UMTS Forum

A White Paper from the UMTS Forum

Spectrum for future development of IMT-2000 and IMT-Advanced

January 2012

UMTS Forum

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Executive Summary

Data traffic on mobile networks continues to grow, demonstrating the immense global importance of mobile broadband as a key socio-economic enabler. Meeting this unabated growth in demand urgently requires the identification by the International Telecommunication Union (ITU) of additional spectrum for International Mobile Telecommunications (IMT) networks.

Drawing on previous studies, industry association the UMTS Forum (www.umts-forum.org) argues in this paper that:

- The World Radiocommunication Conference 2012 (WRC-12) should adopt an Agenda Item for WRC-15, allowing the identification of additional IMT spectrum;
- The ITU Radiocommunication Sector (ITU-R) should conduct during the next study period (between WRC-12 and WRC-15) thorough studies on future IMT spectrum requirements;
- The ITU should urge countries to co-ordinate their actions in order to harmonise IMT spectrum both before and during WRC-15.

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Introduction: facing up to the mobile data explosion

Mobile broadband (MBB) has become the most important enabling platform for innovative services and user applications. Triggering significant and lasting socio-economic growth, these services and applications are changing the way we live.

The benefits of mobile broadband services are not limited to a fortunate few. On the contrary, they extend to a significant proportion of the world's population. Today there are more than 1 billion 3rd Generation (3G)/Universal Mobile Telecommunications System (UMTS) subscriptions (January 2012), and more than 5 billion mobile subscriptions leveraging the Third Generation Partnership Project (3GPP) technology family. Mobile broadband has become the all-inclusive platform of progress.

Given the fast-growing relevance of mobile broadband, it is little surprise that data traffic on mobile networks is exploding. This traffic growth illustrates powerfully the importance of MBB to individual citizens and economies. However, it is also a challenge to mobile operators. There is unrelenting pressure on mobile networks to become more efficient and more densely deployed in response to this organic traffic growth. While these two strategies have already been extensively applied, they are today becoming increasingly constrained by technical and practical boundaries.

Currently, there is just not enough IMT spectrum to support the projected growth of mobile data. The continuing growth of mobile broadband clearly relies on the identification of additional IMT spectrum by the ITU.

The questions of how much additional spectrum should be allocated – and where – are far from trivial. At the upcoming WRC-12 (January-February 2012), the UMTS Forum urges that the conference should:

- Allow the ITU to study the spectrum requirement for IMT as soon as possible;
- Allow the identification of additional IMT frequency bands, ideally harmonised on a worldwide basis, during WRC-15.

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UMTS Forum: supporting UMTS/IMT and mobile broadband development

An industry expertise in traffic prediction and spectrum requirements
Previous UMTS Forum studies played a key role in the preparations for WRC-2000, which identified the 2.6 GHz band for IMT-2000. For WRC-07 preparations, the UMTS Forum played an active role by providing administrations with the best possible information on the development of mobile networks. In 2005, UMTS Forum Report 37 (*Magic Mobile Future 2010-2020*) [1] concluded that mobile traffic would increase by a factor of 23 between the years 2012 and 2020. As such, this study provided an early warning about the huge volume of data that is already starting to flood the mobile networks. Following this call to action, in 2006 UMTS Forum Report 40 (*Development of spectrum requirement forecasts for IMT-2000 and systems beyond IMT-2000 (IMT-Advanced)*) [2] analysed spectrum demand, concluding that a total of around 1600 MHz of spectrum is required for IMT networks by 2020, including the spectrum already allocated at WARC-92 and WRC-2000.

Reports 37 and 40 were provided respectively as inputs to the 2005 ITU-R Report M.2072 on world mobile telecommunication market forecast [3] and 2006 ITU-R Report M.2078 on estimated spectrum bandwidth requirements for the future development of IMT-2000 and IMT-Advanced [4]. ITU-R Reports M.2072 [3] and M.2078 [4] were drafted in preparation for WRC-07. Most significantly, ITU-R Report M.2078 [4] concluded that between 1280 MHz and 1720 MHz of spectrum are required for IMT by year 2020.

During WRC-07, countries and administrations recognised the need for additional IMT spectrum and identified new bands for IMT. Though significant progress has been achieved since WRC-07, the spectrum currently identified for IMT networks is still far below the amount recommended in ITU-R Report M.2078 [4]. The identified amount of IMT spectrum varies between 664 MHz and 947 MHz depending on the Region, when the calculated minimum spectrum demand is 1280 MHz.

The UMTS Forum not only supports the discussion on the amount of IMT spectrum required, but also provides its best support to administrations in order to identify such new IMT spectrum.

In 2007, the UMTS Forum commissioned a study (ATDI Study, [5]) that was distributed during WRC-07, showing the technical feasibility of creating a 112 MHz sub-band in several countries in the upper part of the UHF band (between 750 and 862 MHz). The aim of such a sub-band was to promote advanced mobile broadband services while ensuring that national digital terrestrial television broadcasting requirements were still fulfilled (i.e. that the possibility of rolling out 7 national Digital Terrestrial TV layers per country was maintained, in line with the Geneva 06 Agreement [6]).

The concept of such a sub-band was adopted by ITU Region 1, which allocated the 790-862 MHz range to mobile on a co-primary basis. The European Conference of Postal and Telecommunications Administrations (CEPT) then adopted a harmonised frequency arrangement for mobile, the so-called 800 MHz band [7].

