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Issue 29
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Sponsor
Corporate Communications Dept.
Huawei Technologies Co., Ltd.

Consultants
Chen Lifang, Joy Tan, Jason Qu

Editor-in-Chief
Sally Gao (sally@huawei.com)

Editors
Gary Maidment, Linda Xu
Mi Xueping, Xue Hua, Cao Zhihui

Art Editor
Zhou Shumin

Contributors
Lin Kunchin, Su Yi Chia, Li Ling, Peng Yuguo, Chen Yingying, Zhang Miaomiao

E-mail: HWtech@huawei.com
Tel: +86 755 89241660
Fax: +86 755 89241674
Address: H1, Huawei Industrial Base, Bantian, Longgang, Shenzhen 518129, China

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5G is coming

In the 5G era, everything will be connected, all industries will have digitally transformed, and mobile communication will have changed the way we live and become the basis for socioeconomic development.

GSMA states the number of 5G connections is predicted to reach 1.1 billion globally by 2025, with one-third of the world's population connected to 5G networks.

Vertical industries and the ICT industry will more closely integrate and new services will emerge. To help achieve this, Huawei founded the 5G Automotive Alliance and 5G Smart Manufacturing Alliance. To meet the diverse and specialized requirements of vertical industries, Huawei and operators such as China Mobile have established partner associations, formulated standards, and built industry ecosystems to research and promote 5G technology in industry.

Du Yeqing, Huawei's head of 5G Industry Development, believes that cross-industry collaboration will be the cornerstone of realizing 5G. As such, Huawei has teamed up with industry partners in various domains, including the Internet of Vehicles, smart manufacturing, smart grids, and UAVs, to advance 5G.

Huawei's Wireless XLabs recently published *Top Ten 5G Use Cases*, which analyzes the business value of 5G. At the 2017 Global Mobile Broadband Forum, Ding Yun, President of Huawei Carrier BG, discussed how carriers can choose and incubate services based on their own strategies, and quickly build up capabilities and attain future business success in 5G.

In the 5G era, operators' primary challenge will be figuring out how to use mobile networks to meet the development needs of connected society and connected industry. According to Deng Taihua, President of Wireless Network Product Line of Huawei, the three most important basic network capabilities in the 5G era will be SingleRAN, Mobile Cloud, and Wireless Intelligence. They will help operators build mobile networks with a wide range of service capabilities for 5G in 2020 and quickly seize new commercial opportunities at low cost.

China is leading the way for using mid-band spectrum for 5G networks. Its three major carriers are uniting the upstream and downstream sectors of the industry chain and entering the third phase of 5G technical research and testing. China aims to become the first country in the world to launch a 5G network commercially in 2020.

Sally

Sally Gao, Editor-in-Chief

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Excellence. Simply Delivered

DHL adds digital logic to logistics

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Efficiency, speed, and timing are the top priorities in logistics. With more than 350,000 employees operating in 220 countries and territories, DHL leads the world in logistics. Dr. Markus Voss, CIO and COO of DHL Supply Chain, explains how digital transformation can forge processes that will help the freight giant continue to deliver on its slogan: "Excellence. Simply Delivered."

By Linda Xu

Digital Darwinism

In 2014, Deutsche Post DHL announced its plan for the coming years, Strategy 2020: Focus. Connect. Grow, which includes expanding its logistics services into the world's emerging markets and maximizing returns from the global eCommerce boom. "Digitalization is the key theme for us for the Strategy 2020," says Voss. "It's going to have a profound impact on us and everyone else's lives because logistics is an essential part of life."

The digitalization the physical world won't come without threats to enterprises. And those that want to prosper need to act now: The World Economic Forum (WEF) reports that US$1.5 trillion of value is at stake for logistics players, while a further US$2.4 trillion

worth of social benefits will be generated from digital transformation from now until 2025.

Even established companies can't afford to neglect digital transformation. Voss offers some sobering statistics, "Look at the Fortune 500 companies, the biggest companies in the world in the year 2000: Half of those companies have vanished...Their business models have completely been taken over by digital business models." He believes that competition is cut-throat, "It's a world of digital Darwinism out there. If we don't want to lose out, we have to constantly put new technology-enabled services out into the market."

Legacy inefficiency

Logistics may not be seen as cutting-edge to many, but sweeping changes are descending on the supply chain. The WEF holds that the logistics industry is woefully inefficient in many areas; for example, 50 percent of trucks are empty on return journeys, an unnecessary burden on the environment as well as bad for a company's bottom-line. Voss explains, "We have a number of examples of introducing drones and robots. They essentially do the same thing as we do right now, but they just do it faster, work collaboratively with our workers, and help drive up efficiency by 10 to 15 percent."

New business models underpinned by digital technologies plus targets to reduce cost, create solutions, and offer value-added services are driving digital transformation. According to Voss, "Digitalization means new business models...new

> By 2020, there will be 50 billion connected devices. And we need to trace the goods that we're exporting through the supply chain with a digital mirror.

ways of commercializing and driving something that used to be pure logistics, and offering new services."

AR, VR, and IoT

DHL Supply Chain is one of the first companies to widely apply augmented reality and virtual reality to its daily operations. With a successful AR trial in the Netherlands in 2014, DHL Supply Chain has rolled out the next phase of its Vision Picking Program in the US and Europe. Pickers are equipped with smart glasses that visually display where each picked item needs to be placed on the trolley. Vision Picking enables hands-free orders at a faster pace and lower error rates. "The feedback is just phenomenal. I've just been at one of the warehouses. The workers' glasses were on maintenance. One of our staff was literally crying, 'Give me my glasses back.' So that's very encouraging for us," recalls Voss. "We believe this program is a game-changer in how we run our supply chain operations and deliver added value to our customers."

DHL Supply Chain is applying IoT to its warehousing operations to optimize efficiency and make work safer. "By 2020, there will be 50 billion connected devices. And we need to trace the goods that we're exporting through the supply chain with a digital mirror. IoT enables us to optimize the supply chain," says Voss.

He gives a specific example of yard management in car manufacturing, which requires manufactured cars to be sequenced at the door. "There are hundreds of doors, literally next to each other where trucks need to arrive. This is a problem to organize — telling the right driver when to go to which door," Voss explains. While not a complex operation, it's extremely error-prone. "What we've done with Huawei is use their NB-IoT technology to equip all doors with a sensor that tells us if the door is currently empty." All drivers have a mobile app that tells them when and where to go, which Voss says "has reduced the waiting time of drivers by 50 percent and taken all errors out of the process."

Socially responsible

According to the WEF, logistics produces 13 percent of all global emissions. In August, DHL announced the ambitious plan of reducing its

> [Huawei's NB-IoT] has reduced the waiting time of drivers by 50 percent and taken all errors out of the process.

logistics emissions to zero by 2050. One pilot project that's already in play is deploying electric vehicles for last-mile delivery, or more accurately, over a 70-km radius. However, the type of vehicle DHL needed wasn't available in the market. So, it partnered with the University of Aachen and now, Voss reports, "We have about 3,000 electric vehicles on the roads. We intend to electrify our entire fleet, and we're even selling these vehicles to our partners."

Powered by 30-kW asynchronous electric motors fed by lithium-ion battery packs, the vans have a top speed of 80 km/h and an in-service range of 50 to 80 km between charges, depending on load mass and driving conditions. They can carry up to 650 kg at a time, and weigh about 1,500 kg empty.

DHL is on the road – and in the sky – to making its operations greener, faster, and smoother than ever before.

