrestrial television is costly (estimated at MXN 19 billion, equivalent to USD 1.5 billion) and poses a risk for the local television manufacturing industry, in terms both of meeting demand and of potentially creating a second-hand market where government-funded sets are sold on.

So far, despite these risks, Mexico is succeeding in its transition to digital terrestrial television. As one of the most advanced countries in the digital switchover process in Latin America, and one of the first countries in the region to plan its digital switchover, Mexico had to make some choices based on international experience, without any best-practice examples from other countries within the region. This influenced choices such as the adoption of the ATSC standard, and the decision to fully subsidize high-quality television sets for the poorest households.

Other countries in the Americas

Argentina, Venezuela, Chile and Uruguay, like most Latin American countries, have all chosen the Brazilian standard for digital terrestrial television and can use Brazilian best practice to achieve their digital switchover.

In all of these countries, the penetration of pay-television is much higher than in Brazil (78% in Argentina, 68% in Venezuela, 67% in Chile and 64% in Uruguay). With fewer households relying on digital terrestrial television, the problem of analogue switch-off leaving some households lacking a television signal will be less serious than in the Brazilian case.

Digital switchover in Asia-Pacific

The challenges of digital switchover differ throughout the Asia-Pacific region, depending on market conditions. Where over-the-air television is popular, countries must ensure that digital terrestrial television is affordable for most of the population. Some countries have set up funds for this purpose, to support particular types of viewers (for example, elderly people or lower-income families). However, in countries where other television platforms are widely used to provide digital television and penetration of pay-television is strong, different approaches are needed to make digital terrestrial television attractive to viewers. This article shows how some countries in the Asia-Pacific region have approached digital switchover.

The countries included in this article have all set five- or ten-year plans for digital switchover, for completion between 2015 and 2020. Each country plans to roll out digital terrestrial television broadcasting in phases, beginning with the most populous and usually most economically developed regions.

Not all countries are adopting the same digital terrestrial television standard, or the same approach to the licensing, promotion and availability of digital services. Where digital television services are widely available over broadband networks and a large number of households subscribe to pay television (for example, in Singapore), efforts to make free-to-air digital terrestrial television available are particularly aimed at households that do not subscribe to pay television.

Viet Nam

In Viet Nam, the vast majority of the country's 20 million or more television viewing households has historically been served by free-to-air analogue terrestrial television, with 109 national, regional and local free-to-air programme channels. By 2011, there was already a strong free-to-air digital base, with 12.5% of television viewers served by digital terrestrial television. The first Digital Video Broadcasting — Terrestrial (DVB-T) trial was launched in 2000 and government policy to roll out digital terrestrial television nationally was confirmed in 2005. There has been simulcast of analogue and digital signals since 2011, with analogue switch-off planned in phases between 2015 and 2020. Plans are underway to deploy DVB-T2.

With three nationwide broadcasters and 63 local broadcasters, the country's television industry is marked by regional diversity. In addition, there are around 40 cable operators and four satellite direct-to-the-home operators. Digitization aims to maintain a diverse bouquet of local and national television channels. The existing network providers and broadcasters in each area are responsible for ensuring that the infrastructure is ready for each phase of digital migration.

The government is using digital switchover to restructure the digital terrestrial television industry vertically, so that transmission companies will provide the digital multiplexes for broadcasters. Four national digital multiplexes are being created for free-to-air services, plus a further three national multiplexes to provide pay-television services. A further multiplex is planned in each region to provide digital delivery of existing local television services.

Plans for digital switchover also form part of a wider strategic plan to transform Viet Nam's information and communication technology (ICT) sector, which includes targets for increased Internet penetration, and better availability of fixed and mobile broadband infrastructure. For digital terrestrial television, the government has indicated a target of almost all households being able to view digital television by 2020, after analogue switch-off.

The government estimates that — without a digital receiver — around 8.5 million television viewing households may be unable to receive signals after analogue terrestrial television signals are switched off. This has influenced the decision to phase switch-off

over six years. Viet Nam's five central cities will switch over first, followed by the central and coastal regions in the south and east, and finally the more mountainous, less densely populated regions in the west and north. Ahead of this, the government announced in April 2014 that all new television sets with a screen size of larger than 32 inches would have to incorporate a digital television receiver, to improve the availability of DVB-T2 receivers.

The spectrum plan initially involved the upper part of the Ultra-High Frequency (UHF) band (above 790 MHz) being re-allocated for mobile services, and digital terrestrial television using frequencies up to this, although the longer-term plan is for digital terrestrial television to use UHF channels 21 to 48 only (making spectrum above 694 MHz available for mobile use). VHF Band III is also being used for a combination of digital television and digital radio, under the Terrestrial Digital Multimedia Broadcast (T-DMB) standard.

A publicity campaign, funded through a universal service fund, will support digital switchover. The campaign will involve newspapers, electronic and traditional advertising media, street promotions, a website and a call centre. The government is considering tax incentives for consumers and producers of set-top boxes, transmitters and receivers.

Sri Lanka

Around 3.5 million households in Sri Lanka have a television set. The country is mainly served by free-to-air terrestrial television, and 23 television channels are available to the public.

A 2012 road map showed how Sri Lanka could achieve analogue switch-off by 2017. The framework was subsequently modified, notably by changing the digital broadcasting technology from DVB-T to Integrated Services Digital Broadcasting — Terrestrial (ISDB-T), the digital terrestrial television standard developed in Japan. The ISDB-T standard allows the same signal to be received by fixed, portable and mobile receivers, including any mobile handsets that have the capability built in.

The road map indicated that digital switchover would succeed only if the costs for government, broadcasters and viewers were kept extremely low. The response, outlined in July 2014 by Sri Lanka's Ministry of Mass Media and Information, was that poorer sections of society would access digital television through mobile devices, given the high penetration rate of mobile phones. The functionality of ISDB-T in supporting transmission to mobile devices was seen as the most affordable for the greatest number of people in Sri Lanka.

In addition to Sri Lanka and Japan, other Asia-Pacific countries that have announced they are to switch to the ISDB-T standard include the Maldives (confirmed in April 2014) and the Philippines (November 2013). ISDB-T traditionally used 6 MHz spectrum in Japan. However, ISDB-T in Botswana and the Maldives has been planned to use an 8 MHz channel. While DVB-T and ISDB-T receivers cost a similar amount, ISDB-T normally uses 6 MHz bandwidth for transmission, whereas DVB-T uses 7 MHz or 8 MHz bandwidth. A number of countries have also selected ISDB-T for its earthquake and tsunami early warning messaging capabilities.

Singapore

Singapore began trials of DVB-T2 in 2011. It is now partway through its digital migration process, and digital switchover is scheduled to occur before 2020. Digital television was already available to residents in five central areas by June 2014, with roll-out scheduled to cover all residential areas by 2016. Singapore will then simulcast analogue and digital for at least another two years.

It is not anticipated that Singapore will change the licensing or structure of its television market during digital switchover. The country has three licensed nationwide broadcasters: MediaCorp offers nationwide free-to-air channels; StarHub is a cable pay-television provider; and SingNet is a subsidiary of SingTel that offers pay-television services through its broadband network. Nationwide licensees currently pay a fee of 2.5% of total revenue to Singapore's Media Development Authority.

The government estimates that 1.15 million households had television sets in 2013. Government policies supporting convergence have contributed to the provision of digital television services over national broadband networks as well as digital terrestrial television. Broadband providers StarHub and SingTel both provide digital television services over broadband platforms. It is estimated that StarHub has 543 000 subscribers and SingNet has 391 000, meaning that around 60% of households nationwide already receive digital television through a pay-television service provided by broadband providers.

