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A Sky without limits

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Various media outlets will give you the impression that we are in the midst of a data traffic surge, but the word *surge* implies that the current rates of increase are transitory. Given what lies on the horizon, it is more likely that what we are experiencing now is the new normal. Today’s young & upwardly mobile consumers are constantly maintaining online representations of themselves. The rest of us will soon have to follow if we wish to remain relevant. As of November, China’s microbloggers numbered 300 million (half of which access their blogs on-the-go), an increase of 400% over less than twelve months. By the time you read this, the number of mobile apps in the world will have passed one million, an impressive increase from the roughly zero that existed four years ago. Facebook is closing in on one billion users, with another six billion soon to be assimilated.

But wait! That’s just the people; the machines are next in line. The Internet of Things (IoT) is being pioneered in East Asia primarily through e-commerce, security/surveillance, home appliance, telemedicine, and Internet of Vehicle (IoV) applications; the latter of which is particularly important to mobile operators as vehicles move while vending machines do not. Currently, IoV applications revolve around the usual suspects (navigation & security), but they will soon likely encompass online identity, law enforcement, and traffic management functionality, and perhaps eventually vehicle operation itself.

With cyberspace becoming as vital to human comfort as the real thing, 384Kbps access at most ‘nodes of civilization’ is no longer adequate; the 21st century lifestyle requires foolproof broadband access covering every square mile of *terra firma*, regardless of remoteness, obstruction, or the number of users watching YouTube.

Such ubiquity means infrastructure investment, and a lot of it. This is a tall order, especially in the mature markets, where banks are holding their money dear. If operators are to survive, those 1’s and 0’s flowing through their pipes had better be monetized; this means ownership of the vital links to the data hubs. For the traditional Internet, this means proprietary social media applications that subscribers grow to depend on. For the IoT and IoV, this means cloud-pipe-device architecture. If operators can deliver both, reliably and attractively, profits will surely follow.
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Telekom Malaysia: Getting more from broadband transformation

High Speed Broadband (HSBB) is enriching the daily lives of Malaysians and has brought about fundamental changes to the country’s telecom industry and the country itself. Giorgio Migliarina, CTIO of Telekom Malaysia Berhad (TM), believes that the scope of broadband transformation has widened to the point where it can be used to transform the operator business model in terms of services, mindset and performance.

By Giorgio Migliarina

HSBB catapults Malaysia into the next stage

With a population of about 30 million, Malaysia is a very young country with a median age of 26 years. With its recent surge of broadband adoption, operators must move quickly to catch up with users’ enhanced expectations. Mobile penetration is now above 100%, and there are 4.3 million fixed lines between Malaysia’s roughly six million households. The country’s broadband penetration target of 50% was achieved and surpassed in 2010, with a percentage of 57% (over 16 million Internet users) reached as of summer 2011.

TM, as Malaysia’s broadband champion (4.3 million fixed-line subscribers; 1.7 million broadband subscribers) and leading integrated information and communications group, offers a comprehensive range of communication services and solutions in broadband, data and fixed-line. TM remains steadfast in its transformation into a next-generation communications provider, delivering an enhanced and integrated digital lifestyle to all Malaysians and opening up possibilities through connection, communication and collaboration.

The challenges TM faces are quite similar to those faced by virtually all fixed-line operators. With consumer behavior rapidly evolving, we have seen very strong fixed-mobile substitution and, as a provider, this has forced us to rethink our fixed-line infrastructure and service positioning. Very recently, we have seen explosive traffic growth, especially from video, and our legacy platforms are preventing us from providing broadband and data services as flexibly and efficiently as we would like.

Meanwhile, the government has expressed its desire for HSBB to catapult Malaysia into the next stage of progress with its push for timely and cost-efficient rollout and expectations for coverage and quality. Rather than wait for the industry to evolve into a position that may not meet its expectations, the government has chosen to co-invest for the future. Additionally, HSBB has proven to be a vehicle for a nationwide upswing in GDP, lifestyle and ‘workstyle’ for Malaysia’s citizens.

TM entered into a collaboration with the Malaysian government for HSBB rollout that delivered either FTTH or VDSL to up to 1.3 million buildings, connecting over 2.2 million households and offices in selected urban areas.

Both parties created an RM11.3 billion (USD3.8 billion) Public-Private-Partnership (PPP) national HSBB project in September 2008 to develop next-generation high-speed broadband infrastructure and services for the nation. TM has put up RM8.9 billion while the
HSBB is a key national infrastructure initiative that is crucial to helping Malaysia leapfrog into the knowledge economy. Besides its significant contribution to economic growth, it will also enhance Malaysia’s regional competitiveness.

— Giorgio Migliarina, CTIO of Telekom Malaysia
HSBB promises an enhanced digital lifestyle experience, enabling consumers to create, interact, and collaborate for work, health, infotainment, virtual shopping and distance education.
The HSBB network has been designed from scratch, and has a completely new access network, with FTTH for all single-dwelling houses and VDSL2 for residential buildings. We are planning to cover 1.8 million homes by 2012.

At the same time, we have transformed our technology base by eliminating the spaghetti or stove-pipe diagrams and introducing new architectures based on service delivery platforms, such as IMS, to enable us to go to market with new services in a much faster timeframe. In our planned architecture, we will have broadband access based on FTTH GPON and VDSL2 technologies, while the aggregation layer will be Metro Ethernet and the control layer will be IMS-based. We will also have a new IP-core backbone that provides carrier-class service and offers flexibility to meet virtually any & all customer needs.

All-IP migration is resource-intensive and challenging from a managerial standpoint. We have nine primary platform migration programs, which include the migration of our ATM-based lines towards IP MSAN and the phasing-out of all our PSTN legacy switches and moving towards an AG/IP MSAN-based platform. For the core, we are moving towards IP for both our public and VPN network.

All these migrations have different timelines and specific dependencies; they must be planned very carefully. Factors such as current network utilization, service level, legacy maintenance costs, and migration investments must be noted. As some migrations are very time- and resource-intensive, with the longest planned for NGN (phasing-out legacy switches), TM has scheduled its overall project conclusion for 2017.

New HSBB components

The HSBB network has been designed from scratch, and has a completely new access network, with FTTH for all single-dwelling houses and VDSL2 for residential buildings. We are planning to cover 1.3 million ports by 2012, which will translate into 1.8 million homes.

We will have a new NGN core, over 500 Metro Ethernet nodes, almost 100 routers domestically for the IP Core; we are also transforming our systems by launching a new OSS/BSS suite. A parallel migration for the access, core and IT system has never been done on this scale before. We are collapsing 700 systems to 300, which will eventually be collapsed to 70. Broadband Forum and ITU standards have been employed as much as possible, so that major problems are avoided, especially on the OSS/BSS side where a multi-vendor environment exists for all our platforms.

For the IT systems, migration of existing customers and products has proved crucial. We implemented a brand-new OSS/BSS suite, introduced the HSBB products, and migrated them gradually. The OSS/BSS was up & running within nine months, without any glitches or problems; we are now progressively adding existing products onto the system.

The OSS/BSS migration was a greenfield approach, yet it has still managed to resolve the key issue of timing and degree of utilization of existing systems for new products. TM used a vendor-exclusive solution, based on a single platform, and minimized customization as much as possible. We also looked at the HSBB and high-growth IP products first, ring-fenced them, and only later, when the platform reached stability, did we start migration for legacy products. TM had multiple releases in parallel due to the tight schedule.

There were essentially four key elements to our operation simplification plan. First, we focused on accountability, not technology. We studied the mindsets and behavior of our field people and radically changed the way they provide services, fix faults, and carry out other duties. Second, we sought to eliminate waste. Third, we reinforced management and supervisory activities through simpler tools. We reintroduced very common and effective
As of one year after its November 2010 launch, HSBB has attracted more than 200,000 customers to our UniFi platform, with more than 1,000,000 ports installed.
We launched UniFi, and our IPTV platform was up & running just six months later; I believe this to be a world record, given the complexities involved in setting up an IPTV network.

Remarkable progress

With the launch of HSBB and UniFi triple-play services, we have solidified our basis for sustainable growth. TM is transforming from a voice exchange to an information exchange.

As of one year after its November 2010 launch, HSBB has attracted more than 200,000 customers to our UniFi platform, with more than 1,000,000 ports installed.

In Malaysia, no field team had ever been trained on fiber; we had to create a set of teams from scratch that could go to customers’ homes and effectively install and maintain services. We had to train not only TM staff, but also our contractors; the speed of this training has had the most direct effect on the pace with which we could absorb new customers. Today, we have thousands of TM technical staff members and contractors who are well trained and versed in FTTH technology.

We launched UniFi, and our IPTV platform was up & running just six months later; I believe this to be a world record, given the complexities involved in setting up an IPTV network. Moreover, our OSS/BSS system (Nova) was operational within nine months. In the subsequent year, we have launched four releases and have received invitations from various international OSS/BSS summits to share our experiences.

Our operational simplification program has yielded cuts to our mean time-to-voice activation and restoration by more than 60%, and reduced the mean time for broadband operation by more than 80%. We also reduced costs by reducing complexity in the back office.

For HSBB deployment, a technology audit by one of the leading fixed-line operators in Europe concluded that the rollout so far has been one of the fastest and most economical in history. This stems primarily from the architecture that we are using, especially for access, as well as the fact that we have legacy infrastructure that we can rely on, especially at the access level (switches, street ducts, etc.).

Experiences shared

Industry experiences must be studied before a migration program is carried out. Despite having a multi-vendor strategy, TM has decided to reduce the complexity of these All-IP transformations by anchoring our activities to just a few strategic partners; this has helped manage the complexity of network deployment. The economics of migration also need to be analyzed very carefully, because some results are quite counterintuitive; this includes the use of certain legacy platforms for as long as possible, because of their low fault rate, good performance and high cost of migration. Communications with key stakeholders is also important. It is vital that everybody understands what we are doing, especially our customers.