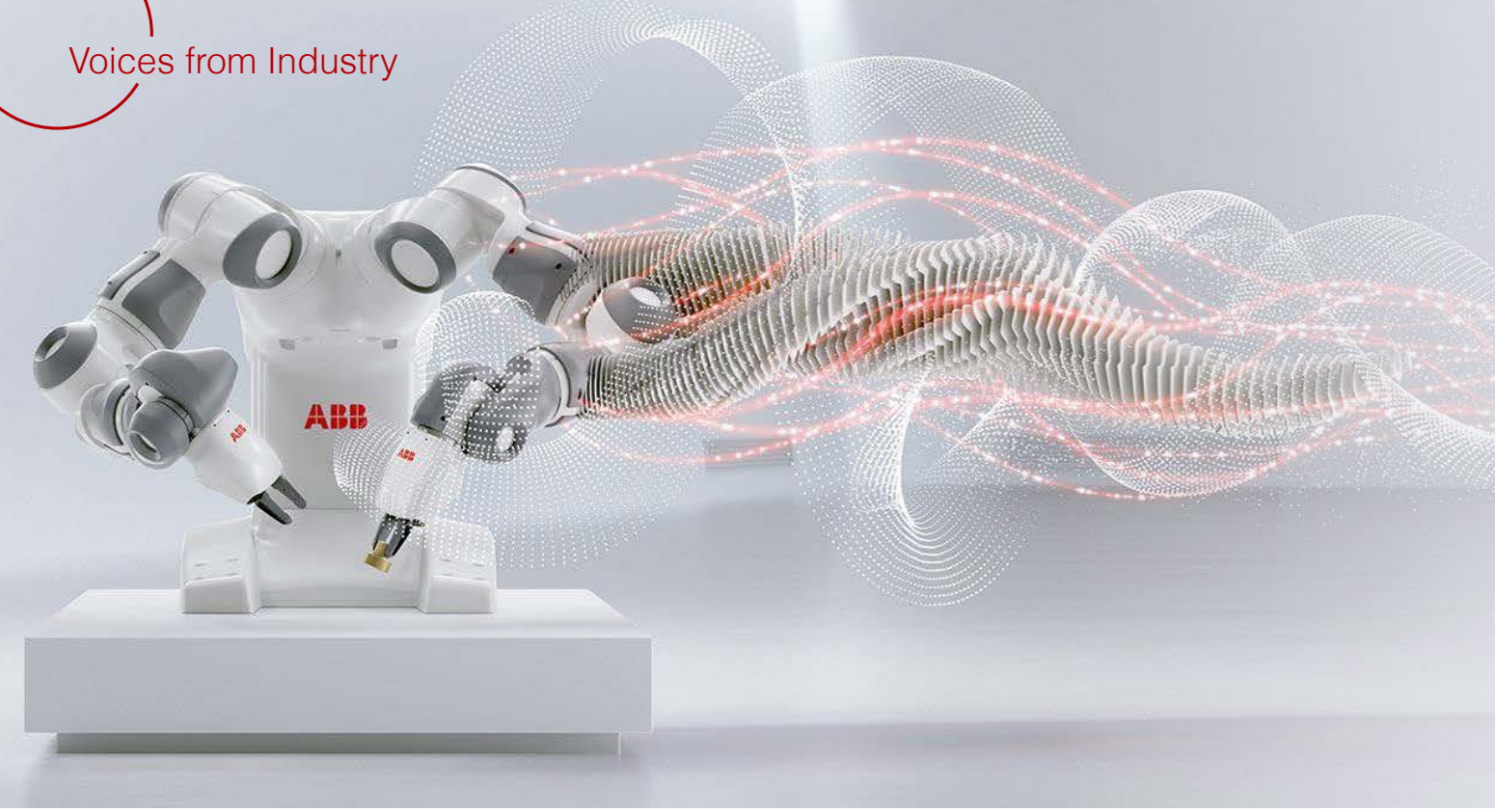

ABB leads the industrial digitalization charge

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More countries are starting to see the advanced manufacturing sector as a key catalyst for GDP growth and competitiveness in the global market. The arrival of the fourth industrial revolution will be driven by a growing range of next-gen digital technologies, including advanced networks that go beyond connectivity and sensors and will achieve unprecedented productivity improvements.

By Justin Springham, Mobile World Live & Linda Xu

The common elements that governments around the world are looking at to drive growth are automation and digitalization, according to Joni Rautavuori, group vice president and head of ABB Robotics and Applications. "Many nations have launched similar manufacturing-led initiatives, but call them different things," he explained. For example, China has Manufacturing 2025 and Germany has Industry 4.0.

Jerry Li, VP and head of business development, digital solutions and CIO at ABB China, agrees that digital technology is fueling a new round of innovation in industrial markets, with industrial digitalization certainly attracting a lot of attention globally. "I think most governments and businesses are looking for

> Smart components and sensors make it possible to use machine learning to develop new ways of programming robots.
>
> – Joni Rautavuori, group vice president and head of ABB Robotics and Applications

energy efficiency, productivity increases and safer operations. These require all businesses to find a better way to operate," Li said.

Rapid adoption

Over the last couple of years, he said many innovative technologies have been introduced – from cloud computing and mobility to the Internet of Things as well as advanced materials – and they're being quickly adopted in industrial areas. In the manufacturing sector, ABB sees a clear need for businesses to improve their production efficiency and energy efficiency.

While ABB offers a wide range of products and services in its portfolio that support improvements in productivity, Li said, "We're also a manufacturing company and we produce a lot of equipment." ABB, with operations in more than 100 countries, isn't just a robotics company. Its solutions range from the software layer to automation systems and to products such as robots, motors and drives. It employs 136,000 staff globally, including 17,000 in China. The company has connected more than 70 million digitally enabled devices and installed more than 70,000 digital control systems and 6,000 enterprise software solutions for its customers. "All of this makes it a really great foundation for digitalization," said Li.

The combination of its digital solutions and a platform that connects customers' devices to perform advanced analytics on the cloud side and control the physical world through its automation systems, robots, and motors creates a huge amount of value for companies.

Partners

ABB is continuously looking for partnerships with all the major players in the industry. Li believes that, "With so many elements in the digital world, there's no single company that can do everything by itself. If you look at digitalization, we're talking about IT and OT convergence."

The company, which is partnering with Huawei in smart manufacturing as well as industrial robotics, is looking at how to combine the latest wireless connection technologies and smart sensors to find new solutions to solve manufacturing challenges. "We're also working

> With smart components and sensors, the robot will figure out and learn by itself, a bit like a child learns. You teach them and they try.
>
> – Jerry Li, VP and head of business development, digital solutions and CIO at ABB China

together in many industries to look for joint solutions and joint market developments," Li said.

Forecasts estimate that there will be 2.6 million industrial robots by 2019, and the density of robots will jump from 36 per 10,000 workers in 2014 to 150 per 10,000 workers by 2020 in China. This will create exponential growth, he said.

Rautavuori noted that China is now the largest robotics market as well as the fastest growing. However, when comparing the density of industrial robots to the country's entire manual labour force, China is still far from the top in the world, with Japan, South Korea, Germany, and the US leading. "China is still catching up, but catching up very, very fast, and we're very excited to be part of that journey," said Rautavuori.

Teaching robots

On artificial intelligence (AI), Rautavuori said that ABB focuses on machine learning, "The development of smart components and sensors makes it possible to use machine learning to develop new ways of programming robots."

For example, he said, instead of programming, the company is moving towards teaching the robot. "We're showing it how to do things. And with smart components and sensors, the robot will figure out and learn by itself, a little bit like a child learns. You teach them and then they try. So that's an area where we're developing solutions that will simplify and make it easier to use robots in the future."

Industrial robots need to be flexible to meet the needs of mass customization, he said, adding that ABB is well known in the market for its software capabilities when it comes to motion control and online and offline programming. Rautavuori believes the industrial robotics market is still a huge untapped market and ABB, which has been in the robotics industry for more than 40 years, is focused solely on the industrial space.

But looking at how robotics is likely to impact people's day-to-day lives, Rautavuori concludes, "We see lots of companies going into the consumer space. And I'm sure there will be lots of, whether we call them robots or not, technology that will help you in your daily life."

Deutsche Telekom

Best-in-class experience

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Deutsche Telekom (DT) has the clear ambition to be a leading European telco, with digitalization a key part of its strategy. In 2016, DT increased its revenue by 5.6 percent year-on-year to reach €73.1 billion based on high investment in its networks. DT CTO Bruno Jacobfeuerborn explained how the German operator is ramping up its network strategy during digital transformation.

By Linda Xu

> We're following a video content aggregator approach. We offer our customers whatever they want in one package on linear TV or other content platforms.

Ambitious content aggregator

WinWin: As content and video are redefining the telecom industry, how can DT shift its video strategy from reactive to proactive?

Bruno Jacobfeuerborn: We are following a video content aggregator approach. We offer our customers whatever they want in one package on linear TV or other content platforms. We do it in Germany, and Europe as well. It's one of our key propositions. We decided to use Huawei's video platform to fulfill consumer demand to experience SD, HD, and 4K UHD video on any screen, anytime, anywhere.

Deutsche Telekom will offer unlimited mobile streaming services without reducing the high-speed data volume included in their tariffs. Customers can stream movies, TV shows, sports or music without worrying that data throttling will kick in. They don't have to look for the next Wi-Fi hotspot to prevent their data allowance from being used up.