The remaining non-pay-television viewers in Singapore access free-to-air terrestrial television distributed by MediaCorp, a monopoly wholly owned by the State investment company, Temasek. MediaCorp is vertically integrated, and is a content buyer and producer. There are also nine niche television licensees which offer 80 linear, on-demand channels in various languages across Internet protocol television. Licences are limited to 100 000 viewers per channel, or a daily broadcast reach of 250 000 unique viewers, and are under light-touch regulation, with no carry, ownership or advertising obligations.

DVB-T2 was trialed from August to December 2011 to ensure its suitability for Singapore's dense urban environment. In Singapore, each user will require not only the DVB-T2 set-top box, but also an indoor antenna.

In 2012, the Media Development Authority published DVB-T2 receiver specifications for manufacturers, and began multi-channel consumer and retailer education, including handing out and posting brochures at major electronic retail outlets, setting up a technical assistance hotline, publishing information on the Media Development Authority website, and issuing press releases. This public education campaign will continue throughout 2014 and 2015, with the government planning to hold roadshow events, before sending information booklets to every household in 2016 and 2017. The Media Development Authority has engaged closely with MediaCorp, SingNet, StarHub and large retailers.

Since December 2013, all seven MediaCorp free-to-air channels have been broadcast in digital format. Four of these channels are also being broadcast in high definition, and the remaining three will be upgraded to high definition by 2016.

The Media Development Authority was allocated the equivalent of USD 173 million in the Singapore budget for 2014, an increase of 18% from 2013. This increase represented funding for public service broadcasting expenditure and the assistance scheme for digital switchover. The government has also announced that households with a monthly income of less than USD 1520, or those that are living in public housing, will receive an assistance scheme package, including a set-top box, an internal antenna and complementary installation service. It is estimated that the scheme will cover around 160 000 households, and will be completed in the next three years. The Media Development Authority will also be working with voluntary welfare organizations on a series of public outreach events to share more information about digital television with residents throughout the year, targeting the elderly and people with disabilities.

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Europe — Thirty Years on from Liberalization

Contributed by Philip Carse, Lead ICT Analyst, Megabuyte.com

Editor's note: In this article, the use of italics refers to the results of Megabuyte's analysis of its sample database of companies.

European telecommunication markets have been subject to competition since the mid-1980s, when many countries licensed mobile operators, typically the incumbent fixed-line telco and one other. The pace of market liberalization has varied significantly by country, but has typically involved a mix of: carrier pre-select, wholesale lines and broadband and local loop unbundling by the incumbent; full infrastructure competition; the licensing of additional mobile operators, as well as mandating MVNO (mobile virtual network operator) services; and allowing cable TV companies to offer telephony. Thirty years on, what does the European telecom industry look like in terms of growth, challenges and opportunities?

Megabuyte tracks and analyses the financial, corporate and strategic activity of over 80 mainly European-based telecoms and network operators with revenues of at least Euro 50 million, generating a total of Euro 260 billion revenues from the major European markets (and Euro 410 billion in total). In our analysis, the top

nine players comprise incumbents or early mobile pioneers (led by Deutsche Telekom, Telefonica, Vodafone and Orange). Liberty Global is the top non-European player/outsider from the United States at number ten. The 80 companies are broadly divided into those with revenues of at least Euro 1 billion and a long tail of companies below Euro 1 billion, the latter mostly serving business communications markets. Of the larger companies, most are incumbents, second/third mobile operators or cable operators, with a few limited exceptions (notably, including United Internet in Germany, Talk Talk in the United Kingdom and COLT).

Overall, *"incumbents"* still account for around two-thirds of total industry revenues, with most *incumbents* still occupying the number one position in their domestic markets in both fixed-line and mobile, as well as being leading competitors in other geographic markets. *Mobile*-only companies (e.g. EE, Bouygues, Hutchison 3G) account for around one fifth of total industry revenues, with the remainder belonging to *Cable* TV companies (such as Virgin Media, Telenet and ComHem), and companies which can be termed *"altnets"* — independent companies ranging from infrastructure-rich specialist network companies to pure business communications resellers. Each group has somewhat different financial characteristics, although in general, *cable* companies currently compare very favourably with their *incumbent* and *mobile* peers, with the latter in particular suffering declining revenues and profitability, rising capex bills and consequently falling free cash flow.

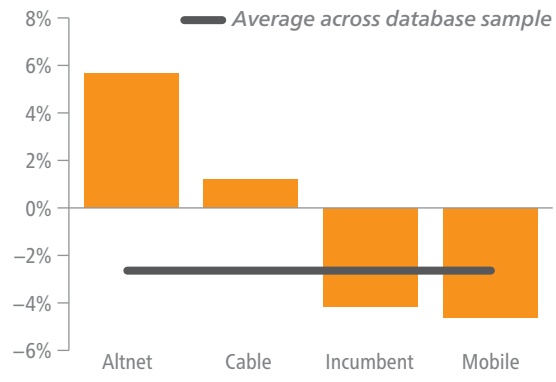
Cable players enjoy best overall financial performance

Based on 2013 data, *incumbents* and *mobile* players faced revenue declines of between 4–5% (see Figure 1), mainly due to regulatory-driven reductions in mobile termination and roaming rates. In contrast, *cable* grew on average by 1%, helped by greater exposure to growing TV revenues and lower exposure to mobile termination rates. *Altnets'* revenue increased by nearly 6% on average, mainly because they are typically smaller and more agile and can find growth from market share gains in a stable market, whilst significant, "needle-moving" M&A (Merger & Acquisition) is also generally easier to achieve. Even so, there are wide variations in financial performance among *altnets*, not all of which can be attributed to country, market segment or age of company.

Indeed, many of the early *altnets* now face the same risk in business model as the *incumbents*, insofar as they risk losing revenues from traditional services, alongside needing to invest in new services. This is particularly true for *altnets* in Germany (e.g. M-net, QSC, Tele Columbus, Ecotel, NetCologne and 3U Holding), Tiscali in Italy, and multi-country network players (such as COLT, Interoute, and euNetworks). In this regard, Jazztel's performance is notable. Despite being at the Euro 1 billion revenue level, the company is growing organically at 15% in the highly competitive and economically challenged Spanish market, by leading with a triple-play consumer offering. The only European telco to outshine Jazztel in size/growth terms is Iliad in France, which saw revenues rise by 19% to Euro 3.2 billion in 2014.

Aside from beating *incumbents* and *mobile* on revenue growth, *cable* players are also performing well in terms of margins, with EBITDA margins (Earnings Before Interest, Tax, Depreciation and Amortisation — a measure of cash earnings favoured by analysts) of around 45%, compared with 34% for *incumbents*, 26% for *mobile*

1 *European revenues under pressure — average change*



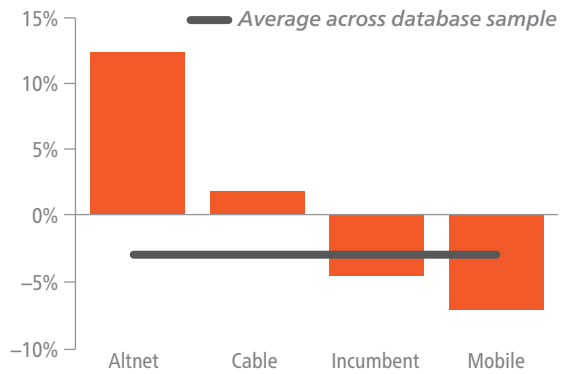
and 21% for *altnets*. The relatively stable EBITDA margins for *incumbent* and *mobile* players actually represent a fairly impressive performance, given the loss of high margin mobile termination and roaming revenues, with the negative impact on EBITDA mitigated by cost savings in areas such as customer service, sales and marketing, and networks.