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The rapid growth of mobile broadband traffic

The dimensioning of IMT networks is clearly linked to the traffic carried over these networks, as detailed in ITU-R M.2078 Report [4]. In order to properly assess the resources required for these networks, it is critical to understand precisely the evolution of the traffic carried by these networks.

Mobile data exploding since 2007

As detailed in the previous section, the WRC-07 discussions on IMT were based on mobile broadband traffic predictions including UMTS Forum Report 37 [1] and ITU-R M.2072 Report [3]. Forecasting significant growth in mobile broadband traffic, these reports were described at the time by some observers as "aggressive".

The analysis of traffic growth between 2007 and 2012 now provides us with perfect hindsight on the validity of these reports. The current traffic observed on mobile networks proves that both reports were presenting forecasts that were actually too conservative. In reality, mobile data traffic has outgrown even the most aggressive 2007 predictions.

The growth of traffic since 2007 is represented in Figure 1 below.

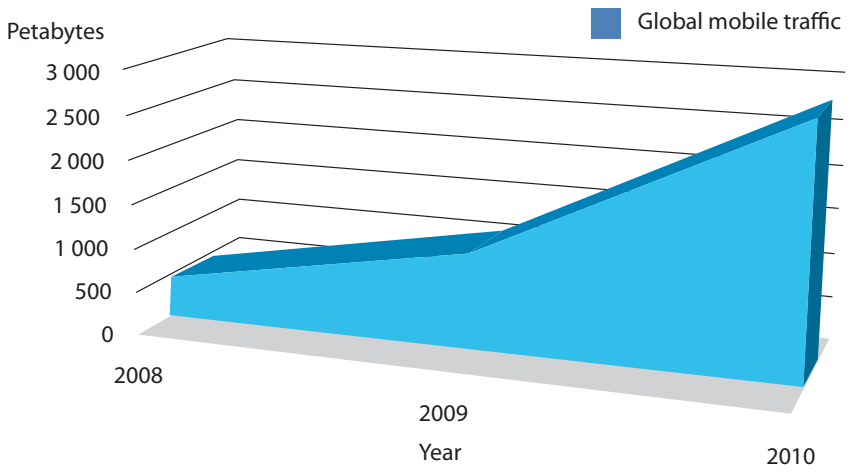

Figure 1: Global mobile traffic during years 2008-2010
Source: ITU-R M.2243 Report [10]

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CEPT study on evolution of mobile broadband traffic
This evolution of traffic growth has been monitored closely by regulators. In particular, the CEPT drafted a report [9] detailing the recent evolution of traffic in Europe. The report provides significant input on a per-country basis. Moreover, it highlights the universal growth of mobile broadband traffic in all countries.

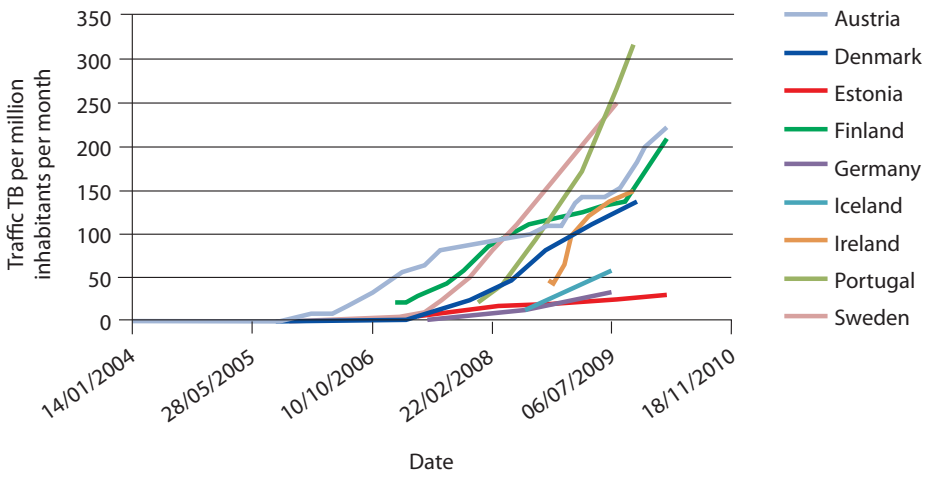

Figure 2: Evolution of mobile broadband traffic
Source: ECC PT1[1]

The report concludes that:
"This CEPT ECC PT1 internal Report indicates that the previous forecasts made prior to WRC-07 greatly underestimated the growth of mobile data traffic. There is a need to review the spectrum estimates due to the traffic predictions showing faster growth than estimated before."

Updated UMTS Forum traffic predictions
The Forum decided in 2010 to update Report 37 [1] in order to:

- Take into account a better understanding of mobile traffic growth;
- Obtain more accurate traffic forecasts for the period 2012-2020.

The result of this project is the UMTS Forum Report 44, *Mobile traffic forecasts 2010-2020* [8].

