

CONNEXION

steering telecom ahead

November-December 2016

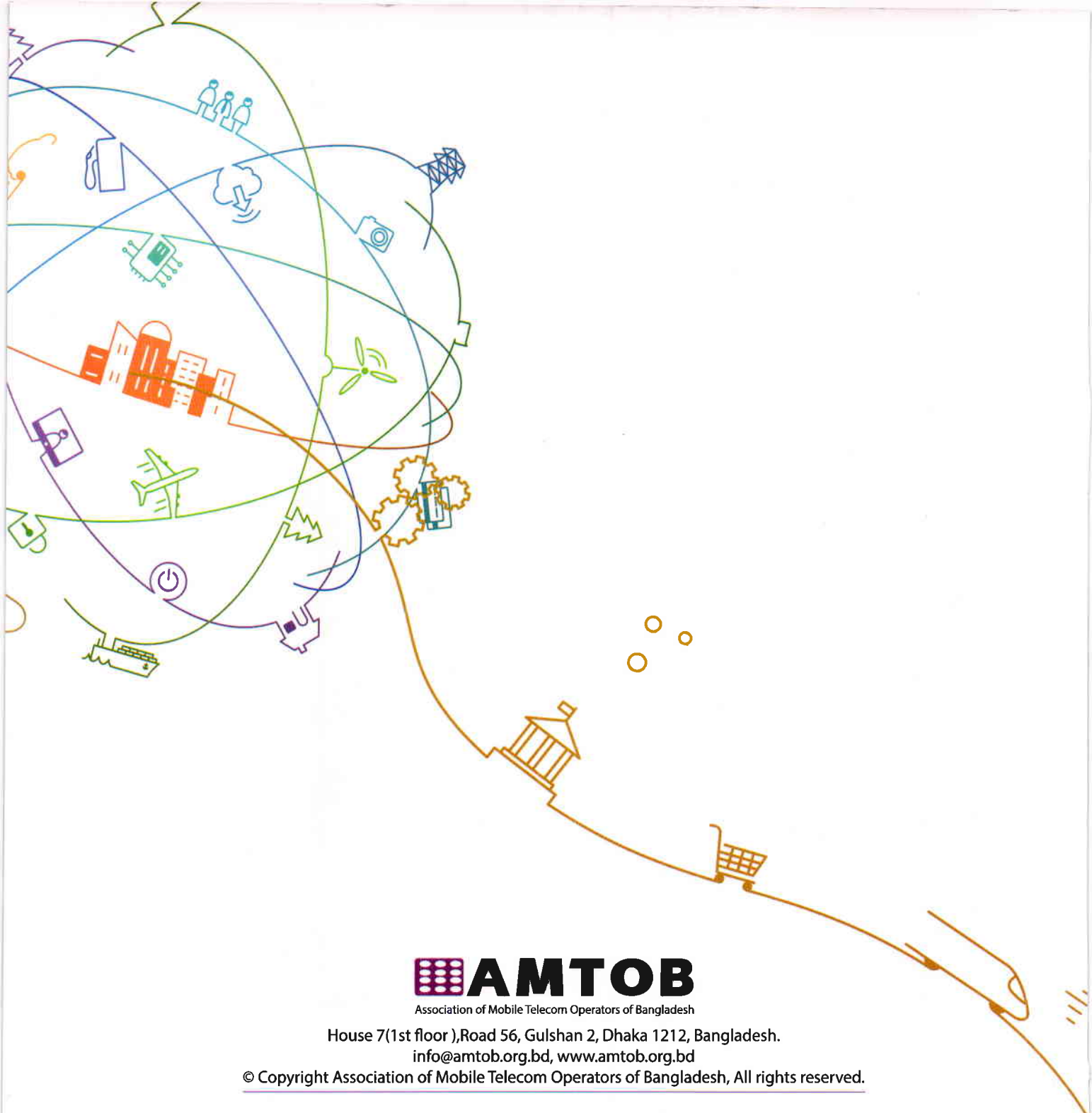
LTE

Road to Digital Bangladesh



AMTOB
Association of Mobile Telecom Operators of Bangladesh

The Voice of Bangladesh Mobile Telecom Industry



AMTOB

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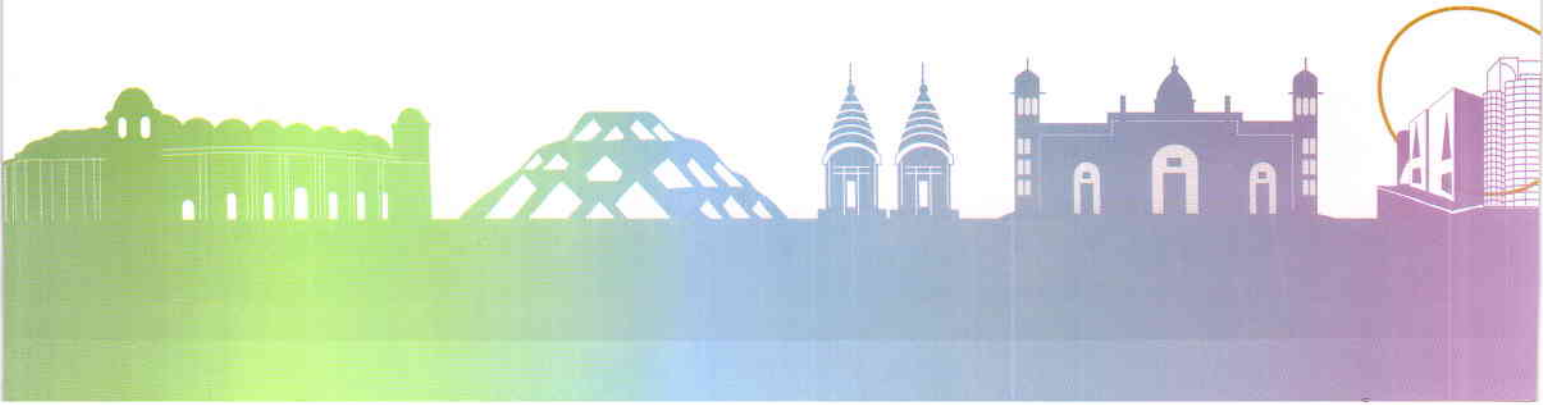
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Editorial

Mobile devices are rapidly becoming the primary medium to access the Internet across age groups, and across mature as well as emerging markets. Experience shows that when operators provide good coverage, service offerings and terminals, mobile broadband takes off rapidly. The main factor for the rapid growth in the mobile internet market is the mobility and reach that it provides to the customers.

Broadband infrastructure and Internet access are critical for economic development at a time when much of a nation's future competitiveness relies on the robustness of its technology infrastructure. With the introduction of smartphones, we have seen an explosion of community sites, search engines, gaming, presence applications and content-sharing like YouTube etc.