In terms of change in EBITDA, trends are also more favourable for *cable*, with average growth of 2% versus average declines of –5% for *incumbent* and *mobile* players, mainly reflecting underlying revenue trends. EBITDA for *altnets* is in fact increasing by a surprisingly strong 12% (see Figure 2).

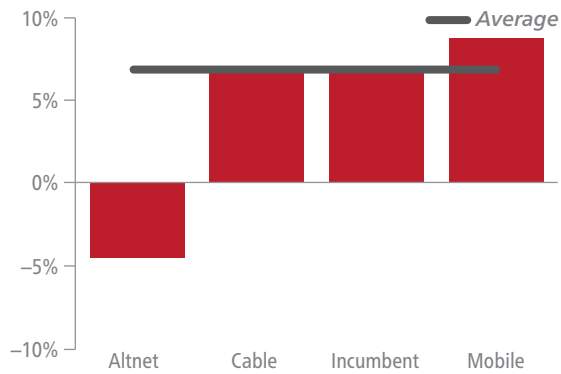
In order to monitor another vital measure of company financial performance — free cash flow (FCF) — we also need to consider capital investment (we use EBITDA minus capex as a proxy for free cash flow). *Cable* companies have the heartiest capex diet, at 18% of total revenues versus 14–16% for *mobile* players and *incumbents* and 8% for typically asset-light *altnets*. Capex for *cable, incumbents* and *mobile* is also rising by 7–9% as they invest in broadband (see Figure 3). Taking into account EBITDA and capex margins, *cable* comes out on top in FCF terms, with an FCF margin of 26% of revenues, versus 16–17% for *incumbents* and *mobile* players and 14% for *altnets*. The *altnet* average is particularly impressive, given that many *altnets* are often resellers of business communication services. They therefore take relatively little, if any, technology or product risk, yet often still manage to generate returns not far removed from their much larger *incumbent* and *mobile* peers. Despite pressures on their FCF margins, *cable, incumbent* and *mobile* players are still generating large amounts of cash from leveraging their networks to pay dividends similar to companies in the utility sector.

How are cable players generating the best combination of returns and growth among European telecommunication players? Overall, cable networks are more technically advanced than their fixed-line incumbent peers, particularly in terms of broadband capabilities, and they enjoy greater exposure to growth areas (such as video). They are also at the forefront of new converged, triple/quad-play business models. It is hardly surprising that incumbents and mobile companies are fighting back in these areas, particularly broadband and convergence.

2 *Trends in EBITDA — average change*



3 *Capex is shooting up, due to growing investment requirements — average change*



Incumbents and mobile companies fight back with broadband

All of the major players are now investing heavily to capitalize on rapid developments in broadband technology, with 4G mobile, very high-speed digital subscriber line (VDSL)+ vectoring, DOCSIS 3.0 and fibre-to-the-premises (FTTP) and fibre-to-the-cabinet (FTTC) technologies all offering significantly faster speeds than hitherto. Whilst 4G and DOCSIS 3.0 are relatively straightforward "no-brainer" technology choices for mobile and cable operators, incumbents face more complex choices between the more expensive, but "future-proof" FTTP and FTTC, with a rather mixed picture across Europe in terms of technology choices.

LTE/4G represents perhaps a huge technology step forward, bringing true broadband speeds to mobile devices of up to 300 Mbps, with15–20 Mbps commonly available. Mobile network operators are also moving to realize the positive impact of 4G in terms of their ARPU (Average Revenue Per User), leading to an acceleration in roll-out plans. Having lagged behind the United States market by a considerable margin, European mobile network operators are fighting back, with EE in the United Kingdom closing 2014 with 7.7 million 4G subscribers, or about a quarter of its base, smashing its original target for 2014 of 6 million 4G subscribers. This increased investment is being supported by an improving outlook in regulatory impacts and company-specific factors — for example, Vodafone's windfall from selling its Verizon Wireless stake.

Technological upgrades are less straightforward for fixed-line broadband providers, where incumbents have multiple choices — for example, between fibre to the premises (FTTP) and fibre to the cabinet (FTTC)/VDSL — and where choices are often based on factors including housing density, the regulatory environment, and so on. While major operators such as BT and Deutsche Telekom have opted for the lower cost VDSL, markets such as Portugal and Sweden are seeing strong growth in FTTP penetration. One contentious issue, of course, is how much bandwidth typical consumers actually need, with some arguing in favour of the 0.5–1Gbps of FTTP, while others claim that the 20–200 Mpbs of various VDSL

models are more than adequate. One ISP (Internet service provider) in Sweden in 2000 (Bredbandsbolaget) considered that its (then) market-leading offer of 10 Mbps supplied over its fibre network offered more than any household would ever need! The lesson is perhaps that supply often creates its own demand.

A converging battleground

Another key industry theme is convergence, with most major consumer-focused players now pursuing a Triple or Quad Play strategy combining fixed-line telephony and broadband with mobile and video. Convergence is not just about common branding, a single unified bill, and discounts — convergence is also technological. For example, Deutsche Telekom uses a hybrid router to combine 4G and VDSL, while Liberty Global uses Wi-Fi in its cable networks to provide better in-home mobile coverage and save backhaul costs on its MVNO arrangements. In general, convergence has broadly helped reduce churn and improve ARPUs. While cable companies have engaged with convergence for some time, incumbents are looking to in-home mobile coverage and video to sustain the need for their fixed broadband services.

The current market structure in most European countries lends itself to convergence, with major players strong across two or more sectors of fixed, mobile and pay TV. The United Kingdom is an exception in this regard, as most major players are focused solely on fixed or mobile services, partly as a result of BT having hived off O2 in 2001. BT's decision to re-launch mobile services through an MVNO agreement with EE has triggered major strategic rethinks among competitors, with BT now pursuing a full takeover of EE, 3UK talking about a merger with O2, and Vodafone, Virgin, Sky and Talk Talk also considering their options. The "for sale" signs put up by the owners of EE (Deutsche Telekom and Orange) and O2 (Telefonica) in the UK are a clear sign of the perceived challenges facing mobile-only businesses in a converging world.

The move to convergence has also been reflected in mobile/cable mergers in Spain, Germany and France, among others. Mobile consolidation is also accelerating, with a move from four to three players over the last 1–2 years in Austria, Germany and Ireland. Similar moves are being proposed in Norway, and may possibly happen in the United Kingdom, France, Italy and Spain. While such mergers are usually associated with stringent regulatory caveats (for example, new MVNOs or a requirement to divest spectrum), these mergers are a rational move in highly competitive and turbulent markets.

Prospects for 2015

Despite the rather gloomy financial performance of incumbents and mobile players in Europe revealed by our analysis, there are some reasons for hope for the major European telecommunication players in the outlook for 2015, driven by growing demand for superfast broadband, both fixed and mobile. In particular, the payback for 4G/LTE investment is turning out to be much quicker than initially expected (*"Long-term Evolution"* is something of a misnomer in this regard), with initial expectations partly tempered by the mixed experience of 3G. At the same time, reducing regulatory impacts and an increased acceptance of consolidation from competition authorities are also improving the outlook for mobile players. Incumbents need to work out how best to leverage their 4G networks without threatening the cash cow of their copper access network, while also keeping an eye on their often financially strong cable TV competitors.

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Leader Interview with Michel Combes

Chief Executive Officer of Alcatel-Lucent

What does Alcatel-Lucent see as the major factors impacting operators, and/or driving the transformation of the industry?

