The Broader Way

Building digital economies
Connecting people
Achieving Win-win Outcomes through Collaboration and Developing Competitiveness through Broadband

Just as steam engines propelled social and industrial development 100 years ago, ICT has been the engine of progress for the past twenty years, profoundly changing our daily lives. Today, ICT brings new intelligence to and enables further convergence of the digital and physical worlds. Social media, online banking, and e-commerce are just the start. More exciting changes lie ahead as ICT is restructureing traditional industries, and creating a new industrial revolution, driven by mobile Internet. For example, electric motors and automated driving are beginning to redefine the automobile, while wearable technologies and cloud computing allow people to observe and react to their environment in a more intelligent way, beyond the limitations of the human senses.

None of this would be possible without broadband connectivity over fixed and wireless connections. ICT applications are influencing socioeconomic development, while broadband networks are becoming the very foundation of our digital society. According to the latest statistics, digital infrastructure, represented by the broadband Internet, has surpassed railways in economic importance, contributing over 35% to global economic output. Broadband is now a core economic competency for any city, state, or country.

However, broadband network development faces a variety of difficulties and challenges, especially in terms of investment models, the cost of construction and collaboration across the value chain. Broadband network development requires country-specific models and collaboration across industries and sectors.

The first issue is the investment model. Broadband networks can be constructed by the carriers themselves, with government investment, or through public-private partnership (PPP), which often proves the most efficient and effective route to national broadband. As carriers with their own strengths are motivated and attracted to take the lead in building broadband networks, investments and subsidies from governments in turn bring broadband to areas and regions where the commercial investment case alone falls short.

The second issue is cost. Currently, over 70% of the cost of broadband network construction is taken up by the purchasing spectrum, acquiring site resources, and deploying pipes and cables. Governments, international organizations, and industries need to better collaborate, to develop policies and standards to encourage and promote cross-industry collaboration that reduces cost. One example, fiber to the home (FTTH) can be incorporated into the building of conventional infrastructure, such as power supply, water and drainage. These assets could be readily accessible and shared by all industries. What’s more, spectrum demand and distribution mechanisms could be better aligned to reduce spectrum costs. All these initiatives can effectively reduce overall broadband deployment costs.

And finally, broadband network development can be facilitated through broader application of the technology itself. Here I want to emphasize that the development of the industry value chain requires collaboration across the device, network and cloud industries. At Huawei, our long-term investments are aimed at achieving these goals. We believe that affordable devices in various configurations, with a wide variety of applications for individual, household and enterprise use, are not only the driving force behind broadband network development, but also the purpose of it.

The physical world has gone digital and the digital world is taking shape. It is a real honor for Huawei to grow together with the industry and serve three billion people around the world through our innovative products and services. In the next two decades, the physical and digital worlds will integrate further and ubiquitous broadband networks will emerge, but we still have a long way to go. As always, Huawei will continue our efforts in technological innovation and open cooperation, and serve our customers through our leading products and solutions. This will help create a better connected world, constantly enabling social progress, and enriching people’s lives.

Thank you for your interest and participation in the Broader Way Forum. I hope you gain as much from your involvement as Huawei will do.

Ken Hu
Deputy Chairman, Huawei Technologies
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Broader Reach
Launched in February 2012 at the Mobile World Congress in Barcelona, Huawei’s Broader Way global events program takes various forms. This year, we’ve incorporated a range of new and expanded activities to ensure world-class standards.

Huawei works in partnership with a number of international organizations to facilitate the events and stage the broadband forum. Partners include influential ICT stakeholders such as industry experts, academics, operators, ISPs, government officials and the media.

Since our first event in Barcelona, the Broader Way Forum has increased in profile and we’ve held several forums either independently or at industry events around the world, including in the UK, Germany, Spain, India, Turkey, South Africa, Indonesia, Poland, Venezuela, the UAE and Nigeria. In total we held 19 forums in 2012 and 20 in 2013.

The monthly publication Telecom Review recently ran a special report on Huawei’s Broader Way Forum and interviewed Huawei Middle East President Yi Xiang, and the forum is now part of the official schedule at the INDABA Conference co-organized by the South African Ministry of Communications and ITU.

The Broader Way Forum of the past and present

In 2014, Huawei will hold approximately 20 Broader Way Forums globally beginning with Mobile World Congress 2014. It’s incredibly exciting to see the Broader Way concept catch on and expand around the world, offering a unique channel for individuals from diverse backgrounds to gather and share suggestions, knowledge and create a better landscape for ICT. Huawei is committed to supporting broadband development globally, and we’re pleased to bring together some of the best minds in the industry at the Broader Way Forum to steer dialogue on this crucial topic and inspire action that will enrich the lives of people around the world.
Over 50 ministers and CXOs of customers participated in the event. Subjects discussed at the congress aligned with the requirements of developing countries for network build-outs. Around 120 government guests were present, including 16 ministers and chairpersons, and 4 deputy-ministers. Among these were:

- Chairman of the Nigerian Communications Commission
- Chairman of Telecom Regulatory Authority of Senegal Post
- Vice Minister of the Ministry of Information Media, Vietnam
- Minister of Côte d’Ivoire Communications
- President of Côte d’Ivoire Communications Fund
- Minister of Communications, Guinea
- Minister of Posts and Telecommunications, Azerbaijan
- Chairman of Telecommunication Authority, Pakistan
- Chairman of Telecommunications Regulatory Authority, Oman
- CEO of Omantel
- Minister of Communications, Uganda

The Key Message given by Ken Hu was well-received and reached a wide audience. The views expressed by Ken Hu at the Broader Way Forum and VIP banquet matched the needs of those stakeholders that attended. He stated that:

- Broadband networks form the new basis and core competence of national economies.
- Cross-domain synergized PPP network build-out models provide unparalleled benefits.
- A wealth of applications is currently driving the development of broadband networks.

A common question asked by customers in meeting/panel discussions is: “How can we build quality NBNs rapidly and cost effectively?”

The congress generated a range of positive outcomes:

In the Broader Way Forum, ITU vice secretary Zhao Houlin praised Huawei, giving Huawei a public endorsement at a key international event.

This congress comprised four types of business activities: Broader Way Forum, VIP banquet, customer meetings, and media coverage. These activities effectively conveyed Huawei’s views about National Broadband Network (NBN) build-out and demonstrated Huawei’s leadership in the industry. The event will definitely facilitate the development of NBN construction worldwide.

Forum theme: Broadband enriching everything

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Forum theme: Industry 4.0: A Revolution for the Future of Germany

Minister Altmaier:
"Today, China is no longer to be regarded mostly as a competitor but rather as a partner of Germany. In turn, Germany will remain a trustworthy partner for China now and in future."

"In light of the turnaround of Germany’s energy policy, I would like to highlight two fields: Smart Metering as an important ICT mechanism to drive innovation; electro-mobility as a challenge to be implemented. With regard to this, I am appealing for cooperation on electro-mobility with China.”

Guo Ping, Huawei Rotating CEO:
"Industry 4.0 manages to cross-link production and automation based on highly innovative information and communication technologies. In this regard, new forms of working and economic activities are possible, which reach not only beyond industry segments but also national borders. This is set to revolutionize our present supply chains.”

"Huawei will keep helping the German industry to fully realize the potential of digitalization.”

Walter Haas, CTO HUAWEI Germany:
"Mobile communication and interoperability" "The so called Machine-to-Machine-Communication is an illustrative example of the fourth Industrial Revolution.”

"This automated information exchange is increasingly due to the Internet and mobile networks.”

2nd Keynote: Prof. Dr. Henning Kagermann, President of ACATECH:
"Industry 4.0 and the internet-based services are as revolutionary as they are demanding; we have broken new ground in many respects.”
Spain
February 19th 2013

Forum theme:
Broadband drives digital society

Welcome and Opening Address (16:30—16:50)
• Dr. Hamadoun Touré, Secretary-General, ITU
• Wen Ku, Director General, Department of Science & Technology, MIIT, China
• Ryan Ding, CEO, Carrier Network Business Group, Huawei Technologies

Panel Discussion—Broadband Drives Digital Society (16:50—18:10)
Moderator: Jeremiah Caron, SVP, Current Analysis
• Wen Ku, Director General, Department of Science & Technology, MIIT, China
• Dr. Eugene Juwah, Executive Vice Chairman/CEO, Nigerian Communications Commission
• Tomasz Gerszberg, SVP, Technology Strategy, Governance and Programs, Deutsche Telekom AG, German
• Mario Castillo, ICT Policy Expert, United Nations Economic Commission for Latin America and the Caribbean (ECLAC)
• Yu Quan, CSO, Wireless Network Business Unit, Huawei Technologies
• Peter Janich, Service Director, Service Provider Infrastructure, Current Analysis

Cocktails (18:30—20:00)

Excellent Points from Panelists

Two important features of ICT developments are mobile data and big data; IC, CT and the Internet will converge and become more open, and play a more crucial role in promoting efficiency and social development. All governments are obligated to create a trusted, transparent, collaborative and open environment for ensuring cyber security. All parties in ICT sector should adopt end-to-end security system to enhance the health and resiliency of the network. - Wen Ku, Director General, Department of Science & Technology, MIIT, China

First, we must address the infrastructure deficit. Then we must release more frequency. By 2017, we will achieve 30% broadband penetration. You must build good fixed broadband infrastructure to have good services through mobile broadband. Now we have to consider how the investment in broadband can be secured in the future. - Dr. Eugene Juwah, Executive Vice Chairman/CEO, Nigerian Communications Commission