This new Report 44 [8] states that: *"the total worldwide mobile traffic will reach more than 127 Exabytes in 2020, representing an x33 increase compared with 2010 figure. […] Significantly, at least 80% of the traffic volume remains generated by users, leading to large variations of the total mobile traffic both in terms of time and space variations of traffic. Future mobile networks must be designed to cope with such variation of traffic and uneven traffic distribution, while at the same time maintaining a permanent and extensive geographical coverage in order to provide continuity of service to customers. […] In 2020, daily traffic per Mobile Broadband subscription in the representative Western European country will stand at 294 MB and at 503 MB for dongles* [representing a x67 increase compared with 2010 figures].

[1] An updated version of the figure can be found at www.umts-forum.org

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Daily mobile traffic per subscription	*2010*	*2015*	*2020*
Mobile Broadband (MB per day)	*10*	*155*	*294*
Dongles (MB per day)	*26.7*	*265*	*503*

Table 1: Daily mobile traffic per mobile broadband and dongle subscriptions – representative European country
Source: IDATE

Finally, we anticipate total worldwide mobile traffic of 351 EB in 2025 representing a 174% increase compared to 2020."

ITU-R study on IMT forecasts

Given the rapid evolution of mobile broadband traffic, the ITU decided to conduct an assessment of the global mobile broadband deployments and forecasts for IMT, published as ITU-R M.2243 Report [10].

This report not only stresses the importance of the growth of the traffic in the past few years, but also provides an overview of consolidated forecasts of mobile broadband traffic on a worldwide basis.

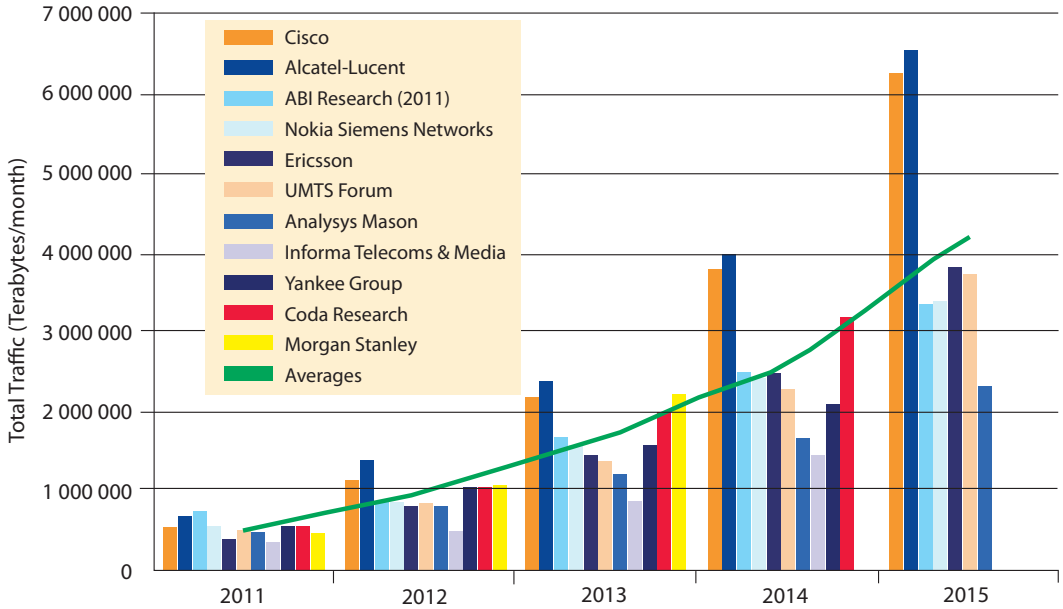

Figure 3: Mobile global data traffic estimates 2011-2015 based on multiple sources
Source: ITU-R M.2243 Report [10]

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The new set of forecasts demonstrates that the studies leading up to WRC-07 – and especially ITU-R M.2072 Report [3] – were conservative, as demonstrated in Figure 4.

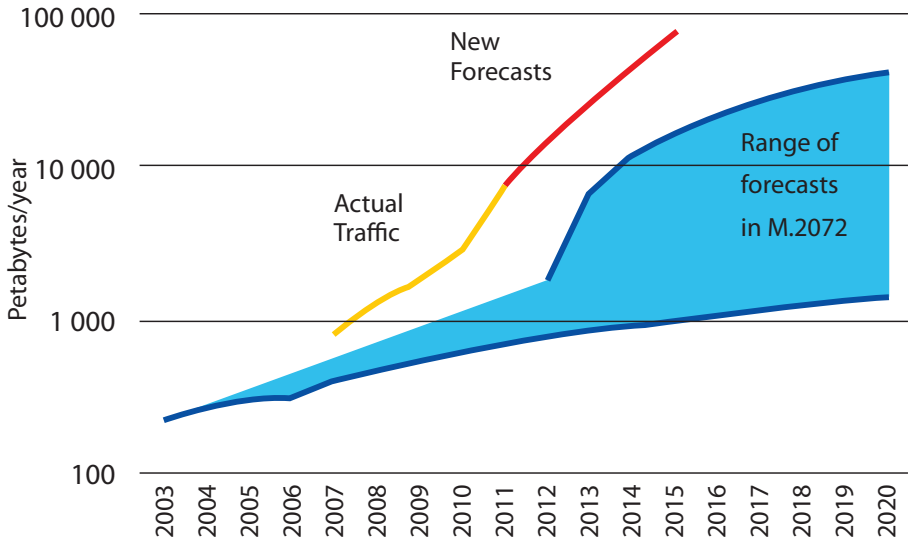

Figure 4: Comparison of M.2072 with current data – ITU traffic estimates done at year 2005 (Report ITU-R M.2072)
Source: ITU-R M.2243 Report [10]

ITU-R M. 2243 Report [10] concludes that:
"The current data traffic (in year 2010) is more than 5 times greater than some of the estimates for Report ITU-R M.2072. Moreover, the actual traffic being experienced by some operators today (year 2011) is even greater than some of the 2020 forecasts given in Report ITU-R M.2072. […] Based on the study of global mobile broadband deployments and forecasts for IMT, this Report clearly indicates that the ITU-R should consider this increasing mobile broadband traffic demand."