Michel — There is a single answer to both these questions: network operators and the transformation of the networks themselves are being impacted by the unprecedented and ever-increasing demand for capacity, which in turn is the result of the rise of smartphones, tablets and myriad devices connecting via the Internet of Things. Growth in demand will only increase as we move forward, as the scope of device and machine connectivity expands.

For Alcatel-Lucent, there are a number of outcomes from this. Firstly, we have the strong conviction that network operators — and I mean telecom service providers, as well as enterprises and institutions operating IT networks — will increasingly adopt Internet Protocol (IP) technology to manage the data capacity and traffic challenge. End-users such as consumers and businesses don't just need more, and faster, data connections, but also more bandwidth — analogous to how having more cars on the road creates a need for more motorways and traffic flow on those roads to prevent congestion.

Secondly, operators must also achieve a combination of operational efficiency and cost efficiency. Virtualization technology has an important part to play here: cloud networking, cloud storage, Networks Functions Virtualization (NFV) and Software-Defined Networking (SDN) all allow operators to move their networks to the cloud and free up vital network resources, and even reduce the physical footprint required for expensive real-estate and energy-consuming hardware — simply put, the volume and energy requirements of hardware can now be significantly reduced.

Thirdly, Fibre-to-the-X (FTTx). The ability to deliver fibre-based ultra-broadband access closer and more economically to residences or places of business — while removing the complexities of doing so — will have a profound effect on the digital society, extending coverage, bridging digital divisions and enhancing community and commercial life.

How will Alcatel-Lucent's work on G.fast (as well as the work of others) impact the business case for FTTH — can copper compete with or enhance fibre deployments?

Michel — FTTx is still the ultimate end-goal for many operators, as many believe FTTx is the only "future-proof" solution. G.fast is not intended to replace FTTx — rather, copper is a complementary tool to address hard-to-reach locations, while keeping deployment costs down.

The degree to which G.fast is utilized will vary widely across different operators in different countries, as they each encounter unique obstacles in their fibre deployments. However, as such, G.fast can help accelerate the deployment of fibre, because G.fast can help improve the business case. In any given deployment, operators will adopt "full" FTTx where they can, but where they can't do so either economically or physically (for example, for protected buildings in historical town centres), G.fast is ideal for the final few metres for broadband speeds indistinguishable from fibre. This can also help ensure that operators retain their customers, reducing the average cost of connecting each user.

It is clear there is very strong interest in G.fast. By the end of 2014, Alcatel-Lucent had conducted 23 trials of G.fast, and we currently have another seven in progress. This is significant, as it is of interest to proponents of both copper and fibre.

Editor's note: see separate article on G.fast in this edition by Alcatel-Lucent.

What are Alcatel-Lucent's top priorities going forward?

Michel — Since I took over as CEO of Alcatel-Lucent in April 2013, I have had a single priority, and that is the restoration of this company to sustainable profitability. In June 2013, we launched "The Shift Plan", which was designed to reposition Alcatel-Lucent as a specialist around the growing, next-generation technologies of IP, cloud and ultra-broadband access, while reducing our costs to an acceptable industry benchmark, divesting assets, and reprofiling our debt, all by the end of 2015. As we have reported in consecutive financial results since "The Shift Plan" was launched, we have made very good progress across all of these dimensions. That said, we are only at the beginning of 2015, and we will not judge our progress fully until we are satisfied that we have reached our ultimate aim of being cashflow-positive in 2015, and that remains my number one priority this year.

What have you personally found to be most challenging and/or rewarding about leading Alcatel-Lucent in such a fast-changing industry as telecoms?

Michel — When I joined Alcatel-Lucent, we faced plenty of challenges, not least of which, the company's apparent difficulty since the 2006 merger to generate profit. Added to that, as you say, we are in a rapidly transforming, convergent industry.

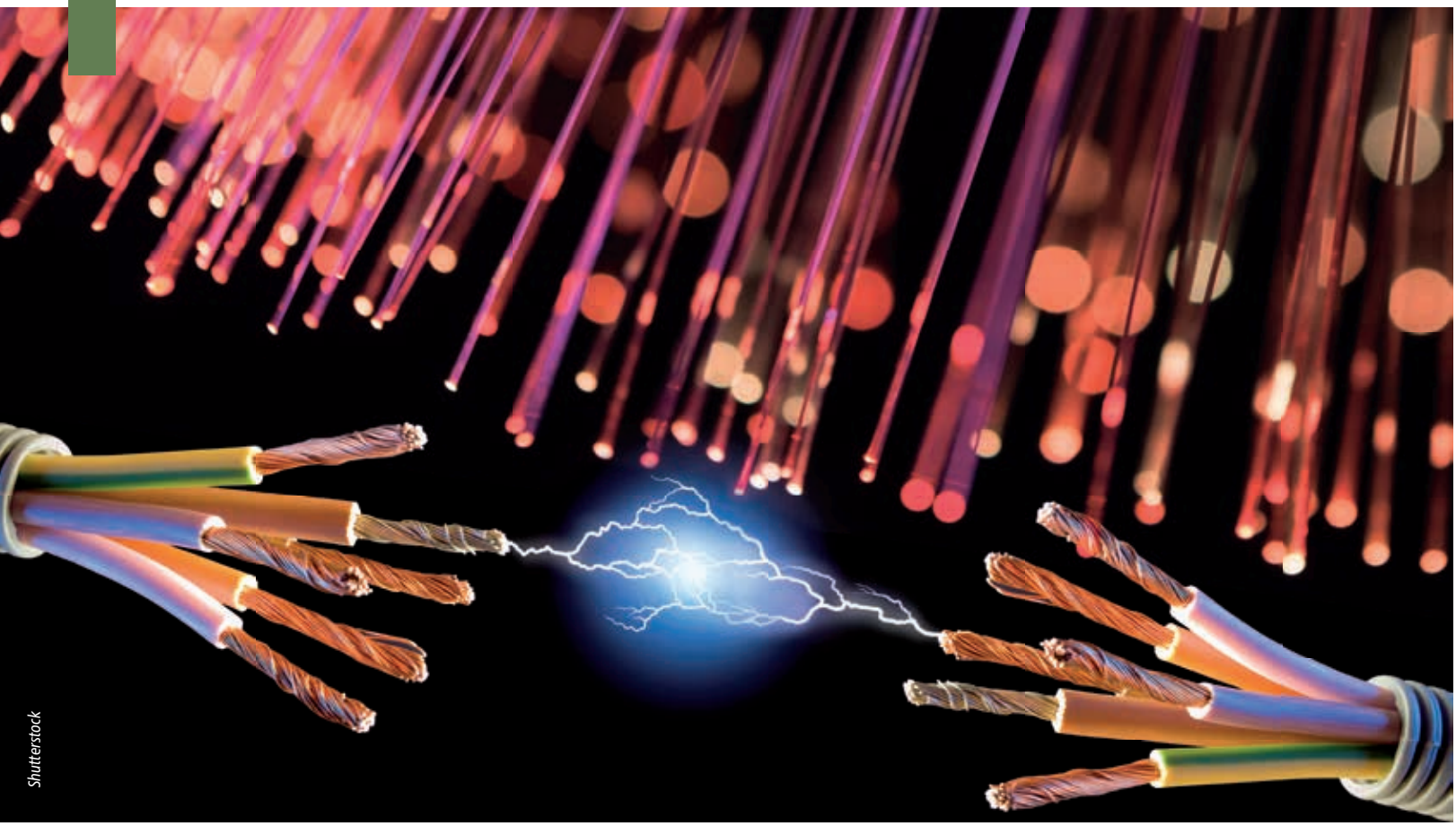
Telecommunications and IT have been coming closer together, as voice telephony has given way to data communications. Today, we no longer communicate via voice and the written word alone as two separate functionalities, but as a combination of voice, video, photography and social media, not to mention a greater number of devices talking to each other on our behalf.