Redefining the business model in the Internet and internal delivery model, especially for the mobile broadband, is a challenge to our business. We need to talk about it openly. We need to involve regulators and politicians, because the industry cannot do it on its own. - Tomasz Gerszberg, SVP, Technology Strategy, Governance and Programs, Deutsche Telekom AG, German

Beyond information and communications, we’re welcoming a new wave of digital revolution. MBII will be overwhelming in the future digital society. Anywhere anytime, 1Mbps is the primary user experience baseline for the digital society. More licensed spectrum allocation is the foundation for ensuring the sustainable development of the digital society. - Yu Quan, CSO, Wireless Network Business Unit, Huawei Technologies

Other countries broadband development was shared during the forum, providing valuable lessons for Botswana to learn. We suggest that Huawei proposes national broadband as soon as possible. - Nonoto E. Molefhi, Minister of Transport & Communications, Botswana

I was impressed by the forum attendance, and found it very interesting and useful. - Tomasz Gerszberg, SVP, Technology Strategy, Governance and Programs, Deutsche Telekom AG, German

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Feedback
This event helps governments learn about the vital role broadband plays in promoting economic development in line with China’s broadband strategy. More discussions and interactions are needed, for example, how government and operators can cooperate in covering remote areas such as western. - Wen Ku, Director General, Department of Science & Technology, MIIT, China

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Thank you for inviting us. We were very much interested in the planning and shared experiences of building a broadband network. We hope government officials and operators can be invited to take part in discussions of the future forums that Huawei organizes. - Dr. Torhan M. Almufti, Minister of Communications, Iraq

Highlights:
• High-level and diverse panelists from governments, operators, NGOs and academia;
• Rich and complete discussion content, including broadband issues from EU, Asia (especially China), Africa and Latin America;
• To further enhance customer relationships, Dr. Touré praised the Ministry of Communications of Nigeria during his speech. The CEO of Nigerian Communications Commission was impressed with the event.
• Simultaneous interpretation helped convey content precisely and effectively, including French.
Expanded Horizons
Impact of broadband

In the last ten years economic researchers have examined the evidence on broadband and its contribution to the economic performance of nations, in an attempt to quantify these benefits. Governments rightly see broadband as an important enabler of economic and social development. This is just as true in emerging markets as in the developed markets. Broadband infrastructure has the power to revolutionize the way we live and work, and is important to the sustainable and long term growth of national economies. It is an enabler of competitiveness, social cohesion and economic growth.

In the last ten years economic researchers have examined the evidence on broadband and its contribution to the economic performance of nations. This research is important, because many governments around the world have been making major investments in fixed and mobile broadband. It is natural to ask whether these policies and the associated investment can be justified.

This is a case where academic research has practical policy implications, particularly in emerging markets where demand for capital investment is high and hard choices must be made between competing priorities. There are some important lessons for developing countries in the results of this research, and some of these lessons have significant policy implications.

| What the research tells us |

Economic research on the impact of broadband is a work in progress, but some clear conclusions can already be drawn. This research falls into two broad classes: microeconomic and macroeconomic. Microeconomics is focused at the level of the organisation, and studies the impact of broadband on organisation behavior, strategy and structure. Macroeconomics uses tools of econometrics such as regression analysis to determine the impact of broadband on historical economic and productivity growth.

Macroeconomic effects can be placed into two classes: impacts due to the initial construction of the broadband network, and impacts due to efficiencies that flow through to the economy. Economic analyses of the impact of broadband rollout have tended to focus on the employment impact in developed markets in the context of the global financial crisis. The employment effects of major broadband rollout programs are significant. For example, in the United States the Brookings Institute calculated that an investment of US$63 billion in broadband would generate 546,000 jobs directly in construction and another 665,000 in other parts of the economy over ten years. These impacts are most beneficial when unemployed workers and underutilized capital can be mobilized to deliver broadband infrastructure, delivering new economic activity.

Once built, broadband provides a boost to GDP. Broadband contributes to higher GDP growth through several mechanisms. Broadband can raise an industry’s productivity, but also enables new services and associated industries to grow. It can also enable industry-level efficiencies, such as outsourcing. Researchers studying OECD countries from 1996 to 2007 established a positive and significant link between broadband availability and GDP, finding that a 0.9% to 1.5% increase in national GDP per capita is achieved for each additional 10% of broadband penetration. Most of these studies have focused on developed economies, but one important study by the World Bank checked developed and developing markets separately for the period 1980-2002, with emerging markets showing greater benefits with a 1.38% increase in GDP. Research by the ITU in 2012 found a lower level of impact, but still found positive and significant correlations between broadband penetration and growth performance in all emerging markets where the data allowed statistically significant results.

The research has demonstrated some other important results. World Bank researchers argue that broadband achieves economic results when there is also an ecosystem of IT-savvy businesses and citizens who know how to use technology and IT providers who know how to deliver it. Other research suggests that critical mass effects apply; in other words, the major benefits of broadband only flow after a large proportion of the population are connected.

Microeconomic analyses of organisational-level efficiencies reinforce the macroeconomic research. At the organisation level, broadband enables more efficient internal business processes and structures and inter-firm relationships that drive higher productivity and output. In addition, other analyses have demonstrated new job creation and improved engagement with global markets.

In Ovum’s view these results justify the growing consensus for policy intervention to promote broadband rollout.

| Implications for emerging markets |

The implications of this research vary between developed and emerging markets, principally because developed markets typically have well-developed infrastructures, skills bases and user bases due to historical investments. In contrast, emerging countries need to attract large capital investment into telecommunications infrastructure and broadband specifically.
Few emerging markets can consider a mass rollout of superfast fixed broadband services, particularly fiber-based services. However, investment is easiest to justify where returns are high.

analyses that have specific consequences for emerging markets:

First, the benefits of broadband are best realized when there are also investments in the ecosystem such as ICT skills and a supportive framework of regulation that facilitates innovation and business reorganization. Complementary investments in skills, both technical skills and general ICT literacy, along with labor and business policies that minimize the cost of technology adoption, are needed to realize the full benefits of broadband. This means that broadband rollout policies should be part of a wider strategy to promote an ecosystem of ICT infrastructure and skills across the economy and society. Specifically, broadband promotion must not be separated from related skills, ICT literacy, business promotion and labor policies that enable businesses to use broadband to make their operations more efficient and encourage consumers to use services.

Second, the “critical mass” effect in the relationship between broadband penetration and economic benefits means that a high level of broadband penetration is needed to before significant benefits begin to flow. This means that broadband policy needs to be national in scope, with fast rollout of basic broadband access. Though based on economic reasoning, this approach is consistent with policies of social or geographical inclusion, which are also an important policy motive.

In developing markets this means that mobile technology will be an indispensable element of a broadband policy. However, Ovum also argues for focused investment in fixed broadband as well. There are specific segments where fixed broadband is indispensable to economic development, both in its own right and as backhaul infrastructure to support cost-efficient wireless services and mobile broadband growth.

Few emerging markets can consider a mass rollout of superfast fixed broadband services, particularly fiber-based services. However, investment is easiest to justify where returns are high. There are several segments and geographies where governments in emerging economies can maximize returns and achieve greater benefits early in a rollout phase. Ovum has identified several of these segments:

- Video is driving bandwidth consumption and video applications will drive bandwidth demand in the home. In addition, many consumers could work from home if they could obtain access to enterprise VPNs and clouds for applications and file transfer. In residential segments where incomes are high, willingness and ability to pay is also high. These geographies are typically in urban environments, so costs can sometimes also be lower.

- Fiber-based broadband has the opportunity to play a strong, supportive role in cloud-based enterprises. In particular, passive optical network (PON) was designed to handle multiple types of traffic with varying latency requirements. PON vendors have begun to adjust solutions for cloud-based enterprises by adding support for scalability and redundancy. Service providers and equipment vendors have developed sophisticated network models (often proprietary) to support networking requirements of various types of enterprises.

- Mobile data services, particularly those supported over LTE or 4G networks, dramatically increase the bandwidth requirement for backhaul. The emergence of heterogeneous networks, where many small cells must be integrated into the network, is generating even greater pressure because traditional mobile backhaul is expensive. Ovum estimates that “business-as-usual” networks and equipment would cost operators $93bn globally in backhaul transport expense and would require the purchase of more than $15bn in backhaul transport equipment annually through 2017. This would place a severe burden on mobile broadband operators. Fixed broadband networks, particularly PON networks, can provide the backhaul required. This is a geographical fit with the enterprise segments discussed above, since most mobile traffic is created in urban areas, such as train stations, shopping malls, sports stadiums and concert venues which are not from high-density residential and enterprise locations.

Policy implications for developing markets

Ovum’s observations of broadband policies around the world have identified policy approaches that will maximize the benefits of policy intervention. In particular, competition regulation, broadband funding and standardizing construction all have a role to play.

Competition regulation that reduces returns on investment will discourage investment in broadband, and may prevent it completely in these early stages. The investment required to build fixed broadband networks is large. The critical mass effect means that returns on investment can be low in the early stages of rollout. Ovum’s view is that heavy-handed regulation of wholesale fixed access will delay rollout and the associated economic benefits. Instead, it recommends that emerging countries adopt a light-handed approach to regulation in the early years, allowing investors to capture the benefits of vertical integration until a longer-term investment return is possible. In particular, fiber unbundling has been pursued in very few markets, and is not recommended for developing countries.

For example in Malaysia, Telekom is providing access to its fiber broadband network, but is allowed to do so on commercial terms. In addition, the Malaysian Government is investing some of its own funds in the network to help improve Telekom’s return on investment. The result has been a significant investment of private sector capital in fixed broadband infrastructure that will be a long-term platform for innovation in the country.