The benefits of mobile broadband depend upon the availability of adequate and appropriate spectrum that is harmonized to the greatest extent possible across borders. Innovation and business growth depends on sufficient spectrum being allocated for mobile broadband, along with significant investment in wireless networks to meet the growing demand for capacity.

The latest wireless broadband technology, 4G LTE ('Fourth Generation Long Term Evolution'), provides substantial performance improvements over previous mobile technologies. LTE infrastructure is designed to be as simple as possible to deploy and operate, through flexible technology that can be deployed in a wide variety of frequency bands.

Compared with previous mobile network technologies, 4G LTE offers much higher bandwidth (speed of data transfer), lower latency (faster response times from the network) and improved spectrum efficiency (increasing overall network capacity).

LTE will deliver improvements in the performance of many existing applications including innovative telemedicine applications, remote monitoring, fully-mobile virtual desktops and high-definition mobile videoconferencing. Finally, LTE's high bandwidth can support the rapid set-up of temporary workplaces, as an alternative or backup to fixed broadband connections.

To realise the full economic advantage that spectrum can provide policymakers and regulators have to take decisions to ensure that more spectrum is released quickly, in sufficient quantities, and at the right price.

With increasing expectations of customers for speed, bandwidth and global access, deployment of 4G LTE is the path to innovation and business growth in Bangladesh.

T I M Nurul Kabir

ABOUT AMTOB

Association of Mobile Telecom Operators of Bangladesh (AMTOB) is a national trade body representing all mobile telecom operators in Bangladesh. AMTOB has emerged as the official voice for the Bangladesh mobile Industry for interacting with relevant government agencies, regulators, financial institutions, civil society, technical bodies, media and other national and international organizations. It provides a forum for discussion and exchange of ideas between the stakeholders and industry actors for the development of mobile telecom industry through public private dialogue. AMTOB facilitates an environment which is conducive for its members and industry stakeholders with a view to establish a world class cellular infrastructure for delivering benefits of affordable mobile telephony services to the people of Bangladesh to eliminate digital divide.

FACTS & FIGS

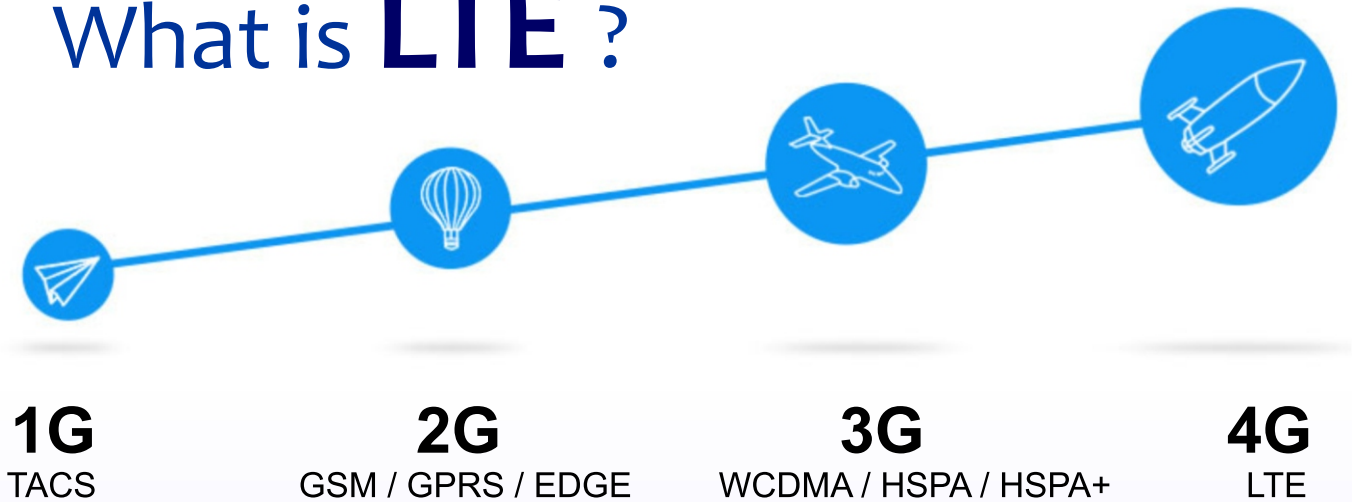
- ◆ Two thirds of the world, or 4.7 billion unique subscribers, are now connected by mobile networks with approximately 200 million additional people being connected each year
- ◆ 2.2 billion people have mobile broadband, enabling them to participate in the digital economy
- ◆ In 2015, mobile technologies and services generated 5.4% of GDP in Asia-Pacific a contribution that amounted to around \$1.3 trillion of economic value.
- ◆ The penetration of the mobile internet in Asia Pacific has increased 2.5 times in the last five years, reaching 45% of the population by the end of 2015.
- ◆ In 2015 the mobile industry made a total contribution of \$1.3 trillion to the Asia-Pacific economies in value added terms, equivalent to 5.4% of the region's total GDP.

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DID YOU KNOW ?

- The link of the first ever website launched was <http://bit.ly/1ix8w0f>
It was published on August 6, 1991 by British physicist Tim **Berners-Lee**.
- There are seven people in the world who hold the '**keys to the Internet**'
Should an extreme natural disaster or terrorist attack disrupt Internet communication, five of the seven key holders can come together to **re-boot the system**.
- **Gmail** was originally a free email service for **Garfield fans** until Google acquired the domain in 2005 for an undisclosed sum.
- Youtube users consume more than **6 billion hours** of video every month!
That's **684,000 years** worth of viewing.
- It took the Internet **4 years to reach** an audience of 50 million.
It took **TV 13 years**, and **radio 38 years** to reach the same amount of people

What is **LTE** ?



LTE (Long-Term Evolution) is a standard for high-speed wireless communication for **mobile phones** and **data** terminals. It is based on the GSM/EDGE and UMTS/HSPA **network technologies**, increasing the capacity and speed using a different radio interface together with core **network** improvements.

Long Term Evolution (LTE) is a mobile network technology that is being deployed by mobile operators on both the GSM and the CDMA technology paths. Depending on the spectrum available, live LTE networks can deliver very fast data speeds of up to 100Mbps in the downlink and 50Mbps in the uplink.

Designed to be backwards-compatible with GSM and HSPA, LTE incorporates Multiple In Multiple Out (MIMO) technology, the Orthogonal Frequency Division Multiple Access (OFDMA) air interface in the downlink and Single Carrier FDMA in the uplink. This combination provides high levels of spectral efficiency and network performance, coupled with high network capacity and low latency. LTE will support spectrum channel bandwidths from 1.4 MHz to 20 MHz and can operate in both paired spectrum (in FDD mode) and unpaired spectrum (in TDD mode).