With all of these rapidly evolving trends, and the unprecedented need for data capacity, Alcatel-Lucent has had to reposition itself to be more dynamic, agile and focused around the new technologies that will grow and support these new paradigms of communication. At the same time, I have encouraged the adoption of the spirit of entrepreneurial innovation from the start-up world to challenge ourselves to shed old modes of behavior. Start-ups are, by their nature, bold, brash and agile. Long-established technology giants are not. So it has been highly rewarding to have presided over the launch within Alcatel-Lucent of our Nuage Networks start-up, developing software-based networking technologies that have already started to be adopted by major customers, in both the telecoms and non-telecoms industries.

Clearly, it has also been pleasing to see the company respond to the challenge of meaningful transformation. Alcatel-Lucent had been through several restructuring programs before we launched The Shift Plan, so I could understand a certain degree of uncertainty from employees at a restructuring program. However, with The Shift Plan, we approached things differently: firstly, we created an industrial plan, to reposition Alcatel-Lucent as a specialist in IP, cloud and ultra-broadband access — the next-generation technologies that will transform digital communications in telecoms and in the enterprise world; secondly, we put in place a financial plan, to address the fundamental weaknesses preventing Alcatel-Lucent from being sustainably profitable; and thirdly, we have implemented a plan to reignite innovation, to rejuvenate entrepreneurial thinking and institute a start-up mentality within the company, to create a company which is agile, bold and prepared to take on the challenges to make Alcatel-Lucent a technology leader, not just a technology business.

We've seen all of this start to pay off. Our employees understood the need to transition from legacy technologies to the next-generation technologies our customers will ultimately have to adopt — and which many of our customers are indeed in the process of adopting. Employees also understood the difficult choices we had to make to change our shape and scale, to stop being all things to everyone, but apply our specialist expertise in technologies and growth markets where we would count.

We can now see the positive results of those choices: in the fourth quarter of 2014, we saw strong growth in those businesses around which we have repositioned Alcatel-Lucent, including a 15% increase in revenue in our IP routing business. Indeed, revenues from these next-generation technologies accounted for over 67% of total group sales for 2014 as a whole. We're also seeing non-telecom customers accounting for a bigger share — around 15% — of our IP business, which is a satisfying reflection of the strategic choices we have made to focus in this area. All of this gives me great satisfaction to see our hard work begin paying off, as well as the strong conviction that Alcatel-Lucent is well and truly back in the game!



Shutterstock

Get to Fast Faster, with G.fast

Stefaan van Hastel

Marketing Director for Fixed Networks, Alcatel-Lucent

Now that large-scale VDSL2 (Very high-speed Digital Subscriber Line 2) vectoring deployments are going live, G.fast is ready to take FTTx (Fibre-To-The-x) deployments to the next level. In 2011, VDSL2 vectoring put copper back on the map as a next-generation access technology by reaching the "magic number" of 100 Mbps downstream. Today, G.fast delivers hundreds of megabits per second — and Gigabit speeds are next.

By offering fibre-like speeds over existing copper telephone lines, G.fast allows operators to terminate fibre as close as possible to end-users, while leveraging existing telephone lines for the final metres or yards inside buildings. This way, technicians can avoid entering the building altogether — which is often a time-consuming and expensive part of any Fibre-To-The-Home (FTTH) roll-out.

Accelerating fibre deployments

Contrary as it might sound, G.fast will actually accelerate fibre deployments. "Fiberizing" an entire nation takes years or decades: workers have to enter every building to install new fibre cabling, which may also mean digging up every street and every front yard. However, most end-users are unwilling to wait that long, and policy-makers have set aggressive broadband goals. Operators need to get fast, faster.

G.fast provides an effective solution in places where installing new fibre infrastructure is uneconomical or infeasible. For example, older buildings are unlikely to come equipped with cable ducts, and some home-owners may refuse drilling or new cabling. Even in the best case scenario, the lengthy process of getting permission from the building owner, making an appointment, and entering the building is cumbersome, time-consuming, and costly.

G.fast avoids these complications by leveraging the existing, in-building telephone lines. Operators now have more options when seeking to deliver fibre speeds to end-users. Combining FTTH and FTTx deployment models is generally the most cost-efficient and fastest way to deliver ultra-broadband to end-users — effectively accelerating fibre roll-outs.

Bringing fibre to the most economical point

Where ubiquitous ultra-broadband is concerned, there is no single "best" solution, although FTTH is often identified as the most future-proof solution and end-goal for many operators. However, FTTx deployments often play a critical role in any operator's strategy, due to its lower cost and faster roll-out compared with FTTH.

In FTTx deployments, fibre is terminated close to the end-user (the "x" can a node, curb, building, pole, manhole, wall, front door, etc.). From this "distribution point", a fibre-fed G.fast (or VDSL2 vectoring) system delivers ultra-high speeds over the telephone lines. The trade-off is between speed and distance: G.fast uses a much wider frequency spectrum than VDSL2 to achieve higher speeds, but the maximum distance is reduced due to higher attenuation, down to typically 250 metres or less.

Obviously, shorter distances also mean higher cost, since fibre must be brought closer to the end-user. And since fewer end-users will be in range of the distribution point, a typical G.fast system will serve fewer end-users. An FTTN (Fibre-to-the-Node or cabinet) deployment with VDSL2 vectoring can deliver 100 Mbps downstream over 400 m, serving hundreds of subscribers. A G.fast deployment can deliver 500 Mbps+ aggregate over 100 m, but typically serving tens of subscribers in a building (FTTB), for example. As a result, FTTB/G.fast works about twice as expensive per end-user than FTTN/VDSL2 vectoring — but still about 30% cheaper than FTTH.

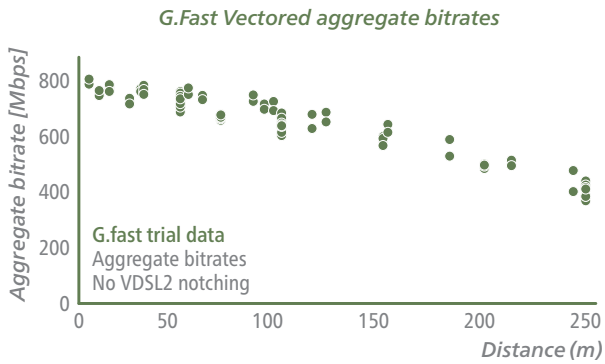
It is clear that operators need to choose between trade-offs between deployment speed, bandwidth, and cost. It might sound complicated and daunting at first, but this toolkit of deployment models (from FTTN to FTTH, and everything in between) allows operators to select the right tool for the job. For every city, street, or building, operators examine various factors (including the expected customer take-up rate; the availability of ducts; the type of soil, and whether it is easy or hard to dig; time needed to get permission; etc.) and select an appropriate deployment model that will connect these end-users in the fastest and most cost-effective way.

G.fast delivers on its promise

Since G.fast provides such a natural complement to fibre deployments, there is very strong interest from operators. Alcatel-Lucent has completed over 30 operator trials (by the end of the first quarter of 2015), and it is increasingly clear that G.fast delivers on its promise.