Ovum recommends that emerging countries open the market to alternative infrastructure providers. This is most advantageous where these providers are encouraged to work together in network sharing partnerships with larger pools of capital. Ovum also recommends allowing mobile operators and foreign investors to enter the fixed broadband market for the same reasons.

Public funding will probably be needed to improve the business case for broadband investment. The high up-front costs and long term for returns, combined with the critical mass effect, mean that it is difficult for private investors to find a stand-alone business case for national investment. Ovum has observed several mechanisms for financial support of broadband investment around the world. These include direct investments in publicly-owned networks, grant funding in private networks, private-public partnerships to leverage private investment from public contributions, and tax incentives and regulatory holidays to encourage investment.

We recommend that governments first consider using public funding to mobilize private investment through private-public partnerships (PPPs). PPP approaches have the advantage that they magnify the impact of public contributions by leveraging additional private capital into broadband rollout. The impact of policy is then not limited to the government’s own resources, but is strengthened by the commitments it can mobilize outside government as well. PPPs have been adopted in both developed and emerging countries such as Malaysia and New Zealand. In these cases, the public investment is often made on a concessional basis, with the government accepting either a lower commercial return or higher share of the commercial risk in order to make private investment more attractive.

Finally, governments also have an important role to play in the coordination of passive infrastructure that can be shared between different utilities. Much of the cost of broadband, particularly fixed broadband, is in civil works and these costs can be minimized if trenching and other forms of passive infrastructure can be shared between telecommunications, power and other utility providers. Cost minimisation strategies are typically implemented in planning or building codes to ensure that opportunities for synergy and cost sharing are taken as infrastructure is rolled out in new and old neighborhoods. This kind of coordination can only be achieved by governments.

Also, building standards to ensure that new residential and business real estate are provisions to support fixed broadband are recommended.
Government is indispensable for enabling an information society

By Liu Yajun

The construction of broadband networks is driven by market demands, yet the industry faces an increasing number of challenges. Governmental support is more indispensable than ever for the success of national broadband projects.

Social value and economic value brought by Information and broadband

Research and real world experience show that broadband can bring huge social benefit and economic value. According to a survey that the World Bank conducted in some Organization for Economic Co-operation and Development (OECD) member countries in 2009, GDP grew by 1.21% to 1.38% as the broadband penetration rate increased by 10%.

The Ministry of Internal Affairs and Communications of Japan, in 2011, planned that by 2020:

- The GDP of industries (such as manufacture, construction, transportation, education, and health care) driven by information and communications technology (ICT) industry shall mount up by 30,000 billion JPY.
- The GDP of the emerging industry shall reach 70,000 billion JPY and up to 3,800,000 jobs would be created.

Broadband also plays a very important role in social innovation. According to the World Bank’s assessment in 2011, the average innovation efficiency of the country with the world’s highest broadband penetration rate is 2.55, while that of the country with the world’s lowest broadband penetration rate is 0.15. The former is 15 times greater than the latter.

After researching the reports of 15 OECD member countries (USA and other 14 European countries) in 2012, International Telecommunication Union-Telecommunication Standardization Sector (ITU-T) pointed out that as the broadband penetration rate increased by 1%, the social production efficiency grew by 0.13%. Taobao (an online shopping website in China) supported about 18 million jobs in 2012. The total e-commerce sales volume of China attained 7,850 billion RMB in 2012, increasing by 30.8% compared with the same period in 2011, and China’s retail ratio of online shopping was close to 6%, surpassing the USA’s 5%.

In addition, information and broadband can also bring a lot of intangible value. Specifically, they contribute significantly to national education and health care. They also play a huge role in eliminating the digital divide and economic inequality, and provide an opportunity for emerging countries to present their late-mover advantages.

Government Conducts Informatization and broadbandization Planning

The government of South Korea is a good example in successfully formulating and implementing a national broadband plan. South Korea’s broadband planning is part of a national informatization plan.

The government of China unveiled the “Broadband China” strategy in August, 2013. The “Broadband China” strategy clearly defines development targets and important implementation measures for broadband. According to the “Broadband China” strategy, the broadband access rate shall mount up to 100 Mbps and the number of broadband users to 410 million by 2020. The implementation plan of the “Broadband China” strategy thoroughly defines the rural broadband development, urban broadband speed-up, technologies to be developed emphatically for the industry chain, content applications, and national broadband management. It also defines national policies on implementing the broadband China strategy, including

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Year: Plan | Access Rate | Access Technology
--- | --- | ---
1995-2000 | First National Information Promotion Plan | 2Mbps | ATM/ADSL/Cable
1999-2002 | Cyber Korea 21 | 50-100Mbps | VDSL/FTTx/WiBro/HSDPA/W-CDMA
2002-2006 | e-Korea | 100M-1G | FTTH/WiBro/HSDPA/W-CDMA
2003-2007 | Broadband IT Korea Vision 2007 | 50-100Mbps | VDSL/FTTx/WiBro/HSDPA/W-CDMA
2006-2015 | U-Korea Master Plan | 100M-1G | FTTH/WiBro/HSDPA/W-CDMA

As shown above figure, South Korea’s national informatization planning consists of several important phases, such as Cyber Korea 21, e-Korea, and U-Korea.

The figure lists South Korea’s national broadband plan. As shown above figure, the government of South Korea planned detailed access technologies and access rates in different phases, which properly directed the follow-up implementation of national broadbandization. South Korea’s national broadband plan spanned 20 years and was divided into different phases. Moreover, South Korea insisted on carrying out national broadbandization and achieved the planned targets.
capital support, access openness, and collective infrastructure construction and convenience. Specifically, the “Broadband China” strategy stipulates that airports, stations, schools, and enterprises shall provide support and cooperation for broadband construction. This promotes China’s broadband development.

**Government provides capital support**

The government of South Korea provides capital support for national informatization and broadbandization in two ways: informatization fund and government’s IT budget.

- The informatization fund includes several parts: government capital (79%), private capital (44%), and other capital (15%). From 1993 to 2002, the total volume of the fund was 7.8 billion USD, among which, 15% of the fund was used for broadband construction, while the rest of the fund was used for training, research, and the formulation of standards.
- From 1988 to 2002, the government’s IT budget added up to 11.5 billion USD, among which, 8% of the government’s IT budget (about 1 billion USD) was used for broadband construction.

The successful broadband development in South Korea demonstrates that government’s capital support has a huge effect on broadband development. The government of Malaysia launched the NBI project in 2010. Telekom Malaysia (TM) established the HSBB project to carry out the NBI project. The total investment of the HSBB project was 9.9 billion MYR over three years. Between 2010 to 2012, broadband users were exempted from 500 MYR in sales tax after applying for broadband services of 68 MYR, or exempted from 456 MYR in sales tax after applying for broadband services of 103 MYR. The number of people who received the training reached 14 million, which is greater than the planned number (10 million people) listed in the left figure. The program covered people from all walks of life; even prisoners can receive the training. This greatly lowers the costs of fiber users and carriers. According to estimates by the USA’s Federal Communications Commission’s (FCC), the fiber routing expense is about 144 thousand USD per mile in USA. However, if fibers are routed together with roads or other infrastructures, the fiber routing expense drops to 101 thousand USD per mile. Both material and construction expenses reduce and the cost of construction falls significantly.

In order to accelerate the infrastructure construction of next-generation broadband networks, the Department for Culture, Media & Sport (DCMS) of the UK issues policies, has specified that the installation of broadband devices does not require the approval of local planning department. DCMS-issued policies include:

- The installation of outdoor fiber distribution terminals (FTTs) does not require advance approval.
- Routing aerial cables in any places does not require advance planning.
- Installing broadband devices under or above private lands does not require long-term negotiation.

Besides, DCMS would simplify the planning process of mobile infrastructure rollout.

**Government promotes and supports collective infrastructure construction and convenience**

In Nigeria, power plants route optical fibers above high-voltage power transmission cables. Phase3 (a telecom company of Nigeria) can also route its own optical fibers above high-voltage power transmission cables and lease optical fibers from power plants. Phase3 is the largest optical fiber carrier in Nigeria. Telecom carriers, enterprises, and government departments lease optical fibers from Phase3 for communication. This greatly lowers the costs of fiber users and carriers. According to estimates by the USA’s Federal Communications Commission’s (FCC), the fiber routing expense is about 144 thousand USD per mile in USA. However, if fibers are routed together with roads or other infrastructures, the fiber routing expense drops to 101 thousand USD per mile. Both material and construction expenses reduce and the cost of construction falls significantly.

**Government undertakes and supports the universal service**

The UK government kicked off the Broadband Delivery UK (BDUK) project in 2010 to provide broadband coverage for remote areas (covering 30% of the UK population). The UK government planned to invest one billion GBP to construct broadband access networks in remote areas to increase the UK’s broadband penetration rate to 90% and above. In March 2011, the first 50 million GBP (startup capital) was allocated to various areas. Each area obtains about 5 to 10 million GBP. In 2012, the UK government invited tenders for the BDUK project, and British Telecom (BT) won the bid. The total investment of the project added up to 2 billion GBP, among which, one billion GBP was contributed by BT, 500 million GBP by the central government of the UK, and 500 million GBP by the local governments.

In Malaysia, the government undertakes part of the responsibility for informatization and broadbandization. The government of Malaysia is investing 60 million MYR to set up 246 community broadband service centers around Malaysia, and invests 40 million MYR to set up 105 e-counters in areas where aborigines live to help achieve e-Government (e-Gov) in remote areas.