We've also launched a mobile TV streaming service offering around 40 channels for smartphones and tablets, which includes all major German public and commercial channels. Each user can register up to four devices for Entertain TV Mobil, including desktops and laptops accessing the service through a web browser interface. To optimize our service quality from end to end, we use machine learning and cloud services. End users can have a single point of content entry with one account and a single payment.

Well-paced network migration

WinWin: How will DT use its rich fixed network resources to deliver a seamless user experience, especially on copper networks?

Jacobfeuerborn: The basis is our Integrated Network Strategy – an intelligent combination of modern fixed and mobile IP networks. So, as video services are really increasing demand for bandwidth, we decided to adopt vectoring and super vectoring to bring us 100 Mbps and 250 Mbps, and G.fast to give speeds of 500 to 700 Mbps. If we roll out fiber to the building (FTTB), we will install fibers in the G.fast box in cellars, which we'll then serve with coaxial cables or normal telephone lines. Customers will get more than 200 Mbps. Bonding technology combines fixed line and mobile capabilities to get even higher speed services.

> DT has set itself the goal of providing up to 80 percent of households in Germany with a mininum of 50 Mbps by 2018.
>
> – DT CTO Bruno Jacobfeuerborn

With such high speeds, I think we can fulfill 99.9 percent of requests from most customers.

WinWin: What is Deutsche Telekom's plan to utilize FTTH technology to better engage with consumers and boost ROI?

Jacobfeuerborn: Our strategy is to bring fiber close to the home. We started with vectoring. Then we'll deploy super vectoring and G.fast, and later FTTH. We're rapidly bringing Germany into the high-speed age. DT has set itself the goal of providing up to 80 percent of households in Germany with a minimum 50 Mbps by 2018. Today, we already have hybrid routers that leverage the best of our fixed and mobile networks. Our next-generation, low-latency, integrated 5G network is a high-bandwidth answer to opening up the digital future in Europe. We have a clear timetable on the way to a gigabit society.

WinWin: How will DT leverage the synergy between fixed and mobile networks to raise its market share?

Jacobfeuerborn: We offer both fixed and mobile services in most of our markets and have adopted an FMC strategy. We're extending our quad-play strategy to many European markets through Magenta One, first launched as MagentaEINS in Germany in September 2014. This combines mobile services with fixed voice, broadband, and TV offerings, with small, medium and large options available. Our 22 million fixed network connections and 40 million mobile customers have demonstrated the market potential for Deutsche Telekom as an integrated telecommunications provider.

All-IP and one cloud

WinWin: How do you see the role of cloud in making your business more efficient?

Jacobfeuerborn: Deutsche Telekom is pursuing a strategy to become what we describe as "the leading telco in Europe". We plan to invest more than €6 billion in the expansion of our European networks by 2018, complete the migration of customer lines to all-IP and offer more cloud-based products across borders.

We're working with Huawei on the way to do that, as we have different platforms in each country. We plan to bring everything into one cloud based on a pan-European approach.

A 5G future: Not just smoke and mirrors

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As a key enabling technology, 5G will take us into an age of unparalleled connectivity and open up a wealth of business opportunities that neither enterprises nor telcos can afford to miss. Professor Rahim Tafazolli, Director of the 5G Innovation Center at the UK's University of Surrey, explains the benefits of this game-changing technology.

By Linda Xu & Gary Maidment

Lucrative 5G services

According to GSMA, 5G could account for as many as 1.1 billion connections by 2025. By then, 5G networks are likely to cover one-third of the world's population. The impact on the mobile industry and its customers will be profound. 5G is more than a new generation of technologies: It marks a new era in which connectivity will become increasingly fluid and flexible. 5G networks will adapt to applications and performance will be tailored precisely to the needs of the user.

Rahim Tafazolli believes that the demand is there, "We need more capacity because people need

Link Huawei Wireless X Labs releases Top Ten 5G Use Cases


Ryan Ding

At the eighth Global Mobile Broadband Forum (Global MBBF) in London, Huawei Wireless X Labs released the *Top Ten 5G Use Cases* white paper. By analyzing dimensions like industry reliance on 5G, business value, and service maturity, the white paper identifies ten of the most promising applications for 5G and sets out the future direction of the 5G industry.

According to X Labs, industry verticals that require high bandwidth and low latency will rely more on 5G. And the larger the market space, the more commercial value a service delivers. For example, as computing and storage resources of cloud VR/AR are located on cloud, we need a network that can provide 5 ms latency and 9.5 Gbps bandwidth to guarantee a high-quality experience.

The white paper also predicts that by 2025, the market value of cloud VR/AR will hit US$292 billion, providing rich opportunities for carriers.

X Labs has identified ten of the most promising 5G use cases: cloud VR/AR, connected vehicles, smart

> By connecting and integrating technologies like IoT, cloud, big data, and cyber security solutions, 5G will enable true digitalization.
>
> – Prof Rahim Tafazolli, University of Surrey

to consume more data...The amount of data and Internet connectivity is doubling every 18 months." Commercially, 5G is a necessity according to Tafazolli, with the B2B space opening up before telcos as a result, "It's mainly concentrating on services in other vertical industries...the automotive industry, health, government, factories, and smart cities. These are new income sources for operators."

manufacturing, connected energy, wireless eHealth, wireless home entertainment, connected drones, social networks, personal AI assistants, and smart cities.

Ryan Ding, President of Huawei Carrier BG, believes that carriers can choose 5G applications based on their own strategies to quickly build up their capabilities.

X Labs also plans to update and publicize use cases.

Tafazolli uses manufacturing as an example. In the future, he says, factories, robots, 3D printing, advanced materials, and sensors will contribute to increased efficiency and flexibility. By connecting and integrating technologies like IoT, cloud, big data, and cyber security solutions, 5G will enable true digitalization. 5G technologies can play a key enabling role in integrating these technologies and offering a ubiquitous platform for interconnecting machines, robots, processes, autonomous vehicles, goods, and remote workers.

Tafazolli explains the application of robots in a factory enabled by 5G connectivity will greatly boost output, "The impact of 5G is to connect robots in a factory working 24/7. It will enhance productivity and efficiency by modernizing manufacturing processes." He cites the low latency offered by 5G as essential for precision robotics, "Robots or a group of robots can work with each other and collaborate with each other."

Key elements of 5G

The Federal Communications Commission states that future 5G networks will rely on three key elements: spectrum, infrastructure, and backhaul. A key difference

> Improvements in spectral efficiency are constrained by background noise, meaning that improvements through coding and modulation design become more difficult and less effective.

between 5G and earlier generations of mobile technology is that the focus of research is on finding the best techniques to improve spectrum utilization, meaning bits per Hertz per unit area, rather than on improving spectrum efficiency, as in bits per Hertz. This is because improvements in spectral efficiency are constrained by background noise, meaning that improvements through coding and modulation design become more difficult and less effective.

Tafazolli mentions several key 5G spectrum bands, "The radio spectrum, especially below 6 GHz, for which we can develop the technology cost effectively, is very scarce. That is the main reason why huge amounts of radio spectrum is required below 6 GHz mainly at 3.5 GHz." He gives the example of Europe, "Where we have another pioneer band as part of 5G that is below 1 GHz, mainly 700 MHz, to provide large coverage cost effectively." In this case, 3.5 GHz and 700 MHz are complemented by millimetric or centimetric bands. "And that's for environments where we need ultra-high capacity communication systems, like football stadiums or areas where the density of users are several orders of magnitude compared to city centers," says Tafazolli.

Charting 5G's commercial course

The broad commercial network upgrade to 5G is expected to make its debut in 2020. Events like the 2018 Olympic Games in South Korea and the 2020 Olympic Games in Japan are coming up in the 5G timeframe. However, there are still differing timeframes due to disagreements on what exactly 5G means and whether a high volume of equipment will be necessary to operate new networks well ahead of the standards being formalized. In addition, 5G won't be replacing 4G any time soon, says Tafazolli, "It will work with 4G and complement 4G with the new applications...and increase the capacity of the 4G by 1,000 times."

He predicts that following the development of 5G standards in 2017, trial devices, terminals, and network architecture will follow, "And in 2019, the World Radio Conference will decide the frequency bands in millimetric bands, which are globally agreed candidate pioneer bands...The first version of 5G will be deployed as early as 2019."

He states that 5G will evolve over time and go through different phases, starting with high-capacity, enhanced mobile broadband, before moving to ultra-reliable, low-latency communication and then delivering massive connectivity for devices, "Network architecture, the fixed part of the network, will gradually be replaced by fully programmable software-defined network architecture, which will give that flexibility based on distributed cloud architecture and processing, with artificial intelligence and machine learning algorithms to run the network more intelligently."