Last but not least, it is absolutely useless if the technology change does not go hand-in-hand with a change in mindset and behavior within the company. You can have a fantastic new technology, but if you do not know how to use it to provide effective services, then it becomes a wasted opportunity. Technology migrations must be linked to fundamental changes in your processes. It is quite difficult to get people to change their behavior at the beginning, but when performance improves incrementally, the transformation becomes easier to push through as pride enters the equation. The transformation then feeds on its own enthusiasm and accelerates, yielding a project done right and on time.
The making of a market leader

Founded in 1994, and with the first call made on its network in 1997, mobile operator Kyivstar became the market leader in the Ukraine in 2001. It is a position the operator has yet to relinquish, currently holding a market share of 41%. Recalling the early days, Kyivstar CEO Igor Lytovchenko says that initially it was hard to find potential partners to believe in the operator. “We went to different countries, and met a lot of different operators, and nobody wanted to come to the Ukraine,” he says. “So we started to develop this business alone.” In the spring of 1998, shortly after the network was up & running in the Ukrainian capital of Kiev, Telenor showed interest, and Russian investors came onboard shortly afterwards.

The contrast to today could not be greater. Kyivstar presently holds a 50% share of the market’s revenue, and boasts nearly 25 million subscribers (out of a total population of 46 million). It is also the top operator in the country in terms of quality perception. Much of this, says Lytovchenko, has been due to the operator’s management team, made up almost entirely of Ukrainians who understand the local market extremely well, as well Kyivstar’s stakeholders, who have a great deal of experience in mature mobile markets. “It has also been about the right marketing strategy, and choosing the right suppliers that are the leaders in different areas. And importantly, it’s about having good partnerships with all these parties. What all this has enabled us to do is introduce new, innovative products into the Ukrainian market, which in turn has made our subscribers really happy. For this reason, we are No. 1 in the Ukraine when it comes to quality perception.”

Despite the success that Kyivstar has enjoyed, Lytovchenko is quick to point out that the Ukrainian telecom industry is undergoing a period of transition. Mobile penetration has hit 120%, and revenue growth from voice has dropped to a mere 2% annually, leaving operators no choice but to look at other sources of revenue. For Kyivstar, future growth lies in broadband Internet development, both mobile and fixed. “Today, Internet, both on the small screen and the big screen, is seeing huge growth and development in the Ukraine market,” he says. “Our strategy is simple – to be No. 1 in the Ukraine in Internet.”

The course is fixed

According to Lytovchenko, one indicator that fixed broadband in a top priority for Kyivstar is the fact that the operator plans to spend the majority of its CAPEX in the coming year on FTTB. “At present, FTTB brings in only a little more than 1% of our revenue,” he says. “But that is because we started to develop it only at the end of 2010. My prognosis for the year of 2012 is that it will be the key year for the development of our FTTB business.” He also underlines the scope of the challenge ahead for the operator. “Currently, the fixed market in the Ukraine is a tough one, as there are
Internet, both on the small screen and the big screen, is seeing huge growth and development in the Ukraine market. Our strategy is simple – to be No. 1 in the Ukraine in Internet.

— Igor Lytvchenko, CEO of Kyivstar
a huge number of competitors,” he adds. “There are a lot of small players in each of the different regions. As for national players – those are fewer. Ukrtelecom is of course, No. 1, and we are No. 2. In the next two or three years, I want us to be No. 1.”

This aim has been much helped by a merger that took place in 2010 between Kyivstar and Beeline Ukraine, which possesses advanced fixed broadband Internet access. “The decision of the two parties’ shareholders to merge their assets was aimed at improving economic efficiency,” says Lytovchenko. “The merger has already generated a synergy effect of USD52 million in the past few months. And users have benefited too, as they now have a new operator with new features combining Kyivstar’s mobile leadership with Beeline’s fixed expertise.” He adds that the merger has now created a multi-service operator that can offer a whole range of telecom services at affordable prices.

The development of fixed broadband will also bring with it IPTV, and Lytovchenko says Kyivstar, which is currently waiting for its IPTV license, is well placed to take advantage of its nationwide presence when it obtains the license. “The scale of our business is definitely seen as a threat by our competitors, since IPTV is a major step towards full-fledged multi-service business,” he says. “Today, we are offering FTTB to two million subscribers across 32 cities in Ukraine. Of course, they will all have access to IPTV when we can provide it.”

Mobile crossroads

One of the impediments to Kyivstar’s plans for growth over the last few years has been the scarceness of 3G licenses for most players in the Ukraine market. Currently, the only 3G license belongs to the operator Ukrtelecom, which has some 600,000 subscribers. Kyivstar, which currently offers mobile data through its EDGE network, is understandably eager to acquire a 3G license. “The demand for 3G is already there in Ukraine,” says Lytovchenko. “People have millions of 3G-enabled devices at present. This technology should have been launched five years ago; 2G and 2.5G are still capable enough, but new times call for new technologies.” To him, the issue of 3G licenses needs to be addressed immediately to ensure that the country is on par with its European peers. “In the Ukrainian telecom market, this is the biggest issue,” he adds. “In other European countries, 3G has been widely available for some time now, and many operators are even developing LTE. However, the government has promised that it will issue a tender for 3G in 2012. If that happens, then I’m absolutely sure that the Internet will develop very fast in the Ukrainian market.”

In anticipation of the arrival of UMTS, Kyivstar has carried out a swap of its network equipment. “We were ready for 3G yesterday,” Lytovchenko says. “We’ve increased voice capacity and data capacity. We’ve changed our old base stations for new ones, and these are ready to support 3G. When 3G is introduced, we will be able to launch our 3G network within a maximum of six months.” He adds that the operator would like 3G to be available by the time the Euro 2012 football championship, slated to be held in Poland and the Ukraine, comes around. “Everyone coming to see this event will expect to use high-speed mobile Internet. I hope Kyivstar can provide it,” he says.

In March, Lytovchenko announced that in case the 3G rollout did not happen soon, Kyivstar would consider a direct transition to LTE. He says, however, that this would not be the first option. “Technically, it is possible to jump from GSM to LTE,” he says. “At the same time, it would be more logical to develop a little bit slowly: GSM-UMTS-LTE, because that’s the way it has been historically. Besides, there are not enough terminals today, and the LTE networks today are not working in the way that we had expected. I think that after two years, it might be possible to make the jump. But today, it is too early.”
A confident future

Fixed and mobile broadband aside, Kyivstar is also looking at VAS as an additional revenue stream. In the last couple of years it has rapidly expanded its multimedia service portfolio. An example of this is the operator’s active promotion of digital music sales by allowing downloading of music tracks directly to a subscriber’s handset via broadband. The operator also generates its own music content; it has set up a unique Internet community of up & coming artists, which to date comprises more than 30,000 singers and bands. Users get to choose the best tracks, which are then sold alongside those by more famous musicians.

“We are aware that operators worldwide are facing a choice: either stay a pipe for third-party traffic, and let other businesses grow around it, or become a smart pipe by developing their own solutions, applications and content, and delivering them to users,” says Lytovchenko. “We have chosen the latter.” The operator has already entered into agreements with the world’s biggest record companies to allow songs to be downloaded into handsets at a rate of just USD0.25 each. It plans to start offering video content as well, including video content it has itself developed. He adds that when high-speed Internet can be offered on mobile phones, new VAS opportunities like video streaming, video & games-on-demand, conferencing and IPTV will open up.

All of this means that Kyivstar can expect to maintain its leadership position in the market well into the future. “I am 100% sure Kyivstar will be No. 1 in every aspect – mobile, multimedia and Internet,” says Lytovchenko, when asked about his predictions for the future. “Today we are the mobile leader, and we will assume leadership in other areas as well. The distance between us and our competitors will be even greater.”

Editor: Julia Yao  julia.yao@huawei.com
Creative cooperation between vendors and operators is indispensable to telco industry progress. **Jaime Bustillo, CTO of Vodafone Spain**, discusses current industry trends and how his firm’s cooperation with Huawei is innovating the field.

By Pearl Zhu

### Innovation through cooperation

**WinWin: Vodafone and Huawei have been cooperating intensively for a long time. How do you view the progress of the cooperation so far and how is Vodafone Spain benefiting from it?**

**Bustillo:** The collaboration with Huawei started a long time ago. Vodafone Spain has the honor of hosting two Vodafone Group Joint Innovation Centers with Huawei – the Mobile Innovation Center (MIC), focused on radio technologies and created in 2005; and the Application Innovation Center (AIC), which was created in 2007 and is focused on applications and software.

More than 25 projects developed in the two Innovation Centers have become commercial. In the MIC, we started applying the remote radio heads and SingleRAN products that we are currently deploying for all networks, and later we improved various radio product features.

We have found a very good match in Huawei. Huawei is very interested in the customer and in innovation. We can work with them to innovate for our customers in a very cooperative way, and that’s what we are bringing to the customer – the best in terms of networking; we are starting to cooperate in terms of applications and we will continue cooperating in all other aspects of our activities. We need to continue working together; we need to improve the way we cooperate in innovation, and for the
The benefits from joint innovation with Huawei are that we have found a very good match with you. We can work with you to innovate for our customers in a very cooperative way, and that’s what we are bringing to the customer – the best in terms of networking.

future I think we should continue building based on the successful cases we have had in the past. We need to do new things in the field of applications and software and we have a very big challenge in cloud computing; both companies are very interested in it. We need to focus on new streams of innovation that we can provide to both companies.

WinWin: SingleRAN was first unveiled at Huawei and Vodafone Spain’s MIC, marking a real milestone. Where do you see SingleRAN’s unique value, in terms of lower costs, increased capacity, increased spectrum efficiency and broader bandwidth?

Bustillo: One of the big pieces of innovation that is very important for us, as I said before, is SingleRAN. We are still trying to understand what SingleRAN can provide us. I think the key advantage is that it provides us flexibility in that we only need to have a presence in some place where we have a site and then we can later modify the frequency, the standard… everything we are going to do with the site. Its flexibility also brings about cost savings in OPEX.

