

Europe | 2011

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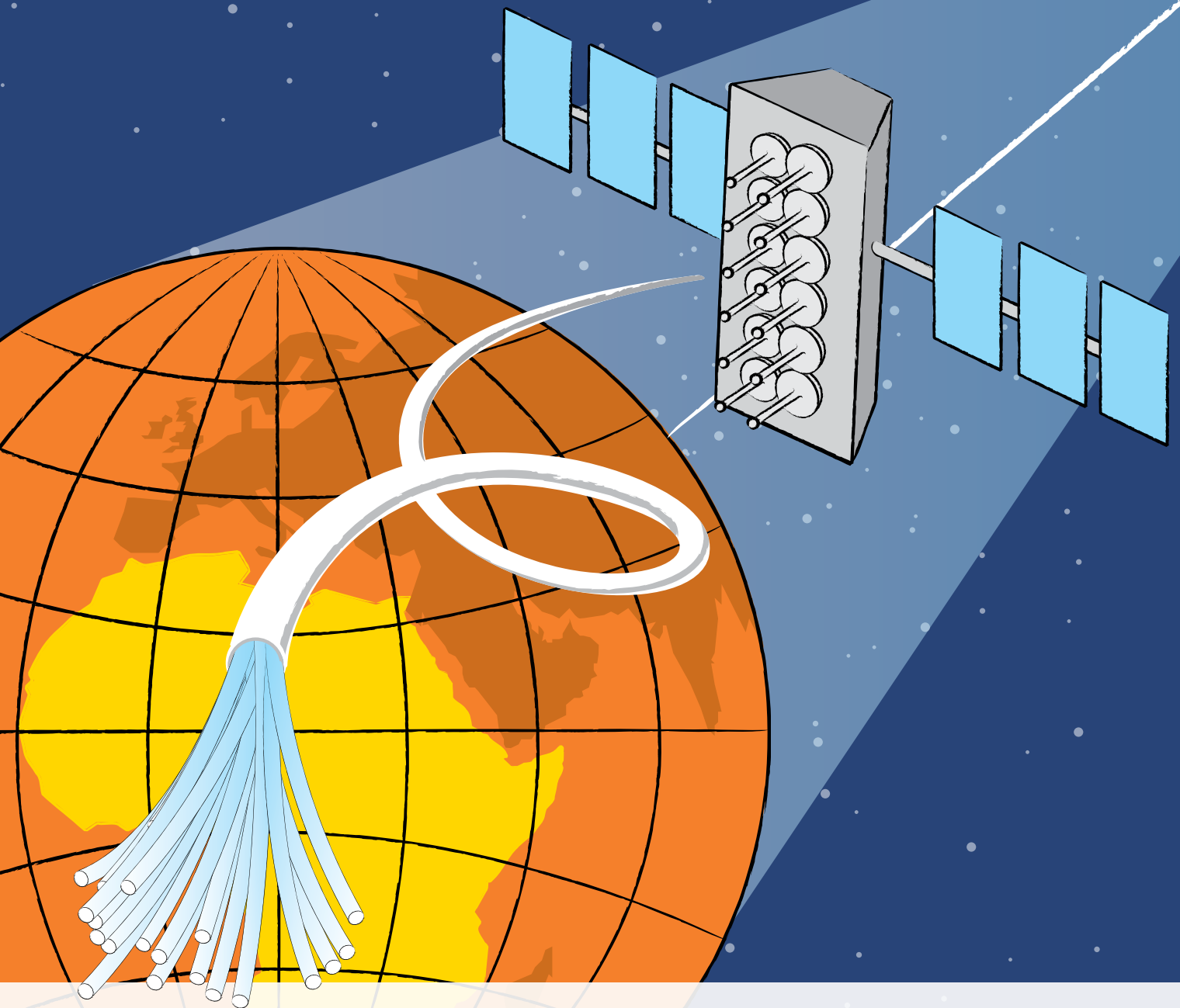
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A close-up portrait of H.E. Mrs Charlotte Sahl-Madsen, a woman with short, wavy brown hair, wearing red-rimmed glasses and a dark, textured sweater. She is smiling broadly, showing her teeth, and has her right hand resting near her chin, wearing a gold ring. The background is dark and out of focus.

H.E. Mrs Charlotte Sahl-Madsen  
Minister, Denmark

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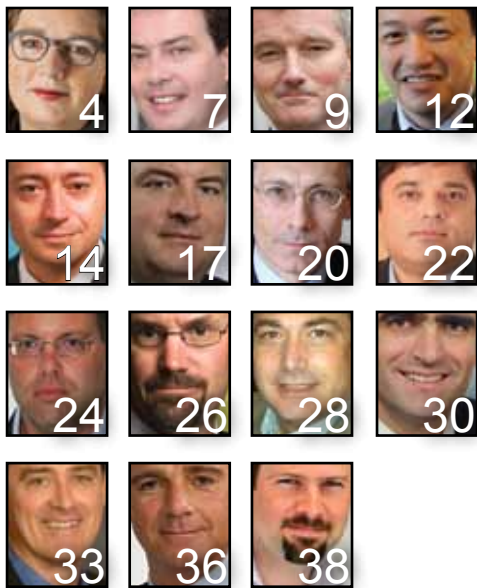
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# CONNECTIONS

## Connections



Mobile is more than a technology; it is a social and economic phenomenon that shows no sign of slowing. Some 80 to 90 per cent of mobiles this year will ship with Web browsers and the PC is no longer the primary means of Internet access. Billions who cannot afford a PC can now access the Internet via their mobile phones. Business use of mobile applications is growing strongly and this is transforming business processes and providing unprecedented facilities and economies. Nevertheless, consumers are the biggest - and still swiftly growing - drivers of demand. Few operators are prepared to handle the growing use of consumer-generated data, of social networking, of YouTube and other video services, and many are hard-pressed to build out their networks fast enough to keep ahead of demand. This demand, for a wide variety of reasons, is likely to hasten the convergence of fixed and wireless networks - indeed, in many regions there seems to be little choice.

Then too, it is not only entertainment and networking that consumers are driving. Mobile money, for example, is just one of many applications that will forever

change businesses of all sorts. mMoney will not only realign the financial sector, it will reshape business of all sizes in urban and rural regions alike.

Cloud computing will make it easier for users everywhere to handle applications and access data far beyond the capacity of a hand-held device. Security and complementary hand-held device technology will be increasingly important.

Vendors, operators, service providers, content developers - the entire mobile sector and the entire ICT sector - are all facing a massive wave of change.

This Connect-World Europe looks into how mobile will affect the sector, the region and users alike - the entire race - to adapt, survive and prosper. The theme for this issue is: *Riding the mobile wave.*

**Fredric J. Morris,**  
Editor-in-Chief,  
*Connect-World*



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email: [info@connect-world.com](mailto:info@connect-world.com)  
URL: [www.connect-world.com](http://www.connect-world.com)

Editor-in-Chief: Fredric J. Morris [fredric.morris@connect-world.com](mailto:fredric.morris@connect-world.com)

Publisher: David Nunes [david.nunes@connect-world.com](mailto:david.nunes@connect-world.com)

Editorial Department: [editorial@connect-world.com](mailto:editorial@connect-world.com)

Production Department: [production@connect-world.com](mailto:production@connect-world.com)

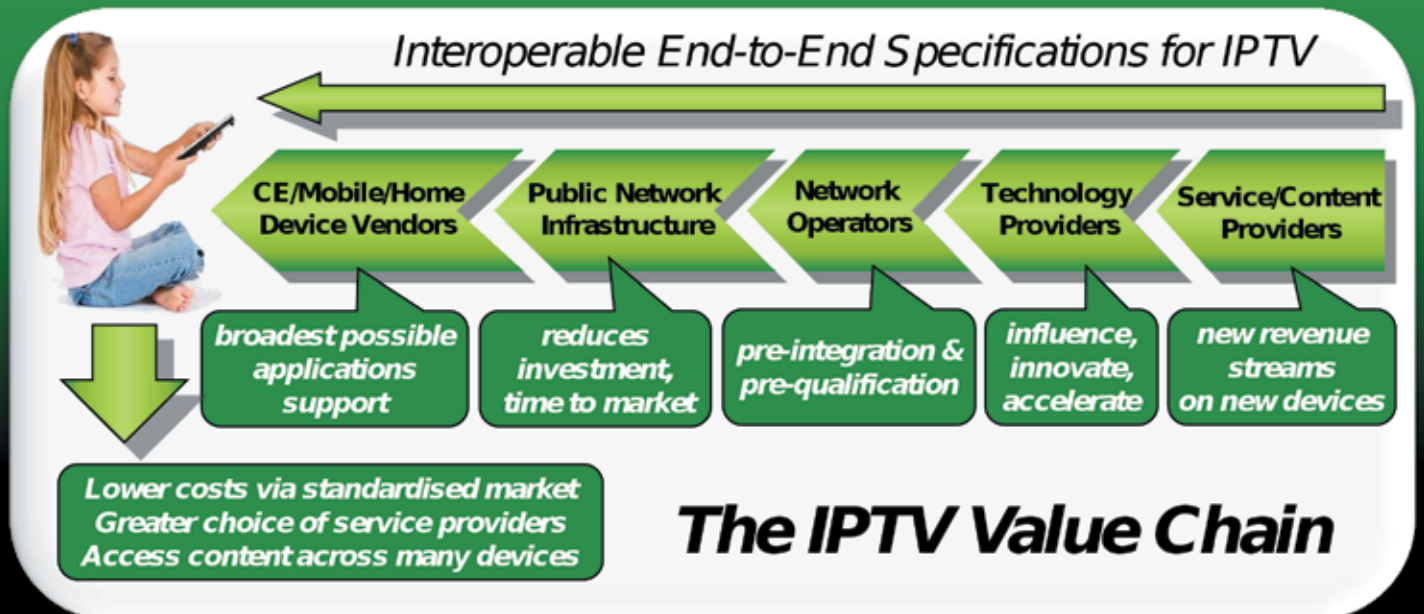
Sales Department: [sales@connect-world.com](mailto:sales@connect-world.com)

Administration Department: [admin@connect-world.com](mailto:admin@connect-world.com)

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## ICT and its role in Denmark

by Charlotte Sahl-Madsen, Minister for Science, Technology and Innovation, Denmark

Mobile technology plays an important part in Denmark's society and industry alike; Danes purchase public transport tickets via SMS or check in for a flight - all with the aid of a mobile phone. Denmark's agenda for growth emphasises ICT, research, innovation and digitalisation. In Denmark, ICT is intensively used to give citizens access to government services; in the welfare and health sectors the export of Denmark's innovative welfare technology and services earned Danish developers approximately €2.4 billion in 2008.



*Charlotte Sahl-Madsen is the Danish Minister for Science, Technology and Innovation; she had extensive experience in various industries before her political appointment, including as Head of R&D and Head of VisionLab at toy manufacturer LEGO, CEO of Danfoss Universe and President of the Universe Foundation. Since taking on her ministerial position, Ms Sahl-Madsen has worked tirelessly to promote and stimulate economic growth. Key policies include focusing on education that matches the needs of both society and industry; the promotion of digitalisation opportunities; increasing public-private cooperation; and promoting and utilising the advantages of increased globalisation, for example, in the education and research sector.*

*Ms. Charlotte Sahl-Madsen studied at various international business schools, including Executive Education, Harvard Business School, USA; and read Law at the University of Aarhus (not completed).*

In Denmark, and Scandinavia as a whole, mobile technology and its benefits play an important part in society and industry alike. We can purchase public transport tickets via SMS or check in for a flight - all with the aid of a mobile phone.

The face of mobile information and applications is constantly changing and we must embrace this change. In 2009, 90 per cent of 25- to 34-year-olds were using their mobiles as their primary alarm clock. In the same year, only 11 per cent of mobile phone owners were utilising mobile payment options. There is clearly room for improvement. We must look to

the advantages that mobile technology and ICT in general can offer us.

Denmark faces a number of challenges. We too have not remained immune to the global economic downturn. Many years of growth have levelled out and public finances have been impacted. The Danish government has rallied and looked to all resources to help set a new political agenda focused on renewing growth.

We must look to all solutions, including ICT, to regain any ground lost during the financial slump. The Danish government laid a new foundation for its policy in

February 2010 with research, innovation and digitalisation playing a key role in stimulating growth.

We regard digitalisation as a driving force for innovation and thus for renewed growth and competitiveness. It improves production and business processes and also provides new, improved products and services.

ICT is not just crucial for economic growth, but also for solving our social challenges. For example, additional ICT-based welfare technology in the health sector can be instrumental in meeting the demographic development.

The implementation of ICT in the welfare sector is seen as one of the key requirements for streamlining the public sector. The Danish government allocated €400 million in 2008 for Investments in Public Welfare Technology. These funds will be invested in numerous projects until 2015. It will not only increase efficiency in the public sector but also offer more user-friendly solutions to residents.

For example, in my hometown region of Southern Jutland, a local municipal project is providing a number of care services to elderly residents via video-link over the Internet rather than in-person visits.

And these kind of ICT-based solutions are not beyond the reach of our more senior residents. For it is important to not only introduce innovative, productive technology but also to educate people in its applications.

I recently visited one of the many data information centres across the country, where elderly residents can learn about emails, spreadsheets and even new social media. I must say, their abilities would put young people to shame. Internet use among 60- to 74-year-olds has risen to 65 per cent in the last two years, compared to 54 per cent in 2008.

If our citizens are willing to use this technology, then we as politicians must not rest on our laurels when it comes to expanding future ICT possibilities.

The Danish government remains committed to ICT research as a viable way of stimulating growth.

In the public sector in 2008, approximately €103 million was spent on ICT research and development - the equivalent of at least five per cent of public R&D expenditure.

Danish ICT researchers consistently provide quality results and are highly regarded internationally. Positions of strength range from theoretical computer science, database research, IT security and 'human/machine interaction' to mobile communication, robot technology, energy-saving technology, and IT in the health sector.

At the same time, we cannot deny the importance of collaboration. Many

successful projects have arisen from public-private partnerships.

The business community spent more than €1 billion in 2007 on R&D in three ICT areas - software integrated in other products; software as an independent product; and hardware. In all, ICT R&D accounted for 25 per cent of the collective private R&D expenditure.