GE: Changing the face of industry with connectivity

Scan for mobile reading

The Industrial Internet holds the power to revolutionize enterprises across the entire spectrum of industry, boosting productivity, improving manufacturing techniques, and reducing downtime for companies of all sizes.

By Justin Springham, Mobile World Live & Linda Xu

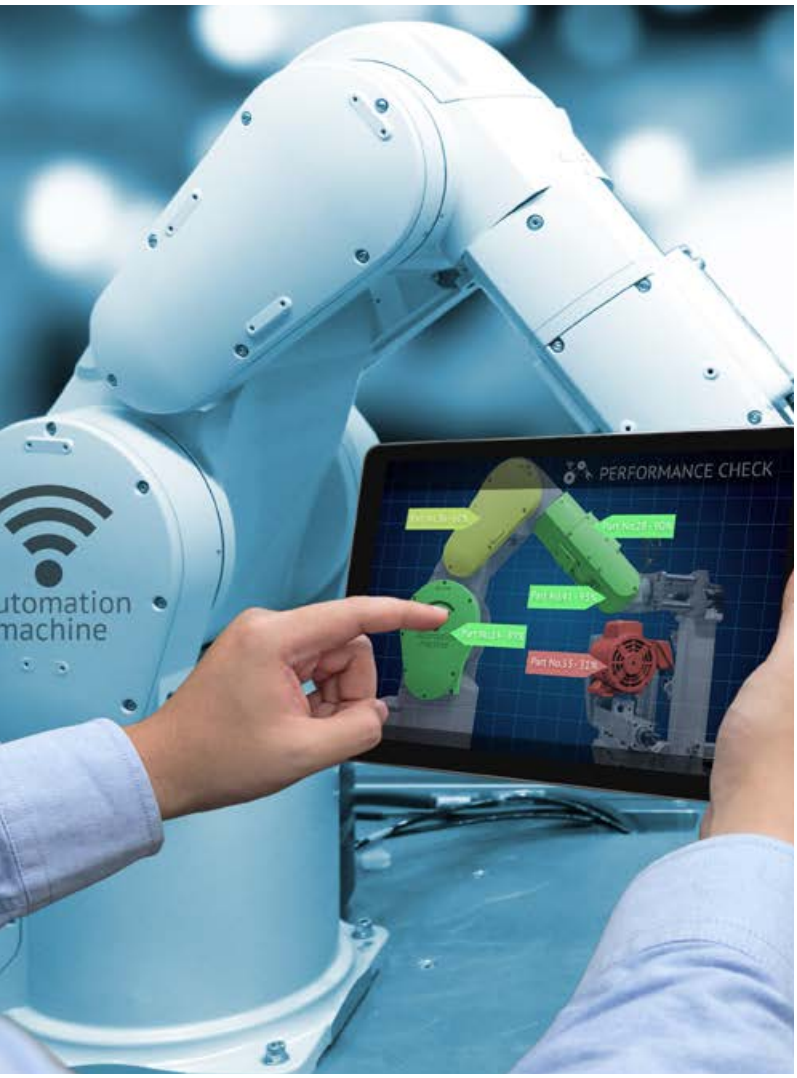
With such a radical transformation already underway across many sectors, it's important that industrial enterprises stay ahead of the curve to remain competitive in tomorrow's business world – both improving processes to keep expenses down and enhancing customer offerings.

US conglomerate General Electric (GE), which now offers far more than the electricity it was originally known for, began examining the use of software and analytics as part of its own digitization and productivity initiatives in 2011. It now offers similar innovations to its industrial customers, and works in partnership with a range of vendors, including Huawei, to deploy services to businesses outside of its core customer base.

Abhi Kunte, VP of Strategic Technology Alliances for GE Digital, explained in detail how the company had changed the way it worked across the globe and now focuses on exporting its business model. "We've gone through a significant amount of change," he said,

Abhi Kunte, VP of Strategic Technology Alliances for GE Digital

> The company reported productivity savings of US$730 million in 2016 alone, thanks to digitalizing its own processes and introducing new automation technologies.



adding, "We've changed the culture of the company, changed the business model inside the company and changed how we operate across the globe."

The company reported productivity savings of US$730 million in 2016 alone, thanks to digitalizing its own processes and introducing new automation technologies. It saw reduced downtime for its systems, lower maintenance costs, and higher throughput from machines – driving higher levels of operations efficiency.

"Our first steps towards digital transformation were to automate and digitize our own equipment and start looking at the data we'd been collecting. Understanding the information is the first step to being able to proactively manage equipment and reduce downtime," Kunte added. "We applied analytics data and studied insights that we've never had before about industrial equipment – how it behaves, how it operates, and what the signs are that could tell us a little bit earlier than normal when things are going to fail."

Cross-industry delivery

GE Digital has now delivered Industrial Internet solutions to many of its long-standing customers

> We have customers in the power industry that are starting to see anywhere from a 5 to 15 percent increase in throughput out of their wind farms with zero extra capital investment.

around the world, with many reporting a significant improvement in operational performance and – as a result – margins.

Notable early successes have been made in the oil and gas, aviation, transportation and power generation industries. "We have customers in the power industry that are starting to see anywhere from a 5 to 15 percent increase in throughput out of their wind farms with zero extra capital investment. This is all driven by software and analytics," Kunte said. "We have [another] customer already seeing roughly US$5 million worth of savings every year in their manufacturing plant."

Working with its partners, GE also expanded the use of this technology into new sectors and markets. One of many examples is a project created in association with Huawei for urban mobility customer Schindler. Huawei and GE are working together to help Schindler monitor the performance of its elevators and develop predictive maintenance services on more than 1 million assets operated globally.

Lifting business performance

Thanks to the innovations created and rolled-out by GE and Huawei, Schindler is already reporting reduced maintenance costs and lower levels of downtime for the company's elevators and escalators.

Kunte explained the service allows Schindler to "understand when and where things are going to fail and be able to proactively go and fix things." Constant monitoring also allows the company to avoid unnecessary costs by sending engineers on maintenance visits to units that are already working well, he added. Huawei and GE announced their collaboration at trade show Hannover Messe 2017. The companies are currently in the process of a market-by-market rollout of the elevator management technology for Schindler. The partners developed the solution to connect devices on the edge to the cloud backend, in turn allowing them to run detailed analytics and derive the full benefits of Industrial Internet technology.

GE and Huawei are now set to work on projects for customers in a number of sectors and in markets around the world. "We're very excited to partner with Huawei around the Industrial Internet of Things market going forward. We look forward to bringing our joint solutions to market utilizing edge technology," Kunte said. As part of their ongoing partnership, GE will join Huawei in developing a range

> The Industrial Internet is potentially a much greater market opportunity than the consumer Internet [due to] a range of benefits around software and analytics.

of emerging technologies including IoT, 5G, and the Industrial Internet to allow companies to enjoy further efficiencies in their businesses.

Industrial Internet opportunities

The Industrial Internet is potentially a much greater market opportunity than the consumer IoT market, according to GE, as companies across a range of sectors have the potential to derive a range of benefits around software and analytics.

Kunte explained: "The Internet of Things is a very common term nowadays and primarily when people talk about it, they're referring to the consumer market. Personal devices, cellular phones and fitness equipment are all part of this IoT definition. From our perspective, those things are great and cool, but they don't really move the needle."

"When talking about the Industrial Internet, we're talking about what we like to call The Internet of Very Important Things. The consumer Internet is fantastic, but industrial is where the real money is." GE's vision of the Industrial Internet is a network of connected assets, data, analytics and people across the world.

Driving the world economy

GE figures suggest that the wide-scale adoption of Industrial Internet applications over the coming years could add between US$10 trillion and US$15 trillion to annual global GDP – equivalent to the entire output of the US doubled and spread across the rest of the world.

In addition to the use cases outlined by Kunte, GE's wide-ranging report on the potential of the Industrial Internet highlights the ability of analytics software to transform industries by connecting, pulling, and analyzing data from locomotives, power plants, jet engines, and other industrial facilities.

Predictions of rapid cross-sector growth fit with forecasts in July 2017 from UK-based specialist analyst firm Visiongain. The research company expects global Industrial IoT spending – defined along similar lines to GE's Industrial Internet use cases – to reach US$224.8 billion in 2017, with companies across the world looking to gain a competitive

> To make a success of the Industrial Internet...companies need to strike partnerships with connectivity experts and those with robust infrastructure to support services already in place.

advantage by adopting new technologies before their rivals. "The current development and deployment of IoT initiatives could create a new golden era in the global economy," reported Visiongain in documents accompanying the report.