**Government provides low-interest or interest-free loans and tax relief**

As stipulated by the government of South Korea, high-tech companies can enjoy national tax relief (partial remission) for 10 years and local tax relief for 15 years. To encourage private investment during the KII-P phase of broadband construction, the government lowered the interest rate on loans and provided interest-free loans for network construction in remote areas. In 2003, the government built the free-trade zone. In the free-trade zone, companies can enjoy rent relief, low-interest loans, and financial support. The government of Cameroon provides guarantees for Cameroon telecom carriers borrowing from the Bank of China. These carriers borrowed 198 million USD, representing substantial financial support.

**Government leads information and application consumption**

Such measures include:
- Support and encouragement of broadband usage
- IT skill training

<table>
<thead>
<tr>
<th>Target Group</th>
<th>Quantity (Unit: Thousand)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teachers and students</td>
<td>3979</td>
</tr>
<tr>
<td>Farmers, fishers, workers, and suburban residents</td>
<td>3291</td>
</tr>
<tr>
<td>Homemakers</td>
<td>2000</td>
</tr>
<tr>
<td>Servicemen</td>
<td>740</td>
</tr>
<tr>
<td>Officials and civil servants</td>
<td>710</td>
</tr>
<tr>
<td>Disabled and elderly</td>
<td>378</td>
</tr>
<tr>
<td>Prisoners</td>
<td>32</td>
</tr>
</tbody>
</table>

**Government provides capital support for national informatization and broadbandization in two ways:** informatization fund and government’s IT budget.

- The informatization fund includes several parts: government capital (79%), private capital (44%), and other capital (15%). From 1993 to 2002, the total volume of the fund was 7.8 billion USD, among which, 15% of the fund was used for broadband construction, while the rest of the fund was used for training, research, and the formulation of standards.
- From 1988 to 2002, the government’s IT budget added up to 11.5 billion USD, among which, 8% of the government’s IT budget (about 1 billion USD) was used for broadband construction.

The successful broadband development in South Korea demonstrates that government’s capital support has a huge effect on broadband development. The government of Malaysia launched the NBI project in 2010. Telekom Malaysia (TM) established the HSBB project to carry out the NBI project. The total investment of the HSBB project was 9.9 billion MYR over three years. Between 2010 to 2012, broadband users were exempted from 500 MYR in sales tax after applying for broadband services of 68 MYR, or exempted from 456 MYR in sales tax after applying for broadband services of 38 MYR. These measures greatly contributed to Malaysia’s information and broadband development.
Boosting information demand:

<table>
<thead>
<tr>
<th></th>
<th>1998</th>
<th>1999</th>
<th>2001</th>
<th>2002</th>
</tr>
</thead>
<tbody>
<tr>
<td>E-banking user (unit: 10 thousand)</td>
<td>--</td>
<td>12</td>
<td>409</td>
<td>1130</td>
</tr>
<tr>
<td>Turnover of on-line retailer (100 million USD)</td>
<td>2</td>
<td>92</td>
<td>570</td>
<td>1020</td>
</tr>
</tbody>
</table>

The government of South Korea planned for information development. The planning including e-Gov, e-health, and e-education, has well supported the initial development of broadband. The data listed in the left table effectively demonstrates that the information development promotes broadband development. Thanks to the Government of South Korea’s step-by-step efforts, broadband in South Korea enjoys continuous development. The access rate and penetration rate of South Korea broadband are among the highest in the world. In content applications, South Korea broadband even takes the lead in the world. The measures adopted by the South Korea government can be replicated by other countries.

Suggestions on policies of the broadband industry

From formulating and optimizing the strategic planning of national information and broadband development to carrying out the planning step by step

During planning, governments are recommended to objectively assess the value that will be brought by information and broadband development and finalize the most-important measures that need to be taken. Based on the successful practices of Japan, the USA, South Korea, and Malaysia, the most-important measures should be:

- Strong planning of national information and broadband development
- Finalizing the investment volume, plan, and direction
- Providing conveniences for broadband construction in terms of municipal pipelines, right of way (ROW), household pipelines, and telecom shafts
- Providing IT skill training, encouraging information development, and giving financial allowances to certain broadband users
- Providing clear guidance on information development, and
- Encouraging investments

During the implementation phase, the government needs to ask the most professional and experienced carriers (including cable operators) to construct, operate, maintain, and run the broadband network. The government only fulfills a supervisory responsibility. Specifically, the government should check whether the carriers are following the plans.

Encouraging investments

The Regulation Holiday policy is recommended for new fiber construction. For infrastructure networks that are in service for many years, it is recommended to lift the regulations. As proved by practice, explicit fiber regulations are beneficial to ultra-broadband penetration, network access rate, and other network KPIs. Thereby, governments are recommended to make explicit all regulations relating to fibre. As huge investments are needed in infrastructure construction, it is recommended to adopt Regulatory Holidays, that is, to specify the fiber investment protection period and lift the regulation after this period expires, or adopt the open-bitstream policy used by the British government. After the open-bitstream policy was implemented in Britain, the number of ultra-broadband users increased by 10 million, among a total population of 60 million.

The government encourages carriers (that have partnership based on business interests) to share access-layer pipelines to improve investment productivity. In October, 2012, Jazztel and Telefonica signed cooperation agreements to construct a network that covers three million FTTH users in Spain. In March, 2013, Vodafone and FT (now Orange) declared that they would jointly invest one billion EURO on their Spanish subnets and build and share FTTH networks in 50 Spanish cities. The cooperation helps avoid wasteful investments and contribute to fast network construction.

For existing infrastructure networks or even networks that are in service for years or decades (such as HFC or power grid), if the government is one of the investors or even the main investor, governments are recommended to lift the regulations on such networks. This helps avoid wasteful investments and save the overall social costs.

Coordinating collaborative infrastructure construction and providing convenience

Governments are recommended to grant operating licenses for communication cables to big infrastructure investors. Compared with railways, roads, power transmission cables, oil/gas pipelines, or municipal pipelines, telecom infrastructure construction requires fewer investments and is of smaller scale. Moreover, the construction of roads and municipal pipelines precedes the construction of telecom infrastructure. If the government grants operating licenses of communication cables to the big infrastructure investors, those investors can add a small amount of investment on communication cable layout after road and municipal pipeline construction. Then, they can lease the telecom network to telecom carriers. This method can greatly encourage telecom infrastructure construction and lower the follow-up telecom network costs.

During the implementation of this method, the government also needs to regulate the prices charged.

Carrying out policies for promoting collaborative infrastructure construction

The government of Kenya gives tax rebates to carriers who share infrastructures such as pipelines and fiber. When governments use tax rebates and financing methods/means to encourage collaborative infrastructure construction, wasteful investment can be reduced. Besides this carrot approach, governments can also use the stick approach. For example, in the USA, the “dig once” law stipulates that the infrastructure at a place can be trenched only once during a certain period. This forces companies to collaborate in infrastructure construction.
Mobile Broadband (MBB) is redefining national broadband

By Wan Muyang, Ye Bo

The mobile Internet era has arrived and everything is going mobile. Bridging the digital divide and connecting the future have emerged as urgent strategic requirements. National broadband now forms the foundation of a country’s development; it stimulates the development of the ICT industry, promotes economic growth, and creates jobs. Mobile broadband will accelerate the evolution of society; engender cooperation and innovation between the areas of broadband, finance and commerce; improve society’s efficiency; and enable a connected and sustainable world.

Mobile broadband enables universal national broadband

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Mobile broadband is more suitable for rural Internet access

Residential broadband is primarily provided by mobile wireless (smartphones and PCs with dongles), cable modem (from the local provider of a cable television service) or over telephone lines for digital subscriber lines (DSL). Other broadband technologies include fiber optic cables, fixed wireless, satellite, and broadband over power lines (BPL).

Recent surveys and studies indicate that rural areas generally tend to lag behind urban and suburban areas in broadband deployment because of lower population density. Deployment costs of wireline broadband technologies such as cable modem and DSL increase with distance, decreasing incentives for companies to invest in broadband in rural areas compared with high-demand urban areas where average incomes are higher and deployment costs per subscriber are lower.

Mobile broadband is more suitable for rural Internet access.

Compared to wireline broadband, mobile broadband incurs a lower cost per line in rural areas. Wireline broadband technologies rely on a direct physical connection to the subscriber’s residence or business, while mobile broadband uses radio frequencies to carry information. In rural areas where residents are sparsely distributed, wireline broadband incurs huge installation costs compared with a single mobile broadband base station that covers many square kilometers.

Additionally, mountainous or forested terrain can also be a hindrance for the deployment of wireline broadband, unlike electromagnetic waves, which are easily transmitted.

Release more sub-1GHz spectrums for ubiquitous connectivity

Lower frequency bands incur lower coverage costs; one 450MHz base station can cover three times the radius covered by 900MHz and 12 times the radius covered by 2.1GHz. Frequencies below 1GHz are more suitable for ubiquitous broadband connections, especially in rural areas.

LTE 450MHz is attracting more attention for its coverage advantages. Brazilian regulatory rules define that by December 31, 2015, all rural areas up to 30 km from the headquarters of all Brazilian municipalities must have LTE coverage in the 450MHz band for voice and data services. Three of the BRIC countries - China, Russia, and Brazil - obtained amazing results when testing 5MHz bandwidth trial networks with actual data download speeds in excess of 32Mbps.

Disabling analog terrestrial television systems will release valuable spectrum resources such as 470-862 MHz/UHF for other uses. Over the past 20 years, the mobile industry has made substantial gains in spectrum use efficiency by utilizing successive generations of technology. Sub-1GHz spectrums will become highly valuable when used in the mobile broadband industry, and some countries have already taken the initiative to offer parts of this spectrum range to commercial mobile broadband networks such as the USA, Canada, and Germany.

International Telecommunication Union (ITU) has defined three global regions for UHF spectrum allocation in the area of mobile telecommunications: Region 1 (DD800: Europe, the Middle East and Africa), Region 2 (US700: America) and Region 3 (APT700: Asia Pacific, Latin America).