Figure 1 shows results from Alcatel-Lucent's first series of operator trials, based on the first phase of the G.fast standard (up to 106 MHz of spectrum). The aggregate bit-rates are both high and consistent. At 100 m, 600 Mpbs or more can be achieved (the ITU–T G.9701 standard had originally targeted 500 Mbps). At 200 m, the trials show speeds of around 500 Mbps (the ITU–T G.9701 standard targeted 200 Mbps). Note that, contrary to VDSL2, all G.fast speeds are aggregate, i.e. upstream and downstream combined. Operators can choose how to allocate this aggregate bandwidth for both

1 *G.fast delivers on its promise — results from Alcatel-Lucent's first operator trials*



Source: Alcatel-Lucent.

upstream and downstream, for example, through their management software — a major advantage.

It is important to note that all these tests used the VDSL2 spectrum. In networks where VDSL2 has already been deployed in the same binder, G.fast would be configured to skip the VDSL2 frequency spectrum (to avoid interference), resulting in bit-rates approximately 150 Mbps lower than the results shown here. The results above are based on the first phase of the ITU–T G.9701 (G.fast) standard, which provides up to 106 MHz of spectrum.

Typical G.fast deployment models

Fibre-to-the-Distribution Point (FTTdp) is the term generally used to indicate a G.fast deployment model. The distribution point can be any point close enough to end-users to accommodate typical G.fast loop lengths, and with access to the existing telephone lines.

Operators are interested in two types of G.fast deployment models: single-user and multi-user. In the single-user model, fibre is brought almost to the home (think FTTWall or FTTFrontDoor), and a single user is served from the G.fast node. In the multi-user model, multiple users are served from a single G.fast system (such as FTTBuilding or FTTManhole). In the multi-user model, neighbouring lines will interfere with each other, resulting in crosstalk and seriously degraded performance (speeds can be reduced by 50–90%). In order to enable multi-user deployments, the G.fast standard includes advanced vectoring capabilities to cancel this crosstalk and deliver near-optimal performance on each line.

Another practical but important consideration for G.fast deployments is powering. Due to the short loop lengths, deploying G.fast inevitably means rolling out tens or even hundreds of thousands of G.fast systems in the field. These systems need to be powered, and due to the number of nodes and their location (up poles, down manholes, or on walls), it is often not possible to rely on local AC (Alternating Current) power. Instead, a typical G.fast system can be powered either remotely (from the central office or street cabinet) or reversely (from the end-user's home, over the telephone line). In the latter case, special care needs to be taken to ensure that the power draw is spread fairly between the active users, and that the system remains operational, even if all-but-one of the users have powered down.

Get to Fast, Faster

G.fast will play a critical role in many operators' ultra-broadband network strategies, delivering more bandwidth to more people, sooner. For the operator, G.fast will result in a faster time-to-market and improved returns on investment. For policy-makers, it means that broadband targets can be met more easily, helping bridge the digital divide in terms of higher access speeds. For end-users, G.fast can help end-users enjoy new services or socio-economic benefits, sooner. In the end, G.fast will change the lives of millions of people around the world for the better — and that's what counts.

From left to right: Houlin Zhao, ITU Secretary-General; Paul Kagame, Broadband Commission Co-Chair and President of Rwanda; Irina Bokova, Broadband Commission Co-Vice Chair and UNESCO Director-General; and Carlos Slim Helú, Broadband Commission Co-Chair and President of the Carlos Slim Foundation

UNESCO

Broadband Commission convenes in Paris

The ITU/UNESCO Broadband Commission for Digital Development convened on 26–27 February at the United Nations Educational, Scientific and Cultural Organization (UNESCO) headquarters in Paris, at the invitation of Commission Co-Vice Chair and UNESCO Director-General, Irina Bokova. The Commission gathered in parallel with UNESCO's flagship "ICT4Education" initiative, Mobile Learning Week, giving the 26 Commissioners present the chance to interact with ministers of education and paedagogical professionals from around the world.

Addressing commissioners and special guests at the opening, Ms Bokova emphasized the power of technology to transform the lives of girls and women through access to education. "Two-thirds of illiterate adults are women, and two-thirds of the world's out-of-school primary-age children are girls," she said. "This is a huge injustice, and a gap that we must fill. The continued expansion of broadband, combined with other technologies, can help us make giant strides towards this."

In his opening remarks, Co-Chair President Paul Kagame of Rwanda reinforced the Commission's core message that broadband infrastructure needs to be viewed as basic social infrastructure, and underlined the critical role broadband plays in Rwanda's development goals. "Broadband enables business and social entrepreneurs to find ways to offer world-class education at low cost, to populations that have never had access. These centres of knowledge already exist, but in order for developing countries and isolated communities to access and use them productively, they will need faster, more reliable, and more affordable Internet access."

This message was reinforced by Co-Chair Carlos Slim Helú, President of the Carlos Slim Foundation, who highlighted that broadband technology should be used to promote social inclusion. "We need to be sure that the potential of broadband for education is fully leveraged so successful initiatives, such as new online course platforms, and many valuable education and training content, become quickly available to people worldwide."

In his inaugural remarks to the Commission as its new Co-Vice Chair, ITU Secretary-General, Houlin Zhao, stressed the power of information and communication technologies (ICTs) to transform the educational landscape. "For the first time in history, mobile broadband gives us the chance to truly bring education to all, regardless of a person's geographical location, linguistic and cultural frameworks, or ready access to infrastructure like schools and transport. Education will drive entrepreneurship, especially among the young — which is why we must strive harder to get affordable broadband networks in place which can deliver educational opportunities to children and adults," he urged.

During **Session One: Leveraging Broadband for Building Inclusive Knowledge Societies,** moderated by Ms Bokova, Dr Sam Pitroda, ICT expert and Special Advisor to India's Prime Minister, stressed the importance of mobile broadband in reaching people in developing countries, where fixed network infrastructure is often antiquated or absent. The latest ITU figures show that mobile broadband is the fastest-growing technology in human history, with almost as many mobile cellular subscriptions as there are people on the planet, while active mobile broadband subscriptions exceed 2.3 billion — more than three times as many as the world's 700 million wireline broadband connections. Most of this growth has taken place in the developing world, which has accounted for 90% of global net additions for mobile cellular and 82% of global net additions of new Internet users since early 2010.

Michel Combes, CEO of Alcatel-Lucent, observed that measuring the value of broadband to communities might be better approached at the grassroots level, and highlighted the need to identify the levers of greater national broadband investment in different countries around the world.

Sun Yafang, Chairwoman of the Board of Huawei, put forward some compelling statistics: schools with an Internet connection can educate 25% more students than non-connected schools. The Former Yugoslav Republic of Macedonia's Minister for Information Society and Administration, Ivo Ivanovski, pointed to his country's strong focus on bringing the latest technology to the educational environment, but highlighted the problem of the "brain drain" in emerging economies, arguing that creating a enabling environment for students, as well as for entrepreneurs, small- and medium-sized enterprises (SMEs) and corporations is an important priority. KT Corporation's Chairman and CEO, Chang-Gyu Hwang, joined the discussions as the newest Commissioner and described his country's "GiGA Island" initiative which has brought high-speed mobile broadband to some of the outlying Korean islands, with great benefits for local communities. Finally, Dr Speranza Ndege, Senior Lecturer at Kenyatta University in Nairobi, spoke of the many benefits of digital libraries for students and educators in developing countries.

During **Session Two: Broadband in the Post-2015 Agenda,** chaired by Mr Zhao, Commissioners agreed that multilateral discussions taking place over the coming months are vital for ensuring that the importance of broadband and ICTs is clearly recognized in the United Nations post-2015 development agenda and the new Sustainable Development Goals (SDGs).

Commissioners argued that, of the 17 SDGs currently under discussion, broadband and ICT would have a major positive impact on each and every one. There was wide concern that broadband is not visible in the current SDG negotiating text — a strong indicator, the Commission agreed, that much work remains to be done.