Compared to WiMAX use, LTE's compatibility with existing GSM and HSPA networks enables mobile operators to continue to provide a seamless service across LTE and existing deployed networks.

Top 10 countries/territories by 4G LTE coverage

South Korea **97%** Japan **90%** Hong Kong **86%** Kuwait **85%** Netherlands **84%**
Singapore **83%** United States **81%** Uruguay **81%** Hungary **79%** Taiwan **79%**



LTE

Road to Digital Bangladesh

Mobile access to Internet

According to the World Bank, a 10% increase in mobile phone penetration correlates to a 0.8% increase of per capita GDP in developing countries, while a 10% increase in Internet penetration increases per capita GDP by 1.4%.

Bangladesh has witnessed tremendous growth in the use of both mobile phones and internet in the recent years. Internet operation in Bangladesh started on June 4, 1996 through subscribing the VSAT (Very Small Aperture Terminal) data circuit by the Government of Bangladesh.

With the evolution of mobile telecommunication system, wireless Internet, a new horizon of Internet service came to light. Now mobile devices are rapidly becoming the primary medium to access the Internet across age groups, and across mature as well as emerging markets.

The main factor for the rapid growth in the mobile internet market is the mobility and reach that it provides to the customers. Customers or users can engage in a real-time contact with others and connect with other systems at the right time of need from wherever they are. *People from various occupations and income levels are now using internet intensively for their occupational needs and personal requirements.*

Digital Bangladesh 2021

Over the past decade Mobile Broadband has not only evolved to meaningfully extend the reach of the Internet, it has actually become the primary method of access for greater number of people around the world.

Now the internet users want portable service as they can use it from anywhere even when they are moving. This also substantiates the notion that the Internet itself is shifting from a desktop

experience to an “on-the-go” experience for developing and developed nations alike.

In Bangladesh, IT-enabled services (ITES) have become an increasingly prominent feature of urban and rural life. As a growing number of processes, including citizen and public services like applications for land tenure, microcredit, visas and passports; enrolment forms for higher education, the delivery of examination results etc. have been digitized, awareness and usage of ITES have expanded tremendously. ITES are now increasingly demanded by all segments of citizens.



This awareness and increasing demand for digital services has been mostly prompted by the government's vision of 'Digital Bangladesh 2021', which aims to utilise ICTs for poverty reduction at a proactive pace and to ensure transparent and responsive governance.

'Digital Bangladesh' is an inclusive vision that encompasses all citizen of Bangladesh and specially focuses on the disadvantaged groups. The deliberate focus on serving the underserved and empowering the disadvantaged citizens is helping to break down traditional obstacles by connecting citizens with government and non-government service

providers through internet and mobile phone-based systems.

It is predicted that as a result of high internet speed facilitating ICT induced service delivery, human development and employment opportunities, Bangladesh's GDP will attain an additional 2.6% of growth by 2020 (MoF, 2014).

Grasping the Adoption Behaviour

Despite relatively low prices, most Bangladeshis still do not use the Internet. 500MB of mobile data is priced in Bangladesh at 3.49% GNI per capita, below the UN's 5% affordability target. Mobile Internet penetration, despite registering 100% growth between 2014 and 2015, stands at just 29.05%. Though there is growing interest among the people, few 'ICT for Development' programmes so far have achieved the size and longevity of impact that merits genuine excitement. ICT-based solutions for the poor which have successfully emerged and endured are indeed in the minority.

The limited number of Internet users represents a significant drawback to Bangladesh's digital aspirations. There is considerable scope for market growth, and an urgent and recognised need to connect the unconnected as well as to provide useful internet services to the present and potential customers remains far from being fulfilled.

A facilitating approach can make adoption behaviour of the people less evasive, by removing whatever barrier to adoption and sustained usage of the internet exist. As providers of connectivity and channels of service delivery, Mobile Network Operators (MNOs) are the major players in the mobile internet sector. In the context of wireless internet services adoption, facilitating conditions have to be created through



Bangladesh's Infoladies Bring the mobile Internet to Villages on Bicycle

collaboration among MNOs, the government, mobile content providers & other stakeholders.

The Long Term Evolution

Increasing expectations of customers for speed, bandwidth and global access has been the driving force behind the evolution of wireless broadband technology. Customers are today connected 24/7 via their wireless devices and want immediate access to the applications and content they use most: business productivity tools, streaming video, social networking and more. In view of customers' requirements and satisfaction, the most inclusive, simplest to use, least costly technologies appropriate to the information needs of target groups are more likely to be successful and sustainable.

The latest wireless broadband technology, 4G LTE ('Fourth Generation Long Term Evolution'), provides substantial performance improvements over previous mobile technologies, and offers the promise that connectivity will no longer be a barrier to realising the benefits of mobility.

4G networks are comprehensive IP solutions that deliver voice, data, and multimedia content to mobile users anytime and almost anywhere. 4G technology standards offer greatly improved data rates over previous generations of wireless technology. Faster wireless broadband connections enable wireless carriers to support higher-level data services, including business applications, streamed audio & video, video messaging etc.

Once fully deployed, LTE technology offers a number of distinct advantages over other wireless technologies. Previous 3G networks split both the voice and data signals. 4G LTE uses an Evolved Packet Core that is 100% IP based (the core protocol of the Internet), facilitating simultaneous voice and data communications.

In comparison with previous mobile network technologies, 4G LTE offers much higher bandwidth (speed of data transfer), lower latency (faster response times from the network) and improved spectrum efficiency (increasing overall network capacity). These improved capabilities help deliver higher quality services and solutions that the customers expect and require. Moreover, 4G LTE includes a number of security enhancements that make it even more secure than previous 3G technologies. Verizon Wireless has stated that its 4G LTE network, which operates in the 700 MHz band, is five times more efficient than its 3G network.