APT700MHz (698-806 MHz) has been widely accepted by a growing number of countries across the APAC and Latin American regions including China, Brazil, Japan, India, Taiwan, Australia, Chile, Mexico, and Colombia. Widespread acceptance of the APT700 band helps create a global LTE ecosystem and delivers ubiquitous Internet connectivity.

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Adopting LTE in unlicensed spectrum to meet the mobile traffic flood

Use of unlicensed spectrum

IMT and IMT-Advanced telecom systems have contributed to global socioeconomic development by providing global wireless connections for communication. In recent years, cellular systems have shifted to mobile broadband coupled with diverse multimedia applications in addition to traditional voice and mobile data services. Newly emerged smart devices such as smart phones, dongles and tablets have become key drivers for increased mobile broadband traffic. Smart devices with larger screens and higher resolution are driving increased data consumption and traffic-intensive applications such as video streaming, causing the data carried on cellular networks to grow exponentially. All scenarios lead to a pressing requirement for spectrum resources. ITU-R has mainly assigned IMT and IMT-Advanced the 700MHz to 2.6GHz spectrum range for its traditional cellular systems; however, more operators are facing the challenge of soaring traffic as more people use mobile broadband applications and each downloads more data.

To date, more unlicensed spectrum has been or will be assigned than licensed spectrum, as shown in Figure 1; operators will use unlicensed spectrum to offload MBB traffic if the licensed spectrum is insufficient. In addition, unlicensed/inclusive use also provides important social value, for example, public service, free access and easy entry for newcomers, which encourages new technologies.

Operators such as CMCC and AT&T have already deployed huge amounts of WiFi APs to utilize unlicensed spectrum. However, doing so usually fails to achieve the intended network performance improvements or cost reduction. Many reasons contribute to these unsatisfactory results, including additional investment in backhaul and core networks that differ from existing IMT infrastructure and the poor performance of WiFi in non-isolated deployment scenarios. Thus, unlicensed spectrum must be used efficiently by adopting the most advanced mobile telecommunication technologies and avoiding duplicated investments.

Figure 1: Summary of frequency allocation

Licensed spectrum summary

<table>
<thead>
<tr>
<th>Country</th>
<th>Current Pipeline</th>
<th>Current Pipeline</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>608</td>
<td>554</td>
</tr>
<tr>
<td>Australia</td>
<td>478</td>
<td>230</td>
</tr>
<tr>
<td>Brazil</td>
<td>554</td>
<td>0</td>
</tr>
<tr>
<td>China</td>
<td>227</td>
<td>360</td>
</tr>
<tr>
<td>France</td>
<td>555</td>
<td>50</td>
</tr>
<tr>
<td>Germany</td>
<td>615</td>
<td>0</td>
</tr>
<tr>
<td>Italy</td>
<td>540</td>
<td>20</td>
</tr>
<tr>
<td>Japan</td>
<td>50</td>
<td>10</td>
</tr>
<tr>
<td>Spain</td>
<td>540</td>
<td>60</td>
</tr>
<tr>
<td>UK</td>
<td>393</td>
<td>265</td>
</tr>
</tbody>
</table>

Unlicensed Spectrum Summary-USA and Europe

<table>
<thead>
<tr>
<th>Band</th>
<th>Current</th>
<th>Pipeline</th>
<th>Current</th>
<th>Pipeline</th>
</tr>
</thead>
<tbody>
<tr>
<td>TV White Spaces</td>
<td>0-150</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>863-870 MHz</td>
<td>-</td>
<td>-</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>902-928 MHz</td>
<td>26</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>1880-1930 MHz</td>
<td>10</td>
<td>-</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>2400-2483.5 MHz</td>
<td>83.5</td>
<td>-</td>
<td>83.5</td>
<td></td>
</tr>
<tr>
<td>3550-3700 MHz</td>
<td>50</td>
<td>100</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>5150-5350 MHz</td>
<td>555</td>
<td>-</td>
<td>555</td>
<td></td>
</tr>
<tr>
<td>5350-5470 MHz</td>
<td>195</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>5550-5925 MHz</td>
<td>24.5-874.5</td>
<td>395+</td>
<td>865.5</td>
<td></td>
</tr>
</tbody>
</table>

Note: Includes “licensed-light” spectrum.
Adapting LTE to unlicensed spectrum

Most operators are upgrading their networks to LTE and planning for LTE-Advanced. Specified in 3GPP, LTE-Advanced features a fine-tuned air-interface, wireless resource utilization, and high spectrum efficiency. The unified industry roadmap promotes the maturity of the LTE ecosystem, especially the quantity of LTE chipssets and commercial terminals. The success of the LTE industry is attracting non-traditional telecom services and cross-industry applications to emerge in the mobile arena, such as trunking and group communications, Machine to machine (M2M) communication, TV broadcast services, and enhanced location-based services (LBS). Mobile video services are booming with the increasing penetration of large-screen smart phones and Full HD video shared across social media platforms and websites. All-service over LTE is an emerging trend that is increasingly reflected in daily life. These include, for example, wireless payments, mobile office, smart homes, smart grids, e-health, and Intelligent Transportation Systems (ITS).

With the maturity of the LTE ecosystem, operators must adapt LTE to unlicensed spectrum (Unlicensed LTE, U-LTE) to avoid the current disadvantages of unlicensed spectrum.

Deployment scenarios of U-LTE

Operator-deployed small cells in unlicensed spectrum form prioritized scenarios, as shown in Figure 2. The best-case scenario is co-located aggregation between licensed and unlicensed carriers. In this case, no extra cost is incurred for new sites or backhaul; however, because unlicensed spectrum is usually located in high-frequency bands, a coverage gap in the unlicensed layer occurs in the case of co-site deployment.

Unlicensed carriers are operated as Secondary Carriers associated with existing licensed LTE Primary Carriers via Carrier Aggregation (CA).

Benefits of adapting LTE to unlicensed spectrum

The key advantage of integrating unlicensed carriers’ existing LTE networks’ by U-LTE is the joint operations enabled for licensed and unlicensed carriers, including mobility management, centralized MAC & RRM, interference mitigation, security, Quality of Service (QoS), and Operation Administration and Maintenance (OAM); for example, UE mobility is still under the control of licensed LTE RAN. Joint scheduling between LTE and U-LTE carriers is adapted by centralized nodes (eNodeBs), while security and service QoS can be ensured with the help of licensed LTE networks. Interference mitigation schemes that are or will be defined for dense LTE networks can be smoothly applied to integrated U-LTE cells. Most importantly, the advantage of economies of scale can be achieved by using basic LTE physical-layer design in unlicensed spectrum. The benefits include:

- Highly efficient use of unlicensed spectrum
- Good coverage and high peak data rates can be achieved in cases of isolated deployment, while traffic in dense deployment can be guaranteed by inherent interference mitigation mechanisms. To ensure the efficient use of unlicensed spectrum, LTE physical-layer design and numerology should be reused as much as possible. Basic LTE architecture can be inherited, such as centralized scheduling, coordination between nodes, mobility management, security, and QoS.

Adapting LTE to unlicensed spectrum also facilitates strong joint operations between licensed and unlicensed spectrum. Unlicensed carriers play the role of the complementary layer for traffic offloading (sending wireless traffic over an alternative infrastructure), while licensed primary carriers ensure mobility, management, security, and OAM. Thus, the CAPEX of U-LTE deployment can be kept low because an unlicensed spectrum costs less and the following are reused: core network, backhaul, and existing LTE network sites. Additionally, U-LTE enables the efficient use of unlicensed spectrum in terms of coverage and throughput.

Future-oriented regulations

To ensure the fair and legal use of unlicensed spectrum by potentially multiple systems, some technology-agnostic rules should be defined by regulators. The use of unlicensed spectrum in the USA is governed by FCC, while the European regulation is determined by the European commission and the ECC. Both institutions clearly defined some mechanisms for fair coexistence among IMT, WLAN, and radar systems, for example, mechanisms of Transmission power control (TPC), Dynamic frequency selection (DFS), as well as Listen-Before-Talk (LBT) in addition to the basic restrictions on transmission power, undesirable emission, etc. are also defined in a technology-agnostic way.

As the LTE was designed in the beginning with targeting for the exclusive use of licensed spectrum, it is desirable to introduce necessary modifications on top of the existing LTE air interface, restricted by the compliance with the diverse requirements under regulations, to facilitate the global deployment of LTE on unlicensed spectrum. That is, it is beneficial and recommended in LTE evolution design to incorporate necessary mechanisms with compliance with LBT/TPC/DFS.

On the other hand, with the expectation that LTE will be popularly deployed in unlicensed spectrum as WiFi, it is also preferred that the regulation evolution should take into account the specific need of coexistence between LTE and WiFi, as well as LTE, e.g., considering the relatively large scheduling/MAC access granularity of LTE, and possible limit of the load provided by a given system in unlicensed spectrum to reduce negative impact on other co-existing systems.

Regulations are expected to evolve to take into account the popular deployment of LTE in unlicensed spectrum.
Creating Success
The role of broadband in promoting economic growth is widely recognized globally. A World Bank study finds that in low- and middle-income countries, for every 10% increment of broadband penetration, the GDP will grow 1.38%. Developing broadband services not only drives GDP growth directly, but also promotes employment, reforms traditional industries, and drives economic transformation and upgrade.

Given the huge social and economic benefits of broadband, many countries around the world have introduced their national broadband strategies, to push the construction of broadband networks at the policy level. The statistical data released around the world have introduced their national broadband strategies, to push the traditional industries, and drives economic transformation and upgrade.