The sessions were followed by a lively lunchtime discussion, moderated by Minister Ivanovski, where Commissioners were invited to identify the major achievements of the Commission, as well as their recommendations for its key priorities going forward. The Commission generously thanked the secretariat and the ITU and UNESCO teams for all their dedicated work and support. The Commission will reconvene in New York on 26 September 2015, ahead of this year's Session of the UN General Assembly.

Radha Basu,
Chief Executive Officer of iMerit Technology Services

Gillian Arnold,
Chair of BCSWomen

GEM-TECH Award winners: Spotlight on iMerit and the British Chartered Institute for IT

ITU celebrated the Gender Equality and Mainstreaming Technology (GEM-TECH) Awards 2014 in Busan, Republic of Korea, on 28 October at a Plenary Session of the ITU Plenipotentiary Conference. The last edition of *ITU News* focused on UNESCO, the first GEM-TECH winner. Here are two more award winners from this event.

iMerit Technology Services

iMerit Technology Services received its award for Category 2 of the seven GEM-TECH Awards, "ICT Applications, Content, Production Capacities and Skills for Women's Economic Empowerment and Poverty Reduction". iMerit is a networked outsourcing Information Technology (IT) services firm that markets the skills of new trainees to global corporations. iMerit aims to empower youth and women through mobilization, training, employment, and up-skilling in IT project services. iMerit and its sister company, the Anudip Foundation, train Indians in basic, marketable IT. The iMerit team offers scanning, data conversion, data verification, data archiving, data entry, data mining and extraction for the document

management industry; image and video editing, and 3D visualization services to the multimedia industry; and global service desk services (such as communication re-routing, employee account management, and IT services).

To date, these two institutions have trained over 30 000 rural women and young people, while providing high-quality, scalable IT service solutions to a global client base including universities, corporations, governments, start-ups and non-profit organizations worldwide. Anudip and iMerit now have 62 training centres around India, mostly in rural areas. To learn more, visit www.imerit.net.

The Chief Executive Officer of iMerit, Radha Basu, a former executive for Hewlett-Packard, expressed her deep honour in accepting the award on behalf of the 30 000 marginalized young students of iMerit/Anudip, who have been mainstreamed into Internet and IT jobs. "The women at iMerit believe strongly in market-based solutions", said Ms Basu. "They do not wish to be beneficiaries of the United Nations and large corporations. They want them to be our clients. Our dream is to become a mini-Facebook or a mini-Alibaba, with women as equal shareholders in the global Internet economy".

British Chartered Institute for IT

The British Chartered Institute for IT (BCS), from the United Kingdom, won Category 3 of the GEM-TECH Awards, "Promoting women in the ICT sector — initiatives to attract, retain and promote women in the ICT sector and into decision-making roles".

The Chartered Institute for IT champions the global IT profession, as well as the interests of individuals working in the sector. It fosters links between experts from industry, academia and business to promote new thinking, education and knowledge-sharing to exchange IT expertise and knowledge. Through professional development and respected IT qualifications, the Institute seeks to promote professional practices tuned to the demands of industry, and provides support and information to its members and volunteer communities around the world. The Chartered Institute also collaborates with government, industry and relevant bodies to establish standards, good working practices and codes of conduct.

Gender diversity still poses a major challenge in the IT and telecoms industry, with women making up less than 20% of the IT workforce, according to BCS. Established in 2007, BCSWomen is a networking group of almost 1500 IT professionals who work on a volunteer basis on numerous initiatives to encourage more women to join the IT profession. They also aim to support members through training courses, social and professional networking events, mentoring, as well as social media and discussion groups. The group comprises women working in diverse technology-based roles from many different countries and industry sectors.

In 2014, the "Women in IT" community published an ebook, "Women in IT: Inspiring the next generation", which seeks to encourage more girls and women to consider a career in IT by showcasing the lives and careers of female IT professionals, entrepreneurs and academics.

Speaking on behalf of BCS in accepting the award, Gillian Arnold, Chair of BCSWomen said: "This GEM-TECH Award is a great honour and recognizes the work we've done over the last five years and more to address the issue of gender diversity in the IT profession" — see www.bcs.org.

Look out for more GEM-TECH Award winner profiles in future editions of *ITU News*.

Celebrating Girl Power on International Girls in ICT Day

International Girls in ICT Day is celebrated on the fourth Thursday in April each year. On this day, tens of thousands of girls and young women around the world get a chance to experience technology, many for the first time. For many of the participating girls, this day is an eye-opening experience, enabling them to experiment with information and communication technologies (ICTs) first-hand and to envision their future as ICT users or even creators. ITU data suggest that globally, some 200 million fewer women are online than men, and that women are coming online later, and more slowly, than their male counterparts, limiting women's access to better-paid jobs that often require digital skills. Since 2011, ITU has recorded that over 111 000 girls and young women have participated in more than 3 500 events celebrating Girls in ICT Day in 140 countries worldwide. This large number comprises many individual stories; a few are detailed here.

Gina and Jiawei in Spain

At a Girls in ICT Day event organized by the ITSCOOL Association last year in Spain, Gina, 18, and Jiawei, 19, learned for the first time how to create mobile apps. According to Jiawei, the event helped her to discover the world of applications, which she now finds very interesting. Both girls are now studying to become engineers.

Runa from Bangladesh


Runa

Runa from Bangladesh had the opportunity to go to school for the first time only after having been first exploited as a child worker. After attending a Girls in ICT Day event organized jointly by Bangladesh Women in Technology (BWIT) and the Underprivileged Children's Educational Programs (UCEP) in 2014, Runa decided that she wanted to study a diploma in engineering. She feels that a career in technology will enable her to help and support girls that come from a similar background to herself in the future.

Ashley in Costa Rica

A Girls in ICT Day event organized last year by Cisco in Costa Rica inspired Ashley, 18, to undertake an internship at Cisco. Ashley is passionate about technology and convinced that a career in ICT offers girls many great job opportunities. She is soon beginning her studies to become a software engineer.

Awele and Omodolapo from Nigeria


Awele

Awele, 16, from Nigeria, attended a Girls in ICT Day event organized by the Youth Initiative for Sustainable Development (YISD) in 2014, offering the opportunity to obtain basic digital skills for the first time. Now Awele has become a proficient blogger. At another event in Nigeria, organized by the Women's Technology Empowerment Centre (W.TEC), Omodolapo, 16, was introduced to apps development, which made her drop her previous plans of becoming a doctor. "I have fallen in love with ICT and would like to now study an ICT-related topic at university", she says. Omodolapo continued developing new mobile apps after the Girls in ICT Day event.

Preparations for this year's Girls in ICT Day, to be held on 23 April, are gathering speed. The global momentum to inspire girls and young women to take up technology careers continues to grow, with more countries and event organizers than ever before expected to join the celebrations in 2015. To help event organizers with planning, ITU has published a toolkit including ideas and resources for event activities, as well as practical tips for making the event a success, available for download on the ITU Girls in ICT Portal at www.girlsinict.org. You can join the global *Girls in ICT community* online on Facebook (www.facebook.com/ITUGirlsinICT) and take part in the online discussion at hashtag #GirlsinICT. For more information on celebrating International Girls in ICT Day 2015, please contact girlsinict@itu.int. If your organization is planning an event, we would be delighted to hear about it, as well as stories of women's individual experiences of the day itself and how it might have contributed to changing lives. So please do get in touch with us at girlsinict@itu.int and tell us all about how you celebrated Girls in ICT Day.