The rate of adoption of LTE has exceeded that of all other mobile communication technologies. The world's first publicly available LTE service was opened by TeliaSonera in the two Scandinavian capitals Stockholm and Oslo on

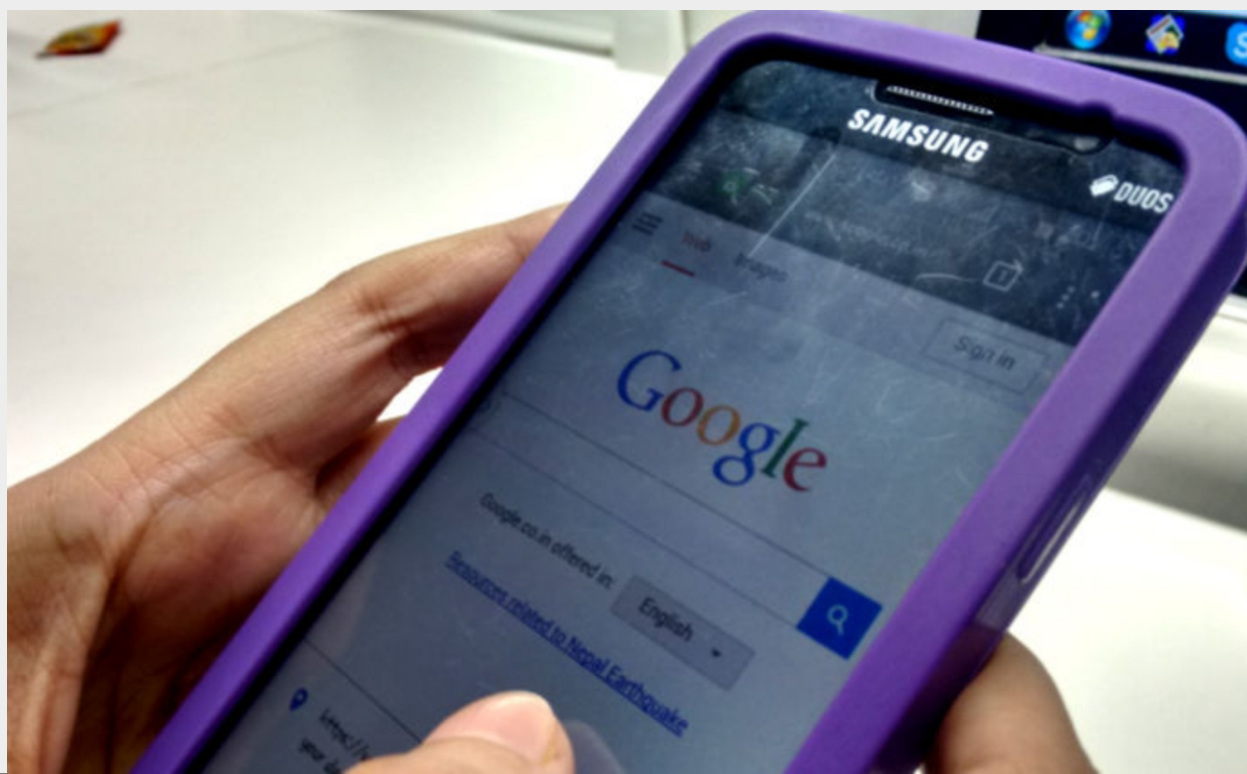
December 14, 2009. Since then LTE has been selected by more than 297 mobile network operators worldwide as their global technology for 4G services.

These global carriers include industry leaders Vodafone, China Mobile and Verizon Wireless, along with AT&T, China Telecom, KDDI, MetroPCS, NTT DoCoMo, Sprint and T-Mobile.

Importance of Mobile Broadband

Broadband infrastructure and Internet access are critical for economic development, with much of the nation's future competitiveness relying on the robustness of its technology infrastructure. Growth of mobile broadband influences the economic activity of organizations, households, and individuals who use the new networks, as well as the overall economic competitiveness of the country.

Mobile broadband has the potential to impact important aspects of societies such as healthcare, education, and different socio-economic groups, particularly the under privileged groups in remote and rural areas. Most importantly, mobile broadband services provide unprecedented opportunities to empower individuals across all classes.



Report shows 59.5% of the mobile internet user in Bangladesh are female and rest of the user are male. 13% of the female user uses mobile internet 3-4 hours daily where as 15.5% of the male user use mobile internet. From this data we may conclude, it is an excellent opportunity for the government to materialize priorities for economic empowerment the women through customized internet services.

Road to Digital Bangladesh

The benefits of mobile broadband depend upon the availability of adequate and appropriate spectrum that is harmonized to the greatest extent possible across borders. LTE is the culmination of decades of technological evolution and development, with each new generation building upon the previous to improve users' overall wireless experiences and meet users' wireless connectivity needs for years to come.

In a country like Bangladesh with poor physical and transport infrastructure particularly in rural and remote areas, broadband infrastructure and internet technology is playing magnificent role in outreaching development programmes to the focused groups and wider masses. MNOS in Bangladesh already face low average revenue per user (ARPU) as a major challenge, which fell from \$30 in 1997 to \$2 in 2013.

Operator revenues are necessary both to meet capital and operational expenses and to reinvest in infrastructure and services. Getting the balance right should enable MNOs to reinvest in the industry and tackle the infrastructure problem, which not only includes access, but also issues around quality of service and speed. It has also been said that Bangladesh is one of the lowest ARPU country in the world with one of the highest tax burden country. It will not be practicable to make the

operators to carry all the charges. It is expected that government / regulator make sincere efforts to keep the spectrum and other charges within the reasonable limit to flourish the broadband and hence help to reduce the digital divide at accelerated pace.



The industry has to continue to innovate and find more effective ways to utilize spectrum while the government should allocate and assign spectrum to the highest-value use like for commercial mobile broadband. Bangladesh has separate legal entities to provide lease line and backbone transmission. However, quality of service from such entities is far from telco grade quality. It is a timely demand of the industry that we all address this issue and improve the affordable availability and quality from the NTTN operators.

Making services more affordable for wider segments of the masses and providing high speed, secure and useful internet experience to the customers are quite vital if Bangladesh is to achieve middle-income status by 2021. Close cooperation between the government and the industry is critical to finding solutions that will ensure that advanced services can continue to grow and meet customer needs. For Bangladesh in the present context, deployment of 4G LTE is the road to digital Bangladesh. ■

Social & Economic Contributions of MOBILE ECOSYSTEM

EMPLOYMENT

Jobs directly supported by mobile ecosystem



17M JOBS 2015

20M JOBS 2020

Plus as additional 16M indirect jobs supported by 2020

PUBLIC FUNDING

Mobile ecosystem contribution to public funding (before regulatory and spectrum fees)



\$430bn 2015

\$480bn 2020

ACCELERATING MOVES TO MOBILE BROADBAND NETWORKS AND SMARTPHONE ADOPTION

Mobile broadband connections to increase from 47% of total in 2015 to

71% by 2020

By 2020, there will be

5.8bn

smartphones, growth of 2.6bn from the end of 2015

Data traffic to grow by a CAGR of

49%

over the period 2015-2020



MOBILE CONTRIBUTING TO ECONOMIC AND SOCIAL DEVELOPMENT ACROSS THE WORLD



Delivering digital inclusion to the still unconnected populations
Mobile internet penetration
2015: 44%
2020: 60%



Delivering financial inclusion to the unbanked populations
270 live services in 90 countries as of December 2015



Delivering innovative new services and apps
Number of M2M connections to reach 1bn by 2020

MOBILE INDUSTRY CONTRIBUTION TO GDP

2015 **\$3.1tn** **\$3.7tn** **4.2% GDP**
GROWING TO BY 2020 ↑

MOBILE OPERATOR REVENUES

Data growth driving revenues and operator investments



2015 **\$1.1tn**

2020 **\$1.2tn**

OPERATOR CAPEX OF UP TO **\$900bn** FOR THE PERIOD 2016-2020

↑
2015 - 2020 **1.9%** CAGR

UNIQUE SUBSCRIBERS

2015 **4.7bn**

2020 **5.6bn**

2015 - 2020 **3.9%** CAGR



2015 **63%** 2020 **72%**
PENETRATION RATE



LTE INNOVATIONS ADDRESS **mobile network efficiency**

Big and small mobile operators are turning to LTE innovations to address not only capacity and spectral efficiency but also related operational challenges. That's because staggering demands on LTE networks have exceeded all predictions for the technology

Why look to LTE TECHNOLOGY now?