"IoT has the potential to increase productivity, disrupt industrial production and change our life as we know it, just as with the earlier technological revolutions. The reason for this is simple: almost every single industry is looking forward and trying to understand how IoT will transform the world. Some governments also hold an interest in the development of IoT."

Partner up for success

To make a success of the Industrial Internet and derive the full benefits of digitalization, companies need to strike partnerships with connectivity experts and those with robust infrastructure to support services already in place.

Although each company has specific requirements relevant to its industry, there are many elements common across sectors. Selecting a partner with experience in helping other companies transform their business is vital and can offer a much greater chance of successfully deploying these technologies.

Ensuring that the end-to-end process of industrial transformation is performed smoothly with minimal disruption to ongoing activities and maximizing final results is central to any deployment. The Industrial Internet provides a unique opportunity for businesses across manufacturing, logistics, power and many other traditional sectors. Early adopters of next-generation technologies can put themselves at a competitive advantage by lowering running costs and increasing operations efficiency – improving margins and offering improved customer service.

Depending on the nature of the business, this can offer increased uptime in service-based industries or boost throughput in factory settings. The benefits are vast and differ from company to company, but there are few businesses that can afford to ignore the Industrial Internet revolution. It is not just a play for disruptors, as many of the world's largest companies are already improving processes using new technologies. It's important to act fast before competitors both large and small seize the advantage – and market share – for themselves.

Mobile Reshapes the World

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During the last eight years, the Mobile Broadband Forum has become a community for creating exciting ideas. For example, last year, we introduced the CloudAir initiative. Now it's an industry standard and has been deployed in 30 networks globally.

Keynote speech by Huawei Rotating CEO Ken Hu at MBBF 2017

Recently, the community has been debating whether we're at the best time or the worst time in the history of the mobile industry. Some say that the market is very crowded, and competition is fierce. Indeed, the mobile penetration rate in over 120 countries and regions exceeds 100 percent. But I believe this is the best time for mobile. So where is the next growth opportunity, and how can we catch it?

Meet our new subscribers

If I told you, there are another 1 billion new subscribers waiting for you right now, what would you do? You'd wonder who they are, where they are, and how you can engage with them. Well, let's meet those new subscribers.

In northwestern China, telcos are helping dairy farmers connect more than 1 million cows with NB-IoT technology and special collars. They've made this into a very successful business for both farmers and telcos.

NB-IoT networks deliver great improvements in battery life, coverage, and cost. This allows cows to move farther, graze longer, and live healthier lives.

> We have to change the way we develop our business. We have to add muscle to our networks, and make them smarter. And we have to build a stronger ecosystem...We have to change the way we manage our business.

More importantly, the collars can collect biometric information from the cows. With this data, farmers can better manage movement patterns and grazing habits. They can also manage the milk production cycle in a more accurate way, and greatly enhance productivity across the whole cycle.

As a result, this solution helps farmers to generate an additional US$420 dollars per cow, per year – that's a 50 percent increase in profit.

Now, you might be thinking: I'm a carrier. How can I make money from a cow? You can. There's money for carriers too. Every connected cow is a new subscriber. In this case, the telco provides an integrated solution for farmers. The special collars, connections, and data services bring in US$10 dollars per cow, per year.

When I first heard about this project, I realized that connected cows are literally cash cows. Let's step back and look at the global market. There are 100 million cows in China. There are 100 million in the US, too. In Brazil, there are 200 million.

Globally, this is a huge business of 1 billion new subscribers offering US$7-10 dollars ARPU that we shouldn't miss.

This is just one of many possibilities

Think about this: There are 20 million shipping containers in the world, 100 million new bicycles manufactured every year, 300 million LED streetlamps lighting up our cities and towns, and there will be 1.8 billion water meters by 2025.

The list goes on. The only limit is our imagination. These are projects we're exploring on our X Labs platform, which we announced last year.

In just one year, our research clearly shows that growth in mobile is possible, and the opportunities are real. All we need to do is take action.

Taking action

We have to change the way we develop our business. We have to add muscle to our networks, and make them smarter. And we have to build a stronger ecosystem. First, we have to change the way we manage our business.

This is a mindset issue. We have to believe that everything can be connected and will be connected.

I believe that more connections mean more possibilities, including connected cows, connected shipping containers, and connected streetlamps. This is a huge opportunity for IoT.

We need a fresh mindset to serve all these new subscribers. For people-to-people communications, the service model is pretty straightforward. However, scenarios for IoT are extremely diverse. They all need different connections and specialized applications. We need a new model. I call this the scale-out and scale-up approach.

First we have to scale out in the traditional sense to provide more connections and get more revenue. Once we get everything connected, we will have a lot of room to develop value-added services. That's the scale-up part. In China, local telcos are working with the water authorities to connect 800,000 water meters with an NB-IoT network and develop a smart system.

In this case, the telcos provide the basic data connections. And beyond that, they work with application developers to provide value-added services like leak detection, water consumption analysis, and predictive maintenance. This helps them to double revenue. While scale-out is low-hanging fruit, scale-up is where the tasty fruit is. But, it's not easy. To realize these value-added services, we need to understand more on the vertical side. And of course, we need partners.

Rethinking networks

For many years, we've been building our networks to connect people. We provide a simple and similar service model to all consumers. However, now we're connecting a massive number of things. We need different connections to support diverse applications.

This is a huge challenge for our networks in terms of performance and operations. We need stronger network performance to support applications that are completely different, like VR in the cloud and robotic arms for Industry 4.0. Our existing networks aren't ready for this.

The same is true on the operations side. As applications are becoming more diverse and complicated, network operations lag far behind. The process is still too hands-on.

Let's look at two figures. One, on average, the cost of O&M is 3 to 4 times the cost of network equipment; and two, 70 percent of network faults globally are from human limitations.

This isn't sustainable. We need a fresh approach to network development. This is Huawei's vision for future networks. We believe that future networks should be application-centric, data-driven, and eventually, they should be intelligent systems.

Future networks have to be able to support diverse applications. That means two things: They have to be software-defined, and they have to provide stronger network performance. We need greater capacity, lower latency, and more connections. As we prepare for Industrial IoT, we'll see a sharp rise in demand for machine vision. In smart factories, cameras will be the eyes of machines. They will generate a huge amount of data, about 10 GB per second per camera. Imagine a factory with 1,000 cameras.

Future networks also need to provide lower and more reliable latency. For example, smart grids need constant 20-millisecond latency. That means no spikes, no dips. We need to start adding this muscle now, so our networks are ready for a huge range of applications in the future.

Future networks should also be data-driven. GE creates digital twins for their engines. When one of their engines is running in the physical world, another virtual engine is running in the digital world. We should do

> Insight from digital twins will help us to automate network operations, provision applications, and perform network maintenance.

the same with our networks. We should build our own digital twins. There will be two sides to future networks: the physical network and the digital network.

The data generated from network operations will be the bridge that connects these two parts. Insight from digital twins will help us to automate network operations, provision applications, and perform network maintenance. Digital twins will also give us a new platform to introduce AI and thus make the whole network more intelligent.

Our goal is to build intelligent networks. We want to build networks that are automated, self-optimizing, and self-healing. Full autonomy is what we're aiming for, just like autonomous cars. At Huawei, we've been working on this for several years. We have successfully introduced AI-powered predictive maintenance in our products and solutions. And in the near future, we'll bring you some really exciting news. Ultimately, future networks should be fully automated, with zero faults.

But technology isn't enough. To access new opportunities, we need a stronger ecosystem. In the past, we focused on connecting people. That was like planting a single tree.

And now, we're connecting things. That's like planting an entire forest. We have to get integrated into the ecosystem, and build it out together.

Many vertical industries have not embraced mobile yet. We should help them understand the value of mobile, and how it's relevant to their business. And telcos need to understand more on the vertical side. To close this gap, we should build more platforms, more communities, and more alliances. The best way to do this is to come together and explore real cases.

To give you an example, we've made exciting progress in low-airspace connections. This is a joint effort between mobile carriers, chipset manufacturers, platform developers, vertical application developers, and drone makers. As an industry, we spent 30 years connecting the surface of the earth. Now we're working to connect everything up to 300 meters in the air. This year, we built a large-scale industrial base for testing. By 2020, we hope to nail down standards together, and connect 30 percent of industrial drones through mobile networks. We call this the Digital Sky Initiative.

Mobile reshapes the world. But, mobile won't change the world by itself. The responsibility is on us.