Focus on World Summit on the Information Society Forum 2015

The World Summit on the Information Society (WSIS) Forum 2015 will welcome a large number of WSIS stakeholders, including high-level delegates from around the world, to the ITU and the World Intellectual Property Organization (WIPO) Headquarters, in Geneva, Switzerland, from 26 to 29 May 2015. The WSIS Forum aims to measure progress in the implementation of the WSIS Action Lines established during the two phases of WSIS (in Geneva in 2003 and Tunis in 2005) and to brainstorm innovation and progress in information and communications technologies (ICTs).

The WSIS Forum is one of the world's largest annual meetings of the ICT for development (ICT4D) community. It is co-organized by an impressive coalition of UN agencies and international organizations, including ITU, the United Nations Educational, Scientific and Cultural Organization (UNESCO), the United Nations Conference on Trade and Development (UNCTAD), the United Nations Development Programme (UNDP), in close collaboration with WIPO, the United Nations Department of Economic and Social Affairs (UNDESA), the Food and Agriculture Organization (FAO), the International Labour Organization (ILO), the International Trade Centre (ITC), the United Nations Office on Drugs and Crime (UNODC), the United Nations Environment Programme (UNEP), the Universal Postal Union (UPU), the World Meteorological Organization (WMO), the World Health

Organization (WHO), the World Food Programme (WFP), UN Women and the United Nations Regional Commissions. This global gathering has already been recognized as an efficient platform where multi-stakeholders collaborate for a just and equitable information society. This unique UN Forum engages multiple stakeholders to discuss issues raised related to ICTs, particularly in the area of sustainable development.

The 2015 Agenda

The agenda and programme of the WSIS Forum 2015 have been designed in collaboration with the multi-stakeholders based on the official submissions received during the Open Consultation Process on the thematic aspects and innovations. Involving all WSIS Stakeholders (governments, civil society, private sector entities, academia and UN agencies), this process aims to ensure an active, inclusive and constant participation of different players during the event. The process began in November 2014, is structured in five phases and includes online submissions and physical meetings.

Innovating Together: Enabling ICTs for Sustainable Development

The key themes of the 2015 WSIS Forum are: Innovation; accessibility; gender empowerment and mainstreaming (Beijing+20); sustainable development (Post-2015 Agenda); cybersecurity and WSIS beyond 2015 (WSIS + 10). Focusing on these aspects, the Forum will be built upon two tracks, the *High-Level Track,* including policy statements, a WSIS project prize ceremony, a Ministerial Round Table, and the *Forum Track,* consisting of high-level dialogues, action-line meetings, country and thematic workshops, knowledge exchanges as well as exhibitions.

WSIS Project Prizes

The WSIS Project Prizes were introduced as a response to requests expressed by WSIS stakeholders in 2011 to create a mechanism to evaluate and reward stakeholders for their efforts in the implementation of WSIS outcomes. The WSIS Project Prizes contest identifies and showcases success stories and models that can easily be replicated to empower communities at the local level. Prizes are awarded in 18 categories linked to the WSIS Action Lines outlined in the Geneva Plan of Action. The contest is open to all stakeholders. The prize-winning ceremony will take place during WSIS Forum 2015 to be held on 25–29 May, in Geneva, Switzerland, where 18 project prize winners will be honoured, recognized and presented with an award recognizing their achievements.

Partners of the WSIS Forum 2015 (Confirmed as of 26 February 2015)

- WSIS Forum 2015 Platinum Strategic Partner: United Arab Emirates
- WSIS Forum 2015 Gold Strategic Partners: Democratic Republic of the Congo and INTEL
- WSIS Forum 2015 Partners for Specific Activities: Japan, Kuwait and Saudi Arabia
- WSIS Forum 2015 Contributing Partners: Poland, Rwanda, ICANN and ISOC.

Further relevant information and the most up-to-date programme are available at: www.wsis.org/forum.

Official Visits

During February 2015, courtesy visits were made to ITU Secretary-General Houlin Zhao by the following Ministers, Ambassadors to the United Nations Office and other international organizations in Geneva, and other important guests.

From left to right: Ram Narain, Deputy Director General (International Relations), Department of Telecommunications, India; Houlin Zhao, ITU Secretary-General; and Shahbaz Ali, Controller of Communication Accounts, Department of Telecommunications, Ministry of Communications and Information Technology, India

Mirian Teresita Palacios Ferreira, Director, CONATEL, Paraguay

Magdalena Gaj, President of Poland's Office of Electronic Communications (left); and Malgorzata Olszewska, Undersecretary of State, Poland's Ministry of Administration and Digitization (right)

Dato Mahdi Rahman, Ambassador of Brunei Darussalam

Diarra Mariam Flantié Diallo, Mali's former Minister of Information and Communication Technology

Murad N. Najafbayli, Ambassador of Azerbaijan

Charles Geiger, Former Executive Director, WSIS Former Special Adviser to the UN Commission on Science and Technology for Development (CSTD)

Professor Baoguo Cui,
Tsinghua University, Beijing, China

Jian Song, Professor (left); and
Changyong Pan, Associate Professor (right),
Department of Electronic Engineering,
Tsinghua University, Beijing, China

Professor Dr Mark I. Krivocheev,
Chief Scientist, Radio Research and
Development Institute, Moscow, Russia

Sadahiko Kano,
Professor Emeritus,
Waseda University, Japan

Dr Abeer F. Shakweer, Minister's Advisor for Social Responsibility and Service, Ministry of Communications and Information Technology, Egypt (left); and Mohannad El-Megharbel, Senior Manager, Standardization and Technical Aspects, National Telecommunication Regulatory Authority (NTRA), Egypt (right)

Pamela Hamamoto,
Ambassador of the United States

From left to right: Captain Esteban Pacha, Director General, International Mobile Satelite Organization (IMSO); Houlin Zhao, ITU Secretary-General; Christian Roisse, Executive Secretary, EUTELSAT; and José Toscano, Director General and CEO, International Telecommunications Satellite Organization (ITSO)

Hailong Wu,
Ambassador of China

From left to right: Giacomo Mazzone, Head of Institutional Relations, European Broadcasting Union (EBU); François Rancy, Director of the ITU Radiocommunication Bureau; Ingrid Deltenre, Director General of EBU; Andy Palmer, Group Director of Technical Operations, Middle East Broadcasting Center (MBC); Houlin Zhao, ITU Secretary-General; Lawrence Atiase, Chief Executive Officer, African Union of Broadcasting (AUB); John Maguire, Director General, International Radio and Television Union (URTI); Gary Thatcher, Associate Director, United States International Broadcasting Bureau; Nigel Fry, Head of Distribution, BBC World Service Group; Catherine Westcott, Communication Regulations Specialist, BBC World Service Group; and Simon Fell, Director of Technology, EBU

All photos are by Charlyne Restivo/ITU.

ITU's 150th Anniversary

This year, ITU is celebrating 150 years since the signing of the first International Telegraph Convention

Innovation & Intelligent Transport Systems

Girls & Women & Innovation

- **Thematic months**
  Each month, we focus on a different theme.
- **Digital History Portal**
  Your gateway to a wealth of information about ITU's history.
- **ICT Discovery**
  Explore ITU's contribution to the history of ICTs with a trip to our interactive visitor centre.

Visit our newly launched website

itu150.org

Join us to celebrate with social media — to share memories or just to say happy birthday, use

#ITU150

150 ITU 1865 2015

ITU TELECOM WORLD '15

Budapest 12-15 October

150 ITU 1865 2015

2015

Join us in Budapest, Hungary
to continue the conversation that matters

BUDA PEST
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Be part of the 1 conversation that matters.

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ITU Telecom is part of ITU, the lead United Nations agency for information and communication technology.
ITU Telecom organizes the annual influential ITU Telecom World event, bringing together key players from across the global ICT community in strategic debate, knowledge-sharing and networking at the highest level.