Ever since LTE was first deployed in 2009, user behavior, devices, and even content have changed. Device prices have dropped — some cost as little as \$50 — and market penetration of smartphones and tablets has been far greater than expected. Plus, we've seen surprisingly rapid and widespread adoption of high resolution, as well as larger form-factor devices.

Video has also become the content of choice -- so much so that there's been a veritable data explosion. That's why capacity is now the

number 1 issue even for LTE early adopters such as Verizon Wireless. Indeed, consumer complaints to the Federal Communications Commission about network congestion have been escalating since 2013.

To stem the tide, Verizon Wireless and AT&T deployed more than 1,000 LTE small cells in New York City alone. Even so, data traffic continues to soar. According to Bell Labs research, overall wireless traffic is expected to multiply 30 times by 2020. For this reason, operators are looking to deploy innovative LTE technologies.

LTE innovations checklist

Before operators make their decisions, they need to know how these new technologies can address their most pressing challenges. Here are some of the latest LTE innovations that should be on the watch list.

Meet the capacity/performance challenge

To handle the capacity crunch, the base band unit should be able to support scalable massive capacity and be ready for a smooth evolution to LTE-A pro, virtual RAN and 5G technology. Moreover, the RF platform needs to be in a modular, smaller form factor that is optimized for power, bandwidth, and performance.

Deploying small cells under the macro layer is also a powerful way to add fast, cost-effective capacity where it's needed (hot spots).

To improve the network performance and especially the data throughput, operators need to deploy LTE-Advanced features such as carrier aggregation (CA) and higher order MIMO to make most of their spectrum assets. Over time, operators acquire spectrum via auctions as well as through mergers or acquisitions of other operators. In these circumstances there often isn't a perfect meshing and spectrum holdings may vary by market. CA lets operators aggregate these disparate chunks of spectrum spanning across different bands by supporting inter-band CA. This is the most common use for CA since most spectral assets that operators have acquired piecemeal over time.

Protect your RAN investment and get ready for 5G

The solution needs to fully support LTE-A and be sufficiently flexible to support different deployment options, including a centralized architecture. At the same time, the product

... operators need to deploy LTE-Advanced features, such as carrier aggregation (CA) and higher order MIMO to make most of their spectrum assets

should allow operators to prepare for a smooth transition to a virtualized RAN, and ultimately to 5G& IoT.

Look for easy network deployment

There are several important considerations for operations, deployment, and maintenance. The LTE platform should use a common FDD and TDD release for macro and small cells. The LTE solution should also accommodate simple adaptations to meet specific customer needs.

Then there is remote, software configurable transmission modes. This allows for quick and easy field modifications to meet changing traffic patterns and market demands. Similarly, operators should watch for self-optimizing networks and automatic neighbor relations technologies. These tools get operators moving faster by reducing set-up time, as well as automatically removing bad neighbors from the network.

Partner with an LTE innovations leader

Finally, operators need to engage with a proven partner who is an LTE leader and innovator. Nokia has deployed 328 Macro LTE networks in more than 100 countries. Nokia is LTE supplier to 18 out of the 20 largest operators by LTE subscriber count. In addition to the macro networks, Nokia has 207 LTE small cell references. Nokia AirScale Radio Access is Nokia's most powerful next generation radio, designed to meet future needs which is supporting 4.5G now and a path for evaluation to future technologies like 5G & IoT.



Connecting the **3.9 billion** unconnected

If you've never connected to the Internet, you probably would not feel your life incomplete. On the scale of human history, the Internet is almost unquantifiable recent, but disconnecting today would be hugely inconvenient to most netizens, with even just a few days without leading to withdrawal.

Today, the Internet is an integral part of our work, leisure, consumption, and shopping. In fact, life is so inextricably intertwined with the net that many people carry two or more smart devices wherever they go to work, surf, and post at any time. We rely on the Internet for the latest news updates and feeds, fearing we might miss something, with even the lives of some becoming so fragmented due to social

media overuse that information overload has become a common phenomenon. However, disconnection in this instance would still be hard to accept, with a range of social norms possibly upset in the process.

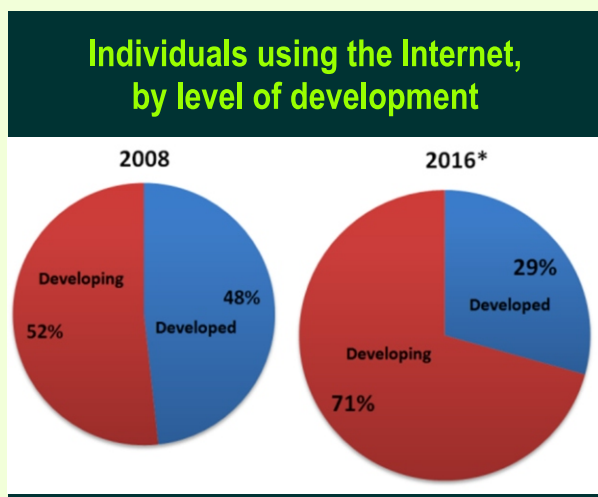
Nevertheless, most of the population of our planet is still unconnected. The International Telecommunication Union (ITU) Secretary General, Mr. Houlin Zhao revealed during the recent ITU Telecom World Summit in Bangkok during Nov 14~17th that approximately 53% of the world population is still not using internet. The absence of the Internet may prevent information overload, but it also prevents what most of you reading this would call a fully-realized life.

The unconnected world

Looking back through the 30 years since the Internet became generally available in the developed world, there's a clear link between Internet penetration and socio-economic development. Even today, it remains the single most important factor, and the ITU has calculated Internet penetration in the context of developed and developing regions, with their statistics revealing that 90% of people in developed areas and 41% in developing



countries are connected in 2016, meaning that less than 60 million of the 3.9 unconnected hail from the developed world.