As mentioned before, ICT welfare technology has a lot to offer our citizens. Additionally, Danish businesses are creating ICT innovative solutions for this developing market. A new report estimates that the export of Danish welfare technology and services netted approximately €2.4 billion in 2008 - an increase of 30 per cent since 2004 - and that the field employs some 25,000 people. The export potential is expected to increase in line with the demographic development as the public sector represents an attractive development partner for the Danish business community.

So what does the future hold for ICT in Denmark? The Danish Ministry of Science, Technology and Innovation announced its Digital Growth Work Programme last summer, focusing on the role that government can play in developing world-class infrastructure, digital literacy and applications that offer opportunities to both the public and the business community.


A strong and competitive infrastructure is a prerequisite for utilising ICT to create growth and innovation. Our government has therefore set a goal that all - businesses as well as citizens - will have access to an Internet connection of 100Mbit/s by 2020. The goal will be reached by a market-based and technology-neutral approach and is one of the most ambitious in Europe. We are well on the way to achieving that target, with 25 per cent of all households and companies already able to access a 100Mbit/s connection.

We are also in the process of drawing up a new strategy for e-Government to promote digital self-service solutions as the first choice for citizens and businesses when dealing with government. So far, our comprehensive approach to e-Government has helped us develop attractive digital applications, some of which have a most

impressive take-up. For example, more than 3.2 million out of 5.5 million Danes have used the self-service facilities of the tax authority's website during the last year.

In the field of digitisation, as in other policy areas, government must remain responsive to society. By maintaining a constant dialogue with citizens and companies, we strive to understand, support and influence the commercial development of digital infrastructure and services.

Our efforts in ICT research and innovation are one of many elements of Denmark's path to recovery. We must meet the wave of new and exciting technologies head-on, embrace them and incorporate them successfully into our lives. However, collaboration is crucial and it is through collaboration between researchers and the business community, public and private entities, and citizens and the government that we can build a successful future together. ●



**Connect-World is celebrating its 15<sup>th</sup> anniversary**

Through the years, *Connect-World's* authors told of the rise of mobile, of fibre, of wireless and of broadband; they told of the dot.com meltdown, of digital inclusion and convergence, of standards and breakthroughs, the rise of IP and the fall of switching and of the regulatory turnaround.

In every issue of *Connect-World* heads of state, ministers and regulators, heads of international institutions and leaders of industry speak of what the ICT revolution, as it happens, means to the people in their regions of the world.

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# Facilitating LTE Advanced - the regulatory challenges

by Kemal Huseinović, Director General Communications Regulatory Agency, Bosnia and Herzegovina

In many developing countries, 4G networks are the quickest and most economical way to make broadband services widely available. Unfortunately, the frequencies needed for 4G are not readily available. Operators in countries converting from analogue to digital TV hope that the bandwidth liberated by the switch will be assigned to 4G. By cooperating, regulators within each region can make it easier to expand 4G. Regulators can also facilitate the growth of 4G by liberating the use of cognitive radio systems.



*Kemal Huseinović, PhD, is the Director General of the Communications Regulatory Agency of Bosnia and Herzegovina. Mr Huseinovic is a frequent speaker at international conferences on telecommunication and audiovisual topics, as well as being an eager promoter and implementer of global regulatory policies in the Bosnia and Herzegovina communications market.*

*Kemal Huseinović's PhD thesis was titled "Competition Enlargement through Establishment and Development of Regulatory Authorities of Communication Market". He earned a Master's Degree in Electrical Engineering Science from the University of Sarajevo titled and a second one in Economic Science and Business Administration from the University of Ljubljana, Republic of Slovenia.*

According to the ITU, mobile cellular has been the most rapidly adopted technology in history. Today, it is the most popular and widespread personal technology on the planet.

A modern man requires mobile service around the clock regardless of place and time zone. Demand for mobile Internet and mobile television continuously grows at an enormous pace. Additionally, ease of use of multimedia services is a key requirement for each such service. Multimedia service users require easy and fast access to find, download and use multimedia content. Mobile television, on the other hand, means much more than simple transmission of traditional television programmes on the mobile telephone screen. The experience of searching for mobile TV

content is quite different in many ways than sitting in front of a traditional TV set. Apart from the fact that mobility enables viewing a programme anywhere, mobile TV lets one personalize their TV content viewing, giving an opportunity to select different types of video reports from sports, business or other events. So far, to fully satisfy their appetites for high-bandwidth applications, consumers need access to 4G networks.

## LTE Advanced - the technology of choice

The mobile technology world is rapidly moving to 4G, and it seems that Long Term Evolution Advanced (*LTE Advanced*) is the technology of choice. According to the Global Mobile Suppliers' Association's (*GSA*) latest analysis, Long Term Evolution mobile

technology will be the "fastest developing mobile system technology ever". Compared with existing and competing technologies, LTE Advanced will enable significant further development and more efficient delivery of new data-rich services, promising faster data rates at lower cost.

For consumers, the LTE-enriched user experience will be typified by large-scale streaming, downloading and sharing of video, music and rich multimedia content. All of these services will need significantly greater throughput to provide adequate quality of service, particularly when the user's expectations are increased by the growing popularity of such high-bandwidth platforms as high-definition TV transmission. For business customers, LTE

brings high-speed transfer of large files, high-quality videoconferencing and secure nomadic access to corporate networks. LTE Advanced has arrived, but it is still at a very early stage and will take several years to reach most markets, especially in developing and underdeveloped countries.

**Frequency demands and cognitive radio**

With the rapid development of communications technologies, the demand for radio spectrum - a limited and valuable resource - is increasing quickly. It is difficult to satisfy the high bandwidth requirements of many advanced wireless services. Traditional wireless communication techniques are designed to provide stable, continuous usage of a defined spectrum range, but the sort of wide continuous spectrum bands some recent applications call for are rarely available given the current policies of stable, fixed, licensed spectrum utilization. The spectrum requirements for 4G technologies, as defined by the ITU, must support a variety of bandwidth allocations up to 100MHz and peak data rates of up to 1Gbps for stationary terminals.

LTE aspires to considerably improve the efficiency of spectrum usage, lower costs, improve services, make use of new spectrum opportunities, and provide better integration with other open standards. LTE's advantages include high throughput, low latency, simple architectures that result in low operating expenditures and plug-and-play from day one. Concretely, LTE Advanced requirements are: peak download (DL) data rate of 1Gbps, upload (UL) rates of 500Mbps, transmission bandwidth wider than approximately 70MHz for download and 40MHz for upload, capacity (spectrum efficiency) three times higher than LTE, support of scalable bandwidth and spectrum aggregation, etc.



Source: Nomor Research GmbH - www.nomor.de

Frequency spectrum is a valuable and tightly regulated resource. Cognitive radios that are aware of the radio environment and can dynamically program their parameters to efficiently use vacant spectrum without causing harmful interference to another users could well be the solution to the shortage of available frequencies. Cognitive radio is also important in heterogeneous networks where mobile users (or their handsets) can

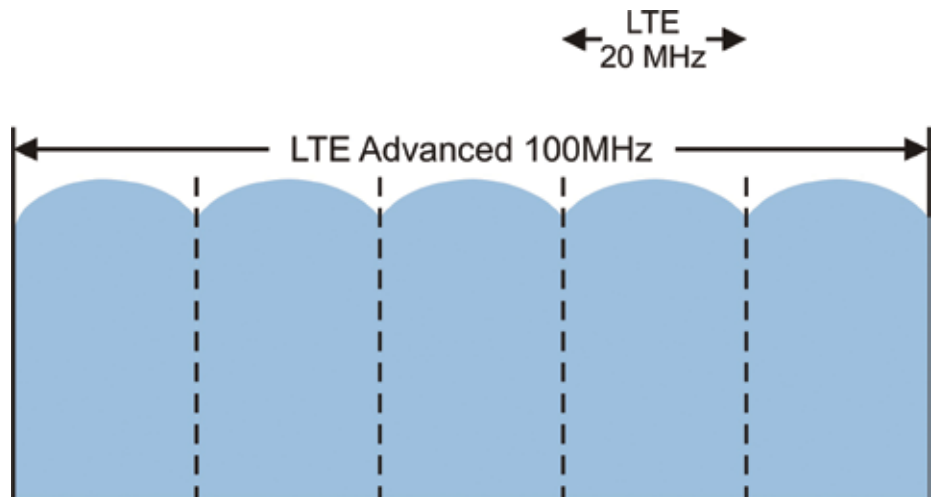


Figure 2: LTE Request for modification of regulatory framework

select between multiple wireless networks - Worldwide Interoperability for Microwave Access, Inc. (WiMAX), LTE, digital video broadcasting (DVB), Wireless Fidelity (WiFi), etc. - and maintain multiple links simultaneously.

The ideal cognitive radio 'knows' everything about user requirements, the capability of the radio device, the network requirements and the external environment - including the radio environment. The radio could plan ahead and negotiate for the best available part of the spectrum. A unique LTE possibility is to use different UL and DL bandwidths, allowing for asymmetric spectrum utilisation. This is possible since cognitive radios can support both paired Frequency Division Duplex (FDD) and unpaired Time Division Duplexing (TDD) band operations. For FDD, UL and DL transmissions use separate frequency bands, whereas in the case of TDD, UL and DL transmissions share the same frequency band. The use of FDD in the network, to some extent, limits the flexibility needed to keep track of changing traffic conditions and requirements. Actually, TDD better suited for flexible spectrum usage and supports data traffic applications better.

**Regulatory challenges**

A number of countries are still making the transition from analogue to digital TV broadcasting. The transition will free the part of the frequency spectrum used for analogue transmission and create a 'digital dividend'. In many countries, the frequencies liberated in this manner will be allocated to new services - including LTE. Enough bandwidth will be liberated to let three mobile operators provide new services in each country. Accordingly, it would be highly advantageous

to build 4G networks using these frequencies. The use of 4G networks would lower the cost of mobile services, make them more affordable and efficient, and stimulate the development of new technology and services.

Operators are seeking common ground with regulatory bodies regarding the allocation of the digital dividend spectrum; operators would like to see these frequencies allocated to the implementation of LTE networks.

Regulations ought to allow the use of Cognitive Radio systems in the interest of technological neutrality, reduced cost and better use of existing frequency resources. Every country should seek to ensure that its legislation does not hinder the development of cognitive radio and thus the efficient use of spectrum. Legislation concerning radio spectrum needs to take into account the recently perceived needs of efficient cognitive radio spectrum usage.

Since many technical, managerial, and financial aspects are associated with cognitive radio concepts - including software-defined radio (SDR) - there is a need to standardize processes, terms, and so on to facilitate its development and use. Until now, the initiatives of the many groups interested in cognitive radio have been incoherent and uncoordinated. Coordination between regulators, academia and product developers is urgently needed.

Although the 4G is moving steadily forward in developed countries, to accelerate the growth of 4G in developing countries, and especially in Southeast Europe, regulatory bodies must work together and strengthen their cooperative ties to create a stronger, more dynamic, regulatory environment. ●

# Mobilising Europe's digital agenda

by Martin Whitehead, Director of GSMA Europe

The European Commission's Digital Agenda for Europe seeks to harness ICT's to contribute to smart, sustainable and inclusive growth. Advanced, high-speed, mobile broadband, and smart ICT solutions, including embedded mobile applications, will enable Europe's transition towards a low-carbon, energy-efficient economy. Mobile will also help deliver public services, reduce costs and improve the efficiency of healthcare. Near Field Communications will enable a wide range of mobile payments and services. The mobile industry is working to meet the challenges identified in the Digital Agenda.



*Martin Whitehead is the Director of GSMA Europe, which is the European arm of the GSMA - the global body that represents the worldwide mobile communications industry. Before joining the GSMA, Mr Whitehead ran his own business that advised companies on how to shape EU policy and regulation. Prior to that, Mr Whitehead worked with the United States Department of Commerce helping American companies and US government representatives engage EU policy makers to improve the operating environment for US companies in Europe. Mr Whitehead spent his early Brussels career in the EU institutions, including a spell with the European Commission's Single Currency Communication Task Force.*

*Martin Whitehead graduated in Economics and Sociology from Bristol University in the UK,*

As Europe strives to recover from the financial crisis, information and communication technologies (ICT) are set to play a pivotal role in both the return to economic growth and in helping the region address longer-term challenges, such as rising healthcare costs and climate change.

Launched by the European Commission in May 2010, the Digital Agenda for Europe is designed to ensure that the region fully harnesses the socio-economic potential of ICT, and to contribute to achieving Europe's 2020 strategy for smart, sustainable and inclusive growth.

The 'Agenda' outlines seven priority areas for action, identifying objectives and challenges for each: creating a digital single market; greater interoperability; boosting Internet trust and security; much faster Internet access; more investment in research and

development; enhancing digital literacy skills and inclusion; and applying ICT to address challenges facing society.

Mobile technologies and services can help Europe meet its Digital Agenda objectives. The late 20<sup>th</sup> century saw key transformative developments in mobile and the Internet; the 21<sup>st</sup> century is seeing the convergence of these two in the mobile Internet. Adding rich applications and broadband capabilities to mobile's existing strengths of connectivity, ubiquity and personalisation reinforces mobile's role as a key enabler of Europe's Digital Agenda.

## Delivering fast Internet access

Mobile broadband can make a particularly significant contribution. Our members continue to invest in network capability, and

to increase connectivity and broadband access for consumers on the move and at home. Their customers are certainly responding. In the last twelve months alone, the number of EU-wide mobile broadband connections using high-speed packet access (HSPA) technology has risen by 67 per cent from 69 million to 115 million.

Developments in mobile technology will continue to drive the rapid uptake of mobile broadband across Europe and facilitate the development of new services and applications. Migration towards HSPA is delivering data speeds of up to 20Mbps and the move to 'Long-Term Evolution' or LTE technology will take speeds much higher and help to use scarce radio spectrum more efficiently. LTE networks are now being rolled out in Europe, and Wireless Intelligence predicts that LTE connections in the European Union will reach 74 million by

2015, equivalent to 11 per cent of all mobile connections in the region.

Data traffic on mobile networks is growing exponentially as consumers and business users increasingly turn to smartphones and connected laptops to access the Internet, email, business applications and social networking services. This trend will continue with mobile broadband subscriptions becoming the key driver for broadband uptake. The availability of the right spectrum will be critical to meeting this surging demand.