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Mobile broadband changes people's lives

The consequences of incredible growth in mobile broadband traffic are very tangible. Smartphones, tablets and the services they enable have changed the way we live.

The biggest technology platform in the world

Smartphones and mobile terminals have become the centre of our digital universe. Until recently, we accessed the Internet from a few fixed locations. Today, many of us demand access to any content, from wherever we are. This has become possible through the rise of smartphones, tablets, smartbooks and small form-factor Personal Computers (PCs). IDC reported that smartphone unit sales surpassed PC unit sales for the first time in Q4 2010[2,3] – far in advance of a tipping point that was initially predicted to occur in 2012[4]. Not surprisingly, Internet access is increasingly mobile as demonstrated by the two examples in Figure 5.

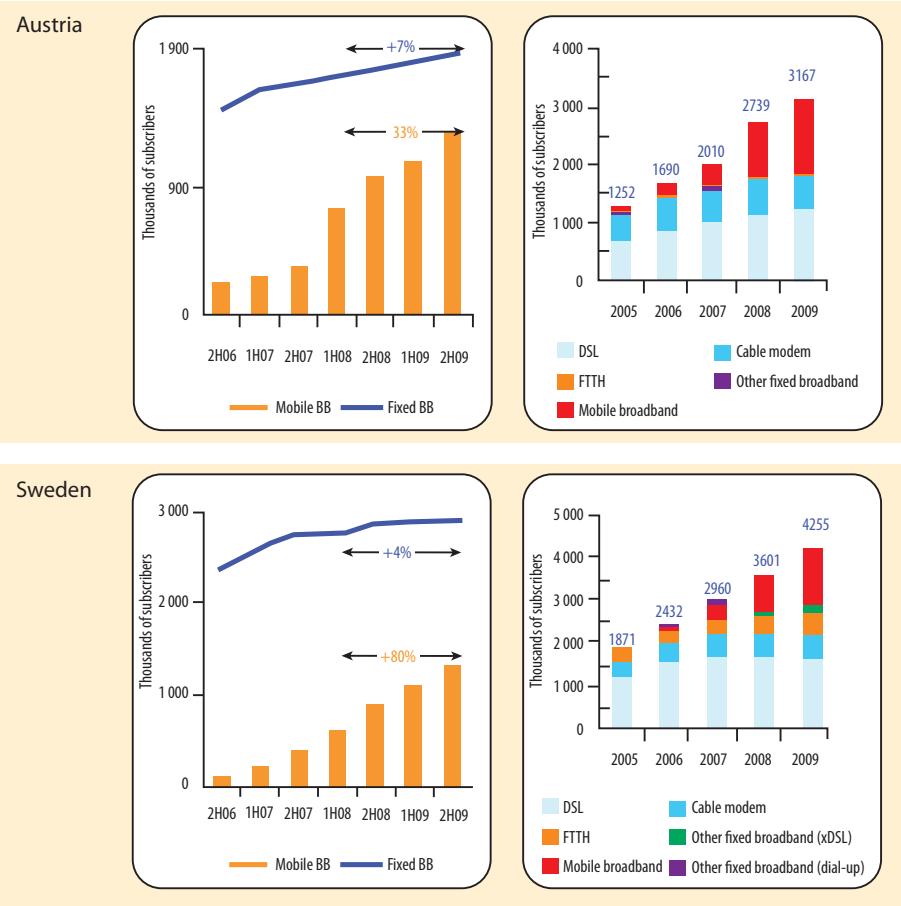

Figure 5: Broadband growth in Austria and Sweden (subscribers) – the Internet is going mobile
Source: NRAs and IDATE

[2] www.idc.com/about/viewpressrelease.jsp?containerId=prUS22653511
[3] www.idc.com/about/viewpressrelease.jsp?containerId=prUS22689111
[4] www.pcmag.com/article2/0,2817,2379665,00.asp#fbid=Xi7MgCMgFsK

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The commercial success of 3G around the world is unarguable, with 3GPP/UMTS representing the leading standard. This appetite for mobile broadband is illustrated by a global total of more than 1 billion subscriptions (January 2012) to the 3GPP family of IMT-2000 mobile systems.

Spanning Wideband CDMA (WCDMA), High Speed Packet Access (HSPA)/HSPA+ and Long Term Evolution (LTE) networks, this 1 billion figure represents almost a fifth of the global total of all mobile connections, numbering over 5 billion GSM/3GPP family subscriptions plus an estimated 0.5 billion CDMA2000 subscriptions.

Of almost 400 3GPP-family networks worldwide[5], the vast majority have now implemented HSPA that gives data speeds in the 2-14 Megabits per second (Mbps) range. Furthermore, around 140 networks are using HSPA+ technology to deliver even higher peak theoretical speeds of up to 42 Mbps for their customers.