Rapid technological development, particularly the proliferation of mobile Internet, has a profound impact on bridging the information network accessibility gap, which in turn derives from underlying economic socioeconomic issues. Figures 1 and 2 show that from 2011 to 2015, the growth percentage (per 100 inhabitants) of both fixed and mobile broadband users increased at higher incremental gaps in the developing markets than in the developed; especially the number of mobile broadband (MBB) users in the developing world doubled whereas in the developed market the pace became 50% of what it used to be 5 years ago. In other words, progress is being made in many of the world's less prosperous places.

China has the largest number of netizens in the world. At the end of 2008, China was home to 117.6 million mobile netizens, less than half of all the people online. By the second quarter of 2013, this number soared to 464 million, accounting for 78.5% of all of China's netizens and demonstrating that mobile broadband is vital to connecting the unconnected.

Netizen numbers are vastly different depending on where you live; for example, 84% of Africans have no Internet access compared with 25% of Europeans and 10% of people in Scandinavia, which boast the highest Internet penetration rates in the world.

To efficiently cover the greatest number of people, we selected the world's ten-most populous countries, which together account for more than half the planet (over four billion people). These countries include two fully-developed countries (Japan and the U.S.) and all four BRIC countries, along with Bangladesh, Indonesia, Nigeria, and Pakistan. Taken on the whole, they offer a fairly representative sample of the issues that perpetuate the digital divide.

A July 2013 report issued by the China Internet Network Information Center (CNNIC) indicates that the number of China's netizens has risen to nearly 600 million, 44.1% of the total population. Similarly, around half of Russia's and Brazil's populations remain unconnected, but India is an outlier among its contemporaries. While its 150 million netizens give it the third largest body of connected citizenry in the world, this figure comprises just 13% of India's population, meaning that 1.07 billion Indians have no Internet access; this is more than the number of unconnected residents on the African continent combined.

Indonesia, Pakistan, and Bangladesh are all also in the same range as India, with 10-to-15% rates in terms of netizenry; this is even more than a simple reversal of the rates in the U.S. and Japan, where roughly 20% of citizens are unconnected, a typical figure for the developed markets.

Nigeria stands alone somewhat as its percentage of unconnected is about halfway between the least-connected countries and

the BRIC countries (roughly two-thirds unconnected), and in many ways Nigeria represents a look at the future in terms of its very high percentage of netizens using mobile connections only. This mobile-only revolution will be enabled by Long-term Evolution (LTE) technology, which offers data rates comparable to or better than the fixed media (if any) available in the developing world, with low-cost smart terminals (LTE-enabled phone costs are expected to dip to USD50 and below sometime in the next couple of years) functioning as both phone and PC.

Despite the importance of economic factors in the digital divide, they are not the only issues in play, as large percentages and regions in even the wealthiest countries remain off the grid.

Dark zones

There are few places left on the map that are completely free of human influence, as LTE base stations now lie both above the Arctic Circle and at the base of Mount Everest, and optical submarine cables connect all continents except Antarctica. However, there are still regions on every continent either un- or inadequately connected. To enable Internet access in these dark zones without migrating people, governments must earmark funds and implement preferential policies to encourage carriers to expand their deployments. In turn, carriers must develop more effective mobile broadband solutions to fill coverage gaps and realize broadband for all.

However, base stations don't run on goodwill; something has to power them, and there aren't a lot of power outlets in the world's far reaches and undeveloped places (85% of rural sub-Saharan Africa lacks access to power mains). In areas with plenty of wind, sun, or other renewable power sources, alternative-energy communication solutions are now being implemented, but that won't work everywhere. Google has proposed something more radical (Project Loon), where high-altitude balloons basically function as floating hotspots, but this is as yet unproven on a large scale or over the long-term. Most of tomorrow's solutions will be more earthbound.

Internet access cost accounts for 5% or less of the income per capita, people are more likely to find it affordable

High costs of entry & access

Even if Internet access is available, it isn't free, and neither are the devices that enable it. This is a particular problem in developing markets, as Internet access is typically priced like a developed market service. A UN report claims that when Internet access cost accounts for 5% or less of the income per capita, people are more likely to find it affordable, and this can create a healthy market demand.



Connecting the unconnected is imperative for humanity, as inequality represents perhaps the defining social issue of our time. It only takes a broadband connection, a terminal, and a good idea to start a business; this represents a far more likely path out of poverty for the unconnected in the current job market

On a global scale, we are still a long way off from this, as Internet access fees in 30 countries around the world exceed 50% of local per capita income, and in the 19 least developed countries, broadband access fees actually exceed per capita income, with the worst actually exceeding it seven fold.

The good news is that the issue of device cost is more tameable, as the nominal costs of both PCs and smartphones have dropped rapidly. In China, a starter smartphone can be bought for CNY200 (around USD30), and this has greatly lowered the threshold for Internet adoption, emerging as the main driver shifting unconnected people to netizenry. At the same time, governments can help, and have. In the EU, governments have formulated preferential tax refunds to encourage low-income people to buy Internet terminals. Similar policies are also being carried out in developing markets in Africa and Turkey.

Skills gap

Internet access has not yet reached the “just there” level in terms of ease of use, and many of the world's unconnected find computers and smartphones baffling. This could be due to illiteracy (as is present in one-third of Africa's adult population), physical limitations (poor vision or motor control), or a disinclination to understand icons.

According to a CNNIC report, a considerable proportion of the unconnected in China do not use the Internet because they either lack the

skill or because they consider themselves too old. To equip more people with adequate Internet skills, governments can work with community organizations and educational institutions to carry out training programs. Terminal vendors should also provide more personalized, user-friendly devices, and application developers can contribute by developing more simple and interactive apps. However, ease-of-use is not the end of the story.

Lack of relevance

A considerable percentage of the unconnected have the means and skill to do, but simply choose not to. Their reason is simple they're not interested. This phenomenon stands out more in the developed markets, but it is present everywhere. A survey covering 27 EU countries shows that over half of their unconnected say that they do not need the Internet, and the findings in the U.S. are similar. The Pew research center discovered that 48% of the unconnected population think the Internet is not relevant to their lives. A CNNIC survey in China shows that a significant percentage of people in China ignore the Internet because "it's hardly relevant to life and they do not have the stimulus to learn new things."

If the Internet provided customized and useful services, more people would use it, which would in turn drive the development of Internet services. A virtuous cycle would then be created.



3.9 bn people,
three-fifths of the
world's population,
are **unconnected**

The untapped 3.9 billion

Today, the importance of the Internet is self-evident to those in the know. The UN views Internet access as a basic human right that warrants guarantee, on par with food, shelter and medicine.

However, more than three-fifths of the world's population remains unconnected. For many, Internet access can trigger a change in life, and it is often those who have no connection who need the Internet's benefits the most, and these include education, opportunity, and greater involvement with the global, national and local communities.