We've successfully connected more than 5 billion people in the world. And we will connect everything in the future. Yes, we will face a lot of challenges. In the Chinese language, "weiji" means both for challenge and opportunity. It means opportunities always come from challenges.

Let's not focus on what limits us. Instead, let's look at where we can be and make it the best time for mobile.

Embracing mobile networks in the 5G era

By Edward Deng, President of Huawei Wireless Solution

Human history is a history of connections. The pursuit of communication promotes the development of connections, and the development of connections promotes the development of society.

In the coming 5G era, all things in daily life will be connected and all industries will be transformed through digitalization.

Mobile has already changed how we communicate and now it's changing how we live. In the future, mobile will change society and reshape the world. Mobile will be the foundation and enabler of transformation in all industries and the development of society.

Looking to the future, new opportunities will bring new growth, new requirements, and new challenges to mobile networks. Are we ready for all these changes?

Three challenges

First, network capabilities will face new challenges. The extreme user experience and new industrial applications require more powerful network capabilities and must have more dimensions.

From 4G to 4.5G to 5G, multi-dimensional network capabilities must keep improving to support increasing service requirements.

Second, network architecture will face challenges. Services and scenarios will become more diverse. For example, AR and VR services require more than

As the 5G era approaches, we can expect huge opportunities along with big challenges. New opportunities will bring new growth and new growth needs new capabilities. I believe future mobile networks will bring amazing changes.

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Gigabit speeds and ultra-low latency, while smart metering requires only kbps speeds and has no special demands on latency. The requirements of these two services have a 1-million-fold difference, but must be supported on a single network. So networks must be flexible and agile enough to support diversity, and at the same time shorten time to market to help operators seize business opportunities.

Another challenge will come from network management efficiency. Site numbers will increase and more spectrums will be released, which will result in increased network complexity and OPEX.

TCO mainly increases due to OPEX rather than CAPEX, so it's important to introduce more technologies to reduce OPEX and reorganize the proportions of OPEX and CAPEX to achieve higher ROI.

To meet all these challenges, we expect future mobile networks to have the following features:

First, they must provide powerful capabilities. As 5G is approaching, SingleRAN will evolve to enable 5G to provide much more powerful capabilities.

Second, they must have flexible and agile network architecture, so new mobile cloud architecture should be introduced to meet these requirements.

Third, networks must be efficiently managed to improve user experience and reduce OPEX, which

> With Massive MIMO and high transmission power, C-band can provide similar coverage at 1800 MHz in downlink. Uplink coverage is still bottlenecked due to antenna quantity limits and the transmission power of phones.

calls for more intelligent wireless networks.

Powerful network capability: 5G era SingleRAN

5G, cloudification, and intelligence are the most important elements of future mobile networks. In the 5G era, SingleRAN should have three major capabilities: high capacity, seamless coverage, and low latency.

To know is easy, but to do is difficult. There are certain obstacles we have to overcome to achieve these capabilities.

Boosting capacity

Site capacity is highly dependent on bandwidth and spectral efficiency. With more bands and antennas from 2T, 4T to 8T8R and MM with 64T64R, the network has the capability to increase capacity by dozens of times per site. But, the main obstacle is how to add so many boxes with limited site space.

Now, with 5G technologies we can provide equipment with wider bandwidth and higher integration, for example, one antenna for all sub-3G bands, one radio unit for dual-bands or even multi-bands, and one AAU or MM unit with a combined antenna and radio unit.

In the past we did addition; in the future we should do subtraction to make the sites simpler and to lower OPEX.

Improving coverage

C-band will be the first global roaming band for 5G. Higher frequency gives lower coverage, so improving C-band coverage to provide continuous 5G coverage is another obstacle.

Now with Massive MIMO and high transmission power, C-band can provide similar coverage at 1800 MHz in downlink. Uplink coverage is still bottlenecked due to antenna quantity limits and the transmission power of phones.

To overcome these obstacles, we've proposed a disruptive innovation. In the 2G, 3G, and 4G eras, uplink and downlink must be deployed on the same band. But why don't we deploy uplink from C-band to lower bands like 1800M and share with LTE? Then we can create a new band combination for cell edge users. At the same time, cell center users can still use the DL and UL of C-band.

This disruptive proposal has already been accepted by 3GPP R15, which will enable co-site deployment of C-band and 1800 MHz to provide continuous C-band coverage with site resources.

In addition, to enhancing deep coverage and high capacity, the number of new sites will keep increasing in the future, not only traditional macro sites, but also

the new pole sites and outdoor small cells and indoor coverage systems.

But how can we increase new sites in an easy, low-cost way? We provide a series of scenario-based site solutions, including TubeStar, PoleStar, RuralStar, and a multi-hop outdoor small cell and indoor Lampsite solution, so we can deliver the most suitable E2E site solution for various site scenarios.

Reducing latency to ms level

Another challenge in the 5G era is low latency and reliability, especially for some industrial applications.

For air interface latency, innovative technologies such as short TTI, grant-free and self-containment, we've already reduced latency to less than 0.5 ms in the IMT-2020 test this year.

For network latency, we need simplified network architecture, and we must decouple service functions and network locations to be able to deploy services on-demand, making services close to end users to reduce latency.

These innovations enable ultra reliable low latency with 1 ms and five 9s reliability, which fully meets industrial requirements.

To support these capabilities, I'm proud to release the portfolio of the 5G Era SingleRAN. This is the first time we've released a 5G series product at MBBF, with 5G and 5G technology leveraged to 4G.

Our 5G Era SingleRAN is part of our 5G series of products.

Agile network architecture: Mobile Cloud

We first released our Mobile Cloud Solution at the last MBBF, comprising CloudEdge, CloudRAN, and CloudAIR. These started a new mobile cloud era.

Our CloudEdge solution is already mature. To date, we've signed more than 120 commercial contracts and commercially deployed 30 networks, with commercial subscribers topping 60 million.

As 5G approaches, CloudEdge will pave the way for a welcome upgrade to 5G cloud-based core networks.

Huawei first released its CloudRAN solution last year, and we've already finished the POC testing with several tier-1 operators to verify performance in terms of flexible network architecture. CloudRAN is scheduled to support pre-commercial use in Q1 2018 and full commercial deployment is scheduled for the end of next year, along with 5G.

At last year's MBBF, we released CloudAIR, which is designed to dynamically share spectrum, breaking the limits of traditional spectrum refarming.

This disruptive innovation enables different access technologies to dynamically share the same spectrum simultaneously according to traffic changes, which significantly improves spectrum and network efficiency.

LTE and NR can share spectrum in both the time and frequency domains, so sharing performance will be even better than that of the current GUL, which will greatly accelerate NR deployment on the low band in sharing mode rather than traditional refarming, because it has less impact on current 4G services.

We released CloudAIR 1.0 in September. And over 30 operators will commercially launch CloudAIR by the end of this year. Next year, we expect over 100 operators to be using this innovative solution. With the joint effort of leading operators and other industrial partners, LTE and NR spectrum-sharing has already

been accepted in 3GPP, and will be supported in R15, which represents huge progress for the whole industry.

Moving from refarming mode to sharing mode is a milestone in the mobile industry.

Our next task is to upgrade CloudAIR 1.0 to 2.0. Currently, 24 percent of spectrum can be dynamically shared. This will reach around 44 percent in 2.0, which means 10 MHz spectrum. LTE can use a full 10 MHz while GSM can use up to 4.4 MHz simultaneously.

For LTE and NR, the proportion of shared spectrums will reach almost 90 percent and they can be shared by UL or DL and UL separately due to support from the new R15 standard and new NR devices. All 4G devices can support it. So we can expect that in the 5G era, the spectrum sharing mode between LTE and NR will become mainstream. Actually in 5G RFI and RFP, spectrum sharing is already mandatory.

Greater collaboration

From the start, existing spectrum should be allowed for 5G to support spectrum sharing.

The whole industry chain of 5G, especially device and chipset vendors, should support this feature based on 3GPP R15. Almost all vendors have released CloudAIR-type spectrum sharing solutions, but continuous R&D and innovation are necessary to further improve sharing performance.

Is all this enough?

We don't think so. In the future, network complexity will far exceed what we can imagine. In fact, optimization and maintenance will increase one-hundred-fold, which will bring huge challenges and ultra-high costs. Future networks will be like a complex flyover transportation system. If there's a lack of an intelligent coordination and scheduling, network efficiency will decline sharply.