In the past, people had to come to the site to do a lot of the installations; we also had to incur a lot of power consumption. Now we can do that with a single piece, for the equipment is very small. It also has three or more radio heads, depending on the application. We need capacity and frequency bandwidth. I think flexibility is the key that we are finding with SingleRAN.

WinWin: What are your future expectations from SingleRAN? What do you think Huawei can improve to create more value for Vodafone’s SingleRAN deployment?

Bustillo: SingleRAN could be more integrated, in terms of radio heads/antennas. That is what we are doing with the integration of antennas together. Support for more frequency bandwidth would also be good. Some kind of beam steering will be good in the future. But in general, the concept is there and we just need to optimize the details.

Staying ahead down the road

WinWin: MBB usage today is increasing rapidly, but some operators’ ARPs cannot keep up with the traffic increase. What are the current MBB challenges that mobile operators are facing globally and in the Spanish market specifically?

Bustillo: The challenge in broadband for us in Spain as operators, not only for Vodafone, but for all of us, is really to be able to monetize mobile broadband. We need to get to a business model that works both for customers and for us as well. And we will work on that for the next few years. In terms of technology, we have the technology that customers require today. It is more a business model discussion that we need to have.

WinWin: In order to gain an upper hand in the market, operators are thinking of transforming, both in terms of service and network. As a veteran of these fields, can you tell us what options operators currently have? Also, what are Vodafone Spain’s plans in this regard?

Bustillo: The market in Spain is very similar to the market in other countries in Europe. Now that we are getting a concentration of operators, like Telefónica, Orange and Vodafone, the market is getting more similar. There will be differences to how everyone approaches social networking/relationships. In the competency field,
The challenges with LTE now for us in Spain and in many countries are frequencies. All the countries are allocating frequencies in 2.6GHz band and 800MHz band. Terminals and frequencies are the two key things we need to deploy LTE.

Bustillo: The challenges with LTE now for us in Spain and in many countries are frequencies. All the countries are allocating frequencies in the 2.6GHz and 800MHz bands. Obtaining the frequencies is the key issue for LTE now. Whereas we are obtaining the frequencies, we need to have the participation of the ecosystem as both vendors and operators are prepared to deploy LTE. Terminals and frequencies are the two key things we need to deploy LTE.

WinWin: What are your expectations from Huawei in the LTE space? When do you think is the right time to deploy an LTE network?

Bustillo: The expectation is flexibility. As I said before, we still don’t know exactly the moment we need to use the frequency bands and capacity. So we need the flexibility to give us response and support. Of course, we believe Huawei has the best technology that we can find in the market.

WinWin: Cloud computing is a very popular topic in the industry. How would you describe the role that it could play in telecommunications?

Bustillo: With regards to cloud, everyone, every company, every telecom operator and big Internet players want to play. There are many definitions of cloud. We need to address many of them. One definition of cloud is private cloud. We need to provide services. We still need to transform the back office into a cloud in a way that we can get better benefits.

Another definition of cloud includes services like
Vodafone Spain has been a pioneer operator developing the cloud concept. We launched “Vodafone Office” more than five years ago. This impressive product takes all corporate communication services to the cloud.

WinWin: What is Vodafone’s plan when it comes to cloud computing, and can you describe its progress to date?

Bustillo: Vodafone Spain has been a pioneer operator in developing the cloud concept. We launched “Vodafone Office” more than five years ago. This impressive product takes all corporate communication services to the cloud, reducing the customer’s infrastructure to the minimum. Now, new cloud services are arising, relating to taking other IT infrastructure to the cloud, like cloud storage; Vodafone Spain is working to develop this part of our business. Our innovation department is working with the marketing teams to define and deploy our proposals for our customers.

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A SKY without limits

A household name in the U.K. with over 10 million pay-TV customers, Sky has been a leading player in broadcast media since its launch in 1989. Mohamed Hammady, Director of Sky Network Services, tells WinWin how Sky’s current innovative push towards triple-play makes the broadcaster “not only the U.K.’s first choice for home entertainment but, with our increasing investment in broadband and telephony, an emerging force in home communications as well.”

By Yingying Li

A constant innovator

Sky’s competitive edge continues to be its commitment to developing and investing in high-quality content. As one of Europe’s most successful pay-TV companies, Sky leads the way in offering the very best in entertainment, sports, news and the arts to its many millions of subscribers. The company spends more than GBP2 billion a year on TV content, making it the largest commercial investor in Great Britain.

One of Sky’s most important innovations came in 1998, when it made the transition to digital, a rollout which was completed in 2001, when it introduced its game-changing Sky+ service.

Mohamed Hammady, Director of Sky Network Services, notes that “Sky+ has changed the way people experience TV, allowing customers to pause, rewind or fast-forward programmes, as well as plan and record the content to make the TV schedule fit around your life, rather than fitting your life around the schedule. It’s about giving customers the control and flexibility to watch what they want, when they want.”

Sky+ revolutionized the way consumers were watching TV and has now become the U.K. favorite personal video recorder (PVR).

“I think all of those now accustomed to Sky+ would find it difficult to go without the convenience it brings. The feature adds further depth to the value offering of subscribing to Sky,” Mr. Hammady adds.

In addition to the success of Sky+, Sky has positioned itself as a leader in high-definition television, delivering over 50 HD channels to its subscribers – the largest offering in Europe.

With the support of many TV manufacturers, Sky first launched its HD service in 2006, enabling a select number of channels to be viewed with a level of quality, clarity and sharpness never before experienced. Now, Sky+HD has developed into a comprehensive service, enjoyed by a subscription base of more than 3.5 million homes.

Sky continues to enjoy strong demand for Sky+HD, with many thousands of customers signing up to the service each week. “If you look at the number of additional
We believe our commitment to offering the most comprehensive selection of great content means we’re well-placed to be people’s first choice for home entertainment.

HD subscribers, there is consistently strong growth. With more and more customers having an HD-ready TV at home, more and more households will consider taking up our HD service. Customers need only catch a glimpse of the latest blockbuster film on Sky Movies HD or football match on Sky Sports HD to notice and appreciate the difference – there’s an exciting future ahead, ” Hammady says.

The introduction of Sky 3D in 2010 was a further breakthrough offering customers a dynamic and exciting new way to enjoy Sky content. Sky is investing heavily in 3D entertainment, announcing in July 2011 a joint-venture with Atlantic Productions to form a new production company with an exciting and original homegrown content agenda. A number of new output deals have also been signed to deliver the latest in 3D programming from Disney, Discovery and MTV direct to Sky customers.

From content only to triple-play service provider

Despite Sky’s strong pay-TV customer base, only 27% of its over 10 million customers have opted for all three of its TV, broadband and telephony services. This means that there is a significant opportunity to not only add new triple-play customers, but to encourage and incentivize existing subscribers to engage with more of the products and services Sky offers.

Selling home communication services to their existing customer base is therefore a major priority for Sky, and forms a key part of their growth strategy. At the end of June 2011, Sky had added 711,000 new subscribers across Sky Broadband, and 734,000 new customers across their telephony service, Sky Talk.

Given the current economic climate, Sky believes more and more households will opt for triple-play services, both to save money and enjoy the convenience of having one bill for all of their entertainment and communications needs.

“We believe our commitment to offering the most comprehensive selection of great content supported by genuine innovation in the form of Sky+, HD, 3D, VoD and multiplatform services, means we’re well-placed to be people’s first choice for home entertainment. When you then factor in great value, high-quality broadband and home telephony, we’re also then the first choice for home communications too,” says Hammady.

“Many millions of Sky customers take their communications services from incumbent telecom providers. They have the opportunity to switch those services to Sky for a better experience – such as truly unlimited downloads and more consistent download speeds – while saving money too. The percentage of people signing up to the triple-play service among new subscribers is very high. We see a strong uptake among our new customers.”

IMS meets challenges

As a new player in the home communications space, Sky is able to implement up-to-date technology without the constraints of a legacy network weighing it down. However, such fast expansion can come with its own problems – for example, given that Sky’s network currently experiences significant increases in traffic each year, how will its infrastructure cope with such a fast growth rate?

“We have a five-year view of the network evolution, then we update this five-year view every year based on our customer growth and projections, and also based on the production of potential new services – it’s a step forward
but not a step that we need to go back and dismantle one year later, there is always an adaptation,” Hammady explains.

“We want to build a network which delivers what is needed today but which is capable and open to what we will need tomorrow, because you don’t want to change things every day.”

In 2009, Sky started to trial Huawei’s IMS solution, which not only suits Sky’s current need for fixed residential telephony services, but also allows Sky to build new products and services much more easily in the future.

“We are starting to see that people need to access the same data, in order to watch the same channel on the move, at home, or in the office,” he says. “The unique feature of IMS is how it promises the future requirement for our customers to access any service from anywhere via any device.”

Since Sky started migrating customers to the IMS network in September 2010, many records have been reached. Within four months, nearly half a million customers had been successfully transferred across to the network – a new benchmark in terms of volume and efficiency in the industry. Another wave of migrations began in July 2011, with estimates of a further 370,000 customers being added to the network, totaling 1.1 million customers altogether.

After the deployment, Sky will be equipped to launch further innovative, media-rich services. IMS will also enable Sky to provide a seamless experience to its customers across a number of platforms and devices.

“The IMS network is always about two things: making it cheaper and faster to develop new services. In the short term, it will increase the cost, but from a long-term perspective, it will help to reduce cost,” said Hammady. “We’re confident that our customers will see the benefits of our investment over the coming years.”

Unlike other operators who rely heavily on IP, Sky adopted a hybrid solution, using satellite to deliver TV and fixed broadband to deliver VoD through its rapidly growing service, Sky Anytime+.

Be the best at what you are good at, not everything to everyone

“We expect to continue to be the U.K.’s fastest growing home communications company,” Hammady says with confidence. “It's about understanding what you need to deliver, and finding the right technology to deliver on those requirements.”