What does this mean for telco? We have a long way to go. Fortunately, we are heading in the right direction, as the number of netizens around the world has increased by two billion in the last ten years, and Huawei is confident that the next two billion people can be covered in an even shorter time span. Some countries have made connection a matter of policy. Estonia, Finland and France have stipulated laws ensuring the basic right of Internet access

for all citizens, and by mid-2013, over 130 countries outlined national broadband strategies to boost Internet adoption and usage.

Connecting the 3.9 billion unconnected is imperative for telco, as we all know that fighting over the already connected is a zero-sum game. In an industry where growth opportunities are running low, and users grow more jaded and demanding, the unconnected represent the last market segment that can truly be wowed by what you have to offer. The fruit here may not be exactly low-hanging, but it will be plenty sweet once we have it in hand.

Connecting the unconnected is also imperative for humanity, as inequality represents perhaps the defining social issue of our time. It only takes a broadband connection, a terminal, and a good idea to get a business started, and in the current job market, this represents a far more likely path out of poverty for the unconnected.

So, what will the world look like with everyone connected?

LTE

ROAD TO MOBILE BROADBAND IN BANGLADESH

Mobile broadband is a reality in Bangladesh. The Internet generation is growing fast and they demand to have broadband access wherever they go, and not just at home or in the office. The majority of these will be served by HSPA and LTE networks. LTE is the next step in the technical evolution of 2G/3G networks.

Experience gained from the mobile broadband arena shows that when operators provide good coverage, service offerings and terminals, mobile broadband takes off rapidly. Packet-data traffic surpassed voice traffic during May 2007

based on a world average WCDMA network load. This is mainly due to the introduction of mobile broadband in the networks. USB dongles and data cards were first, and smartphones are getting more and more popular. Several operators have seen a four-fold increase in data traffic in three months after they launched 3G. This traffic growth is paid by mobile broadband customers.

A number of broadband applications are significantly enhanced with mobility. With the introduction of smartphones, we have seen an explosion of community sites, search engines, gaming, presence applications and content-sharing like YouTube, to name just a few examples. With mobility, all these applications become significantly more valuable to users. User-generated content is particularly interesting, because it changes traffic patterns to make the uplink much more important. The high peak rates and short latency of LTE enable real-time applications such as gaming and video meetings.



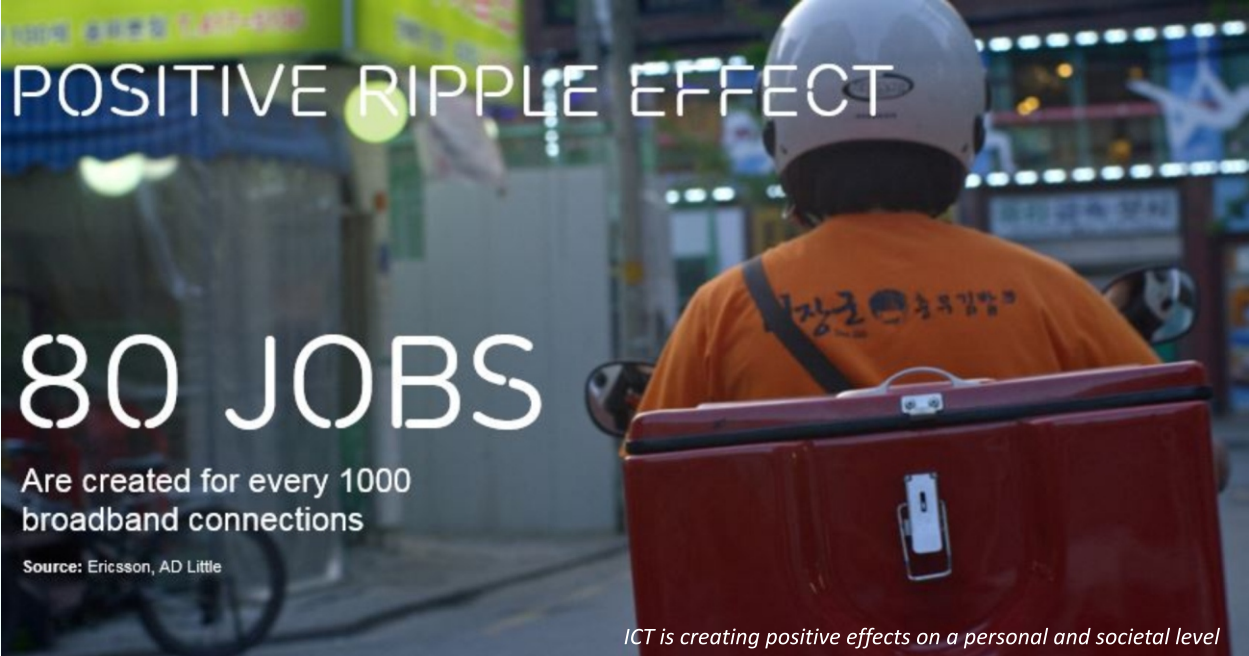
Showing new behaviors among users

Operators are doing business in an increasingly competitive environment. They are competing not only with other operators, but also with new players and new business models. However, having new business models also mean new opportunities, and mobile operators have the advantage of being able to offer competitive delivery of mobile broadband services for digital services enriching consumers' new life style. The continuous development of LTE performance, to create increased bandwidth, higher capacity and better spectrum utilization, will bring about new potential revenue opportunities for the operator by providing new services, as well as economies of scale, enabling mobile broadband in new areas where it was not economically feasible before. In addition to high end users in urban areas, LTE can also be used for rural coverage of broadband, one example of that is Australia.

deployments. This means that an operator can introduce LTE in both new and existing bands. In contrast to earlier cellular systems, LTE will rapidly be deployed on multiple bands.

Our growing desire for 24/7 internet access is relevant to all aspects of daily life. Mobile broadband devices are mass-market products, and LTE-enabled devices are growing fast. The first LTE-capable devices were USB dongles, as was the case with HSPA. Since then, however, we have seen a faster introduction of other devices taking place in a shorter time frame, such as laptops with embedded LTE, MiFi, routers, smartphones and tablets.

Deployment of LTE varies from country to country, according to regulatory requirements. The devices are multimode-based, meaning that wide-area coverage, mobility and service continuity can be provided from day one.