The European Commission recognises this; it is encouraging all Member States of the European Union (EU) to free up the 800 MHz digital dividend spectrum band for wireless broadband by 2013. Mobile broadband in the 800MHz band, combined with the liberalisation of the 900MHz band through the amended GSM Directive, is critical to helping meet the challenge of what some are calling the 'Data Tsunami' challenge. Spectrum at these frequencies is also the key to connecting citizens and businesses in those parts of the European Union that might otherwise miss out on digital opportunities. This brings us back to one of the key milestones of the Digital Agenda: basic broadband coverage for all EU citizens by 2013.

### Helping address societal issues

However, mobile is far more than just an access technology for the Internet. Mobile technologies are already being used to reduce greenhouse gas emissions and costs across a wide range of sectors of the economy by using SIM cards and radio modules embedded in machines and devices to deliver smart traffic management and logistics, smart power grids and meters, and smart buildings. Other uses - such as teleworking, using telepresence to manage heating or lighting, real-time freight management, and dematerialisation of physical goods - mean that by 2020 mobile could reduce emissions in other sectors by more than 4.5 times the mobile industry's own carbon footprint. That is the equivalent of taking one of every three cars off the road. The mobile industry is also working to better manage its own energy efficiency. In November 2010 the GSMA launched a Mobile Energy Efficiency (MEE) benchmarking service that aims to unite the industry behind a common methodology to identify areas where efficiencies can be achieved.

As mobile becomes the dominant Internet access technology, people will be more likely to connect using a mobile rather than a fixed line -

the mobile platform is becoming an increasingly important means to deliver public services. In the case of European Union healthcare expenditures, mobile operators can help deliver significant cost savings by improving the efficiency of the healthcare industry and raising the quality of service. Mobile can deliver telemedicine services to the chronically ill and remind patients when to take medication or go to a doctor's appointment. It can also enable remote monitoring using machine-to-machine (M2M) technologies and support the secure storage and transfer of medical data from anywhere to anywhere.

### Enhancing trust and security

The protection of personal data is an essential component of the Digital Agenda: trust and security. Here the focus is on building confidence in digital technologies and services so that EU citizens and businesses are ready and willing to seize their digital opportunities. With mobile, it is clear that customers seek reliable privacy, regardless of where they use applications or what services or technologies are used. The mobile industry is working to address these challenges and to ensure that user privacy is respected and the security of their data protected. The focus is on helping define a sustainable relationship between users and suppliers of digital services that enhances user privacy and strengthens confidence and trust in the broader digital society.

The mobile sector is leading the development of specific tools to allow parents to protect children online and on mobile. Since its launch in 2007, the European Framework for Safer Mobile Use by Younger Teenagers and Children has led to the roll-out of codes of conduct on safer mobile use in 27 EU Member States. In addition, the mobile industry is significantly contributing to the fight against illegal child sexual abuse images online. Through the Mobile Alliance Against Child Sexual Abuse Content, mobile operators have committed to creating significant barriers to the misuse of mobile networks and services for hosting, accessing, or profiting from illegal child sexual abuse images.

### Driving innovation and interoperability

Interoperability and innovation are also at the heart of the Digital Agenda, and both are critical elements in the mobile space. Indeed interoperability is central to the GSM standard; it allows end-users to enjoy the same experience for voice and data services, no matter where they are in the world. The GSMA continues to work with its partners in the mobile ecosystem to ensure that new applications, capabilities and

devices will work together and offer consumers and businesses a seamless experience.

One area where interoperability and innovation come together is Near Field Communications (NFC), which will be a pivotal technology in enabling mobile payments. However, NFC is not just about payment. It will put the mobile phone at the centre of a wide range of innovative services and applications, such as mobile ticketing, mobile couponing and secure access, and will contribute to smart homes, offices and cities. There are now more than 20 NFC pilot projects underway around the world and many more are planned.

### Enabling the 'Digital Single Market'

With over 622 million active mobile connections in Europe, each with an individual billing relationship with an operator, the mobile industry is in a unique position to help create mechanisms to support the growth of the Digital Single Market. The mobile medium can, for example, be a major conduit for eMoney, which would facilitate commerce and cross-border travel through ease and speed of ticketing. By storing a consumer's credit/debit card within the mobile handset's SIM card, or enabling consumers to use their existing billing relationships with operators to make payments for goods and services, mobile phones can be used to complete transactions.

Mobile Internet access also enables consumers to exercise greater choice in their purchases, with easy and ubiquitous information about competing offers for a good or service, either in nearby locations or on the Internet.

### Mobilising Europe's digital agenda

A Digital Single Market based on fast Internet connections and interoperable applications will spur innovation, economic growth and improvements in the daily lives of citizens and businesses. Smart ICT solutions, including embedded mobile applications, will act as a crucial enabler in Europe's transition towards a low-carbon, energy-efficient economy.

The mobile industry is playing its part in meeting the challenges identified in the Digital Agenda by delivering fast Internet access, enhancing trust and security, enabling the digital single market, driving innovation and interoperability, and helping address key societal issues such as healthcare and climate change. In short, we are mobilising Europe's Digital Agenda. ●



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- WEB2.0 security
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- Digital forensics practice against cyber crimes

#### AGENDA AT A GLANCE

DAY ONE MORNING	DAY TWO MORNING
<ul style="list-style-type: none"><li>- Global cyber crime outlook</li><li>- China police updates on e-crime actions</li><li>- Cyber security approach in China</li></ul>	<ul style="list-style-type: none"><li>- Web 2.0 security in China: web applications security</li></ul>
DAY ONE AFTERNOON	DAY TWO AFTERNOON
<ul style="list-style-type: none"><li>- E-commerce vs organized e-crimes in China</li><li>- Evolving cyber threats and attacks</li></ul>	<ul style="list-style-type: none"><li>- Smarter criminals, smarter solutions – Digital forensics practice</li></ul>

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## IPTV - the future

by Yun Chao Hu, President and Chairman, Open IPTV Forum

Originally, IPTV consisted of a single service provider offering TV content and interactive services via a set-top box. Today, IPTV's multi-service-provider, multi-content-source, multi-network, multi-device universe delivers a 'what I want, where I want it, when I want it, how I want it' experience. This variety is great for the consumer, but is increasingly difficult for service providers to manage without industry-wide standards for IPTV services and devices such as those being developed and introduced by the Open IPTV Forum.



*Mr Yun Chao Hu is the President and Chairman of the Board of the Open IPTV Forum that targets the development of the next generation IPTV providing end-users a completely new experience for their entertainment and communication services. Yun Chao Hu is currently employed by Ericsson Sweden in Ericsson Corporate Function Standardization where he is responsible for IPTV standardisation strategies as well as business and product strategies for Ericsson IPTV solutions. Yun Chao Hu has worked within several Ericsson organizations within China, Sweden, Japan and the Netherlands. He was actively involved in many standardization areas including Intelligent Networks (IN), IMT-2000, UMTS, IMS and PacketCable and participated in such standardization bodies as International Telecommunication Union-Telecommunication (ITU-T), 3rd Generation Partnership Project (3GPP), International Trade Commission (ITC) (Japan), China Communications Standards Association (CCSA) (China), CableLabs (USA) and European Telecommunications Standards Institute (ETSI) (Europe). He acted as ITU-T SG11 Q.24 Rapporteur, 3GPP TSG CN WG 4 Chairman and several editorships.*

*Yun Chao Hu began his career at Ericsson Netherlands as a member of the IN Application Laboratory. Before joining Ericsson, he worked as System Analyst for Cross Connect switches and as research-assistant at the Technical University of Eindhoven in the Netherlands.*

The original IPTV proposition involved a single service provider offering TV content and interactive services via a single STB (*set-top box*), but this view of IPTV is being superseded by a multi-service-provider, multi-content-source, multi-network, multi-device concept and corresponding mindset which delivers not only a 'what I want, where I want it, when I want it' experience but as International Telecommunication Union-Telecommunication (ITU-T), 3rd Generation Partnership Project (3GPP), International Trade Commission (ITC) (Japan), China Communications Standards Association (CCSA) (China), CableLabs (USA) and European Telecommunications Standards Institute (ETSI) (Europe). I

want it' experience. This environment is characterized by diversification of content and content source at one end of the delivery chain, diversification of delivery device and location at the other, and flexibility regarding the path between content and consumer.

Central to this changing definition of IPTV is the fact that video from multiple sources, delivered through various networks to any device, must now be considered an inevitable and desirable (even essential) part of a compelling future TV experience. For this reason, credible IPTV solutions must be prepared to adapt and evolve to accommodate this broadening definition of IPTV.

Ironically, as the world of IPTV becomes ever more complex and potentially ever more fragmented, this evolution poses a risk to the development of a coherent and efficient IPTV market. Although it's possible for many desirable linear and on-demand IPTV services to exist using independently developed technology islands, the potential for IPTV innovation becomes more compelling if 'joined-up thinking' is applied to the infrastructure, the services, the content and the applications.

It's this desire for joined-up thinking which led to the creation of the Open IPTV Forum (OIPF), a global organization involving many key stakeholders in the IPTV market. The goal of the Forum is

to stimulate an end-user mass market for IPTV by accelerating the introduction and deployment of industry standards-based IPTV services and devices. It aims to achieve this by agreeing and placing in the public domain a set of end-to-end specifications for the creation of standardized IPTV solutions and services, using existing standards from established standards bodies wherever possible.

By dealing with the detailed interactions at the many interface points within and between networks, services and users, the OIPF specifications allow the different elements to be decoupled (for example, separating network investments from in-home investments). This means that vendors can develop products independently, within the scope of the specifications, confident that the results of their efforts will integrate and interoperate more readily in the broader IPTV environment.

So there's tremendous interest today in the potential for IPTV, broadly defined as the delivery of 'televisual' content using Internet Protocol, to reshape and eventually redefine the TV experience. But this reshaping involves not only our relationship with the TV set as a standalone device, but also the ways in which it can interact with other devices and various content sources to engage us in new and innovative ways, and the reality that a TV experience need no longer actually involve the TV set, or may include the traditional TV set in combination with other devices. The emergence of video as a ubiquitous format has thus changed perception of the term 'TV', which in one context means the familiar device in the corner of the living room which is many people's primary source of information and entertainment, but also refers to a particular consumer video experience which is characterised as having high visual quality and reliability, and a simple model for control.

The OIPF is focused on the development of pragmatic specifications and usage profiles which correspond to these evolving expectations of the IPTV market. This is not easy, as trends emerge, morph and fade with alarming speed, but there are certain fundamental expectations which permeate these trends and which the OIPF has adopted in defining the basis for the published specifications.

So what does this mean in today's rapidly changing market for video consumption? Is

all video a form of TV, and does TV include the delivery of video in all forms and in all environments? There's no consistent answer to these questions, but it's fair to say that the human interaction requirements of many popular online video services do not incorporate the key TV characteristics of quality, robustness and simplicity, so when we think of a future, broadly based IPTV solution we must adapt our mindset with respect to what constitutes TV. It's a very subjective concept, based largely on the expectations and tolerance of the individual TV consumer.

The goal of the OIPF in defining its specifications is to accommodate this flexibility and leave it to service providers to decide how narrowly (or not) they wish to define TV in the delivery of their services. There is clearly a push to incorporate OTT (*over-the-top*) Internet-based content alongside managed high-quality content in delivering a broadly based and differentiated TV service, but in many cases the distinction between perceived content quality will be reflected in the devices used for consumption. So although the OIPF allows and accepts a flexible mapping between source and consumer device, this flexibility may only be partially implemented in many cases.

Ubiquitous availability of increasingly capable network technologies, in the fixed line, wireless and cellular domains, is by its very nature blurring the distinction between devices and more specifically between screens. The largest screens on mobile devices are larger than those on the smallest TVs, so size as a delineation factor for delivery of services is no longer an appropriate metric. TVs, PCs, PDAs, Tablets and smartphones all have capabilities which can, if desired, be utilised by service providers and hence by consumers.

This blurring of screens leads to a natural desire to make content ubiquitously accessible from any device, so standardising the repurposing of content is a key element in catering for the expanded multi-device environment. But being able to simply access content on different devices is not enough. The OIPF specifications also allow for session transfer between devices, so a piece of content can be part-watched on one device, paused, and then seamlessly picked up on a different device at a later time in a different location.

By blending communications services with content services, shared experiences can

be enjoyed by different people in different locations and on different devices. So standardisation of this expanded form of IPTV allows developers, service providers and consumers to start to explore the innovation and imaginative services which were intended from the outset to be the driver for IPTV.

In the case of handheld devices, not only can they participate in the kind of flexibility described above, but the device itself can be used as a remote control for other devices and services, such as remotely programming a PVR (*personal video recorder*) device or even being used as a content selection device in which the screen can be configured to provide simple, highly functional control for specific applications developed for traditional TV sets, but which cannot easily be controlled using a conventional RCU (*remote control unit*). When coupled with such existing mobile capabilities as itemised billing, hand-held devices become natural candidates for network-based control of large-screen applications.

Whether consumers will want to access the same content on all devices is still a matter of much debate, and it may well be that consumers will vary in terms of their willingness, for example, to watch lower quality online clips on their large plasmas, or Hollywood movies on their mobiles. However, it is reasonable to assume that as average video quality improves, and average connection bandwidth increases, the distinctions - which may initially be geographic, or generational, or depend on the breadth and quality of the traditional local TV service - will diminish.

IPTV will continue to evolve, but the fundamental requirements of infrastructure compatibility (integration and interoperation), and apps and content portability (develop once, deploy many) will persist. The OIPF is determined to facilitate these characteristics for the benefit of all IPTV stakeholders, not just the Forum members, and is making substantial progress in this respect. Ultimately, however, the success of the OIPF will depend on broad industry support for its goals and use of OIPF specifications, profiles and certification; and an invitation to join the Forum is extended to anyone who shares the ambition to make IPTV a major force in the connected future. ●



## The tides of change

by Christian Morales, Intel Vice President and General Manager, Intel Europe, Middle East and Africa (EMEA)

Mobile systems will shape the consumer market during this decade. ‘Companion’ computing devices- smartphones, tablets, laptops, netbooks and such - with wireless Internet connections, truly powerful processors and access to an amazing variety of apps store systems will dominate consumer ICT. Devices designed for visual computing will lead the market; context-aware computing systems will use hardware and service provider information to ‘sense’ users’ moods and anticipate their needs; and ‘client-aware’ clouds will provide an online experience optimised for the user’s needs.