“Before we select any technology, we try to understand what the need is – then we try to find what technology will suit us best. Remember what people used to say about WiMAX? Where is WiMAX now? To be a good telecom provider, you are not obliged to implement every technology. You have to be selective.”

Unlike other operators who rely heavily on IP, Sky adopted a hybrid solution, using satellite to deliver TV and fixed broadband to deliver VoD through its rapidly growing service, Sky Anytime+.

“This is because it won’t be possible to deliver all the channels we have on broadband, like HD. If you try to do everything over IP, then you might not offer the same quality, due to the need to scale to demand and avoid network contention. For high-bandwidth services like HD and 3D video, a broadcast technology like digital satellite remains the most effective, and efficient, to meet growing demand,” says Hammady.

“We already have some VoD content delivered over satellite. We’re constantly recoding some of our most popular programmes and making them available to customers via their set-top boxes.”

“But, to expand VoD choice further, we’ve been using broadband to give customers access to a wider range of additional programmes more quickly. This hybrid model helps us achieve our goal of enabling a stable and diverse on-demand offering with great speed and efficiency.” Despite the emergence of IPTV competitors, Hammady believes Sky’s hybrid network positions the company well.
When Sky met Huawei

Before Sky chose to partner with Huawei, the latter had hardly any customers in the U.K. Given the appetite for great content delivery at Sky and the cutting-edge technology available from Huawei, Mr. Hammady is convinced that the partnership is the right decision for customers.

“Apart from its strong products, what’s impressed me most about Huawei is the quick response it provides. The second important thing is the respect we have for the Huawei team. The fact that 48% of their staff work in research and development (R&D) is incredible – other companies only have a small fraction of this, which means innovation will take them much longer.”

He also praises Huawei’s entrepreneurial spirit, support from their executives and the accessibility of their R&D team.

Is Sky the limit?

In 2011, Sky acquired The Cloud, an established and growing network of over 5,000 Wi-Fi hotspots across the country. The Cloud will enable Sky to offer new services to its customers, particularly those who are on the move and want to continue having access to Sky content. Sky also intends to boost its Wi-Fi footprint significantly.

“We’re delivering lots of content on mobile today, and The Cloud will allow us to deliver even more content to mobile devices using Wi-Fi,” Hammady says.

“We believe that the compatibility of Wi-Fi with mobile data communications is ideal. It’s all about understanding the needs of our customers and delivering things more efficiently without following the traditional way of doing things.”

Editor: Julia Yao Julia.yao@huawei.com
The Norwegian telecom giant, Telenor ASA, is inarguably the leader in its home market. Like its peers, the operator faces challenges from unorthodox players as well as opportunities in new areas such as mobile broadband. **Bjørn Ivar Moen, Vice President of Product & Business Development at Telenor Norway**, says the operator will need to become more relevant to customers in the years to come.

**WinWin:** The Scandinavian telecom market is highly developed both in terms of technologies and business models. As the market leader in Norway, what are the top three market challenges facing Telenor Norway today?

**Moen:** Well, there are a number of challenges. The challenge from new business models, especially from over-the-top (OTT) players, is a major one. Voice services are now included in a number of alternative services (Skype, iCall), which poses a threat to our voice service revenue and forces us to evolve our business model.

Secondly, we will need to become more of a broadband company in the future. To achieve this, we need to rethink how we do business – the way we build our networks; the way we converge fixed and mobile services, and the way we prioritize services.

Thirdly, these factors compete with traditional services and we need to find a balance. We need to compete for basic revenue, while adjusting for future revenue and changing our business model.

To handle these challenges, we need to rethink and renew ourselves consistently so that we remain aggressive.

**Coopetition with OTT players**

**WinWin:** Many operators find OTT players to be a threat. How do you describe Telenor Norway’s relationship with these players? Competition or cooperation; which is more accurate?

**Moen:** We can describe the relationship as coopetition. We are launching our own OTT initiative, dubbed comoYo in the Nordic countries, which develops OTT services and makes them available for our customers. We think that’s a valuable proposition and makes us relevant to customers.
I think that’s the way we need to look at it, because if you just close your eyes and pretend OTT is not coming, this is a very dangerous way to think about it. On the other hand, embracing it fully without taking a role in it could also be a dangerous strategy. We are trying to balance different elements. By launching our own initiative, we can partner with OTT suppliers and evolve our business model in a coopetitive way.

WinWin: What does Telenor, as a telecom operator, gain from such a coopetitive business model?
Moen: Firstly, we have to remember that OTT players actually provide more demand for network bandwidth and network capacity. That’s good news for us as a network provider. We will benefit from network traffic as long as our business model keeps us relevant to our customers. Now, if we actually can provide OTT services to our customers, we can make additional revenues from those as well. Moreover, if we enable customers to see those services in relation to each other, this will increase our relevance to them; they will be willing to pay us for those services.

WinWin: How can your customers benefit from your OTT initiative? Can you give us an example?
Moen: Customers can benefit from a better service experience. For example, we have our own music service in Scandinavia called WiMP (Wireless Music Player). It is a streaming service focused on local content, local playlists, local music, as well as international music. It’s an OTT service and has totally changed the business model for record companies and music distribution channels.

If customers want to pay directly to the service provider, that’s okay, but we can actually provide an option where they pay the service with their phone bill, and we can give them a discount if they bundle it up with our services. I think that’s a good example, in terms of promoting new services, and being relevant for customers. On top of that, we are being relevant to the music industry in Norway because we can promote legal digital music to the domestic marketplace.

WinWin: Telenor has an aggressive plan for HSPA+ and LTE networks. How do you differentiate HSPA+ and LTE market positioning and propositions?
Moen: We are actually focusing more on the end user experience, as such, rather than the technology behind it. What we are saying to customers is “5Mbps-speed mobile broadband, good coverage and good services,” rather than saying “HSPA+ or LTE,” which are expressions that are not that relevant to our customers. Yes, LTE has become an expression in the industry. We are not hiding it in any way, but we focus on what is important for the customer, which is the user experience – speed, quality and coverage.

WinWin: Nordic countries have some of the highest smartphone and tablet penetration rates in the world, with a smartphone penetration of over 50%. How does this impact your MBB strategy and thinking?
Moen: We welcome smartphones and tablets as they make new services available to customers, in combination with the network. Customers become more engaged with these advanced devices and, at the end of the day, that’s how we are going to make money. Also, we can learn from their makers’ success, particularly Apple’s success. Their devices succeed because they are put into context for customers, especially by the application universe, which makes the device so much more interesting and provides the users with unlimited access to entertainment, business
solutions and more, with a single touch. These types of services represent an additional revenue stream, solve relevant customer issues, and allow Telenor to relate to the customer in an entirely new way.

Taking customers on this journey and helping them understand which services work for them is important. This is one of the reasons why Telenor Norway is rolling out Telenor stores in Norway. You can easily go to a telephone kiosk if you just want to buy a phone, but in order to put things into a broader context for the customer, we need to take our Telenor store customers on a journey, showing them not only hardware but the services we offer as well.

**WinWin: Small-screen and big-screen customers exhibit different usage behavior when it comes to mobile data services. How do you market and balance the two?**

**Moen:** It’s important to distinguish between small-screen and big-screen services. For small-screen data service, we have tied it in with voice subscriptions, which has proven successful. For the large screen, we are constantly developing new price models in order to be relevant.

It’s true that large-screen devices consume more data, but we register an increasing amount of data also for the small screens, particularly as the new and advanced smartphones become prevalent. Large-screen subscriptions go for a higher price, so we don’t see one as better than the other. We think they will co-exist; both are important to our MBB development.

With that being said, we find it very important to combine different SIMs, especially for business customers. Nowadays, it’s common that a customer has several SIMs – one for the handset, one for a second handset, one for a tablet, one for a mobile router, and one for a PC dongle. We have launched new pricing models that make it easier for customers who have several SIMs to combine services on different devices. We have offerings where different devices interact with each other, combining volumes, speeds and services between SIMs. This gives customers better user experiences with connected devices.

**WinWin: How do you envisage mobile broadband development in your market?**

**Moen:** We have big expectations for mobile broadband. It’s going to be incredibly important. Fixed broadband and mobile broadband will work together, and offer a seamless experience for customers. I think we are going to see a lot of new services. If we can provide good coverage, good user experience, stable networks, efficient price models and relevant offerings, we are going to have huge success in mobile broadband. We have a very aggressive MBB strategy where LTE is a key element. We are going to have a very aggressive launch in order to defend our strong market position and expand further in Norway.

**Looking ahead**

**WinWin: In your opinion, how will mobile broadband and fixed broadband develop in relation to each other?**

**Moen:** One of the things we are looking into and keen to explore is how far mobile broadband can go. Is mobile broadband going to replace fixed copper broadband, and take over the role for DSL? That’s a very interesting question. I believe mobile broadband will be the dominant force in broadband in a few years, while fiber is likely to be the endgame on the fixed broadband side, and this will complement mobile broadband.

If the fixed and the mobile broadband can build on each other, we need to find areas relevant for customers to see them connected to or related to each other. Partly, we
think mobile broadband challenges DSL technology, but we will like to see mobile broadband and fixed broadband in connection. If we can make relevant bundles of the two, we will go down that track.

**WinWin: Some argue that traditional voice service will cease to exist as a result of the prevalence of OTT. Do you agree?**

**Moen:** Voice service will be here for a long time. We will continue to make it relevant for the customer. Honestly, if you compare it to OTT voice services, traditional voice service makes you able to call everybody, not just the ones that have the same OTT service. We need to be humble about OTT service taking over as part of the voice picture, but we also need to be confident that our voice service is still the best voice service around. We can develop that and still be relevant to the customer. It’s going to be around for a long time.