POSITIVE RIPPLE EFFECT

80 JOBS

Are created for every 1000 broadband connections

Source: Ericsson, AD Little

ICT is creating positive effects on a personal and societal level

LTE can be used in both paired (FDD) and unpaired (TDD) spectrum. LTE is defined to support flexible carrier bandwidths in many spectrum bands and for both FDD and TDD

Existing legacy mobile networks can be used to fall back in areas where LTE is not available. It can be mentioned here that deployment of LTE infrastructure is simple and cost-efficient. For

WE LEAD TRANSFORMATION THROUGH MOBILITY

NETWORKS

Create one network for a million different needs

- › Mobile Broadband
- › Managed Telecom Services
- › IP & Transport Networks
- › Core Networks
- › Network Optimization

Ericsson leads transformation towards networked society

IT

Transform IT to accelerate business agility

- › Consulting
- › Operations & Business Support Systems
- › Systems Integration
- › Managed services
- › Cloud

MEDIA

Delight the TV consumer every day

- › Cloud TV platforms
- › Managed Broadcast Services
- › Media Delivery Networks
- › Software defined video processing
- › Transformation Consulting services

INDUSTRIES

Connect industries to accelerate performance

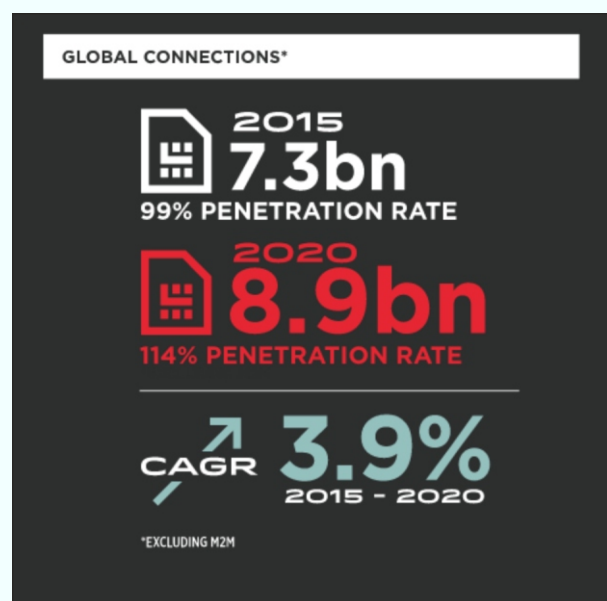
- › Utilities & Energy
- › Automotive
- › Intelligent Transport Systems
- › Maritime
- › Public Safety
- › Commercial & Industry Real Estate
- › Mobile Financial Services

example, it should be possible to upgrade existing radio base stations to LTE using plug-in units, so that they become both dual-mode and dual-band. Stand-alone base stations for LTE will also be simpler to deploy than today's products. Network rollout as well as operation and management can be simplified with plug-and-play and self-optimizing features reducing both capex and opex for the operator.

As a market leader, Ericsson Solution carries most of the global LTE traffic -- 40 percent of the world's mobile traffic is carried over Ericsson networks. Ericsson is present in all high-traffic LTE markets including the US, Japan and South Korea and tops LTE market share within the world's top 100 cities. More than 210 LTE RAN and Evolved Packet Core networks have been delivered worldwide, of which 175 are live. September 2016, Ericsson demonstrated downlink speed of 1 Gbps in the commercial network in Telstra, Australia.

Ericsson's strategy for LTE has been first and foremost to deliver a high-speed, responsive

network that delivers significantly better user experience from day one. Ericsson leads transformation through mobility and delivers extreme app coverage for operators and end users alike by delivering Gigabit LTE, Elastic RAN, IT & Cloud solution with global knowledge of services to meet the ever-growing needs and opportunities of the Networked Society.



AMTOB ACTIVITIES



AMTOB members hands over a bouquet to Tarana Halim, MP, State Minister of Posts and Telecommunications Division to congratulate on her receiving ITU award for Bangabandhu Satellite Launching Project



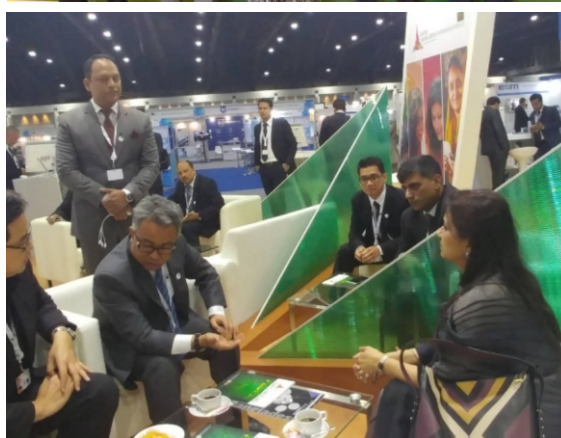


SATRC-17, Dhaka Event



SATRC-17, Dhaka

GLIMPSES OF ITU TELECOM WORLD 2016



GLIMPSES OF ITU TELECOM WORLD 2016

ITU
TELECOM
WORLD
'16
Bangkok 14-17 November



Adv. Tarana Halim MP, State Minister for Posts and Telecommunications along with the Bangladesh Delegation Team at the ITU Telecom World 2016 held in Bangkok, Thailand during 14-17 November 2016

AMTOB MEMBERS' ACTIVITIES



Sajeed Wazed, Honorable ICT Affairs Advisor to the Honorable Prime Minister inaugurated the country's first ever IT incubator, a joint initiative of the ICT Division of Bangladesh Government and digital communications service provider Banglalink. Houlin Zhao, Secretary General, ITU, Zunaïd Ahmed Palak, State Minister for ICT, Augie K. Fabela, CoFounder, VimpelCom and Erik Aas, CEO of Banglalink were also present at the ceremony.



Grameenphone received the second batch of GP Accelerator, a mentoring program for technology startups, in the presence of Advocate Tarana Halim, MP, State Minister of Posts, Telecommunications Division and BTRC Chairman Dr. Shahjahan Mahmood.

AMTOB MEMBERS' ACTIVITIES



Hon'ble Prime Minister (PM), Sheikh Hasina at the event of Digital World, inaugurated the "Digital Training Bus" a project co-sponsored by Robi Axiata with Govt. for Sustainable Women Development through ICT. Abul Maal Abdul Muhith MP, Hon'ble Finance Minister, Imran Ahmed MP, Chairman, Parliamentary Standing Committee on MoPT&IT, Zunaid Ahmed Palak MP, State Minister, ICT Division and Mahtab Uddin Ahmed, Deputy CEO of Robi Axiata Limited are also seen in the picture.



Adv. Tarana Halim, MP, State Minister for Posts & Telecommunication Division, MoPT& IT inaugurates Teletalk Customer Care Center in Banani on 20 October 2016. Gias Uddin Ahmed, MD, Teletalk is also seen in the picture.

AMTOB ASSOCIATE MEMBERS' ACTIVITIES



Mr. Rajendra Pangrekar, Country Manager of Ericsson Bangladesh Limited addressing to the invitees at a Iftar Party



Huawei Customer Solution Integration and Experience Centre (CSIC) was inaugurated by the Honorable State Minister Ms.Tarana Halim