*Christian Morales is an Intel Vice President and the General Manager of Intel Europe, Middle East and Africa (EMEA); he is responsible for Intel product sales and marketing in the EMEA region. Mr Morales has held senior international management roles in sales, channel operations and general management including as Intel’s Vice President of the Sales and Marketing Group and Co-General Manager of Asia Pacific and General Manager of Latin America. Mr Morales joined Intel in Paris as a field sales engineer and soon became Director for Spain and Portugal.*

*Christian Morales graduated with an electrical engineering degree from the Electricity, Mechanics and Electronics Engineering School in Paris and later completed the Young Managers Program in the MBA program at INSEAD.*

Change and innovation in the digital world are things that we take for granted; they are almost considered constants. More obvious is the way it is changing our lives at home and in everyday life, but also in the workplace. The constant rise of the consumer, something that is regularly remarked upon as a demand driver in Europe and indeed in other parts of the world, should not obscure the challenges that mobile computing poses - and offers a solution to - in business.

Moreover, the notion of mobile is also evolving rapidly. Not so long ago it was terminology confined to laptop computers. In 2007 the iPhone gave new life to the smartphone and 2009 was the year of netbooks, companion devices for some,

and first-time devices for others. Last year, 2010, saw tablets, yet another form of companion device, finally make an impact in the marketplace. Three new devices in four years tell this story of relentless and increasingly rapid change. It also makes foretelling the coming year in terms of one or two trends or devices very tricky, so it is necessary therefore to cast the net slightly wider for 2011.

### Going visual

One trend that stands out is visual computing. This means different things to different people, but here we are talking about the advent of a range of new experiences that all have a strong visual

component, all underpinned by devices and components designed explicitly for enabling such experiences.

The figures speak for themselves. Over two billion photos are uploaded every month to Facebook, adding to the 20 billion already uploaded. On YouTube, two billion videos are viewed every day. And it is not just content consumption. Content creation is no longer the domain of a privileged few: 24 hours of video (an entire day’s worth of content) is uploaded every minute on YouTube, more and more of it in HD.

Gaming too has emerged into the mainstream. More people than ever enjoy games, whether it be casual, mainstream or the more





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The implications of this shift to visual computing are significant, and the profile of the Internet will change, as visual content increasingly becomes the main bulk of content. However, the growing data flood needs to be carried by a world of heterogeneous networks that will need to support billions of new devices, leading to smarter client devices that can move seamlessly across different networks, wireless or wired.

In a sense, the device is almost irrelevant - all it needs to do is consume content or create it. While the PC is undoubtedly the device for creation, smartphones, netbooks, and tablets will all consume this rising tide of content.

#### Fusion of devices, content and smart TV

The morphing of form factors will also continue apace. Previously stable devices will shift with new shapes and sizes blurring together to create compact devices that include touch screens as standard and the first context-aware interfaces.

This fusion will also be accompanied by an increasing amount of content. Take, for example, smart TV, which is gaining increased popularity among consumers. It collates reams of programming and images from sources as diverse as websites, personal photograph libraries, film libraries and more. It presents this wildly diverse content via a super slick interface, signalling an evolutionary movement from passive TV watching to active engagement with what appears on the screen.

However, 'smart TV' will not be confined to TV and the living room. Smart TV content will spread to mobile devices. People will naturally view their favourite TV shows on mobile devices while travelling, for example, and finish watching on their TV screens when they get home. We'll see continued fusing of content across mobile devices.

#### Companion computing devices

The year 2010 saw PC shipments reach one million per day. In the coming year we expect laptop demand to stay strong. The visual experiences and the technologies that enable them will be the main drivers of this, alongside perhaps an increased uptake from small business.

From the vendor's side a noticeable push this year will be the profusion of Tablet PCs. Having seen arguably only one tablet dominate the market in 2010, this year could see that number rise considerably, offering differing sizes, operating systems and capabilities, and all of course at different price points.

Also in the companion device space, netbooks are likely to continue their popularity, offering throughout 2011 an increased range of capabilities and form factors. Also serving to keep this category fresh and invigorated, the nascent app store infrastructure will offer to users of these devices what tablet and phone users have had all along.

In the smartphone category, the only prediction here is that they continue to go from strength to strength.

#### Protecting mobile computing

As the wave of mobility reaches even greater heights there's going to be a corresponding need for enhanced security and protection. Today, hacking is largely confined to hidden attempts to extract money or information from servers and desktop PCs.

However, as mobile computing becomes more prevalent with new usage models, such as the cloud and numerous CE (*consumer electronics*) devices connecting to the Internet, security will remain one of the highest priorities for the IT industry, both to protect our data and identities online, but also to handle the growing number of financial transactions - expected to reach two trillion by the end of this decade. This year, 2011, micropayments are likely to grow strongly as the uptake of subscription-based apps increases; micropayments will be among the most important drivers of online financial payment volumes.

Over the next year, the industry may have to focus on such basic capabilities as hardware-based security, enhanced by software to protect the infrastructure and safeguard personal, business and government information.

#### New mobility

The definition of what constitutes mobile computing continues to change, and an industry that has its emotional heart in Europe is set to take this a step further. The automotive sector, the leading light of

European industry, is leading the way in in-vehicle infotainment (IVI) systems. It may well lead the world in making this a reality in 2011.

These IVI systems promise much the same in terms of experience as other mobile computing devices, based as they are on the same hardware, software and connectivity building blocks as every other type of device I have so far mentioned. I am genuinely excited not only at the prospect of this technology, but also that it is Europe that will be in the vanguard of making this a market reality.

#### The Internet of things

Taken together the dynamics I've outlined above are incremental steps in the movement towards more ubiquitous mobility. And in the coming years the continued realisation of Moore's Law will enable us to add computing capability and Internet connectivity to literally billions of devices. In turn this will lead to new computing usage models which will define new categories such as the smart home, the smart car and smart energy.

As you are reading this, hardware and software development is going on all over the world that will create an era of context-aware computing. Mobile computing devices will use sensors such as cameras and GPS-based information together with a service provider's information about, say, their users' food preferences to make on-the-spot recommendations regarding nearby restaurants. This combination of 'hard' data and 'soft' information will be used in a wide variety of situations to 'sense' users' moods and anticipate their needs.

Finally, 'client-aware' clouds, which know what types of applications, commands and processing power your computer uses and needs, are coming closer to reality. Network infrastructures will be central to making this a reality. However, we're not that far away from the time when a mobile computing device will take a user's profile and device features to provide an online experience that is absolutely optimised for the user, whether it's business or pleasure.

We're on the cusp of a brave new world of mobile computing and content delivery that is going to change the face of how we interact with each other and the world around us. ●

## Monetising the cloud

by Liam Maxwell, Vice President of Products, Oracle Communications

Cloud computing is an evolutionary next-step, a major improvement in how we use technology to achieve business objectives and accelerate return on investments (*ROI*). Cloud computing is a combination of technologies that have been brought together to provide flexibility, streamlined business processes and enhanced, more efficient, architectures. However, it also brings challenges to the fore in areas such as security, integrity and cost apportionment. Communication Service Providers (*CSPs*) are in an ideal position to effectively monetise cloud services through service differentiation.



*Liam Maxwell is Vice President of Products for Oracle Communications, responsible for product development and strategy for the Communications and Media industries. Mr Maxwell joined Oracle via its acquisition of Portal Software where he last served as Chief Product Officer. Prior to this, Mr Maxwell held management positions with Aerial Communications and Computer Sciences Corporation.*

*Liam Maxwell graduated from Illinois State University with a Bachelor of Science degree in Business Administration and Information Systems.*

### What is cloud computing?

Cloud computing is Internet-based computing, where shared resources, software and information are provided to computers and other devices on demand. It is not a technology revolution, but rather an evolution, which has huge potential value when viewed in this context; and one that allows existing investments to be maximised.

As a phenomenon, cloud computing continues to experience significant growth, both in terms of people's awareness of it, and its implementation.

For *CSPs* (*communications service providers*), the commercial potential of providing a public cloud to customers is significant. However, as well as providing a great opportunity to create new revenue streams, *CSPs* need to know that the cloud also has the potential to impact existing revenue streams and services.

### Generating revenue from the cloud

With cloud computing appearing on the front page of *The Economist* and household names such as Google and Amazon already providing cloud services, cloud computing is quickly becoming mainstream. It is also

now firmly on the agenda at many corporate board meetings. As a result, *CSPs*, Internet players, systems integrators and technology vendors are all striving to become cloud providers and ensure their place at the table. This dash to secure a slice of the revenue means that swift action is essential for those who wish to succeed in the race to provision and successfully monetise the cloud model.

For years, *CSPs* have been using elements which can be viewed as cloud technologies, such as virtualisation and scalable storage. However, in order to achieve scale and reap the benefits cloud has to offer, *CSPs*



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should look to deploy clouds in their own operations as a test bed for the technology.

CSPs have a critical differentiator when it comes to cloud computing, which is the network itself providing the connection fabric that links the 'cloud' element together. By positioning themselves at the heart of the cloud and getting business end-users to operate through the cloud, they will greatly increase their network traffic and transport revenues.

The first two revenue-generating opportunities open to CSPs are derived from this function. By selling networking capabilities as a service to enterprises, CSPs can charge for a given level of connection quality to a cloud provider. Similarly, CSPs can also charge cloud-based providers for delivering agreed levels of network service quality.

The third revenue-generating stream is more complicated; however, the ROI is much greater when CSPs are offering IT resources directly to customers and become cloud service providers themselves. Verizon and Orange Business Services are examples of global operators who already offer their own cloud services to businesses.

In addition, CSPs are uniquely placed to understand which industries are not using the cloud and identify opportunities to generate new revenue. For example, CSPs are already developing a wide range of offers across segments such as: utility hosting; providing development environments for third parties to test application programming interfaces; enterprise ecosystems; desktop service creation; and digital content creation - all of which are well beyond their core communication services and network connectivity.

#### Business benefits of the cloud

Cloud computing delivers real business benefits that are easily measurable including cost reduction, increased efficiencies and systems and platform rationalisation.

Cost reduction is a significant factor; businesses can significantly benefit from the economies of scale and low cost of ownership offered by the cloud. In addition, reduced costs associated with real estate and utilities such as electricity and air conditioning can also greatly reduce an organisation's overall operational and capital expenditures.

Efficient delivery of services is another benefit. Providing businesses with access

to resources through an on-demand infrastructure means that they can turn on and off specific systems and services as and when required. Consequently, the cloud gives users greater choice and flexibility. As such, the CSP public cloud model means that businesses can have on-demand access to a powerful set of systems and applications, which they may not have been previously able to afford, and only pay for the services and time they use.

By using a CSP public cloud, businesses can eliminate the cost of keeping duplicate - often underutilised - IT architectures and systems in place. Many businesses have numerous servers, which never run at capacity while others are often over worked. By utilising a CSP public cloud model, businesses can rationalise their systems and platforms and remove these inefficiencies and their associated costs.

The cloud also enables superior customer interaction. Having customer information in a single place can greatly enhance a business's knowledge of its customer base. By providing a 360-degree view of customers, businesses can deliver faster, more responsive services across every channel from the call centre to the social web. In addition, by linking up different functions from across the business, such as sales, marketing and CRM, they can gear themselves around the single view of the customer and work in conjunction with other areas of the business, rather than working in isolation.

#### Successful cloud transformations

Before CSPs can monetise the cloud, however, they need to capitalise the business transformation programmes they have already undertaken to make sure that the investment in these programmes isn't wasted. For the most part, the business transformations already underway in CSPs are 'cloud-friendly', however much needs to be done to ensure that everything runs smoothly once implementation is complete.

When a CSP undertakes a business transformation they need to take a number of aspects into account to make sure it is a success. CSPs need to ensure that they have the right strategy in place, with clear organisational direction and directly aligned IT support.

Systems are also crucial in the transformation process as the right

infrastructure is necessary to support new business and customer-driven processes. Equally, innovative use of new technologies is required to establish competitive advantages in terms of cost reduction through economies of scale, rationalisation of IT and scalability.

Once the cloud is in place, as with any system, CSPs need to ensure that they have the right people running it. Cloud implementations can often have a significant impact on organisational structure and this needs to be addressed and aligned to suit the needs of the business.

Finally, there is the need to ensure that the correct policies and processes are in place to govern the cloud and the need to ensure that the interfaces are seamless in order to facilitate their use by businesses and key constituents, and to make sure that everyone is able to use the new cloud model.

There is a real opportunity for CSPs to monetise the cloud by providing services to business. However, if they are to succeed, they need to act quickly to ensure they do not miss out to emerging competitors like Amazon and Google who have already started winning mind share with potential cloud customers.

The legitimacy of CSPs in cloud provisioning is not in question. In fact, given that they provide the fabric that binds cloud computing together, they have a very good case to put themselves forward as cloud providers for businesses. Presently, however, CSPs are not doing this, and an emerging market that they are well positioned to capitalise on could slip through their collective fingers. CSPs need to they might lose, such as voice, if they do not. If this happens and CSPs don't rise to the challenge they will face difficult questions from stakeholders when traditional revenue streams start to dry up or disappear.

CSPs can play a very important role in the cloud. The combined CSP/cloud offering can be very enticing for businesses looking for a mix of elasticity, flexibility and fast access to services, on demand. However, to take advantage of this opportunity, CSPs need to start their cloud transformations now to ensure that they do not lose out on revenue to competitors in the not so distant future. ●

## Making mobile Internet flourish

by *Thierry Bonhomme, Executive Vice President of Networks, Carriers and Research & Development, France Telecom Group*

Nowadays, users are demanding high-speed connections to a wide variety of devices and services. To serve them, operators are working to get more out of existing spectrum, find new spectrum, migrate to technologies such as LTE and share network resources with other operators. Video-based services now account for the bulk of broadband traffic growth and new 'rich services' also promise to drive network traffic. To prepare for this future, operators need industry-wide standards, and networks optimised for individual service requirements.