In addition, with the boom in new services, service-oriented recognition and prediction will be a basic condition to ensure user experience of various services with limited network resources, which will also need a new mechanism. To address these challenges, we believe that future wireless networks must be more intelligent to make things simple.

Efficient network management: Wireless intelligence

First, with intelligence, network O&M will be easier and more efficient, and will gradually transform from automated to autonomous, fully realizing network potential for the best user experience and network performance.

With wireless big data and machine learning algorithms, networks will be more intelligent and provide more new capabilities.

Wireless tech in action

To deploy massive indoor small cells, automated and simple operations are a must. Huawei's new intelligent LampSite solution can greatly shorten deployment duration through self-configuration and self-awareness.

At the same time, it can also enhance user experience by surrounding traffic detection and the automated optimization of cell configuration such as cell splitting and cell merging to simplify operations. In the future, with the development of automated capabilities, the network can continuously enhance operating efficiency and make things simple.

MM is a typical product in the 5G era with powerful capabilities and flexible configuration in various scenarios.

To achieve the best network performance, our

> The wireless intelligence solutions for smart carrier aggregation ensures the device is always on the best carriers with multi-dimension input.

wireless intelligence pattern tuning solution can adaptively select the most suitable parameter combination. For example, if a sports event is happening, most people are probably in concreted areas. MM would adaptively change to a narrower beam to improve capacity and respond to the number of users. After the event finishes, it will change back to wide beam to improve coverage.

In addition, mobile networks also have the capability for self-learning to understand which patterns have better KPIs and user experience, so eventually the network can achieve best performance by running on the best configuration.

The next phase of wireless intelligence is to explore more possibilities with big data and machine learning. We can logically split each cell into thousands of virtual grids and each grid can store all wireless parameter data from the control plane, user plane, and management plane, both real-time and historical data. With all this data, networks can understand real scenarios more accurately and network resources can be used more efficiently.

The wireless intelligence solution for smart carrier aggregation ensures the device is always on the best carriers with multi-dimension input.

And that's just the beginning. We're linking more data and characteristics into virtual grids to build a unique network fingerprint. We can thus imagine new capabilities and applications. For example, as hotspots become less predictable, wireless intelligence can automatically predict a possible instant hotspot and call for a new mobile site, such as UAV, to set up, self-configure, and self-optimize with the whole wireless network, thus meeting traffic requirements in advance. That's an intelligent network.

Another case in the near future, is achieving sub-meter level positioning with a unique network fingerprint to achieve 10 times greater accuracy than GPS, both indoors and outdoors, which will enable new applications such as interactive mobile gaming with AR.

Our understanding of wireless intelligence is just starting. But, we will step up R&D investment to bring more innovation to our customers. I believe this intelligent brain will make our wireless networks smarter, more flexible, agile, and efficient, and it will far exceed our expectations of the future.

5G, mobile cloud, and wireless intelligence are combining to provide powerful network capabilities with flexible and agile network architecture that can be efficiently managed. This will help operators achieve more commercial success, with Everyone on Mobile, Everything with Wireless, and Every Industry plus Wireless.

Onwards and upwards with cloud

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Cloud was a major theme at Huawei Connect 2017. Find out how Huawei Cloud is helping customers and partners – including Orange, CERN, and Microsoft – reap digital rewards

By Joseph Waring, Mobile World Live

Speed and flexibility drive public cloud

Driven by rapid technological innovation, the fourth industrial revolution will enable enterprises in nearly every industry to boost efficiency, innovate, and step up productivity.

Survey data from IDC on the top 2,000 global enterprises reveals that by the end of 2017, 67 percent of CEOs will position digitalization as a core strategy. Industry insiders agree that cloud is the best tool for enterprises and governments to deploy robust ICT infrastructure for a digital future.

At Huawei Connect 2017, Orange Business Service CEO Thierry Bonhomme stated that software will enable companies to quickly deploy agile micro-services to meet customer requirements. Earlier this year, Orange launched Flexible Engine, its own

public cloud service platform based on Huawei infrastructure. According to Bonhomme, "The solution provides flexible IT infrastructure and nurtures ecosystems in various verticals."

While Orange operates mainly in a private cloud environment, Bonhomme believes there's space for players other than the usual hyperscalers. In the long run, this can lower the price of migration because the ecosystem comprises native cloud applications, compared with the business model today.

"Migration to native cloud apps take time, so you need a partner you can trust," he said.

Data overload

The move to public cloud isn't just driven by the need for flexibility. Europe's nuclear research giant CERN, which operates the Large Hadron Collider in France, began facing massive computing challenges as its search for new particles expanded massively.

To cope with the projected 60-fold increase in CPU capacity, it wasn't viable to migrate to a private cloud based on OpenStack, because the cost of running the data centers would be too high.

So CERN started to shift from private clouds to public clouds, migrating last year to Open Telekom Cloud. "The public cloud [can] burst our resource provisioning," said Jan van Eldik, the CERN team leader in charge of resource provisioning, "At the beginning of the year CERN and Huawei started to work jointly on improving OpenStack. I'm excited about this project and looking forward to seeing the results of it in production in our clouds in the coming years."

All about cloud

Cloud was the major theme at Huawei Connect this September. Covering 20,000 meters, the annual event was 30 percent larger than last year's, and attracted around 20,000 visitors, more than 60 sponsors, 10 industry organizations, and 130 solution partners.

As part of its commitment to become an industry cloud enabler for enterprises, Huawei plans to invest US$500 million over the next five years to enhance the service capabilities of its cloud services. It aims to provide customers with end-to-end cloud transformation services that enable them to effectively build, use, and manage their cloud platforms.

Sun Maolu, president of the technical service department for Huawei Enterprise Business Group, said: "With the emergence of a cloud-only era, Huawei is adopting a long-term cloud transformation service strategy to support its enterprise customers

on their cloud journey."

Huawei's enterprise services will focus on four key areas: cloud innovation, a digital platform, smart operations, and enabling businesses.

Sun said that Huawei will increase investment in developing service solutions and global service centers, as well as tools, platforms, and verification labs for professional services. In the next five years, it will focus on industry cloud R&D, increasing annual investment by more than 50 percent.

Cloud advances

Zheng Yelai, president of Huawei's Cloud Business Unit, gave a progress update on Huawei Cloud, with a number of enterprise customers sharing their digital transformation experiences.

Huawei Cloud was developed to help enterprises go digital more smoothly and is constantly being updated, said Zheng. Huawei has released 4,500 new features for its cloud, as well as 40 new services. Since the cloud business unit was established at the end of August, Huawei's cloud customer base has grown by 238 percent.

At Huawei Connect, the Shenzhen-based company announced a number of expanded partnerships, including strategic collaboration on cloud services to enable more Microsoft enterprise-level applications to be released on Huawei Cloud.

"As a global leader in enterprise IT, Huawei is a strategic partner for Microsoft in the mission to empower organizations as they transform," said Alain Crozier, CEO of Microsoft China, "Our increased collaboration will drive innovation as we build a seamless platform to benefit customers through industry-leading technology. Together, we're confident that we will lead and win in the era of digital transformation by focusing on what our customers need."

Huawei also signed an MoU with Dassault Systems for its 3DEXPERIENCE Platform to run on Huawei Cloud. Combining Huawei's high-performance computing cloud solutions and Dassault's industry solution experiences portfolio, the solution will offer integrated enterprise design, verification, and manufacturing solutions in various industries.

"Industries today are intersecting to imagine, engineer, deliver, market, operate, and service smart, connected experiences that blend hardware, software, content, and services," said Olivier Ribet, VP of high-tech industry at Dassault. "Greater cloud adoption opens up new possibilities to share and create – for companies embracing open innovation projects to municipalities simulating use cases."

Two drivers

Yang Xiaoling, chief digital officer at China Pacific

Insurance Company (CPIC), remarked that companies' digital transformation strategies are designed to address two main operating problems that enterprises face: customer experience and operations efficiency.

CPIC launched its digital transformation strategy in late 2016, focusing on five areas: digitalized clients for E2E interaction, digitalized supply chain, higher computing capacity, a more agile technology platform, and better security.

The company unveiled the robot insurance adviser Alpha InsurAdvisor on September 1. Using AI to help families define their risk defense index, Huawei supports the back office.

"In the Fintech era, we hope to strengthen our partnership with Huawei...particularly in image recognition and deep learning, so as to provide better solutions that suit the needs of our customers," Yang said.

CPIC recently signed an MOU with Huawei covering the development of data centers, cloud platforms, big data, AI applications, and digital security.