In different stages of national broadband development, operators and participants of the industry chain need to work together to identify the priorities of the corresponding stages, and the government also needs to introduce the corresponding policies to guide its development.

In the planning stage, operators need to consider five key factors: coverage of national broadband, access rate for consumer and corporate users, extent to which it can promote economic growth, amount of government investment, and selection of network coverage technologies and business model.

In the deployment stage, operators need to choose the right partners to construct and to operate the national broadband networks. The equipment suppliers cannot just supply equipment, as they also need to have the EOT abilities (E stands for Establish, which refers to the ability to perform joint design, planning, and construction; O stands for Operate, which refers to joint operation as well as helping the operators train the operation personnel; and T stands for Transfer, which includes the transfer of skills, documents, and processes). After the official transfer, the equipment suppliers can also help operators develop services and users through the service experience center, joint innovation centers, and joint promotion activities.

In the commercial operation stage, many industries can benefit from the national broadband project, such as e-government, e-education, e-health, smart transportation, and smart grids. The specific publicity and promotion efforts of the beneficiary industries and sectors can help the kickoff of the national broadband initiative and become the catalyst for the development of national broadband services and users. Globally, the development of broadband services is divided into three stages: The first stage focuses on broadband connection, with the home penetration rate of broadband usually being smaller than 20%. In this stage, the main concern of operators is to provide access services, with content coming from the Internet. In the second stage, operators focus on developing their own video services, with the home penetration rate of broadband being 20% to 70%. At this stage, operators usually have exceeded basic communications services and launch bundled services such as Triple Play. In the third stage, the home penetration rate of broadband is over 70%, such as the cases in Japan and Korea today, and operators’ services will be extended to some vertical industries, such as vertical services in cooperation with banks, healthcare and educational organizations.

To realize the healthy development of national broadband, services provisioning is the key. How to develop services based on the national broadband infrastructure is a pressing issue.

Developed markets: improving service experience through zero waiting

In developed markets, constant changes of information forms on the Internet and the endless evolution of user interface blur the service boundaries between the Internet service providers and the telecom operators. Technological innovations have also made it possible for more players to provide telecom services, which were monopolized in the past, making business models more and more fragmented. The “scissors” difference between traffic growth and service income is growing, and broadband operators must collaborate with other information providers to form new industry chains and systems in order to develop rich and diverse fragmented services based on pipes. In doing this, they can be avoided becoming mere pipes providers with increasing business volume but a stagnation in income.

Among those services, the ‘digital home’ combines multiple services including data, voice, and video to resolve problems such as too many boxes at home, difficulty in interconnection, and poor service stability and to increase income sources while improving user experience. Some global leading operators already have some useful adventures in providing home services. PCCW’s Eye-series products, for example, provide voice, SMS, information entertainment, and life application services through multimedia fixed lines in order to maintain a stable user base of fixed networks and to increase the average revenue per user (ARPU) of voice services by US$ 5 on average. By introducing high-definition (HD) and 3D videos, France Telecom has increased the income from its IPTV services by 30%. Korea Telecom has introduced the home care robot called
“Kibot”, and by controlling the robot in online mode, users can remotely take care of their children at home. In addition to the profit from direct sales, this terminal can generate a monthly fee of US$ 6.

Supported by high bandwidth, the HD video conferencing service can improve communication efficiency and reduce travel costs, and therefore has become increasingly popular among corporations. Broadband operators can provide dedicated lines for major corporations to support HD video conferencing, or they can build their own HD video conferencing systems and lease the service to SMEs.

With the accelerated convergence between IT and CT, the ICT services for SMEs have become increasingly complex. Considering this, operators can integrate various types of ICT applications and other communications services to provide a single service platform for SMEs, to help them choose personalized broadband business information services such as Internet access, corporate website construction and hosting, video monitoring, corporate SMS, and network fax on this platform. This represents a brand-new market opportunity for operators.

In the medium and long terms, operators can also develop services such as digital theatres, M2M, and cloud services by relying on the national broadband, to make life easier for people, and to generate more profitable revenue.

Singapore’s national broadband is seen as one of the key factors for Singapore to rank No.1 globally in terms of innovation and competition. Singapore’s national broadband initiative now has six service providers, which can provide more than 30 optical broadband network access solutions for selection by end users. They also provide various home and business video services. By mid 2012, Singapore’s national broadband covered 95% of the population in 880,000 homes and 19,000 buildings.

HSBB, Malaysia’s national broadband initiative is led by the Malaysian government. It is a high-speed broadband initiative aimed at improving the country’s competitive edge. As of the end of 2011, HSBB was available to more than 1.1 million homes, connected more than 250,000 users, and the quarterly growth rate of users was 109%. The first stage of HSBB focuses on the home IPTV service, which has effectively promoted the use of broadband by the users and improved the profitability of the operators.

Emerging markets: promoting social progress through zero omission

In emerging countries, NBN initiatives currently focusing on building the basic optical fiber infrastructure through national ICT initiatives mainly provide mobile access to include as many people as possible into the digital society with zero coverage omission.

National broadband can promote the progress of healthcare in developing countries. Many African countries are not economically developed, and cannot afford expensive healthcare services. As a result, their healthcare levels are low, and many poor patients cannot get timely treatment. With mobile broadband becoming widely available, free consultation and online help for patients using mobile phones is now emerging in African countries. In South Africa, people can use mobile phones to quickly search HIV/AIDS knowledge. In Tanzania, people can also use mobile phones to check out medicine inventory. This helps to increase the management efficiency of medicine delivery by 75%. In 2011, MTN teamed up with South Africa’s healthcare service provider to introduce a mobile healthcare application, offering services such as patient record searching, real-time monitoring, and patient care in communities and clinics. In Kenya, Safaricom and Kenya Telecom have also introduced mobile health consulting and diagnostic services.

National broadband can also promote the development of education, increase the use of education resources, and reduce people’s cost of receiving high-quality education. The Cambodian government has deployed an education network based on the broadband network to connect the networks of 500 elementary schools in 15 states. This helps to manage educational resources in a unified way to optimize the allocation of resources. China’s Ministry of Education deployed China’s remote education network of higher learning institutions, to enable more young people to receive higher education online and to improve the overall cultural levels in the society.

Cameroon’s national broadband initiative began as a national ICT initiative, under which a 3,380 km backbone optical network with 5 loops was deployed across the nation. The optical fiber system with a total length of 6,300 km covers 35 major cities, and the planned access bandwidth is from 512 kbit/s to 10 Mbit/s. The development of these network infrastructures will drive Cameroon’s GDP to grow more than 2% and will help the development of e-government, e-health, and e-education which effectively promote the progress of the Cameroon society as a whole.
Collaborative infrastructure construction for faster broadband network development

Collaborative infrastructure significantly reduces cost and speeds up network construction.

Huge potential of overall broadband construction cost decrease by reducing infrastructure construction costs

Although the number of global Internet users is continuously increasing, a large number of users in developing countries cannot enjoy the Internet service. Even in developed countries users cannot access required Internet access speeds. Networks are fundamental to the implementation of online services. However, this requires huge investments on infrastructure, regardless of whether they are for developing countries to improve national broadband penetration or developed countries to evolve their broadband networks to ultra-broadband networks. The huge investments concentrate on new pipelines and cables. The figure below illustrates the cost structure of fiber to the home (FTTH) construction in China in 2012. Among the costs, the optical distribution network (ODN) takes 60% of the total costs. The high expenditure arises from rising land prices and labor costs, customer premises network (CPN) engineering and overall increased workloads. In developed countries, the ODN network takes an even larger share of costs. For example, the Germany ODN network takes 70% of the total FTTH costs. The growing price wars between cable carriers, mobile broadband carriers and telecom carriers lower network construction and maintenance costs. This is particularly true of infrastructure, because these broadband carriers cannot fix prices to underpin profit or increase revenue from service.

Strategies of using collaborative infrastructure construction to reduce broadband network construction costs

In Nigeria, PHCN (an electric company) routes optical fibers over high-voltage power cables. Phase3 Telecom, the largest optical fiber carrier in Nigeria, routes its optical fibers over high voltage power cables and rents PHCN’s optical fibers. The Nigerian government, enterprises, and other telecom carriers rent Phase3 Telecom’s optical fibers for communication. This greatly reduces their optical fiber costs.

The Nigerian collaborative infrastructure construction is a success story. In most countries, national infrastructures, such as electric power cables, oil pipelines, highways, railways, municipal electricity, and buildings, are managed by different non-coordinated departments. The collaborative construction reduces overall infrastructure workload and difficulty. If the communication infrastructure can be collaboratively constructed with transport, energy, municipal pipeline network, and building infrastructures, the telecom carriers’ network construction costs will be significantly reduced. According to the Federal Communications Commission (FCC), the separate optical fiber layout cost is 144,000 USD per mile. However, the cost is reduced to 101,000 USD if the optical fibers are routed with the construction of other infrastructures, such as highways. The cost in material fees and especially in engineering fees is significantly reduced.

The collaborative infrastructure construction effect is especially obvious in developing countries, because a huge number of projects are being annually constructed in these countries. If optical cables and fibers can be routed with the construction of highways, electric power cables, and buildings, the broadband network deployment cost will be greatly reduced, especially in harsh environments, such as across pagodas.

Broadband infrastructures that can be collaboratively constructed from various aspects

Backbone network: The infrastructures on the backbone network connect railways, highways, high-voltage power cables, and oil/natural gas pipelines between countries or cities.