*Thierry Bonhomme is the Executive Vice President of Networks, Carriers and Research & Development (R&D) for the Group. Mr Bonhomme previously served as Director of R&D within the Orange/FT Group strategic marketing function and, earlier, headed business enterprise and customer distribution for FT Group in France, managing the distribution of all Group business products and the control of sales and customer services.*

*Mr Bonhomme began his career at France Telecom where his first role involved fieldwork in networks, transmission and switching. Mr Bonhomme left FT to join Idate, a company specialising in research for the telecoms and media industries, as Director. He later returned to FT Group as a Director of technical management, initially for the Paris regional division and then for the Grenoble and Marseilles regional areas.*

*Thierry Bonhomme earned his degree in engineering at the Ecole Polytechnique and the Ecole Nationale Supérieure des Telecommunications (ENST) in Paris.*

We have entered a new phase in the digital revolution. Customers are now in a fully digital world and at the centre of several personal, professional, and social networks. This phase is characterised by the need to remain constantly connected, by the abundance of offers, applications and services and by the explosion of traffic exchanged by each user. We are also seeing a growing number and wider variety of devices, tablets, netbooks and, now, TV sets that are connected and which offer specific services.

This poses new challenges for telecom operators as the current technical and business models become obsolete.

### Cost-effective delivery of mobile broadband

Broadband services are multi-format. Broadband service is challenging, and the primary challenge is to provide customers with cost-effective, simple, and easy-to-use services and access.

Very high-speed broadband access is of great value for mobile users. Telecommunications operators all provide the first two basic services that customers most appreciate: reachability and throughput, that is, access to a network. The mere possibility of being always connected and able to send and receive information (voice, SMS, email, Web, video...) is what they most value.

Operators have invested heavily in recent years to improve this service and expand their mobile coverage. To increase the speed of connections, telecom operators have also invested their plans for third generation (3G) evolution to High Speed Packet Access (HSPA), HSPA+ and LTE.

There are four priorities for advanced network development:

- Getting the most out of existing spectrum resources
- Operators are deploying various versions of HSPA and now HSPA+, and are working to increase both network capacity and provide the increased performance that customers require.

**“A considerable amount of video content is already found on newspaper websites. These companies which traditionally handle texts and photos have been very good at understanding the power of video content on the Web. This trend will continue to grow as video quality gets better and new technologies, such as 3D and interactivity, become more widespread.”**

- Accessing new, suitable, spectrum resources - New spectrum bands will be needed in the near future to cope with the traffic by improving both the capacity in dense areas and the coverage of mobile broadband services. The ‘digital dividend’ spectrum and the 2.6GHz bands are complementary so that both goals can be reached.

- Migrating to more efficient technologies - The evolution of mobile backhaul to packet technologies is a good example of such migration. LTE will be a major step towards packet-based technologies optimised for large volumes, in all parts of the networks, from the radio to the core network.

- Developing and deploying complementary access technologies - WiFi access and femtocell access are currently the two main technologies in the short-range/high-throughput category. They offer a cost-effective way to expand mobile network capabilities in densely populated areas.

‘Mutualisation’ - The sharing of network resources - is an effective way to decrease network unit costs, and network operators are pursuing it actively. There are various forms of mutualisation - national roaming, RAN (*radio access network*) sharing, mutualisation of service platforms, mutualisation of operational teams within a group, outsourcing of operations, and the like. However, they all target the same goal: reducing costs to remain competitive through economies of scale and the elimination of redundant infrastructure.

#### Broadband growth trends

Mobile Internet is not merely a question of faster access; it brings new behaviours, new usages, and new applications.

One trend that is emerging in mobile broadband, and fixed broadband too, is the development of video-based services. These services now account for the bulk of broadband traffic growth. They include real-time TV and VOD (*video on demand*) services, which have seen

a very high adoption rate in France, as well as Internet video clips (YouTube and Dailymotion), and video content produced and posted online by companies and individuals every day.

A considerable amount of video content is already found on newspaper websites. These companies which traditionally handle texts and photos have been very good at understanding the power of video content on the Web. This trend will continue to grow as video quality gets better and new technologies, such as 3D and interactivity, become more widespread. However, some of this video traffic will require dedicated management to guarantee cost-effective, high-level, quality.

The second emerging trend is the development of ‘rich services’. ‘Rich services’ refers to services that are easy to use and which give customers clear and direct benefits with real, usable, value. Rich services are complex to deliver and require technological innovations. They may require the combination of various types of information and services, and, in many cases, involve several specialised service providers. ‘Location-based services’ are an example of such services. To create these services, we need to develop an industry-wide cooperative environment, in which value is created jointly by several actors - each of which is rewarded according to their level of contribution.

#### Mutual involvement for customer satisfaction

Customers’ expectations are high, and in order to meet them we need:

- efficient networks;
- appealing devices;
- applications that bring value to the user;
- simple and attractive offers;
- value for money and rewards for all.

The first two requirements are obvious and network operators are already working on the needed high-performance networks. The other requirements are less tangible and more difficult and a variety of actors will have to work together to achieve them.

Two specific items need further development - open interfaces and interoperability, and the optimisation of network behaviour for individual service requirements.

#### Open interfaces and interoperability

Many operators already have some open interfaces and many have open APIs that developers of applications for SMEs can use. The need for interaction between the operator’s services and the many applications developed by users and developers will increase. We have to, as an industry, continue developing common models and standardised interfaces, to ease the development of new applications.

#### Optimisation of network behaviour

The existence networks carrying traffic without capacity limits (the ‘all you can eat’ model) while maintaining a consistently high quality of service, is a myth. Networks must be optimised for the services they carry and this need will always remain. The overall optimisation is already under way, as described in the first section. The next optimisation that will be needed is an optimisation that takes into account the specific characteristics of the service and its value for the customer. This optimisation may take the form of quality of service parameters specifically set per service. It may take the form of caching of content adaptation and usage policies. However it is done, we will have to put in place the mechanisms to manage and optimise the customer experience.

The foundations are being laid today to respond to the mobile Internet boom. Nevertheless, we still have work to do to reach maturity and offer a full variety of services - each with an optimised user experience - but there is no doubt that our sector can answer these challenges. ●

## Near field communications brings touch and transact

by GV Kumar, Founder and CEO, XIUS

Near field communications, *NFC*, is a short-range (about 10cm) wireless technology. It is available on some smartphones and used primarily to substitute cash and credit cards at points of sale (*POS*). Touch an NFC device to a point-of-sale terminal - a vending machine, a mobile poster, a subway turnstile, a mobile top-up sales point - and the transaction is closed. New contactless subscriber identification module (*SIM*) cards lowers the cost of NFC and makes it feasible for low-income users throughout the world.



*Mr GV Kumar is the founder of XIUS and the CEO of XIUS-begi; he has nearly two decades of IT and telecommunications' experience. Mr Kumar is credited with the conceptualisation and commercial development of a number of patent-pending wireless technologies and services in such emerging fields as intelligent networks, convergent solutions, mass subscriber customization, wireless roaming and wireless OSS. Prior to XIUS, Mr Kumar began his career with the Godrej Group of India, and last served as CEO of Godrej Telecom Ltd – the telecom arm of the Godrej Group.*

*Mr Kumar graduated from the National Institute of Technology, Bhopal, with a specialization in electrical engineering and received an MBA from XIMB.*

Mobile technology continues its march around the globe. It is changing lives by connecting families and friends through voice, text and email. New mobile handset-centric applications such as games, navigation and shopping are growing and such critical services as mobile banking and mobile healthcare are increasingly present in the lives of people around the world.

High-end users are changing their handset as frequently as they change their wardrobes; the mobile phone has become an extension of who we are. However, the mobile user's experience varies depending on the phone that they

use - a hot smartphone or a basic handset. With the availability of higher bandwidth and smarter phones, new and more sophisticated content and applications are available to users. While both smartphones and basic mobile phones offer voice and SMS services, the divide between the sort of services available to the user widens, depending upon their handset, when it comes to value-added services such as ring tone, music, video, billing top-ups, and more.

For basic handset users, as opposed to smartphone users, the service experience depends largely on the subscriber's handset

model, their familiarity and knowledge of that handset, and their ability to pay. Although smartphones with Web connections offer easy and intuitive one-touch access to the latest mobile apps and services, basic handset users must rely on USSD (*Unstructured Supplementary Service Data*) or SMS to receive services. With basic handsets, the experience can be complex or inconvenient at best and, at worst, disenfranchising, for poor or illiterate mobile subscribers.

Luckily for subscribers, the burgeoning availability of the mobile phone has also sparked innovative service delivery



improvements. By uniting near field communications with 'touch and transact' point-of-sale components, mobile network operators can deliver on the promise of true anytime, anywhere retail and mobile commerce access, serving a broad spectrum of mobile subscribers. NFC is taking great strides in changing the perception of mobile commerce from that of a value add for the high end-user to a basic service for all subscribers.

Mobile touch transaction solutions offer retailers, banks and other businesses an opportunity to boost their revenues via NFC-based applications that offer anytime, anywhere electronic talk time recharge, bill payment, utility payment and other self-service value-added services for subscribers. Through the application of mobile touch and NFC technology, mobile operators, retailers and essential service providers can offer easy-to-use, cost-effective interfaces for all subscribers, regardless of handset preference.

Network-agnostic mobile touch technology platforms work through touch points such as a 'stick-on' contactless-SIM, touch pads, in-car services and 'mobile posters' to provide anytime, anywhere value-added services. The mobile subscriber initiates any and all transactions by simply 'touching' their handset to network components such as readers, POS terminals or smart posters. The user does not have to dial- or SMS-in information, nor do they have to establish complicated connections such as GPRS. The simple and user-friendly transactions are completed in seconds, as opposed to magnetic stripe credit cards or scratch card transactions, which can take several minutes from start to finish.

Mobile posters are a type of printed electronic technology - a paper-thin-self-service terminal device with a glass touch sensor. By including an NFC tag on the handset, basic phone and smartphone users alike can perform interactive transactions in real-time by simply tapping the mobile poster. Icon- or text-to-speech-based interactions provide users with a visually attractive and familiar means to collect information that is handset-independent and available in a language and layout the user will understand. The posters are visually appealing and can be tailored to specific consumers based on region, language and location. Mobile posters can enable as many as 18 retail touch points at any given customer-gathering point.

Mobile poster transactions are likely to be particularly appealing to pre-paid subscribers who, until now, would have had to divulge personal information to store clerks in order to top-up their accounts. With mobile touch technology, top-up transactions are done via a mobile poster within the operator's retail location. The subscriber simply interacts via the poster to specify top-up amounts, and all information is retrieved and stored via a back-end database. This ensures privacy by eliminating the need to divulge personal information - such as phone numbers - to a retail clerk. New services such as train ticket purchases, micro-purchases, mobile banking and a wide variety of other yet-to-be-defined services will be increasingly available in the near future.

To appeal to the smartphone subscriber base, mobile operators can use mobile touch technology to provide low cost, self-service, 'virtual mall' posters in both populous and rural areas, introducing previously unavailable convenience. Convenient mobile poster touch-points offer high-end services such as mobile commerce, money transfer and mobile banking and also provide an opportunity for impulse purchases for items such as lottery tickets, bus/metro tickets and more. Additionally, with advanced display capabilities, barcodes for proof of purchase and redemption are securely sent to the user's phone to complete the transaction end-to-end.

The contactless SIM, on the other hand, is an application based on unique dual chip architecture with onboard cryptographic co-processors. These SIMs can work with millions of existing active handsets allowing customers to perform contact-less transactions for essential activities such as prepaid recharge or electronic bill payment, or for impulse purchasing such as booking movie tickets or transactions in cafes or music shops. Alternatively, subscribers without NFC phones can still benefit from the use of a stick-on contactless SIM card, which acts like a smart card and provides the same functionality as a smartphone with built-in NFC. Using this method, user authentication is done via touch pad. The user simply needs to punch in his/her authentication code, and transactions are completed upon authentication.

Delivery of value-added mobile services is convenient to some and critical to many. But whether you consider your phone a

fashion statement, or a critical link to the outside world, innovative application of technology in the areas of NFC/mobile touch technologies have the potential to deliver anytime/anywhere access to premium services for subscribers of every social and economic stratum. Touch and transact technology promises to simplify the process of obtaining information and purchasing goods - and reverse the trend towards increasing complexity of handset interactions. For subscribers, this means convenience, faster transactions and complete security. For retailers and operators, this technology opens up new revenue streams, customer 'stickiness' and operational efficiency. Best of all, this technology exists today and can be used with existing distribution and telephony networks to provide unique value-added services for subscribers the world over. ●



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# Automating mobile application testing

by Eran Yaniv, CEO, Perfecto Mobile

Smartphones, tablets and such have given birth to a new, enormous, market for applications (*apps*). Users expect apps to work on any device and network from the start so they must be tested. Testing mobile applications is time-consuming and daunting, but now developers have only to access devices through the cloud and run automated tests. The cloud helps testing from design to pre-launch testing to post-launch monitoring; resulting in faster launches and better mobile applications that cost less to develop.



*Eran Yaniv is the CEO of Perfecto Mobile; he came to Perfecto Mobile from Comverse America where he was VP of Product Marketing. Prior to assuming his responsibilities at Comverse, Mr Yaniv was the general manager of the Valisys Quality Management business unit in Technomatix. He served as the director of R&D in Technomatix Ltd in Israel, where he managed most of the company's development activities.*

*Eran Yaniv earned a BSc and MSc in computer science from Tel Aviv University.*

The market for mobile communications has one of the highest levels of mass adoption ever seen; today, mobile devices, smartphones and tablets are omnipresent. The ubiquity of mobile computing presents an opportunity and a challenge for marketers and developers. Users have come to expect a mobile version of nearly every application, and developers are understandably eager to meet those expectations. However, the approaches to mobile application testing upon which companies relied in the past are no longer adequate. Today, the competitive and dynamic mobile market includes a rapidly proliferating number of handsets, tablets, operating platforms and carriers. Developers need to test for all of the many variables that their applications might encounter. This raises numerous questions about testing methods and reliability.

There are several factors businesses should keep in mind during the testing phase of application development:

In an ideal world, developers would have the time and resources to test every application on a physical device or tablet. This is not an ideal world.

Apple gets the credit for breaking ground and building the public's hunger for apps. Its App Store dominates the market with ten million downloads every day. However, Apple is no longer alone in this market. Operating systems like Android are gaining popularity, enabling third-party handset manufacturers such as HTC and Motorola to create Android-based devices and compete for market share. When we consider tablets,

the landscape looks even more crowded. That is both a boon and a difficulty for application developers who want to deliver to every user on every device and on every network.