After the first LTE networks launched commercially in December 2009, commercial LTE deployments now number over 50 networks, with over 150 operators committed to launch the technology. In a second step, Fourth Generation (4G)/LTE-Advanced was standardised by the end of 2011 and will be commercialised by 2015, promising peak data rates in the range of 1 Gigabit per second (Gbps).

Taking the end of 2009 as "Year Zero" for commercial LTE deployments, there are fast approaching 10 million LTE subscriptions. And while forecasts vary, some observers predict that LTE subscriptions will ramp up faster than the birth of 3G a decade ago. As the classical constraints on consumer uptake are removed – notably terminal availability and pricing – it is widely anticipated that demand for LTE will hit mass-market volumes from 2013.

Looking further ahead, market analyst IDATE forecasts that by the end of 2015 there will be around 400 million LTE subscribers worldwide, which confirms the figure already forecast in 2008 by UMTS Forum/Analysys Mason in the report, *Market potential for LTE*. Asia-Pacific will be the leading market with some 180 million subscribers, followed by North America (95 million), Western Europe (85 million) and Eastern Europe (20 million).

This insatiable demand for mobile broadband is further underlined by changing user behaviours. The smartphone has become a focal point for many people's digital lives, displacing the PC as the primary means of accessing the Internet. Facebook claimed in October 2011 that 350 million of its 800 million worldwide users are accessing the social networking site via their mobile device.

As these figures amply demonstrate, mobile has become the largest and most sociologically significant technological platform in the history of mankind, ahead of even PC adoption and fixed-line telephone networks. Mobile devices are, quite simply, our entry point to the digital world and the centre of our digital lives.

[5] Source: Wireless Intelligence

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Innovative services on mobile broadband
Mobile broadband literally changes the way we live by offering services that were previously not available. Some of these services – like Internet access – were traditionally available on fixed networks. But now we are freed from the need for a fixed access point: the Internet has become available anywhere and at any time. Other services are entirely new, benefitting from the added value that mobility provides through features like geolocalisation, truly nomadic connectivity and personalised access.

ITU-R M.2243 Report [10] provides some examples of the innovative services provided by mobile broadband:

"The demand for mobile cloud services is expected to grow exponentially since the users are increasingly adopting more services that are required to be accessible. […] Multimedia services captured on mobile devices will overwhelmingly carry the greatest cloud computing and storage demand and the average size of these media files will grow substantially as camera pixel resolution continues to increase (ARC Chart[6] predicts that mobile-generated content will consume 9,400 PB of cloud services by 2015). It is expected that e-health, e-education and other e-government services will also be accessed by mobile devices, which will contribute to improvements in social welfare. Furthermore, cloud services are getting a lot of attention since, among other benefits, they save costs for enterprises. […] As mobile software applications advance due to increasing processing power, mobile data traffic is expected to increase."

On a daily basis, we are experiencing how mobile broadband improves our life through enhanced entertainment and social connections. But these new services go far beyond mere entertainment. Mobile health and mobile education provide concrete examples of the typical services that mobile broadband will deliver to society, and how critical it will be in the future.

Economic impact of mobile broadband
Mobile broadband does not only provide services to individual consumers. It can actually be used by governments to stimulate economic growth and improve national productivity and competitiveness.

The Broadband Commission for Digital Development[7], a joint initiative of the ITU and United Nations Educational, Scientific and Cultural Organization (UNESCO) in response to United Nations (UN) Secretary-General Ban Ki-Moon's call to step up UN efforts to meet the Millennium Development Goals (MDGs), stated in a 2011 report [11]:

"Nearly all [research reports and case studies on the economic effects of providing broadband access to the Internet] suggest positive returns can be expected from investment in broadband infrastructure. For example, an analysis for the European Commission estimates that broadband can create more than two million jobs in Europe by 2015, and an increase in GDP of at least EUR 636 billion. A study in Brazil

[6] ARC Chart Research Report on the mobile cloud: Market analysis and forecasts, June 2011
[7] www.broadbandcommission.org/

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reported that broadband added up to 1.4% to the employment growth rate. In China, every 10% increase in broadband penetration is seen as contributing an additional 2.5% to GDP growth. In Thailand, where in 2010 only some 3% of households had broadband and 12% of individuals, it has nevertheless been forecast that if broadband is promoted, it could add 2.4% per cent to the country's GDP growth rate."