- From the aspect of infrastructure attributes, the highway infrastructures resemble communication infrastructures most because they both use the network structure and a destination is reachable through different routes for the sake of security protection.
- From the aspect of construction and maintenance costs, the construction of broadband network infrastructures should be considered with that of transport and energy infrastructures for the best collaboration.
- MAN network: In municipal pipeline network construction in developing countries and new infrastructure construction such as the laying if optical fiber, optical fibers can be routed using existing MAN network infrastructures, such as drains, heating pipelines, natural gas pipelines, electric power cables, municipal roads, and utility poles.
- CPN network: CPN networks are complex and are different from each other in different countries and regions. In customer premises buildings, electric...
Infrastructure construction is a key part of governmental expenditure. Although land, price, labor cost, and later-phase engineering workloads increase, proper planning for the communication infrastructures will still reduce construction costs. In addition, constructing future-oriented infrastructures can maximise the balance of construction costs and service requirements. For example, in Boston, USA, according to the “shadow conduit” policy, the first company requiring pipeline digging must ask whether other companies have the same service requirement. This implements future-oriented infrastructure construction.

Maximum support for collaborative infrastructure construction through national policies

National strategies and plans

Most countries have planned and formulated national information and broadband strategies. Each country should annually review and optimize the collaborative infrastructure construction plan to achieve maximum collaboration between communication infrastructure construction and public infrastructure construction, such as transport, energy, municipal pipeline network, and building infrastructures.

Granting of communication cable operating licenses to large infrastructure construction investors

Compared with the construction of public infrastructures, such as highways, railways, electric power cables, oil/natural gas pipelines, municipal pipelines, the construction of communication infrastructures requires much less workload. The highways, municipal pipelines, and communication pipelines and cables are constructed in time sequence. Therefore, if the government grants communication cable O&M licenses to the large infrastructure construction investors, they can route communication pipelines and cables when constructing highways and municipal pipelines with few extra investments. Then, they can rent the communication pipelines and cables to communication carriers. This not only encourages communication infrastructure construction but also reduces follow-up communication network construction costs.

Opening of infrastructures after the investment protection expires

The government should legislate for opening infrastructures, such as municipal pipelines, highways, metros, and utility poles so that telecom carriers can use these infrastructures for free or at a low price. For the infrastructures constructed by cable carriers, electric broadband carriers, and telecom carriers that compete with each other, the government should set an investment protection period for the infrastructure. After the period expires, the carriers must open the infrastructures for open competition. For example, telecom carriers have opened their twisted pairs. Cable carriers’ coaxial cables and electric broadband carriers’ electric power cables should be equivalently opened. The open infrastructures reduce drop broadband construction costs, repetitive investments, and engineering difficulties as well as shorten construction period.

Rational infrastructure price regulation

Collaborative infrastructure construction can be promoted taking market-based measures. However, infrastructure prices require government regulations. Price regulation is an important method at the early stage of collaborative infrastructure construction. For the sake of healthy infrastructure construction development, the government should budget investment costs and commercial return, regulate prices with interests balanced between each party, and annually evaluate the prices for smooth transition to market-based adjustment. For example, the Federal 224 legislation clearly defines the policies and prices of renting and opening infrastructures, which positively promotes healthy infrastructure construction development.

Stimuli to collaborative infrastructure construction

In Kenya, the carriers sharing infrastructure such as pipelines and optical fibers, can obtain tax rebates from the government. Accordingly, the government takes financial means, such as tax and financing, to stimulate the collaborative infrastructure construction and prevent repetitive construction. In addition to fiscal stimuli, the government should also formulate legislation. For example, the USA’s “dig once” regulation requires that a place can be dug only once within a specified period of time for pipeline layout, which forces all companies to construct collaboratively.

Collaborative infrastructure construction significantly speeds up network construction. With the completeness of network infrastructures, the number of global Internet users will increase exponentially, information will spread faster, and technology innovation platform will be richer. The digital data will positively contribute to human development.

Powering collaborative infrastructure construction

• Power cables, water pipelines, heating pipelines, natural gas pipelines, CATV cables, communication cables, wireless indoor distribution system, and micro-BTS radio backhaul lines can be collaboratively routed and constructed through shafts and various pipelines. Out of customer premises buildings, electric power cables and drains can be collaboratively constructed.

• Consider the following factors in collaborative infrastructure construction:

  • Cost: Construction cost.
  • Maintenance requirements and modes vary by infrastructure. During collaborative construction, consider maintenance similarities and differences.
  • Network security: Take disaster tolerance measures and ensure that collaboratively constructed infrastructures do not affect each other’s security.
  • Other infrastructures’ communication requirements: The infrastructure maintenance, such as remote monitoring and maintenance, requires smooth communication. Therefore, implement collaborative infrastructure construction based on mutual benefit.

Planning collaborative infrastructure construction in new fields

Most developing countries are facing heavy infrastructure construction requirements. Based on existing collaborative infrastructure construction experience, these countries need to formulate more complicated infrastructure construction regulations and standards for the collaboration of various infrastructures. The regulations and standards may cover many industries. The governments must guarantee that the regulations and standards gain traction to prevent social resources wasting.

The preceding planning and construction measures reduce follow-up communication, pipeline and cable layout costs.

Using existing infrastructures to construct communication infrastructures

Share and open existing infrastructures to promote broadband service development. The following section has two examples:

• In Sweden, the government grants optical fiber rental licenses to electric, gas, and broadcast TV companies. Then all these companies can route optical fibers for renting. This policy promotes rapid optical fiber layout using existing infrastructures.
• In Spain, Telefonica can use existing pipelines to construct ultra-broadband networks and other carriers can use Telefonica’s pipelines.

The utilization of existing infrastructures speeds up communication infrastructure construction in the two countries. Sweden has world-leading broadband take-up and access rates.

New technologies support collaborative infrastructure construction

Many new technologies have been introduced using existing infrastructures. For example, drop power cables can transmit data and twisted pairs transmit data at 100Mbps. If a new technology replaces the optical fiber layout from street cabinets to user homes, the overall FTH construction costs will be reduced by at least 20%. Future technologies will also reduce communication infrastructure construction costs.

Using foresight consciousness to construct infrastructure

The following section has three examples:

• In April 2013, China issued the Code for Design of Communication Engineering for Fiber to the Home in Residential Districts and Residential Buildings and Code for Construction and Acceptance of Communication Engineering for Fiber to the Home in Residential Districts and Residential Buildings, which defined each pipeline and cable connection indicator before and after engineering, which significantly reduces optical fiber layout workload and difficulty. Based on Huawei’s analysis and calculation, the regulation-compliant engineering reduces telecom carriers’ construction costs by at least 13%. This also speeds up FTH service development in new residential areas.

• The South Africa government requires that the municipal infrastructures, such as highways, electric power cables, water pipelines, natural gas pipelines, and health facilities, be collaboratively constructed.

• In San Francisco, USA, according to the “trench once” policy, a place can be dug only once every five years. Before a location is dug, the government informs all latent users who may require pipeline and cable layout.
Super-fast broadband reaching out across Britain

It’s not clear if TV is the “killer app”, but there’s no doubt that video content is propelling the industry forward at a remarkable rate. We first saw this in 2008 when the BBC launched its “iPlayer” service. With the previous seven days’ TV and radio content put online, viewers could use the Internet to catch up on any shows they had missed. iPlayer and similar “catch-up” services from the broadcasters have caused bandwidth demand on our core network to skyrocket to the point where we’ve had to rethink the way we store and distribute content to bring it closer to the customer.

Looking at the other drivers of video content, such as YouTube and iTunes, if we don’t gear up to deliver huge bandwidth to customers and organize a network that prioritizes user experience, then we’ll miss a tremendous opportunity. So this is what we’ve been doing to prepare for this next wave of video and TV service.

| Broadband access for everyone |

Super-fast fibre access network

Openreach is deploying fibre optic technology into the U.K.’s access network in two ways: FTTP, which provides a pure fibre infrastructure capable of 100Mbps download speeds and very high upload speeds – 15Mbps and higher, and FTTC, which is part fibre and part copper. FTTC is currently providing 40Mbps download speeds and 10Mbps upload speeds, and will be deployed from the exchange to the street cabinet, running parallel to the copper feeder cables which supply the voice service.

FTTC will form approximately 75% of our broadband rollout, with around 25% of the network being planned for FTTP. Openreach launched FTTC at the beginning of 2010, and we’ve already seen a very good customer uptake and high level of pre-registrations. There are four important milestones in our super-fast broadband program. During July of 2010, we passed 1.5 million premises with FTTC. Milestone 2 will then pass 4 million premises with FTTC by the end of 2012. By the summer of 2012, we intend to have connected 40% of the U.K. – or 10 million premises with a mix of FTTC/FTTP and by 2015 we will have passed two thirds of the U.K. homes. For FTTP, we’re running industrial scale trials during 2010, and the nationwide launch is set for early 2011. Additionally, as part of the BT partnership for the 2012 Olympic Games, we’re focused on transforming London into a fibre-enabled digital city well before the Games commences. All the Games venues will be fully fibered and a very high percentage of homes and businesses in London will be passed with fiber by 2012.

Engineering, of course, still remains a challenge. Huawei has done a great job in delivering the electronics for our early infrastructure rollout, but delivering services to homes will inevitably be a demanding process – not just the physical network, but also in customers homes. Our customers have multiple devices and computers in their homes. To deliver services delivered over the fiber access, we have to help our customers configure their computers, TVs, printers, and other devices. Given the risk this poses to a good customer experience, we’re delivering self-help diagnostic tools to facilitate automatic device configuration for our customers.