Developers could, once, test their applications on actual devices to find flaws and enhance performance. However, the current diversity of devices, operating systems and carriers makes it virtually impossible to manually test for reasonable quality standards with a sufficient range of physical mobile devices. Attempting to do so poses major time-to-market implications. Physical device-testing is both time-consuming and error prone, often leading to late bug discovery and significant delays in the release of applications. For new companies on a budget, physical testing is

especially problematic, since it is difficult for a test manager to accurately estimate the time, cost and resources for the project. Moreover, a testing lab for physical devices is expensive, especially when new devices are launched frequently and must be tested with applications in a multitude of live networks worldwide.

There is a time and a place for simulation testing, but it is not adequate on its own.

Emulators and simulators give an approximation of devices that can be useful in early stage testing. Their results are close enough to influence preliminary application development. However, when marketers and developers choose to rely solely upon simulators, they often encounter serious flaws when the applications reach the market. Simulation can provide false data related to performance, security and fault-tolerance in various different parts of the world and different networks. The software versions these devices emulate are not always up-to-date, so developers are likely to get a shock when their applications launch after simulation-only testing. There are additional problems with simulation; they don't offer advanced capabilities like automation, so the testing process can be protracted, delaying efforts to release an application. Given the market's intense competition, application developers cannot afford to bring late, flawed products to market.

Automation is essential to maintaining competitive advantage and producing accurate test results.

Today, companies can and should mechanize the tedious, repetitive trial scenarios that are necessary, but time-consuming, to the testing process. Companies can accomplish far more with fewer resources when they have the ability to script multiple usage and test scenarios for data-driven regression and functional testing, schedule them, run them in loops, and run them in multiple devices. Automation transforms tasks that previously took manual testers days to complete. This capability enables the unattended execution of comprehensive automated test scripts on multiple devices.

Test automation also has the advantage of accurately documenting the same sequence of steps with each session. This is especially important for bug detection. In manual testing, developers might uncover defects through casual experimentation and then find they are unable to reproduce the steps that produced the bug.

Testing scripts can also incorporate built-in functions according to device manufacturer, model, operating system and version, as well as additional elements. The user defines the function once, and then the task becomes part of the automated testing procedure. For instance, users might automate procedures for macro recording, validation and monitoring functions. Functions of this kind make it possible to create simple test scripts in minutes and with minor modifications, reuse the scripts on several devices, and use them again for enhancement and approvals of mobile applications and services. The cloud's automation tools can reproduce defects and ensure the overall accuracy of regression, integration and application testing, enabling bug detection and correction early in the application development cycle.

Finally, developers can use advanced test scripts to help combat the app stores' complicated submission and certification procedures. All of these factors support the need for automation in mobile application testing.

Remote device access lets developers test on multiple devices and carrier networks without depleting resources.

We know developers should not rely solely on simulators for application testing. We know that warehousing and manually testing on every single device is impractical, close to impossible, but it is possible to automate the testing for multiple devices with existing technology. We know that automation is essential to a timely application launch. The parameters for exhaustive testing seem to make comprehensive testing impossible, but the introduction of remote device access makes it not only possible to test on multiple devices, but easily accessible and, given market conditions, essential.


The cloud can support remote handset testing, troubleshooting and monitoring of applications on real devices over the Internet in real time and across major global mobile networks. Cloud-based platforms provide real devices connected to the Web that can be used to make phone calls, send text messages and download applications. Developers simply choose which device they want from a list of hundreds of options located around the world. The team then remotely runs reliable and automated exercises such as regression testing, functional testing, data-driven testing, security testing, monitoring and more. Given the rapid state of change in the mobile marketplace, remote access testing

is a game changer for application developers and marketers.

#### Application testing moves to the cloud

Web usage statistics are rising rapidly, and mobile devices are fuelling that increase. As more and more people rely on smartphones and tablet devices for personal and business use, application developers face nearly endless opportunity for innovation. To date, the main hurdles have been their own imaginations and the limitations on testing. The latter is no longer an issue.

Testing mobile applications is a time-consuming and daunting process, but now it is a simple matter of accessing devices through the cloud and running automated test scripts. The 'handset cloud' helps quality assurance teams move from design to pre-launch testing to post-launch monitoring. The results are faster launches and better mobile applications that cost less to develop. ● ●



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## Next generation, network-wide, dynamic policy management

by Mike Manzo, Chief Marketing Officer, Openet

Given the exploding demand for bandwidth, operators have to make difficult resource management decisions on a second-by-split-second basis to keep their networks functioning, to maintain quality of service and to generate reasonable returns on their investments. 'Policy management' administers network traffic to ensure appropriate QoS levels. Next-generation policy management lets operators dynamically and intelligently control, in real-time, what, when, where and how subscribers can access network resources and allocates network resources - bandwidth, traffic priorities, volume, etc - accordingly.



*Michael Manzo is the Chief Marketing Officer at Openet where he oversees all aspects of marketing and product management. Prior to joining Openet, Mr Manzo worked in the Enterprise Solutions group at Nokia, where he consulted on M & A integration and marketing of enterprise mobility solutions. Mr Manzo has also held executive positions at Traverse Networks (acquired by Avaya), Omnisky (acquired by EarthLink), Telocity (acquired by Hughes DirecTV), and Notify Technology Corporation.*

*Michael Manzo has a BA in Journalism from the University of New Hampshire.*

Today's operators face an increasingly complex market landscape. Data access services are becoming commodities and many service providers face slowing or declining subscriber growth as markets become saturated. Market saturation, increased competition and overall declines in prices per unit of bandwidth are leading to downward pressures on pricing and margins.

Within this environment, operators face exploding demand for bandwidth. The increasing availability of, and demand for, IP content and applications via many types

of devices not only offers new market opportunities, but also strains network resources. Operators are discovering that the default options for managing network capacity - best effort routing of network traffic, simple over-provisioning, and building extra capacity - are not cost-effective. The flat rate, 'all-you-can-eat', service plans many service providers offer make it difficult to cover their growing capital and operational expenditures by increasing revenues.

Customers are becoming sophisticated and they demand more from their service

providers such as: a seamless experience across content, platforms, and devices; better Quality-of-Service; greater control over their services and spend; and on-demand access to applications and services. As subscriber data needs become increasingly diverse, businesses and consumers are expecting highly personalised services tailored to meeting their individual needs.

At the same time, network service providers are in danger of being marginalised by Over-the-Top (OTT) providers. Rather than bandwidth delivery, subscribers are



recognising that the content accessed, applications delivered and services enabled provide the true value of accessing the Internet. As a result, a variety of OTT providers are developing business models to monetise the delivery of rich and valuable content while bypassing the service providers. Telecom and cable operators face a real threat of ending up as mere Internet traffic transporters and could miss out on emerging, higher-value revenue opportunities.

Operators must deal with several strategic questions, including how to profit from data growth, how best to manage finite network resources and how to become a central element in the customer experience. Operators recognise that they must innovate if they are to go beyond being simple bit-pipe carriers. However, as new services are increasingly delivered over IP networks, operators have thus far struggled to identify, measure, manage and monetise IP-based services in real time.

#### Policy management matures

Network operators have grappled with policy management, in its many guises, for years. As networks, services and indeed subscribers evolve and their needs mature, dynamic, effective and thorough policy management has become a holy grail for telecom operators.

Policy management is used in systems and processes associated with managing network traffic to ensure that appropriate levels of QoS are applied (e.g., VoIP receives priority over email traffic). First generation policy management is limited to the realm of network traffic management. Static policies that manage QoS, network traffic and security policies are implemented locally, using a 'stove-piped' approach, on separate network elements focused on a particular access method. Since first-generation policy management was not able to incorporate subscriber or session information when making policy decisions, it utilised a one-size-fits-all approach to managing network traffic.

Next-generation policy, on the other hand, enables operators to intelligently control subscriber entitlement to network resources with real-time, dynamic policies. In contrast to its predecessor, next-generation policy controls use session and subscriber-aware policy rules such as subscriber entitlements, network resources available, application entitlements, device type,

location information, security triggers, application function triggers, SLA between partners, charging rules and the like. These policies are centrally managed in a convergent manner across multiple access networks. As networks become more complex, a centralised policy management framework can reduce the administrative overhead of managing hundreds of policies and improve control over the integrity of the policy catalogue.

Next generation policy is a dynamic function in which real-time decisions are made by taking requests from the network via policy enforcement points (e.g., deep packet inspection devices) and governs:

1. what, when, where and how subscribers can access content and applications;
2. how network resources are allocated (e.g., bandwidth, traffic priorities, volume, etc).


#### Next-generation policy management in action

Two of the newest and most popular policy management-based solutions in the industry are RAN (radio access network) congestion and IP offloading. Several types of RAN congestion solutions are popping up all over the world; they help operators manage network resources more effectively by utilising more granular network controls rather than global network policies. On the other hand, at the edge of the network, IP offloading lets operators route low-revenue-per-bit traffic off the network. The ability to identify and decide which traffic to offload requires a combination of the new offloading gateways working together with policy management systems.

Monetisation, another key component of policy, is often overlooked, but deeply important to operators - especially their marketing functions. This is the gateway that does everything from enabling new subscriber services to increasing customer loyalty and, most importantly, increasing revenues. The answers to these questions are part of a bigger picture of network control. Policy management platforms, intelligently and dynamically, control network resources independent of any knowledge of monetary values. In order to make better, more comprehensive, monetary-based decisions, online charging systems must work in collaboration with policy management. The powerful combination of these two functions provides operators with a long list of new

revenue-generating solutions, which are needed more than ever before as subscriber loyalty shifts from the carrier to the device and smartphone functionality often outpaces network capability.

Ultimately, next-generation policy management centres around three core principles: control, monetisation and visibility. This is exactly what operators need to make the most of every subscriber. This is just the beginning for-next generation policy management and the different ways operators will use these technologies to differentiate themselves and grow revenues. ●



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## 4G in developing markets

by Steve Caliguri, VP of Business Development of Acorn Technologies, Inc.

Developing nations need 4G wireless networks to provide both voice and high-speed data connectivity, but the technology is so expensive that building a solid business case is difficult in many regions of the world. Low cost handsets are needed, but traditional ways to improve equipment performance are expensive. Today, innovative chips exist that improve network throughput by over 60 per cent and significantly reduce both handset and network deployment costs, so mobile operators can profitably deploy and market lower-priced 4G services.



*Steve Caliguri is the Vice President - Telecom at Acorn Technologies Inc.; he has over 25 years of experience in the telecom and technology sectors and has led Acorn Technologies telecom division since its inception. Previously, he was a founder and senior executive officer of Leap Wireless, Inc., which began as a spin-off of Qualcomm. Mr Caliguri was also responsible for Leap's Chilean Wireless operating company investment, SMARTCOM PCS. Prior to Leap Wireless, Mr Caliguri was Senior Director of Product Management for the CDMA Infrastructure Division of QUALCOMM where he focused on the development of products for system-level applications, including WLL, mobility systems, data systems, and advanced network solutions.*

*Steve Caliguri received his Bachelor of Science degree in physics from Boston College and an MSEE from Northeastern University. He also attended Boston College's MBA program.*

We have come to expect from all of the media coverage that the roll out of 4G networks in developed nations will bring with it blazing multimedia performance, zero-lag voice communications and thousands of mobile apps, which in turn will boost economic performance and productivity. Developed nations therefore expect an optimized wireless infrastructure supporting sophisticated smart devices.

Developing nations, on the other hand, do not have the benefit of a comprehensive wired online experience. Furthermore, usage of wireless networks is typically limited to a small proportion of the population and is used for fundamental communication needs.

Wireless devices must be low cost to address the majority of the population. Smartphones are not in this category. The cost pressures in many developing nations can be among the most extreme of any world market, although 4G networks can provide excellent costs/benefit ratios; 4G market penetration will be quite low unless the high cost of LTE/WiMAX handsets is controlled.

Much of the cost is due to handsets designed with high-cost features aimed at established markets like the United States, Japan and Europe where smartphones with large multimedia-capable displays are becoming the norm. Nevertheless, even if we strip away the large displays and the bells and whistles, the

core handset is still too expensive for base of the pyramid markets.

Changes at the core of the handsets' physical design - the core of the handset's physical layer, the so-called 'PHY' - are needed to reduce their costs and match their performance to the needs of developing markets. These design changes can also improve these phones' high-speed performance, so they can even help drive short-term financial gains in developed markets.

In developed markets, 4G data rates in excess of 100Mbps are a reasonable objective. Wireless channels, however, impose fundamental range and data rate limits that make this a significant challenge. OFDM

**“In any market deployment, wireless operators and device manufacturers need to manage the trade-off between performance and system cost. Since the effective capacity of any given bandwidth allocation is degraded by multiple sources of interference, several techniques are available on the market to restore as much performance as possible.”**

(orthogonal frequency-division multiplexing - the basis for LTE and WiMAX 4G) is inherently vulnerable to Doppler frequency shifts that result when the handset is in motion - say, in a car - even at moderate speeds. OFDM is also sensitive to interference from other base stations - a serious problem in dense urban deployments. These vulnerabilities reduce data and voice rates, and seriously hamper the ability of these networks to bring high-speed, cost-effective, communications to developing regions.

In any market deployment, wireless operators and device manufacturers need to manage the trade-off between performance and system cost. Since the effective capacity of any given bandwidth allocation is degraded by multiple sources of interference, several techniques are available on the market to restore as much performance as possible. However these solutions - additional antennas and amplifiers, for example - make the handsets significantly more costly without significantly improving throughput. With wireless broadband, for example, multiple input multiple output (MIMO) schemes for both base stations and handsets are often used to counteract interference. These solutions increase network capacity compared to current single antenna solutions, but the handsets tend to be complex and expensive, due to the miniaturization and compact configurations required.


Handset technology now exists - chip-level, IP core receivers for OFDM-based 4G wireless networks - that provide gains in spectral efficiency of over 60 per cent. With these capacity increases and bandwidth efficiencies, mobile operators can deliver higher data rates and wider coverage to end-users. This sort of capacity greatly improves the business case for deploying LTE or WiMAX networks in data-hungry markets - even, as in developing markets, if they are only focused on basic services. These chips make it possible to economically manufacture high performance single-antenna user handsets that rival the performance of devices with two antennas. Reducing the complexity and eliminating a second transceiver can reduce the cost of handsets considerably and makes it easier to miniaturise the device.