**WinWin: To rethink and reinvent yourself, Telenor needs trustworthy and capable partners. That’s why Telenor and Huawei have been working closely to explore new business models. What are your expectations for the newly established Joint Business Innovation Center and for future cooperation in this field?**

**Moen:** The new Joint Business Innovation Center looks very promising for us. We think we will definitely benefit from working with players like Huawei. You are able to provide us with valuable insights on what is happening on the network, hardware, handset and tablet side. This is very valuable to us when we develop our roadmaps and offerings so that we can provide value for our customers. We have had a good start. We have high expectations on how to proceed, and we will focus our efforts on finding good areas where we can jointly benefit from cooperation.

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Internet of Vehicles
Your next connection

The Internet of Vehicles (IoV) is an inevitable convergence of the mobile Internet and the Internet of Things. It’s comprised of all new and current vehicles, either fitted or integrated with two-way RF equipment. It is a converged technology that encompasses information communication, environmental protection, energy conservation, and safety. To succeed in this emerging market, acquisition of core technologies and standards will be crucial to securing strategic advantage.

By Dr. Liu Nanjie (Nanjing University of Posts & Telecommunications)

Concept of IoV

Although the IoV is an emerging concept, some nascent forms exist today. Intelligent Transport Systems (ITS) in Europe and Japan have adopted certain forms of IoV technology. In New Delhi, all 55,000 licensed rickshaws have been fitted with GPS devices so that drivers can be held accountable for their questionable route selection. China’s Ministry of Transport (MOT) has ordered that GPS systems be installed and connected on all long-haul buses and hazmat vehicles by the end of 2011 to ensure good driving habits and reduce the risk for accidents and traffic jams. The Brazilian government has set a goal for all cars in circulation to be fitted with electronic ID chips from its National Automated Vehicle Identification System (Siniav).

The launch of the U.S. National Strategy for Trusted Identities in Cyberspace (NSTIC) is a milestone for IoV. It requires that “security chips” be embedded in all online devices, including those in vehicles. Clearly, the IoV is no longer a matter of IT applications in the automotive industry; instead, it has become a national security concern.

What is the IoV?

IoV technology refers to dynamic mobile communication systems that communicate between vehicles and public networks using V2V (vehicle-to-vehicle), V2R (vehicle-to-road), V2H (vehicle-to-human) and V2S (vehicle-to-sensor) interactions. It enables information sharing and the gathering of information on vehicles, roads and their surrounds. Moreover, it features the processing, computing, sharing and secure release of information onto information platforms. Based on this data, the system can effectively guide and supervise vehicles, and provide abundant multimedia and mobile Internet application services.

Viewed from the network perspective, an IoV system is a three-level “Client-Connection-Cloud” system.

Client system – The client system is a vehicle’s intelligent sensor, which gathers vehicular intelligence and detects driving status and environment. It is a ubiquitous communications terminal that features intra-vehicle, inter-vehicle, and vehicle-network communication. It is also a device that enables IoV addressing and attainment of a trusted vehicular identity in cyberspace.

Connection system – This layer addresses V2V, V2R, V2H and V2I (vehicle-to-Internet) interconnectivity to realize communication and roaming between ad-hoc vehicular networks (VANETS) and other heterogeneous networks. It ensures real-time network ubiquity in terms of functionality and performance. It is also a merging of public and private networking.

Cloud system – The IoV is a cloud-based vehicle
operation information platform. Its ecosystem covers ITS, logistics, cargo/passenger transport, hazmat transport, vehicle repair/fitting, vehicle manufacturing, vehicle dealerships, vehicle supervision, insurance, emergency rescue, and mobile Internet, making it a nexus for a variety of copious data sources. Cloud-based functions such as virtualization, authentication, real-time interaction, and mass storage are therefore required. Its application systems also integrate vehicle data gathering, computing, scheduling, monitoring/control, management, and applications.

It is noteworthy that the current GPS+GPRS system is neither true IoV nor IoT; it is only a combined application of existing technologies. Nonetheless, many ITS tests are being implemented based on this technology. It would be unfavorable for any country's strategic priorities and technical innovations if IoV development is based simply on this technology.

What is GID?

A vehicular global ID (GID) terminal is at the core of the IoV. It is a communications gateway and integrated or mounted terminal with global ubiquitous network connectivity. It is also an intelligent in-vehicle sensor with global positioning and global online identification (online license plate) functionality. A GID integrates a vehicle's smart information sensor, networking, and online license plate, as shown in Fig. 1.

Vehicular status perception – The GID features various embedded sensors and connects with a vehicular bus, such as onboard diagnostics (OBD) or the controller–area network (CAN), enabling it to perceive and monitor almost all static and dynamic vehicular information, including environmental and status-diagnosis information.

Ubiquitous communication – The GID features V2V, V2I, and ad-hoc network communications; intra-vehicle networking; inter-format bridging and relay; and global communication/positioning/roaming capabilities.

Online license plate – The GID determines the status of vehicles, networks and users to generate an “online ID” for a vehicle, which is a trusted ID in cyberspace rather than a mere tag.

Simply put, the GID addresses problems with traditional radio frequency identification (RFID) that include its one-way nature, limited range & coverage, lack of speed, passive and unintelligent operation, lack of perception and communication, high cost, lack of standardization, and its ease of loss or damage. The GID also features the V2V, V2I, and global roaming/coverage required for the IoV, making it more than a mere telematics instrument. More importantly, GID provides vehicles with “cyber license plates” or “cyber IDs,” thereby solving the most difficult problem with IoT – the fact that an address cannot be separated from its network ID. GID brings greater online visibility by uniquely distinguishing all vehicles worldwide. In addition, by working with the back-end cloud system, GID submits vehicle and driving status, and even in-vehicle black-box information, at any time.

Dynamic, multi-source data obtained from the GID can be utilized for IoV, machine movement, ITS, and cloud computing.
With GID capabilities, the IoV need no longer rely solely on static, external information sources. Sources can now be more diverse and far-reaching, but this will require major changes to ITS technologies.

Vehicle and traffic status information can be gathered from the CAN bus and other sources; such information covers driving (location, direction, speed, and acceleration), status (inside and outside temperature, air flow, and tire pressure), power (fuel pressure, rotational speed, and oil level), vehicle safety (seatbelt, airbag, and door/window lock status), and environment (weather, road conditions, and congestion levels).

**GID-based IoV system**

**Mutual IoV & ITS development**

IoV development has everything to do with ITS, automotive electronics, and mobile Internet access. Next-gen ITS development requires the overcoming of challenges such as comprehensive traffic status information access, timely detection of road conditions and vehicle operating status, and intelligent release of information based on relevant factors such as vehicle/road conditions, thereby providing travelers with more effective traffic information; this makes transportation more eco-friendly and efficient.

ITS depends on the road and the vehicle equally. Traditional ITS solutions involve static and fixed road-related elements such as roadside units (RSUs), video shooting, roadside displays, RFID readers, traffic condition displays, and pressure-sensitive coils, but overlook the fact that vehicles themselves are the most relevant factors that affect traffic conditions, accidents and the roadside environment.

The advent of GID-based IoV represents the evolution and advancement of traditional M2M and telematics. With GID capabilities, the IoV need no longer rely solely on static, external information sources. Sources can now be more diverse and far-reaching, but this will require major changes to ITS technologies.

**Relationships between IoV and cloud computing**

The IoV will eventually generate much more information than the telecom industry. Take the ITS for example; the
entire smart process of gathering, processing, and releasing dynamic traffic information from various sources across a city will require a petabyte-scale ($10^{15}$) information processing system. Cloud computing would seem suitable for handling data of this magnitude. In a cloud framework, systems for comprehensive information gathering and processing, road traffic status monitoring, vehicle regulation and guidance, signal control, system interlocking, prediction or information release must be integrated with the entire smart system. Information is shared among these systems so that unified decisions are made. Cloud services related to the IoV and ITS fall into the following three categories as shown in Fig. 2.

**Infrastructure as a Service (IaaS)** – Basic IoV-and traffic-related computing services are based on the cloud framework, including vehicle/traffic status data storage, area-based vehicle monitoring/control, vehicle safety status monitoring/control, real-time traffic analysis, and access billing and settlement. Meanwhile, as a core capability, open APIs are provided to any third-party application developer to help them rapidly build related application services.

**Platform as a Service (PaaS)** – Includes bulk GPS data and GID data processing, ITS holographic data processing, cloud storage, information mining and analysis, information security, and data buses.

**Software as a Service (SaaS)** – Through basic cloud services and third-party service resources, any developer may create certain applications that support IoV and ITS from various terminals (PC browsers and mobile phones).

**Opportunities and challenges**

The IoV combines Internet, IoT, communication, automotive production, automotive after-sales service, ITS, automotive insurance, traffic control, LBS and mobile Internet elements. It will bring about fundamental changes to ITS, urban congestion management, transport & logistics, urban traffic, public facility construction, telecom operations, terminal manufacturing, and our collective lifestyle. However, it remains difficult to unify
the concept and scope of IoV from different perspectives. As a result, top-level design for the IoV must be done from a nationwide perspective.

**Issues yet to be resolved**

**Converged V2V and V2I communication** – V2V and V2I represent two systems within a single vehicle. Few vehicles have V2V capabilities, while V2I is used to a limited extent on ordinary public networks and does not guarantee real-time data; 802.11p is also not entirely capable of bridging and converging V2V and V2I.

**Open CAN buses** – CAN protocols vary with vehicle make and model, which constitutes a huge obstacle to IoV establishment.

**Precise vehicle positioning** – Assisted GPS (AGPS) cannot fully satisfy vehicle positioning requirements for IoV; it is also insecure and does not carry the weight of law. A more precise and regulated navigation system is needed.

**IoV standards** – Various institutions, bureaus, branches of the military, and enterprises have their own respective understandings of the IoV; but which, if any, will become dominant? Rules and standards will involve compromise, but someone will have to go first. National security will have to be balanced with innovation and standardization.