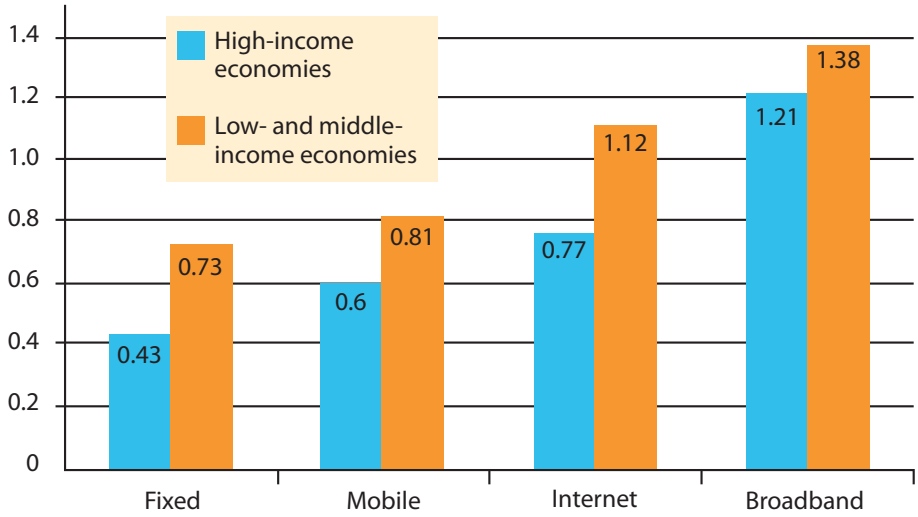

Figure 6: How investing in broadband can boost economies
A 10% rise in mobile broadband penetration could provide an additional 1.81% and 2.29% additional economic growth to respectively high-income economies and low-income economies.

Note: The vertical axis is the percentage-point rise in economic growth per 10-percentage-point rise in penetration.
Source: World Bank (2009)

Ensuring that the right resources are available to respond to the growth of mobile broadband traffic is not only just about enabling new services to customers and citizens, it is quite simply ensuring the future economic growth of our economies.

We will not achieve our goals through technology and investment alone
In the past, the introduction of new air interface technologies has corresponded to major performance improvement in terms of spectrum efficiency (bits per second per Hertz for a given wireless channel). For example, evolution from analogue to digital systems (second generation or '2G') and evolution from 2G to 3G have corresponded to significant advances in spectrum efficiency. However, the performance of mobile systems is unlikely to improve significantly with the introduction of new air interface technologies in the future.

The spectrum efficiency of an air interface for a given wireless channel is limited by a theoretical bound called the Shannon capacity of the channel. The performance of the latest air interface technologies (HSPA+ or LTE) is now very close to the Shannon capacity for most channels [12], [13], leading to a situation where new air interfaces will not provide significant performance improvement in terms of spectrum efficiency.

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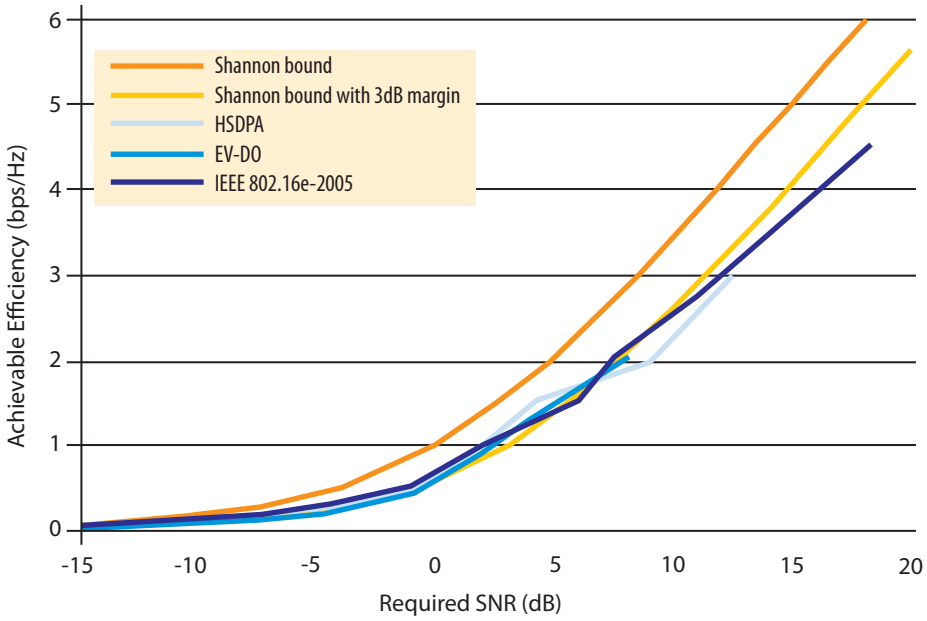

Figure 7: System performance and theoretical limits
Source: 4G Americas, September 2010

Since the latest IMT air interfaces are operating very close to the capacity of given channels, the only possibility to introduce systems with higher performance is to operate on channels with higher capacities. The Shannon capacity of a channel depends on three basic parameters:

- The number of antennas at both the transmitter and the receiver and the geometry of the transmission channel;
- The Signal on Noise and Interference Ratio (SINR) at the receiver;
- The bandwidth of the channel.

LTE is already leveraging the use of several antennas at both the transmitter and the receiver through the so-called Multiple Input Multiple Output (MIMO) technologies. However, the gain obtained through MIMO is limited by several factors. The number of antennas that can be deployed at base station sites and inside terminals is obviously limited. Furthermore, the geometry of the transmission channels is also important, leading to a situation where antennas that would be located too close to one another would not benefit from the MIMO effect anyway.

The SINR at the receiver is influenced by two main factors: the radiated power at the transmitter and the channel loss between the transmitter and the receiver. Since the radiated power at transmitters is limited, the only way to improve the SINR is actually to place the transmitter closer to the receiver, i.e. to increase the density of base stations in mobile network deployments. While technically sound, such an approach requires massive investment in order to improve the capacity significantly. It is therefore likely that the operator would be unable to respond to the challenge of the explosion of mobile broadband traffic only through increasing the density of mobile broadband networks.