Ubiquitous broadband

Before we embarked on our journey to deploy fiber in the U.K., we had been working for several years on our 21st century network, transforming and building the high-capacity core. By 2009 we had enabled copper broadband to 99% of U.K. homes with speeds of up to 8Mbps. By March 2011, we will have reached 75% of our customers with ADSL2+ at up to 24Mbps. We’re targeting our enterprise customers with Ethernet and, although we were slow out of the starting gate, we’ve emerged with the largest Ethernet footprint in the U.K. over the last couple of years. We’ve enabled over 400 Ethernet points of presence (PoPs) nationwide and 90% of business premises are now within reach of an Ethernet node.

Taken together, the sum of these projects means we’re developing a complete portfolio of broadband services, as well as complete data and voice services. We target government, consumers and businesses with our connectivity services, and provide a spectrum of options, including 8Mbps services, high-speed copper services, fiber variants, and Gigabit Ethernet services.

| “Mixed Economy” fiber strategy |

“Mixed Economy” is the term we use to describe our strategy for providing copper, fiber and other access technologies to promote customer choice and flexibility. Over time, we would want to see every home in the U.K. with access to super-fast broadband, delivered over fiber. However, the physical challenge of realizing this vision means that for several years to come we will be working simultaneously on fiber and copper based broadband, identifying market trends and service opportunities. We will anticipate where customer demand will fall and deploy the most economic solution to deliver broadband services.

Variants of FTTC for consumers

BT Retail offers two options for end users who want a fiber broadband service. The first is a 19.99 pounds (30.55USD) a month service for the FTTC broadband consumer, offering up to 40Mbps downstream and 2Mbps upstream. The attractiveness of this service is evidenced by the takeup and the high level of pre-registrations in areas where we’ve not yet enabled the exchanges. The second option has a higher upstream option – up to 10Mbps upstream. This option is priced at 24.99 pounds (38.19USD) a month. It is particularly popular with those working on video content, web builders, and others who need high upload speeds.

Openreach’s mission is to operate openly and equivalently in the access network, deliver ubiquitous services to every communication provider on the same basis, and bring ultrafast fiber access within reach of U.K. homes as fast as it can be achieved. By delivering this super-fast access network, Openreach is supporting all of the U.K. communications industry and enabling “Broadband Britain” to move to super-fast broadband delivery.

Video takes pole position

The catalyst for major change is the explosion in video content, and distribution to individual customers. As we view the consumer, wholesale and business markets, it’s clear that video content has become a huge industry driver. Our future revenues and growth are tightly bound with how quickly we can provide fiber access networks to support TV and other video content distribution.
**EE: A head start in LTE**

**WinWin: How has the customers responded to this brand new service experience?**

Hanif: Our customers are very interested in the new 4G service. We are in the process of a big education operation, showing consumers and businesses what 4G really is and what it can do for them. We are the first in the market, so the onus is on us to explain 4G to the UK. We find that once people try it, they love it. They really do understand that they want to stay with 4G rather than moving back to 3G. 3G is really good, but 4G is a whole new experience for end users.

**WinWin: How does EE plan its investment across both the legacy and new networks?**

Hanif: We’ve got a very clear strategy of where we want to go. We now operate 2G, 3G and 4G. In terms of 2G, we have already refarmed 2x20MHz (for LTE) in 15 major cities. We have no plan to switch off our 2G network, but we do actively encourage our customers to step up to 3G, because we believe the user experience is much better now with 3G. We are still investing in the 2G and 3G network, as well as rolling out our 4G network.

A big part of our investment strategy is to fully integrate our current network assets into a single EE network – this will significantly improve the customer experience. That also increases our capacity for 3G customers. As we integrate those two networks, we free up four frequencies for 3G. That will improve the customer experience as well. We have also invested in dual-cell HSPA technology, so we are offering the highest throughput in the country for customers on 3G.

As well as continuing to invest in the rollout of our 4G network, we are also increasing speeds and throughput via new technologies, including carrier aggregation. This will begin in the Tech City area of London where we can help startups to build new applications for those technologies.

**WinWin: What is EE’s load balancing strategy across different networks in terms of device planning and network engineering?**

“Focused on handsets from launch and we now estimate that up to 25% of our total customer base will have LTE-capable handsets within the next two years. That’s a significant market for upgrade to 4G.”

Hanif: For the 1800MHz layer, I think it’s very clear it’s a sweet spot. In terms of size and scale. In terms of customer take-up, we have been very pleased with the progress. As of August 2013, we have almost 700,000 customers already, and we’re on target to exceed one million customers by the end of this year. We are also pushing the coverage further, to achieve our goal of covering 98% of the population by the end of 2014. It’s definitely going to be a very fast and challenging rollout.

**WinWin: Is it fair to say that EE had a distinct advantage in getting handset manufacturer support because its LTE operates on 1800MHz, the main stream band?**

Hanif: It’s fair to say that 1800MHz is the main stream now. But when our management made the decision to anticipate 1800MHz (handsets), it was far from being main stream. And the general view at the time was that having a significant range of handsets was still two years away. So we took the challenge. We took the risk, and we decided this was the way we were going to go. And we needed to build a wide industry alliance across devices, handsets, operating systems and network vendors, to bring that vision forward by a year. I believe that we had some influence in making the LTE1800MHz mainstream at a device level.

We wanted this to be a mass market launch. We strongly believe end users get strong quality uplift from the use of 4G handsets. We were also very clear that we wanted all our LTE handsets to be capable of the latest technology on 3G as well. All our handsets must have dual-cell HSDPA and LTE. It means that, for the customer, it is quite an easy proposition. They don’t need to choose from a dual-cell HSDPA and LTE. They know that by taking a 4G upgrade, they can get the best of 4G and best of 3G in their subscription with the right handset. It is a very easy choice.

So I think it’s a question of getting the time right, and at the same time pushing the ecosystem a little. To get the handset manufacturers, the big names, ready to go with us just after our launch, it was critical to manage timing. So we were delighted that all the major handset manufacturers were in time for our launch.

**WinWin: How does EE plan for the roll-out to be as fast as possible?**

Hanif: We believe that we were the first major LTE launch that focused on handsets from the beginning. We also offer a lot of data devices, and 4G mobile Wi-Fi is very popular with our business users, but the majority of customers are handset consumer users. The day we launched, we already had a range of about five handsets that were LTE-capable.

**WinWin: What is the rationale behind this?**

Hanif: We believe that we were the first major LTE launch that focused on handsets from the beginning. We also offer a lot of data devices, and 4G mobile Wi-Fi is very popular with our business customers.
Castles on shifting sands

WinWin: What are the challenges EE faces with network layer coordination?

Hanif: The challenge now is about managing the interaction between the 2G, 3G, and 4G networks. We have a complex situation in our network, because we are still integrating the legacy 2G and 3G networks, from ex-Orange and ex-T-Mobile U.K.

We have optimized our sites by removing any overlapping sites. We have removed thousands of overlapping sites which were hindering a smooth user experience. At the same time, we have integrated sites from two different networks and PLMN into a single network. In that way, we can all focus on optimizing that single network. In most of the main cities in the U.K., we have already completed integrating the 2G and 3G networks. Now, we are moving very fast in parallel with the LTE launch.

It’s a massive engineering challenge, like building castles on three or four layers of shifting sands. So the traffic is shifting all the time, and as we integrate the sites, the 2G traffic is changing and the 3G traffic is changing. We integrate, move and commission the sites, so it is a very delicate mix to keep that together. Thousands of people work on the network, doing changes all the time. Any change we do, we need to update our databases, making sure all of the types of adjacencies are maintained. That’s a massive challenge if you look at our network, not only with its vertical integration in 2G, 3Gand 4G, but also across network adjacencies between 2Gand 3G networks.

The interaction within the LTE system itself will be another big challenge, between 1800MHz, 2600MHz, and 800MHz. We need to make sure that solutions will allow us to control interactions between the LTE layers and from the LTE layer to the 3G layer, and back, regardless of the device or spectrum band used. We would really like to have the intelligence built into the network rather than the device, so that we are controlling access to various layers and can effectively manage which handsets access which layers, and manage the transition between them to create a smooth customer experience.

One step ahead

WinWin: You mentioned EE’s interest in trialing carrier aggregation features in Tech City. Can you tell us more?

Hanif: Carrier aggregation itself has already been well trialed and tested. We know a lot of operators are working with Huawei to trial. However, we believe there are very few operators who are going for 2x20MHz. That is the headline shout in terms of the full throughput that you can achieve. In terms of our plans, we certainly will not be the first to do carrier aggregation commercially, but we do expect to be in the leading tier of operators who do 2x20MHz carrier aggregation to get the speed up to 200-300Mbps in wider areas, that’s our target.

WinWin: Operators generally see devices as a hindrance to commercial carrier aggregation application. What’s your take on that?

Hanif: My feeling is that the big challenge for handsets for carrier aggregation at 2x20MHz is that two carriers of 20MHz will create a huge amount of data. The heat dissipation that keeps it in a reasonable phone form factor for the consumer market is a massive challenge. I can’t predict how long it will take for the device ecosystem to catch up with our network, but I would expect data-only devices to come first, because they can manage the form factor easier, and then perhaps the handsets will follow within six to nine months.

WinWin: In what areas will EE continue to maintain your first-mover advantage and your differentiation in LTE?

Hanif: Name any area of mobile service, and our target is to stay one step ahead there. We have the spectrum assets to do that, the engineering teams to do that, the partners to do that, and the ambition to do that. We are ahead now, and we want to stay ahead. That means in coverage, speeds and experience for our customers. We will maintain our focus on quality to ensure we remain a world leader. We are adding more sites every single day, and we continue to do so. We are adding a lot of capacity in the backhaul networks as well. So for every single sphere and every single area we can compete in, we aim to be the best.

We respect our competition and we know that they will fight hard, but we are very confident that we have what it takes, especially the right people and right partners, to stay one step ahead.