In addition, the GID encompasses in-vehicle device functions required for the IoV, but standards need to be unified for GID-cloud and cloud-terminal communication protocols as soon as possible. Communication ubiquity must also be established for all relevant network elements, if the IoV is to work at all.

**IoV operation** – The IoV entails an extremely large amount of data, beyond the limits of ordinary platforms. To ensure security and credibility, the IoV must be on a ‘real-name’ basis. Each vehicle will carry a number of mobile terminals, persons, and devices. It will have multiple attributes and be multihoming. As a result, IoV operators will be neither traditional telecom operators nor mobile Internet SPs, automakers, or auto dealerships. There are obvious needs for virtual operation.

There are also a large number of technical difficulties and obstacles to cloud platform opening and interface, as well as network visualization, positioning and computation, timely retrieval, and data mining & analysis. A plethora of new problems will also emerge as the industry deepens.

**Bright future for IoV**

As a special form of communication that combines industrial and IT applications, the IoV will be the next focus for telecom and Internet transformation. It is an emerging field for the automotive industry, where IoV development is second only to “going green” in priority; this presents many opportunities.

First, online vehicle status check, annual inspection, and monitoring will come to pass, if they do not already. It will be possible to remotely determine a vehicle’s operational legality, regulatory compliance, and license status of the driver, which will reduce vehicle management costs, change industries, and save lives.

Secondly, vehicles will have IDs in cyberspace. This will amount to an online presence on a quasi-real-name basis, which will no doubt make the operation of falsely registered, smuggled, and illegally modified vehicles much more difficult. It will also enable easy bundling with mobile payment and driver & passenger information records, thereby increasing overall security and creditability in cyberspace and the physical world as well. Cyber license plates and black boxes alone will spawn entire industries.

Thirdly, the IoV will supplement the RFID+GPS system to create a fully-encompassing ecosystem. As mentioned above, the GID is a new type of in-vehicle terminal that features processors, sensors, communicators, security IDs, memory, and wireless bridges. It has greatly expanded the capacity of the RFID/GPS industries and changed the
A large number of smart terminals will emerge tailored to the IoV, both in-vehicle and handset. With these terminals in hand, the IoV will be integral to the mobile world.

foothold of current ITS and IoV terminals. It enables real-time information release and intelligent route navigation by mobile terminals when used together with the existing ITS; it will doubtlessly influence the entire ITS landscape.

The IoV also enables new mobile Internet and LBS (location-based service) applications. It introduces numerous physical items into cyberspace, while avoiding identity infringement issues, thereby assuring unique mapping between the virtual and physical worlds. It will cause a sharp increase in the number of mobile Internet customers and create new gold mines in online privacy protection and trusted ID services.

The IoV will generate robust data services. It enables multi-level [such as R2I (road-to-Internet), R2V (road-to-vehicle), V2H and V2I] data storage and query, as well as six-degree association with industry chains relevant to vehicles, thereby interconnecting all aspects of human life. Mass data storage, processing, distribution, applications, e-commerce and digital transactions will all require a physical platform for completion. Said platform will be much larger than existing communication platforms, as it will convert a lot of effort in the physical world into the same in cyberspace. As a result, the IoV will doubtlessly help drive the cloud computing boom, becoming one of the first practical large-scale cloud IoT applications.

Finally, a large number of smart terminals will emerge tailored to the IoV, both in-vehicle and handset. In the future, IoV terminals should come with special man-to-machine interfaces, be able to connect to in-vehicle screens, and serve as mobile payment terminals. They should also feature IoV LBS and SNS functionality, as well as all special IoV cloud services such as ITS, automotive insurance, rescue, positioning & search, vehicle checking, remote diagnostics, and networking with the GID. With these terminals in hand, the IoV will be integral to the mobile world.

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Japan is a highly developed economy with a booming telecom industry. Japan’s Ministry of Internal Affairs and Communications (MIC) developed the u-Japan Policy early in 2004 to accelerate the realization of network access ubiquity, not only for users but also for smart devices. Its rapid development of the Internet of Things (IoT) not only embodies Japan’s obsession with robotics and other cutting-edge technologies, but also reflects a practical mechanism to cope with its aging society through reduced human resource costs.

Business opportunities

As is often the case with such matters, IoT commercial application began earlier in Japan than in Europe, where IoT hype crested in 2002 and washed away with very little progress being made. Japan, on the other hand, has been grinding out IoT applications slowly but steadily, with minimal hype.

Today, there are more than 3.17 million individual IoT (SIM card) subscriptions in Japan. NTT DoCoMo has more than 1.5 million users, mostly from the sectors of transportation, surveillance, remote payment (including vending machines), logistics assistance, and remote metering. Although a late entrant, KDDI has focused on high-speed, large-capacity IoT communications from the very beginning. It has acquired more than one million users in the transportation and logistics sectors through in-vehicle, small-scale, lightweight, and low-cost IoT communications services. SoftBank, as the most recent telco entrant, has a little more than 250,000 subscriptions; most of its relevant products involve consumer electronics, along with a small number of elevator surveillance and vending machine devices.

Japan’s telecom industry has high hopes for the Internet of Things. It is expected to boom in sectors such as telemetering, transportation management, e-payment, surveillance, digital signage, and data backup, thereby bringing huge business opportunities by creating new areas of growth in the already saturated Japanese mobile market.

Applications

Currently, the most popular IoT services in Japan involve vending machines, transportation management, surveillance, and e-wallet services.

Vending machines

Vending machines can be seen on almost every street corner in Japan’s cities; their total number is estimated at five million. To increase efficiency, the Tobacco Institute of Japan (TIOJ) introduced IoT applications to their operation in partnership with NTT DoCoMo. It first implemented automatic inventory management through real-time wireless transmission of inventory status to ensure timely supply. It then devised transaction interfaces enabling e-wallet transactions through wireless communications, so that purchases could be made conveniently through mobile phones and contactless IC cards such as the Suica card. Furthermore, vending machines would no longer be vulnerable to underage users buying restricted goods, as minors could be identified through user information stored in electronic transaction devices.

By combining traditional vending machines with IoT applications, NTT DoCoMo has adopted a cross-industry business model that differs from traditional telecom services. First, they set access standards for the communications module, including 2G and 3G access, while directly buying communications modules made to these standards from equipment suppliers. They then bundled these modules with communications tariff packages and sold them to NTT Data, a system integrator (SI) of communications devices for vending machines. After integration, NTT Data sold them to, and installed and maintained them for, the TIOJ. This business model is used for most NTT DoCoMo IoT services, some of which involve SI management and service customization; industry customers may also directly pay the SI, who in turn pays the operator a communications fee.

Transportation management

Transportation management services can target companies or individuals. Hizen Transportation Co., Ltd., in Tokyo installed a company-wide IoT system for its long-distance trucks meant to ensure driver safety and reduce fuel consumption. Dubbed e-navi, it is a real-time operation management system that utilizes the NTT DoCoMo 3G network. Dashboard devices inform the driver verbally if the speed limit is being exceeded, while truck locations and operational habits are recorded in real time, enabling driver behavioral analysis and recommendation provision aimed at optimizing fuel economy.

The best known individual transportation service is the G-BOOK navigator co-launched by Toyota and KDDI. According to a Toyota survey, all new vehicles will eventually issue an alarm if an accident occurs. With the G-BOOK system, when an airbag ejects, an alarm with GPS-coordinates is immediately sent to a rescue center. Authorities need no longer rely on phone calls from witnesses and passersby who often cannot precisely
relay their location; delays are reduced and lives are saved. In addition, the G-BOOK provides value-added security services related to security navigation, such as tracking and notification in case of vehicle theft, at the cost of approximately JPY1,000 (USD13) a month. Its call center also offers voice information services related to news, weather, and 24-hour medical care, for roughly JPY33,000 (USD420) a year.

**Mobile Payment**

Among e-wallet services provided by NTT DoCoMo and KDDI, the former’s Osaifu-Keitai service is best known. This service originally provided mobile payment through Flica technology only. Currently, NTT DoCoMo is planning to develop “all-in-one authentication,” an integrated work management service for individuals. It has already designed various application scenarios for this service, including clocking in, computer network access recognition, vehicle use for business purposes, lunch reservation, personal storage bin management, and public transportation, all of which can be implemented using handsets and associated IoT devices.

**Surveillance**

Surveillance services are mostly used for municipal management (sewage monitoring), nuclear power safety, and expressway maintenance and scheduling. They are widely employed overall, but each application only has a small number of subscriptions. In some cases, an application may run on less than twenty devices.

**The future**

Most current IoT applications, such as surveillance, billing, and payment, do not consume much bandwidth. In fact, more than half are supported by 2G networks; for those that require 3G support, a bitrate of 384Kbps is sufficient. However, Japanese telcos expect IoT-related video applications to multiply, as remote diagnosis and medical training are becoming commonplace. Remote video surveillance for transmission lines, emergency repair monitoring, and scheduling & control will be required for any smart power grid. In almost all smart cities, video-based city security surveillance and management will be common. LTE, with its superior capacity, will better support the real-time IoT of tomorrow.

Japanese IoT subscriptions are expected to grow by eight million over the next three years. Though exceeding the accumulated number of subscriptions over the past decade, this number is still conservative in a country with more than 100 million mobile subscribers. One hindrance to IoT adoption is that large industry players such as Panasonic and Toshiba already have their own data transmission protocols and standards; a unified standard for both would take a long time to achieve. Another hurdle is the fact that numerous industrial products are built to last decades, while most IT products are obsolete within five years; frequent retrofitting of an industrial device is impractical. The IoT value chain is also very long; cost efficiency improvements for communications products (such as communications modules) cannot be quickly realized for industry customers.

While still committed to industrial development, operators such as NTT DoCoMo and SoftBank believe that IoT applications can be scaled up quickly for consumer products such as digital photo frames, e-books, communications devices for children, and electronic pet collars. To promote IoT growth, Japan’s communications industry is working to adjust its business model; measures include standardization of communications modules to attract more industries, strengthening partnerships to enter new industries, and shortening of the IoT industry chain so that costs are reduced and efficiency is enhanced. 