The advanced PHY IP core (the chip's 'physical layer') mitigates noise and interference by leveraging an extremely evolved mathematical algorithm pioneered in the 1950s for physics applications. With far lower complexity and occupying less than one-half of a square millimetre of chip space, these algorithms demonstrably, both in simulations and in commercial hardware, offer upwards of 10dB packet error rate (PER) improvement under standards-defined conditions and environments. It is also particularly effective at reducing Doppler-related and co-channel interference performance degradations.

Increasing overall receiver performance, by whatever means, provides capacity improvements under challenging mobile channel conditions; co-channel interference, inter-carrier interference, and multipath interference no longer have to be the drains upon capacity that they are today. Compared to other solutions, the advanced PHY chip circuitry provides some of the highest spectral gain per dollar, while retaining critically low implementation complexity. Moreover, it can be easily integrated into any 4G-chipset solution with minimal impact. Perhaps best of all, the advanced PHY can work with a single antenna or as an improvement to MIMO receivers. All things considered, service providers can deploy fewer base stations and still deliver a better user experience; the cost reduction could be critical to deployments in developing nations.

The advanced PHY can boost existing MIMO performance and, in some instances, eliminate the need for, and cost of, advanced MIMO. In fact, simulations have shown the advanced PHY, in a single antenna (SISO) configuration, can perform better than certain MIMO implementations specified in current standards. This advanced PHY also helps in DSL (*digital subscriber line*) fixed-wire and HD digital TV broadcast applications. That is, it is widely applicable in any communication system with multi-tone (e.g., OFDM) schemes, regardless of the standard employed. Simulations suggest that the algorithm can potentially double effective spectrum capacity over current PHY designs at significantly lower costs than the proposed alternatives.

The race to 4G is currently a consumer-driven competition mostly focused on developed nations. Growth in data consumption requires higher connection speeds and efficient spectrum use. Although developing nations have less need for extremely high-speed data traffic, wireless operators and device manufacturers still seek cost-effective methods that let both consumers and service providers in these regions get the most out of 4G networks. Simply put, advanced PHY gives 4G operators and manufacturers an explosive return on investment and offers greatly needed cost advantages for developing markets. ●



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## Making over-the-top video work for the operator

by Andrei Elefant, VP Product Management & Marketing, Allot Communications

Over-the-Top applications such as video are a ‘must have’ for the subscriber, but a great burden on the network. These applications can be detrimental to the operator’s bottom line and the Quality of Experience (*QoE*) that the subscriber demands and deserves. However, operators do have a way out. Operators can combine the benefits of DPI, policy enforcement and charging to maximize network resources, generate new revenue and offer personalized packages to the subscriber.



*Andrei Elefant, VP Product Management & Marketing, Allot Communications. Mr Elefant joined Allot as a product manager, and served as Director of Product Management before being named to his current position. Prior to Allot, Mr Elefant worked in the product management of airborne systems.*

*Andrei Elefant has a B.Sc. cum laude in Mechanical Engineering and an MBA in Marketing and Business Development.*

We don’t need WikiLeaks to tell us that mobile Internet is on the rise, it is not a secret. What mobile operators refer to as ‘Over-the-Top’ applications are gaining popularity as millions of people use their mobile devices to access content where and when they want it. Cisco predicts that in the next four years, more than 90 per cent of all content traversing the Net will be some form of video, whether it’s peer-to-peer or streamed from servers (source: Cisco VNI Report). According to our MobileTrends Report, global mobile data bandwidth usage increased 68 per cent during the first half of 2010. Furthermore, video-streaming continued to be the fastest growing application type, with a 92 per cent increase during that same period.

Regardless of whether it is YouTube or Hulu, video is a mass-market application that spans generations. The demand for video is straining the mobile network. The amount of raw data accompanying these applications can be detrimental to the operator’s bottom line and to the quality of experience (*QoE*) the subscriber demands and deserves. Without visibility into its network traffic, operators are hit with a double loss from both an operational and a revenue perspective. An operator that cannot effectively manage network congestion will face problems when their customers do not receive the *QoE* that they expect. At the same time, the operator will miss opportunities to create new revenue streams through tiered services and revenue-sharing models.

However, operators can turn a potential negative into a positive. Operators can combine the benefits of application recognition, policy enforcement and charging to maximize network resources, generate new revenue and offer personalized packages to the subscriber.

Deep Packet Inspection (*DPI*) gives operators critical information about network traffic at the application level. It is important to understand that not all network traffic has equal value to an operator and not all applications require the same amount of resources - P2P applications consume substantial bandwidth while VoIP doesn’t use much at all. DPI helps operators prioritise certain types of applications when the network is congested. For example,



although VoIP traffic does not require a lot of bandwidth, it is delay-sensitive and requires precedence when travelling across the network, so VoIP traffic can be given priority over P2P when the network is taxed.

Operators can gain additional information at both the network level and at the subscriber level, providing an in-depth understanding of how their networks' utilisation. Visibility into the network topology allows operators to better monitor and manage infrastructure elements. Operators can quickly identify parts of the network or particular cells that are currently congested, verify the applications causing the congestion, and change the priorities for a given cell to reduce the congestion - all in real time. By giving operators the ability to manage their infrastructure this way, they can increase the usage of their current infrastructure by up to 30-50 per cent and improve the subscriber's experience.

By paying closer attention to what applications matter most to their subscribers, operators can optimise their networks and create better pricing and new products. Operators can use network visibility to understand user needs better, personalize the experience and monetise it through new charging models. The idea is to give choice to the subscriber as to how they use and access the Internet via mobile devices and applications. By building personalised services aimed directly at the subscriber, operators will find it easier to charge for services that they know the subscriber wants. These services give operators a way to reverse ARPU decline.

By feeding application and network traffic data into the policy and charging functions, operators gain a more complete and accurate picture of the network. Granular intelligence enables network providers to feed information about the application, subscriber and topology intelligence directly into policy enforcement rules.

Operators can manage each subscriber session and put ad hoc policies in place. Taking it one step further, traffic can be detected and matched to a subscriber profile in order to implement a specific service plan. For example, traffic policies may prioritize or allocate a guaranteed amount of bandwidth to certain traffic. Or, policies may prioritize bandwidth when usage exceeds predefined congestion thresholds. The charging function supplies information about pricing and gives

operators contextual insight on how and when to charge/bill the subscriber. These technologies can work together regardless of the access technology so they can function transparently across 3G, 4G/LTE or even a converged fixed/mobile network.

Today, the combination of DPI, policy enforcement and charging technologies gives operators some very powerful tools and we can expect to see many specialized deployments in the years to come.

Today, many operators have already made the shift from flat rate services and billing to tiered services. Tiered services categorise services in levels and define what each level provides the subscriber. Levels can be based on quotas, throughput, QoE, content or any combination of factors. For example, with a premium plan, a subscriber may get a given amount of megabytes per month, plus guaranteed prioritization of favourite applications.

The marrying of the DPI, policy and charging technologies lets operators match the traffic detected to the subscriber's profile and service plan and feed the information charging system. By using these technologies, subscribers can be given choice, in real time, to purchase extra bandwidth for the month or move to a higher tier whenever their traffic is close to surpassing their monthly quota.

Another service plan, often dubbed 'happy hour', gives subscribers incentives to use the network during non-peak hours. This helps alleviate peak hour congestion since more people use the network when it is usually less utilized. As a result, during off-peak hours subscribers can pay lower rates or use applications without deductions from their monthly quotes. Such a plan offers value to the subscriber and to the operator.

There are also service pass plans that let a subscriber use any device to access the network, applications and content. A subscriber may choose a service pass that delivers a large amount of Gigabytes per month while another subscriber may choose a pass that gives them unlimited access to their favourite website. More advanced service plans are now being considered to alleviate congested networks.

Content providers are also eager for solutions such as 'bundles' that let consumers buy applications and receive all the connectivity to support it for the

same price. A package to view a designated number of movies - a combined offer from both the content provider and the operator - would give the content buyer access to the bandwidth needed to view it; no relationship with the operator would be required.

We may also see deployments in the near future fuelled by split billing among service providers.

For example, a subscriber may receive the first 15 minutes of a movie for free. If the user buys the movie after this initial period, the operator and content provider will share the revenue. If the user does not buy the movie, the content provider who ran the movie promotion pays for the network resources used for the 15 free minutes.

These innovative data access propositions let users choose what works best for them. Users do not need to sign a two-year contract; instead, they choose their preferred device, application and even their network provider. If the subscriber isn't happy with their service provider or the price then they can go elsewhere. The operators also gain; they can manage their networks to both deliver Quality of Experience and affordability while creating new revenue streams.

The combination of DPI, policy enforcement and charging are a powerful way to maximize network resources, generate new revenue and personalize the experience for the subscriber. However, it's also important to realize that taming the mobile environment is not the job of one technology, solution or provider. It takes a full mobile ecosystem of industry participants to manage and control the network while sustaining subscriber QoE and affordability and giving the operator a viable business model.

It is up to operators to educate their subscribers and the public at large to help them understand that the mobile Internet is a complex ecosystem of technologies and a finite resource with physical limitations. The operators' job is to offer their subscribers choice in how they want to consume that Internet and to give them the best experience possible. ●

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# Mobile data, the ecosystem and the electric vehicle

by Leo A. McCloskey, Vice President, Marketing, Airbiquity

A new digital lifestyle is evolving based on the ubiquitous presence of inexpensive mobile devices often embarked in automobiles and other everyday products. These devices will link information about us - our needs, habits, schedules, and such - to virtual platforms in the clouds that will use this information not only to seamlessly provide us with needed services - often before we realise we need them - but to provide feedback to the services and utilities we use to minimise our impact upon the environment.



*Leo A. McCloskey is the Vice President of Marketing at Airbiquity; he has nearly two decades of experience in networked-services marketing in North America, Europe and Japan. Mr McCloskey was most recently Vice President of Marketing for IntelliTax, a provider of software and services for tax professionals, and has held senior leadership positions at Nexagent, Ebone and Terabeam. While at EDS, Mr McCloskey defined a novel method for connecting customers to the EDS global service delivery infrastructure.*

*Leo A. McCloskey holds a B.A. in Russian studies and language from Dickinson College.*

A new decade dawns - and it is nothing like the last. As you may recall, the world was set to end at the beginning of the previous decade as information systems collapsed under the weight of more than two digits. Instead, this decade begins with burgeoning ambitions for integrating all things into personalized digital mobile ecosystems.

Mobile data consumption is exploding and mobile phones built only for texting are now only a niche category. The mobile devices of this decade will adopt multiple form factors according to individualized needs. These 'create, consider, connect and communicate' devices will be gateways to a personalized digital lifestyle that, quite literally, integrates all things.

An Internet of things is springing to life around each of us. It is built on the same micro and nano-technologies - relentlessly pursued by all manner of device and equipment manufacturers - that let us manufacture common devices inexpensively in mass quantities, and then customise them - for markets throughout the world with different cultures and languages - using chipsets, firmware and software. These capabilities will be harnessed to weave a hyper-personalized digital lifestyle that is 'aware' of one's possessions, one's tasks - both routine and irregular - and one's combinations - in both a temporal and spatial sense - and all will be built on mobility.

This digital lifestyle will not thrive, and may not even survive, on just mobility. These digital capabilities will integrate what are today disparate tasks and behaviours into single actions that automatically organize and control multiple, interdependent actions. For example, a calendar that has place and time awareness can automatically set a wake-up alarm each morning, set and start the kettle bubbling or coffee brewing, precondition the car before the driver enters it, populate the vehicle navigation system with all known stops for the day, set reminder notices for child pickup that arrive as a text message 15 minutes prior to the hour, notify the crèche you will arrive late because of a traffic jam, maintain an inventory of refrigerator and cupboard

contents, and create a shopping list when stocks are low after searching the Internet for discounts and special offers, and manage the temperature at home to reduce both environmental impact and personal cost.

Among the first things to be connected will be the automobiles, scooters, cycles, cars, vans, buses and trucks that we use for transportation. For many, the automobile is the most essential item of their lifestyle. We drive it to and from work, we use it for errands, to buy groceries, and collect the kids from crèche, sport and school. The automobile has also quietly become a very sophisticated and powerful computing device. Automobiles will become increasingly less reliant on the internal combustion engine; many manufacturers plan electric vehicle launches, and progress in alternative fuel technologies, especially hydrogen, is promising. Developments in information and communications technology will meet the increased information needs of alternative fuel vehicles and promote major changes in consumer and commercial automotive use and functionality.

With advances in mobile communications, both technological and psychological, consumer expectations for near-instant access to information - public, private and personal - are the norm. We remain stubbornly sophomoric in this digital lifestyle, however, and seem to lack the sensibility to know when and how to request information or services.

When the vehicle is connected to the Web, it becomes 'aware' of time, space, driver and destination and this lets it prioritise and access services that would be hard to contemplate today. Imagine being able to notify subsequent stops along a planned route of updated arrival times. In the example above, the crèche knew that the parent would arrive late. Some may find that interesting but trivial, but then picture this in a commercial environment, where schedule and time have real financial impact that can be measured to the minute and second.

It is in the commercial world where dramatic changes are likely to occur initially. The main fuel used in alternatively powered vehicles is electricity. As a commodity, electricity has many curious attributes. For example, it is perishable. Once power is produced by anything from a gas turbine to a windmill, it must


be consumed at some endpoint along the distribution grid or it is wasted. As a fuel, electricity has many advantages. Electricity is very clean, although its source might not be. Electricity is quiet, so a small noise generators industry is emerging to create devices that alert drivers when the motor is working and warn pedestrians of a vehicle's approach. Electricity can inexpensively be collected and stored for later use when the demand is lowest, typically at night, and then used during the waking hours. Since power generation is not easily adaptable to demand cycles, lowest cost power is when demand is at an ebb point. Any price is better than no price.

The converse is true as well, which intrigues many urban planners and utilities. The availability of precise real-time and projected data regarding when and where power can be obtained as well as storage capacity and usage details can make possible tremendous improvements in power generation and distribution. Electricity pricing follows a fairly straightforward price/demand curve - when power supply exceeds demand, it costs less. When power is in short supply or when demand peaks, it is most expensive. Demand tends to peak, for example, on hot afternoons when people are at work, school or other routines and energy is required to keep temperature comfortable. Accordingly, power generation and distribution is over-dimensioned to handle peak period demand, and this increases overall generation costs.