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Finally, the capacity of mobile broadband channels increases with the channel bandwidth, at constant emitted power spectrum density. This path is clearly favoured by the ITU as the requirement for 4G systems such as LTE-Advanced corresponds to transmissions over channels with 100 MHz bandwidth, compared with the 5 MHz typical bandwidth of 3G systems.

It is unlikely that the explosion of traffic can be addressed through a single solution. It is likely that MIMO technologies (i.e. new technologies), increased network density (i.e. increased investments) and larger bandwidth must be combined in order to properly address this challenge. However, it is clear that mobile broadband networks will not be able to address the rise of traffic without allocating the adequate amount of spectrum required by IMT networks.

Mobile broadband traffic growth: a unique opportunity

As detailed in the section above, mobile broadband will grow significantly in the next decade. Such rapid growth will pose significant challenges to operators and will require large resources to respond to it.

While these challenges can be daunting, it is important to remember that they only mirror the opportunities offered by mobile broadband. Quite simply, mobile broadband services and applications are changing the way we live and triggering socially responsible economic growth. For each answered challenge, the cost in terms of missed opportunities is likely to be several fold.

This explains why governments all over the world are adopting mobile broadband plans, in order to ensure that all hurdles are removed and that mobile broadband will not be artificially limited. For example, the USA's national broadband plan[8], the EU's Digital Agenda[9] and Radio Spectrum Policy Program (RSPP)[10] or Australia's National Broadband Network demonstrate the commitment of government all over the world to secure the benefits of mobile broadband services for their respective countries.

8 www.broadband.gov/

9 http://ec.europa.eu/information_society/digital-agenda/index_en.htm

10 http://ec.europa.eu/information_society/policy/ecomm/radio_spectrum/eu_policy/rspp/index_en.htm

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Turning the IMT/mobile broadband potential into reality

Governments and regulators across the world understand the potential of mobile broadband and are working to allocate additional spectrum to IMT. So isn't the future secure? In reality, the ITU leadership must demonstrate that its positive actions will result in benefits for all mobile broadband users. New spectrum allocations will only bring the benefits of additional and improved services if solutions are not fragmented, but harmonised at international level.

Ensuring full availability of IMT identified spectrum
Mobile broadband users can gain immediate benefits through access to well-established terminal and user equipment ecosystems, i.e. the pre-existence of a large and diversified terminals and User Equipment (UE) commercial offering. The use of spectrum in other regions also provides immediate opportunities in terms of international roaming opportunities. As such, it is clear that the most benefits are derived through ensuring that the currently identified IMT spectrum bands are made available to commercial services to the largest possible extent.

The amount of available spectrum per region is documented in Table 2.

Region	Total spectrum available for IMT (Typical country)
APT	Between 330 MHz and 510 MHz
ASMG	Between 340 MHz and 630 MHz
ATU	370 MHz
CEPT	590 MHz
North America (CITEL)	478 MHz
Latin America (CITEL)	Between 270 MHz and 360 MHz

Table 2: Typical regional spectrum availability
It should be noted that some specific countries may be different from a typical approach in their region and may have more or less spectrum available for IMT.

An ITU study of IMT future spectrum requirements
Following the concerning report about the unexpectedly rapid growth of mobile broadband traffic and in light of the exploding number of applications, it is undeniable that the mobile broadband landscape has evolved in strides since the last World Radio Conference.

To adopt the most appropriate solutions, it is critical to base any reasoning on renewed and updated analyses of future IMT spectrum requirements. The most urgent task for the ITU to complete is an update of ITU-R Report M.2078. This will provide a clear common framework and understanding of future IMT spectrum requirements at worldwide level.

Support spectrum harmonisation at ITU level
Harmonisation of IMT frequency bands is more important than ever. While terminals are supporting more frequency bands than in the past, hardware progress is only on track with the number of bands in any given region, but fails to keep the pace of the worldwide growth of the number of bands. During the 2G era, a terminal could typically support 2 to 3 different bands, when any region would have 2 mobile bands and a world phone would only need 4 bands.

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Nowadays, terminals typically support 6 to 8 different bands, with even the most harmonised continent benefiting from substantial deployments in a minimum of 5 different frequency bands. What is more, 3GPP LTE specifications standardise no less than 34 frequency bands.

Frequency band harmonisation is by far the most critical enabler for a large and diversified choice of terminal devices in the market. Products operating on harmonised bands are cheaper (through sharing the research and development costs over a wider customer base). They are also available more rapidly (due to the very reassuring market outlook) and are usually most attractive (due to the increased competition). It is not coincidental that some of the most successful terminals in the past years are 'worldwide products', with a single model being sold in most markets.

The ITU has a unique leadership role to play in securing harmonisation to the largest extent possible and ensuring that any new IMT spectrum is identified in a co-ordinated manner, both from a geographic and timing standpoint.

Enable timely identification of additional IMT spectrum
Ultimately, the development of mobile broadband services requires the identification of additional IMT spectrum. What was already a certainty in 2007 has only become a matter of urgency following the explosion of mobile broadband traffic between 2007 and 2012.

The identification of harmonised spectrum is a long and strenuous process. As such, it requires co-ordination of numerous countries, including aligned political decisions in each of these countries. WRC-15 will be a unique opportunity to complete such a process, in order for the currently identified IMT spectrum not to become saturated.