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**Lessons for operators**

Generally speaking, Japan’s cautious approach to IoT has yielded a lead over the Western hares. Several lessons can be learned from Japan.

- The Internet of Things enables operators to create new revenue sources in an already fiercely competitive mobile market.
- Successful IoT promotion requires both technical and business model innovation. IPv6 and LTE have enhanced IoT applications, but a flexible business model is needed to stimulate cooperation between actors in the value chain.
- IoT developers must respect the industrial standards already in place; they should also focus on communications access layer services for the Internet of Things (the golden pipe strategy) as well as M2M modules and service gateways to facilitate operational management and maintain core competitiveness.
MTN pioneers managed services in Zambia

MTN, Africa’s top telecom operator, entered the Zambian market in 2005. Five years later, it partnered with Huawei to undertake a network managed services project, the first of its kind in this sparsely populated country. Farhad Khan, CEO of MTN Zambia, and Ernest Paul, CTO, discuss the operator’s fruitful managed services journey with WinWin.
Developing a sustainable business in Zambia

Zambia has a total land area on par with Turkey, but a population on par with Istanbul (roughly 13 million), yielding a population density in the bottom 20% of global countries (18 people per square km). This, combined with Zambia’s undeveloped economy and high unemployment rate, makes high-quality telecom service provision challenging. Barriers such as import duties and taxes on SIM cards, along with high airtime and handset prices, further hinder local telcos.

In 2005, Huawei was certified as a strategic partner by the MTN Group; both partners signed an agreement for provision of products and services. This happened in the same year that MTN entered the Zambian market. Since then, it has cooperated with Huawei every step of the way, including network & terminal equipment provision, turnkey projects, and managed services.

MTN had very ambitious plans in Zambia and through persistent implementation of its strategy, the operator has managed to exceed expectations. It has netted over 2.2 million customers and covered all 73 districts of Zambia, accounting for 80 percent of the population, while increasing the base station number nine fold and doubling the percentage of the total population covered, from a minority to the majority, as of mid-2011. The operator also deployed service centers and other outlets in all nine provinces, totaling over 24,000 points of presence. Finally, MTN is the first operator in Zambia to offer convergent billing and the first mobile operator to have implemented an international gateway and HSPA on EASSy cable.

“The MTN brand is exceptionally strong in Zambia and is here to stay,” said Farhad Khan, CEO of MTN Zambia. “It is a brand that aims to enhance the lives of the people it connects. It is recognized by the public for its global brand stature, as well as the fact that it is a pure African brand.” Khan added that MTN Zambia is known and respected for its quality network, low occurrence of dropped calls and ease of setting up calls. “We have been making telecommunication more affordable by offering real value for money and Zambians have rewarded us by subscribing to our network. No surprise that we are Zambia’s fastest growing network!”

Managed services enhance business efficiency

Globally, MTN has reached a stage where efficiency and optimization are key to future growth. In its drive for efficiency, MTN is not merely focused on costs, but also a clear understanding and identification of holistic cost drivers, as well as process efficiencies. In this context, it was a strategic decision taken by MTN Zambia, in conjunction with the MTN Group, to employ managed services. In a 2010 trial project, where Huawei built and maintained 169 sites, Huawei exceeded expectations by delivering the

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— Farhad Khan, CEO of MTN Zambia
intended results in three months instead of six. This boosted MTN’s confidence in Huawei and was no doubt a factor in their later decision to partner with Huawei on managed services. In this regard, MTN Zambia is the first non-greenfield operator in the MTN Group, as well as in Zambia, to outsource its network and implement a shared services model for its IT infrastructure.

The key driver for MTN Zambia in its managed services project has been long-term sustainability. “We anticipated that tariffs would decline with the introduction of new competition, and to ensure that MTN Zambia was well positioned against this possibility, it was critical that we moved to enhance our efficiency and process environments across the business. Customers immediately benefit from this focus, while also having the benefit of a high network quality thanks to managed and maintained network KPIs by the vendor. Nevertheless, MTN Zambia would have rapid access to global technical expertise for rapid technology evolution like UMTS and LTE,” declared Ernest Paul, CTO of MTN Zambia.

Paul further elaborated that as the biggest OPEX consumer in the organization, the network had to support and facilitate revenue growth. It was evident to him that managed service (MS) would also lead to decreased asset and tool CAPEX, but still manage to maintain growth. In this regard, improved cash flow through long-term OPEX predictability, as well as decreased OPEX over the next five years, would also support the MS model. “There is no doubt that the MS partner would assist in business growth and organizational transformation and Zambia was an excellent starting point for MS in the MTN Group as almost 100% Huawei core and access equipment are already in place,” Paul added.

**Smooth employee transfer**

When discussing what he expected for the project, Khan stated, “For the MS project in MTN Zambia, we felt strongly that our people would be the highest priority during the actual implementation. We strongly believed that a global technology company like Huawei would offer substantially better development opportunities from a technological development perspective. It was also critical that our people be in a similar, if not better, position after the transfer to Huawei, and to this end we embarked on an extensive management program that cut across all aspects of the human components of the transition.”

MTN Zambia sponsors commented positively on the employee transfer project, which was completed in April 2011. “MTN Zambia wanted to ensure that there was minimal impact on employees who were transferred to Huawei, while ensuring that network integrity was not only maintained but improved after the transition. Huawei took all affected staff on board, with no members adversely affected, financially or otherwise. Some staff members have, in fact, chosen to pursue other challenges within Huawei, which has given them international exposure. At the same time, there has been no dip in network KPIs, while clear improvements in network quality have been noted.”

Contingency plans were formulated to ensure business continuity that took various scenarios into account. All of these eventualities were planned for and covered through a “simulation” process that led to a smooth transition and eventual stabilization.

According to Paul, “A key to delivering this network and resource transition is, without a doubt, in the detailed planning for covering people, processes, regulatory requirements and governance. The success or failure measure for a project of this nature is how well you equip people to deal with this change whilst maintaining delivery.”

“The managed services model is in its infancy in MTN Zambia, but we have already seen significant benefits from a skill and process perspective. All our plans are still on track for full transformation and we are confident that the long-term benefits will be substantial,” added Khan.

“At an organizational level, we now have a much more efficient technology environment, with clear and finite predictability of our operational costs and expenses. This, in turn, allows MTN to focus on its core competencies and strategic delivery in the market with immediate access to technology when required,” stated Paul, who later added, “Previous employees now have further and wider
opportunities through a vendor with a massive global footprint.”

**Leveraging managed services**

“Huawei is a global player and they have significant experience to bring to the table. It is a very dedicated company where things mostly go according to plan, but whenever a challenge presents itself, they will do their utmost in ensuring that the issue is resolved,” stated Khan.

From Ernest Paul’s perspective, “There is no doubt that Huawei has demonstrated their ability to focus on the needs of the customer through partnership. In the case of MTN Zambia, Huawei was a very vital and key component to the success of the project and will continue to be in the future. Through Huawei’s ability to supply highly-qualified and skilled resources, implement proven business processes, and source world-class tools, they ensure that bigger challenges in the managed services environment become easier to execute.”

Paul added, “Thanks to Huawei, as a partner in managed services, MTN Zambia will continue to be a very fierce yet efficient competitor in the markets within which it operates and will continue to grow through this partnership. We now have a much more efficient technology environment, with clear and finite predictability of our operational costs and expenses. This, in turn, allows MTN to focus on its core competencies and strategic delivery in the market with immediate access to technology when required,” said Paul.

MTN Zambia has clearly risen from a second-tier operator to a competitor of substance in this highly competitive marketplace. Khan sums it up by saying, “We grew from roughly 20 percent market share to 36 percent market share in less than 24 months, giving our competitors some food for thought. We are strongly positioning ourselves to take MTN Zambia to greater heights by becoming the operator of choice within Zambia during the next three years.”

— Ernest Paul, CTO of MTN Zambia
Swisscom

From fast to faster

To provide ultra-broadband access in urban areas and universal broadband access nationwide, Swisscom launched a broadband access acceleration program in 2005 for the DSL stream and in 2008 for the fiber stream. The operator is currently deploying fiber and VDSL2 technology simultaneously, which makes for a novel approach.

By Wang Guyu       Editor: Chen Yuhong chyhong@huawei.com
Competition and responsibility

In 2005, Swisscom was competing mainly against two broadband service providers (BSPs), namely Cablecom and Sunrise. Building on its strengths as a TV cable operator and bi-directional cable network, Cablecom was able to offer bundled cable TV and broadband access services. Sunrise appealed greatly to price-sensitive customers through its economy packages.

With its well-known brand and diverse services, Swisscom boasted the lion’s share of the broadband market. However, it had no outstanding advantages in the field of fixed broadband services, where market competition was intense. First, the majority of its fixed broadband subscribers used ATM DSLAM. Given the limitations of ATM DSLAM equipment relaying for ADSL, subscribers could only receive modest bandwidth and thus were missing out on services such as IPTV. As a result, Swisscom risked losing those customers to other operators.

Moreover, ATM DSLAM came with relatively high costs of operation and maintenance (O&M), which had significant effects on its profits and reduced its competitiveness. Maintaining its competitiveness in the broadband market was a key issue for the operator.

Swisscom launched a broadband access acceleration program intending to invest CHF2.0–3.0 billion (USD2.5–3.8 billion) over a period of six years in order to realize the strategic transformation of its broadband access business. The operator aimed for one million Swiss homes (roughly one-third of the population) passed with FTTH by the end of 2015, with 80% of Switzerland covered with high-definition TV.

Building a high-quality access network

Following a thorough assessment, Swisscom decided to simultaneously deploy fiber and VDSL2, to satisfy the need for ultra-high bandwidth. It intended to increase bandwidth through FTTH in the 20 largest cities and suburbs and FTTC for the rest of Switzerland.