Ideally, urban and utility planners would access electrical resource use, generation and availability information via mobile cloud platforms that continuously receive data, in real-time, regarding usage and generation - including from electric vehicles. These vehicles, from a power-planning viewpoint, are both users and - depending on the hybrid technology used - portable power stations. When the number of vehicles with hybrid technology reaches a reasonable level, excess vehicle power might be harnessed (along, for example, with excess power generated by home solar panels) via information and communications technologies to increase the energy supply during peak demand periods. Legislation in many countries has introduced feed-in-tariffs (FITs) that requires the utility to accept - and pay for - power contributed by non-utility sources, including, perhaps, vehicles. The opportunity for drivers to contribute to environmental sustainability, and receive compensation at market rates, is very real;

energy in excess of the owner's projected needs could be fed into the energy grid while the vehicle's owner remained at work.

A platform that receives and integrates all the data from in the emerging mobile ecosystem is essential. Such a platform would create individual mobile presences within the cloud and, through these, interconnect participants to services and utilities in a way that maximises the potential of each individual's hyper-personalized digital lifestyle. This will maximise the benefits each receives and minimise the adverse impact each of us has upon the ecosystem. ●



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## The mobile wave - changing the way you think and do business

by Richard Alden, President of TOA Technologies Europe

Mobile workforce management optimisation lets companies use mobile technology to improve their customer's experience by better managing their field operations. The divide between companies using mobile computing, cloud services and even social networking to communicate with their customers - and those that don't - grows in parallel with smartphone usage and on-demand feature availability. These devices and technologies help companies compete more effectively - they improve operational efficiencies and productivity while at the same time greatly improving the customer's experience.



*Richard Alden is President of TOA Technologies Europe. Mr Alden previously served as CEO of ONO, Spain's largest cable broadband provider. Prior to ONO, Mr Alden held positions as CFO of Optel Inc in the USA and as CFO of Videotron Holdings in the UK, both part of the Canadian Videotron Group. Mr Alden is currently a non-executive director of several European media and telecoms businesses, including FON, the world's largest free WiFi community.*

*Richard Alden has a degree in Modern History and Politics from the University of Liverpool.*

Globally, mobile data traffic is set to double every year until 2014. During 2011, analysts from Informa expect the mobile broadband market to overtake its fixed counterpart, growing to 670 million subscribers, and 51.8 per cent of the overall broadband market. A key driver of this growth is the plethora of mobile devices from smartphones to tablet PCs entering the consumer market, opening up a new world and bringing the Internet with all its possibilities for interaction to the user anywhere, anytime. But it's not only consumers who are adopting mobile broadband. Enterprises have shown an increasing appetite for mobile bandwidth as well. IDC predicts that mobile computing, cloud services, and social networking

technologies will mature and become mainstream this year.

Companies adopting these technologies will be surfing the mobile wave as well as sustaining it. A new mobile workstyle will increase workforce productivity throughout the enterprise while cloud computing will give enterprises a flexibility previously unknown and the opportunity to build a future-proof infrastructure that will provide them with a competitive edge. Lastly, social networking will become an important tool for companies to engage with their customers in new ways. By refusing to accept old-fashioned, traditional, ways of interaction - often slow and inconvenient - that no longer fit their lifestyles, consumers

are putting pressure on service-oriented enterprises, including carriers and mobile operators, who operate in mature and highly competitive markets. Customer service will become a key differentiator in the quest to increase customer satisfaction and retention rates. So telco providers do not only need to prime their networks to keep pace with the innovations that are driving the mobile wave; they need also to embrace these technologies just like any other enterprise trying to outperform its competitors.

In terms of mobile workforce management, IDC identified three significant technology trends - mobile computing, cloud services, and social networking technologies. These trends are combining to transform mobile

workforce management - a mission-critical but often neglected, inefficient and slow part of a business - into a highly productive, efficient and customer-oriented powerhouse that will contribute significantly to business success, so it is high time that companies reviewed their mobile workforce operations.

A recently commissioned survey found that many businesses in the United Kingdom and Germany suffer, in terms of both lost revenue and reputation, as a result of their customers' poor experience with field workforce operations. When it comes to wait times for in-home appointments in particular, telecom and cable service providers ranked amongst the poorest in the field. And long wait times often resulted in low customer satisfaction ratings and high churn rates.

Customers have high requirements in today's always-connected-get-it-now society and will turn to competitors quickly if their expectations are not met. The survey indicated that 55 per cent of Germans and almost a quarter of Britons, 23 per cent, had switched providers due to poor wait times in the last year. At the same time, research also demonstrated that companies that provide quick and efficient services, and put the consumer's needs at the heart of what they do, not only retain their customers longer, but are more likely to receive recommendations.

#### Cloud computing and mobile workforce management

The capabilities of web-based solutions in combination with mobile technologies help companies to achieve two overarching business objectives when deploying a mobile workforce management solution. One is to increase efficiency and reduce cost by optimizing the workflow between the field and dispatchers. The second objective is to improve the customer experience by leveraging the appointment as a relationship-building opportunity.

Cloud computing and on-demand applications and services are the perfect fit for a truly mobile and flexible enterprise's mission-critical tasks of managing the field workforce and customer communications. Cloud-based, on-demand, software-as-a-service (SaaS) solutions are quick to deploy and highly reliable. They are powerful, affordable tools for enterprises of all sizes, from the largest telecoms operator to specialty retailers. They do not require major up-front investment, enabling companies to realise previously unobtainable savings and

efficiencies in a few months versus years with traditionally installed applications.

Cloud-based mobile workforce management solutions are also easily accessible - anywhere, any time - on any web-enabled device. This makes them the perfect fit for enterprises that seek to optimise their mobile workforce with a focus on the most critical touch point - the customer appointment event.

Too many companies fail to capitalize on the opportunities provide by in-home appointments. Often it is the only time a company meets with their customers in person, and the impact this company representative has in terms of enhancing or damaging a brand is significant.

Combining SaaS benefits - computing power, always accessible, device-independent - with the latest mobile technologies, predictive analytics, and automated interactive customer communications increases operational efficiencies and improves the customer experience at the same time.

#### Customer communications

The evolution of mobile devices, high availability of mobile broadband, development of resilient mobile and cloud computing services and the growing popularity of social media and other forms of instant communication means that customers no longer need to be prisoners in their own homes, when it comes to appointments. Mobile services allow enterprises to change the way that they interact with their customers.

A recent blog post in *The New York Times* highlighted the fall in the amount of time that people are spending emailing from desktops and the rise in texting, instant messaging and social networks, or emailing from mobile devices. The increasing variety of communication channels available to consumers and businesses and the growing desire for instant responses is changing the way that we live and work and our expectations in the way we deal with businesses. Service providers who do not meet these expectations are quickly discarded if there is a better alternative. Cloud-based mobile workforce management and the capabilities of today's mobile devices address this challenge twofold. First, the real-time data from the field lets enterprises shrink customer wait times to a minimum. Second, it helps to vastly improve proactive customer communication. Having the data does not

suffice - you have to communicate with the customer, confirm appointments and update appointment times in case of delays. A growing number of companies are starting to use some of these systems with great effect, from VirginMedia and Ocado (the British online grocery delivery firm) in the UK, to ONO in Spain, and Arhaus Furniture in the US.

#### Customers and the mobile workforce

In highly competitive industries such as telecommunications and cable, customer experience may be a significant differentiator between service providers. But customer relationship management strategies frequently fail to incorporate the mobile workforce - despite the fact that these employees are often one of the few personal contact points between the enterprise and the customer.

If an in-house appointment is completed smoothly, this will have a positive impact on the company's image. In addition, the field worker can use the personal contact to support sales - selling additional products and services.

New mobile devices like the iPad make it even easier to support the mobile workforce. Arhaus Furniture, for example, uses the iPad with a custom-tailored application to implement a paperless delivery process with quick turn-around times, and also to bring the electronic product catalogue to the customer's house while the new sofa is assembled.

Extending CRM, brand and marketing activities to include the mobile workforce in this way creates a truly positive customer experience.

#### Mobile is leading the way

Mobile workforce management optimisation is only one example of how enterprises can capitalize on the technology innovations that support the new mobile lifestyle of consumers as well as the mobile workstyle in enterprises. The divide between companies riding this mobile wave by embracing mobile computing, cloud services and social networking and those that remain offline grows wider with every new web-enabled smartphone or on-demand feature made available. These new technologies offer a wealth of opportunities to gain a competitive advantage by improving operational efficiencies and productivity, while at the same time greatly improving customer experience - companies just need to adopt them. ●

## Fixed numbers going mobile

by Rod Ullens, CEO and co-founder, Voxbone

The telephone number, the original personal communications identifier, remains a telecom operator's greatest single asset. Yet the number system hasn't evolved to meet the needs of a globally mobile society. Operators must make it easier to port numbers internationally or risk devaluing them. International telephone numbers already exist in many countries; they give mobile operators the ability to assign and port virtual international phone numbers from one country to subscriber handsets in another and provide international connectivity at nominal subscription rates.



*Rod Ullens is CEO and co-founder of Voxbone, a leader in worldwide geographical, toll free telephone numbers. Before founding Voxbone, he provided advice, training and seminars to European carriers, such as Belgacom mobile, KPN, France Telecom and Orange, as well as several European governments.*

*Rod Ullens holds a B.S. in telecommunication engineering from the University of Louvain in Belgium.*

Society has become increasingly mobile, so many of us regularly relocating for work or study and need a simple and cost-effective way of keeping in touch with those we've left behind. And while it is relatively straightforward to have a personal email address that we keep for life wherever we're located, changes in circumstance and service provision can still necessitate the need for new phone numbers, whether mobile or landline.

While it may seem preposterous, customers are still regularly forced to give up their telephone numbers and change a vital part of what identifies them to other people. It has always been this way. Why would it be in the telecoms industry's own

interests to change this historical practice now? A simple glance at recent trends in mobile telephony provides the answer.

Greater mobility and the expansion of global markets have led to increased international call volumes year on year while subscriber bases and network coverage have continued to grow. Alongside this, advances in technology have put multimedia smartphone devices into the hands of a growing number of consumers, which enable easy access to new networks such as WiFi, 3G or 4G and new protocols such as VoIP.

Regular international calls can be very expensive and fall outside of most

monthly minutes plans but suddenly customers have a choice when deciding to make an international call. Do they go through their mobile operator, or do they bypass them entirely and use a third-party application that promises much lower rates? The convergence of these trends has created demanding customers who want value-added services instead of simple voice calls and easy and low rate plans as opposed to obscure tariffs.

New Internet-based communications networks already offer the world's biggest networks; they are able to connect billions of people and now threaten the primacy of the telephone number. So, as long as the telecoms industry continues to deal with



customers in a manner that is line-focused rather than based around the individual, it is only helping to sideline itself, pushing users into the arms of alternative services that eschew traditional numbers altogether.

This places the global telecoms industry at a major crossroads. Does it choose to fight and slow down the erosion of international call revenues by blocking third-party applications, limiting 3G data traffic and charging premium rates? Or does it choose to innovate by using new opportunities to offer value-added services and content and maintain the central role of the telephone number?

We are firm believers in this second approach, which has helped mobile operators to open up new revenue streams. In fact, telcos should go much further and make number porting as easy as possible by building partnerships - for instance, involving third parties in the creation of a centralised database that helps to support more features on numbers such as presence, video etc. and also store these capabilities.

International telephone numbers already exist in many countries, enabling mobile operators and virtual operators to have international geographic phone numbers pointed to the handsets of subscribers, including the ability to port a landline number onto a mobile phone. For example a person from Poland who lives and works in London could theoretically still use the same fixed number they had back in Warsaw alongside a new UK mobile number. Using VoIP, the mobile operator could then charge the customer a flat monthly fee to receive calls on the original Polish number regardless of their current location.

Friends and family back home would then be able to continue to call the familiar number to stay in touch at local rates, rather than using a software client or PIN code and long access number to stay in touch. This is likely to increase customer commitment and encourage them to use their mobile network rather than exploring a more complicated alternative.

This is a compelling proposition for many users and for mobile operators as well. Foreign communities, immigrants, business people and frequent travellers are all likely to be willing to pay a flat monthly rate in order to make their

friends', families' and their own lives easier and to facilitate contact with those they physically leave behind. Allowing a user to receive incoming calls on a foreign number which has been assigned to their SIM also means subscribers will be more likely to use their handsets to make outgoing international calls, thereby increasing traffic on the network and boosting the operator's revenues.

As a unique global identifier the telephone number remains a network operator's single greatest asset. Yet the world has moved on and it simply no longer makes sense to rigidly tie them down to a specific country or city. A new kind of geography is being formed that is about local presence and global relationships far more than distance or national borders. The operators have a great opportunity to innovate, reflect users' needs and open up new revenue streams. They should seize it with both hands.

#### Case study - International Favourites

UK operator O2 has embraced the benefits of VoIP by introducing a service that makes international calling both simple and affordable. The service is offered in collaboration with Jajah, a Telefonica subsidiary specializing in IP-telephony solutions. The 'International Favourites' add-on offers a brand new telecom experience to those who have friends and family abroad.

Users pay a flat fee of £10 per month in return for 3,000 minutes (50 hours) of calls to three selected international landlines and a virtual overseas - 'Call Me' - number which friends and family back home can call without paying international rates. The number complements the subscriber's UK mobile number allowing them to have two phone numbers mapped to the same device. The billing process is simple, as it is added directly to the customer's regular monthly bill and it works with any O2 phone.

#### How does it work?

O2 customers that subscribe to the International Favourites service receive a phone number from the country of their choice. Their friends and family in that country can dial this number and will only be charged as a normal local call. The call is then transmitted through an IP network

to the UK, where O2 sends the call to the handset of the subscriber that registered for this number. The subscriber will receive a regular incoming call that does not require a special phone or application.

#### International Favourites in action

Juan lives in London and he regularly speaks to his family and friends in Madrid, Spain. O2 International Favourites gives Juan a local phone number from Madrid for his friends to call. They can now reach him on a local number from their home town anytime and Juan can answer the call with his cell phone, which of course still supports his UK mobile number as well. ●



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