It is critical for the ITU to decide during WRC-12 to allow the identification of further IMT spectrum at WRC-15. Failure to adopt this decision will impede the development of mobile broadband services, artificially limiting the benefits of these services to citizens and the economy as a whole.

An efficient organisation of the ITU studies
Based on the study of global mobile broadband deployments and forecasts for IMT, ITU-R M.2243 Report [10] clearly indicates that the ITU-R should consider this increasing mobile broadband traffic demand. In this context:

- WRC-12 should adopt an Agenda Item for WRC-15 allowing the identification of additional IMT spectrum;
- The ITU-R should conduct between WRC-12 and WRC-15 thorough studies on the future IMT spectrum requirements;
- And finally the ITU should urge countries to co-ordinate their actions in order to harmonise IMT spectrum both before and during WRC-15.

As the time interval between WRC-12 and WRC-15 is quite short, it is critical for the ITU to adopt an extremely efficient organisation to conduct the studies. Clear management, ideally relying on existing study structure, would provide the biggest chance of success for this ambitious task.

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Conclusion

Mobile networks have become the largest and most sociologically significant technological platform in the history of mankind, ahead of even PC adoption and fixed-line telephone networks. Mobile devices are, quite simply, our entry point to the digital world and the centre of our digital lives. Mobile services and applications are changing the way we live, and triggering socially and ecologically responsible economic growth.

The development of these services has led to the unexpectedly rapid growth of mobile broadband traffic. The mobile data traffic in 2010 was more than 5 times greater than some of the estimates for Report ITU-R M.2072 [3]. Moreover, the data traffic being experienced by some operators today (year 2011) is even greater than some of the 2020 forecasts given in Report ITU-R M.2072 [3]. This very rapid mobile broadband traffic growth is a challenge not only to mobile network operators, but to the entire mobile broadband community: will we be able to carry the traffic and provide all the services that users are craving?

Given the extent of the challenge, it is unrealistic to expect that one single solution will solve all problems. Current mobile networks have to become always more efficient[11] and always more densely deployed[12] to respond to this growth of traffic. However, these two solutions have already been extensively applied and are more and more constrained by technical and practical boundaries. First and foremost, the identified IMT spectrum should be made fully available as soon as possible in all countries.

More generally, there is currently just not enough IMT spectrum to support the projected growth of mobile data. Additional IMT spectrum must become available to complement these early solutions. This explains why governments all over the world have been adopting mobile broadband plans, in order to ensure that all hurdles are removed and that mobile broadband will not be artificially limited.

The ITU has a unique leadership role to play in the process of identifying additional IMT spectrum. The ITU is the only body that can secure harmonisation to the largest extent possible and ensure that any new IMT spectrum is identified in a co-ordinated manner, both from a geographic and timing standpoint. The ITU should endorse the following tasks in order to ensure the continuous growth of mobile broadband services:

- WRC-12 should adopt an Agenda Item for WRC-15 allowing the identification of additional IMT spectrum;
- The ITU-R should conduct during the next study period (between WRC-12 and WRC-15) thorough studies on the future IMT spectrum requirements;
- And finally the ITU should urge countries to co-ordinate their actions in order to harmonise IMT spectrum both before and during WRC-15.

As the time interval between WRC-12 and WRC-15 is quite short, it is critical for the ITU to adopt an extremely efficient organisation to conduct the studies. Clear management, ideally relying on existing study structure, would provide the biggest chance of success for this ambitious task.

[11] Through adoption of more efficient air-interface technologies.
[12] Through network densification for improving capacity and offloading of the traffic.

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Acronyms

APT	Asia-Pacific Telecommunity
ASMG	Arab Spectrum Management Group
ATU	African Telecommunications Union
CDMA	Code Division Multiple Access
CEPT	European Conference of Postal and Telecommunications Administrations
CITEL	Inter-American Telecommunication Commission
EB	Exabytes
EU	European Union
EUR	Euros
Gbps	Gigabit per second
GDP	Gross Domestic Product
GHz	Gigahertz
GSM	Global System for Mobile communications
HSPA	High Speed Packet Access
IMT	International Mobile Telecommunications
IMT-2000	International Mobile Telecommunications-2000
ITU	International Telecommunication Union
ITU-R	ITU Radiocommunication Sector
LTE	Long Term Evolution
MB	Megabytes
MBB	Mobile Broadband
Mbps	Megabits per second
MDGs	Millennium Development Goals
MHz	Megahertz
MIMO	Multiple Input Multiple Output
PB	Petabytes
PC	Personal Computer
RSPP	Radio Spectrum Policy Program
SINR	Signal on Noise and Interference Ratio
TV	Television
UE	User Equipment
UHF	Ultra High Frequency
UMTS	Universal Mobile Telecommunications System
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organization
USA	United States of America
WARC-92	World Administrative Radiocommunication Conference 1992
WCDMA	Wideband CDMA
WRC	World Radiocommunication Conference
WRC-12	World Radiocommunication Conference 2012
WRC-15	World Radiocommunication Conference 2015
WRC-2000	World Radiocommunication Conference 2000
2G	2nd Generation
3G	3rd Generation
3GPP	3rd Generation Partnership Project
4G	4th Generation

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