Simultaneous deployment of fiber and VDSL2 technology

GPON and Point-to-Point (P2P) are two mainstream modes for optical fiber access. Based on the point-to-multipoint concept, one GPON optical interface can support up to 128 subscribers.
Such topology, while reducing investment in fiber infrastructure, makes it difficult to provide open access such as local loop unbundling (LLU) in a fiber network.

Swisscom eventually chose P2P as the primary mode for pure fiber access and aimed to provide subscribers with 100Mbps ultra-broadband services. In this way, it could provide home users with both HDTV and ultra-broadband access, thereby attracting users through diverse ultra-broadband services. For enterprise users, P2P would ensure reliability, bandwidth, and differentiated quality of service (QoS).

Outside the 20 largest cities, Swisscom would utilize existing copper to employ xDSL technologies in order to provide subscribers with digital TV and high-speed Internet. Following a thorough evaluation, Swisscom picked VDSL2 technology over ADSL2+, as VDSL2 is a more future-proof technology that provides higher bandwidth to deliver triple-play services. For users who want to stay on their ADSL and ADSL2+ packages, they don’t need to change CPEs. If users want to increase bandwidth and switch to VDSL2, they can simply replace the ADSL-CPE with VDSL2-CPE. As a result, ARPU increases while customers’ diversified needs are satisfied. In short, Swisscom decided to deploy VDSL2 technology to deliver wide broadband access coverage, thereby providing nationwide subscribers with universal broadband services.

Tackling technical challenges

Swisscom encountered a series of challenges while deploying the VDSL2 network.

In order to realize the full benefits of VDSL2 technology, the distance between the VDSL2-DSLAM and the user had to be shortened. Consequently, Swisscom deployed VDSL2 from existing central offices and from new remote locations (FTTC). The target length for copper was limited to a few hundred meters to ensure high bandwidth for end users. The FTTC solution required that outdoor cabinets meet various outdoor conditions, and be easy to deploy, install and power. Moreover, the cabinets had to allow engineers to perform daily maintenance and management remotely instead of on site.

Moreover, since outdoor cabinets could only cover users within a few hundred meters, only medium-capacity DSLAM equipment was needed. To save O&M costs, large-capacity DSLAM equipment at central offices and medium-capacity DSLAM equipment would share one hardware platform and version of software. This would bring great advantages in testing software, managing spare parts and keeping a consistent service level.

Another challenge came from the boards involved. Two different VDSL2 boards – the VDSL2-over-POTS board and the VDSL2-over-ISDN board – were needed since numerous ISDN and POTS services coexisted in Switzerland. This
would increase TCO and lead to a possibility that VDSL2-over-ISDN boards would be discarded when ISDN customers migrate to POTS, resulting in wastage. Adding to the complexity was the need to take into consideration both ADSL2+ and ADSL services. Swisscom adopted Huawei’s VDMF board, which supports six modes in a single board, namely VDSL2-over-POTS, VDSL2-over-ISDN boards, ADSL2+ over POTS, ADSL2+ over ISDN, ADSL-over-POTS and ADSL-over-ISDN.

To sum up, Swisscom developed a clear scheme for network upgrade and deployment; the CO-side access platform would support access through both fiber and copper. Optical fiber access was used for P2P access by high-end and enterprise users while copper supplied VDSL2 access outside of the top 20 cities. The dual optical and copper platform led to a significant decrease in Swisscom’s TCO, while helping the operator maintain its competitiveness.

**Broadband access acceleration in progress**

On April 9, 2009, Swisscom announced that Huawei’s industry-leading SingleFAN solution had been selected for its next-generation FTTH network project, which meant that Huawei was now a Swisscom partner for the access network. On November 24, 2009, Swisscom signed a large-scale VDSL2 framework agreement with Huawei.

Swisscom has been accelerating the deployment of VDSL2 and P2P in 2011 as part of its efforts to deploy more than 300,000 ultra-broadband lines per year, enabling more and more subscribers to enjoy digital TV and high-speed Internet.

Following the success of the broadband access acceleration program, the operator has been able to offer packages like Vivo Casa based on FTTH, which provides 50Mbps downlink speed (with an option for 100Mbps) and supports two high-definition IPTV channels, thus enabling a complete high-speed Internet surfing and HDTV experience, as well as free landline phone calls across Switzerland. Outside of the FTTH-rollout areas, Swisscom can provide packages that bundle high-speed Internet, high-definition IPTV and fixed telephony.

**Expectations for the future**

To provide subscribers with even higher bandwidth on copper lines, Swisscom is interested in utilizing technology enhancements currently under development at Huawei. Swisscom endeavors to maintain its edge in the market, while providing urban and rural areas with broadband services under the principle of “making broadband services available everywhere.” With its current lead in simultaneous fiber and VDSL2 deployment, it is well on its way.
China Unicom

Enhancing the user experience

China Unicom Shandong has optimized its end-to-end network through an innovative and proactive approach to user perception, which has yielded rapid subscriber growth and a sterling reputation for QoE.

By Wu Kunpeng & Yang Xin

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Data service & operational challenges

Shandong is an economically developed coastal province; its mobile market has grown steadily over recent years, but this growth has brought greater demand for data services. These services have become the battleground where operators compete for newly added subscribers and cultivate new revenue streams.

China Unicom Shandong (Shandong Unicom) has committed to this battle wholeheartedly. It has carried out intensive marketing campaigns under its own brand (Wo) and committed a variety of other resources to furthering its data service competitiveness. Its efforts have paid off handsomely; its 2010 3G subscriber additions were double what they were in 2009, while 3G revenue jumped twelve fold. However, all this new business was straining its infrastructure and outpacing its O&M practices.

Shandong Unicom had trouble comparing and managing service quality between different hotspots; user perceptions were hard to quantify, leading to lapses in quality control. A long E2E service chain for mobile data; service diversity and complexity; as well as varied assessment criteria for service quality and user perception, all added to their O&M management difficulties.

Subscriber data is also generally difficult to access, making it difficult to identify and evaluate data services. Currently, evaluation is performed primarily through drive testing (DT) and call quality testing (CQT), which are often performed after complaints have been filed. While these tests are suitable for finding dead spots in coverage, they typically cannot isolate the fluid conditions and traffic surges that often lead to disruptions in today's networks; they cannot paint a big picture of what is happening on the network.

What's more, even with network key performance indicators (KPIs), user perceptions often remain unclear. A core network's put-through/call-through rate and wireless call drop rate are both indicators of network performance, but they do not reveal what the user is hearing or experiencing.

Perception-based optimization

Shandong Unicom partnered with Huawei to explore user perceptions in depth. It has put into place a QoS evaluation system meant to reflect user perceptions. It has analyzed factors that affect service quality throughout the connection process and identified differences between terminals in the provision of various services. This system has enabled Shandong Unicom to carry out across-the-board optimization at the network, service platform, and device levels, which has led to improved 3G operations and happier customers.

User perception indicators

Shandong Unicom has put into place a correlation system for QoE, KQI and KPI, where real-world service perceptions are quantified and used to determine other relevant factors. It has established a model for QoE, KQIs, and KPIs for certain services and defined a five-level scale for QoE evaluation ranging from very satisfied to very unsatisfied; then
based on Huawei’s understanding of key points in end users’ service experience, it put in place a set of KQIs for service quality evaluation; finally, combing the KPIs and KQIs, it went deeper to identify hidden root causes at the network level that affect user experience.

**We’ve found the problem, now what?**

The ensuing challenge for Shandong Unicom has been leveraging this evaluation system for diagnostics of current user perceptions and optimizing the system accordingly. With input from Huawei experts, Shandong Unicom has developed a set of methods and processes to do just that. On the one hand, it looks at KQI and KPI values with the help of testing tools or a network management platform to diagnose problems. On the other hand, it identifies key regions and subscriber groups by looking at statistics or other derivative data, to solve common problems among them. By combining these two approaches, Shandong Unicom has put into place optimization measures across the board and effectively improved both service quality and user perception.

The process boils down to five key steps – probe & drive testing at the Uu interface; internal signal tracking and analysis at the radio network controller (RNC) layer; internal signal tracking and analysis at the Serving GPRS Supporting Node (SGSN) layer; external signal analysis at the Gn/Gi/Gw interfaces using the system quality metrics (SQM) system; and internal signaling tracking and analysis at service system gateways. By deploying equipment at these checkpoints to monitor/gather packet data and performing deep data mining and error code analysis at layers ranging from the service to the physical, Shandong Unicom has been able to locate the faulty network segments that cause service quality deterioration immediately after problems are discovered; they have also been able to provide guidance for resolution and optimization at the network level.

**Improved E2E service quality**

Leveraging this evaluation system, Shandong Unicom has carried out special 3G initiatives in the provincial capital of Jinan to improve user perception for MMS, WAP, FTP, streaming media services, and iPhone applications.

Its MMS completion rate has increased by 14.9%, while its InterRAU has risen by 13.9%. Web page access speed has also significantly accelerated for certain terminals, while FTP interruption has disappeared. Switching from 2G to 3G for the iPhone has sped up and, through the adding of a suitable player, the play quality for streaming media on the iPhone has improved.

Complaints related to 3G quality have dropped sharply, from 24 incidents in January 2011 to 13 in April of the same year; complaints per 10,000 subscribers have fallen to 1.9 incidents from 4.4, a reduction of 57.6 percent.

In addition, Shandong Unicom has analyzed differences in service usage between terminals, considering their type and number in use. It has begun to understand user tendencies for specific devices, thanks to user behavior analysis and sorting; it can now identify potential subscribers after looking into factors that affect service failure, and provide targeted support for service promotion.

Through continued optimization of its network and practices, Shandong Unicom now offers a premium 3G experience under its Wo brand, laying a solid foundation for further improvements in QoE and the attraction of new subscribers.

"Through continued optimization, Shandong Unicom now offers a quality 3G experience under its Wo brand, laying a solid foundation for further improvements in QoE and the attraction of new subscribers."
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