One of five

Huawei's Rotating CEO Guo Ping predicts that the speed of digital technology development coupled with rising investment levels will drive massive consolidation and lead to a world with just five cloud networks.

"Cloud is the cornerstone of the intelligent world," Guo said in his keynote at Huawei Connect. "Clouds around the world will begin to converge – becoming more centralized. In the future, we predict there will be five major clouds in the world. Huawei will work with its partners to build one of those five clouds."

Guo said Huawei will build a cloud network based on its own public clouds and build a global cloud alliance with its key telco partners, including Deutsche Telekom, Telefonica, and Orange Business Services.

Huawei's experience in connecting half the world's population via telecoms networks and its leadership in the China market positions it well to be a global cloud leader.

IDC data reveals that China is one of the main engines of global cloud growth, with spending on cloud hardware in the mainland forecast to increase by 19 percent annually between 2016 and 2021, compared with the world average of 13 percent.

Connections are necessary to maximize cloud efficiency and release its value, said David Wang, president of Huawei Products & Solutions, adding that

connectivity and cloud are the two engines powering smart cities, governments, and enterprises.

"Our strategy is to stay focused on cloud and connections to digitalize organizations faster by innovating solutions that achieve business growth and social progress," Wang explained.

He said that the goal of cloud services is to enable total flexibility in allocating resources, with seamless migration among public and private clouds.

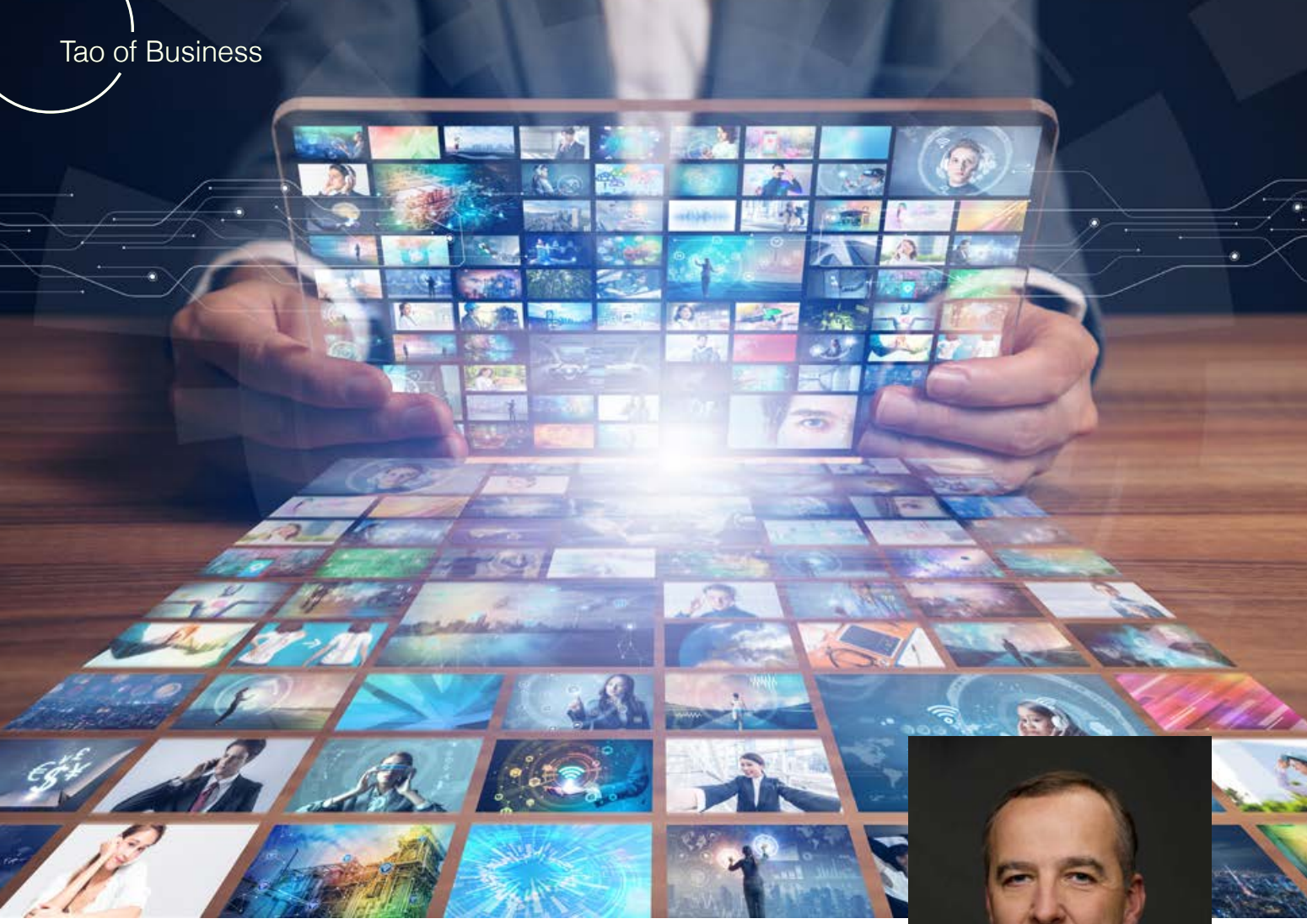
New initiatives

Huawei also launched a number of new products at Huawei Connect, including Enterprise Intelligence (EI) cloud services, which it will support with general and scenario-specific solutions.

"Integrating EI into Huawei Cloud \makes Huawei Cloud more intelligent, and will help create greater industry value with advancements in technology," said Zheng.

While not the biggest [cloud platform] in the world, he said: "We're the fastest moving player and making rapid progress. Today Huawei isn't a great talker obsessed with fancy ideas...but we're a great doer that makes things happen."

Huawei isn't building out a cloud platform for the sake of having a cloud offering, said Zheng. Instead, the company focuses on creating business value through cloud platforms and services.




Hanno Basse

Why movie night will get a whole lot better

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20th Century Fox Film Corporation has given the world some of the most iconic movies in history, including *Star Wars*, *Titanic*, and *Avatar*. More recently, it's rolled out blockbusters like *The Martian* and the *Planet of the Apes* trilogy, and cult classic contenders such as *Kingsman* and *Deadpool*. So, when the company's CTO, Hanno Basse, tells you, "The main thing has always been and always will be the story," you know his words carry weight – in this case 82 years and some of the biggest grossing movies ever.

By Gary Maidment

Visual immersion

Like every other industry vertical, digital technologies have landed in Hollywood both on the production and user sides. Basse believes that the biggest shift has been in the quality of the home experience, "We went from tape, standard definition, square-looking TVs to ultra-HD, blu-ray, 4K HDTV." In parallel, these tech advances have raised consumer expectations and influenced Fox's strategic direction, "That's why Fox was the first studio [to get] 4K and HDR content made," Basse says.

For those who want to know the difference between 4K, UHD, and HDR, here's a quick rundown: 4K refers to the pin-sharp, ultra-high resolution of 4,096 horizontal x 2,160 vertical pixels, which you'd find on the big screen at a digital cinema. UHD (Ultra High Definition) is designed for TVs, giving a slightly lower pixel count at 3840 x 2160, but still four times as many as you'd get on HDTV.

While 4K and UHD are technically different, popular usage has merged them into 4K UHD, which describes the UHD home viewing experience that you'd enjoy on your couch rather than the true 4K you'd see at the cinema.

Compared to SD and HDTV, 4K UHD gives the viewer better clarity and definition – to a certain extent anyway. According to Basse, "The difference between 2K to 4K is a little bit difficult for consumers to distinguish."

This is because 4K exceeds the limits of our 20/20 vision when it comes to tracking a moving image. Imagine trying to perceive individual grains of sand – you might be able to do so very close up, but it's clearly impossible when they're in motion at a distance of 9 to 10 feet, which is the average TV viewing distance. Adding more grains of sands – or pixels – doesn't really help.

So, is 4K the fools' gold of definition? Not exactly, but its application isn't all-encompassing. It best serves in three scenarios: one, big screens that you'd find at the cinema and – and here opinion is divided – TVs that are 50 inches or bigger; two, static images where the eye can pick out more detail; and, three, very close up. The second scenario and possibly the last tie in with today's consumer mobile viewing habits and explain why handheld devices may emerge as the primary drivers of 4K. However, whether or not 4K is overkill on a phone screen is still the subject of debate.

HDR shows its true colors

Unlike 4K UHD, High Dynamic Range (HDR) doesn't pile on the pixels to raise picture quality, instead boosting color accuracy and contrast ratio. Both have a huge impact on realism. In fact, HDR on a 1080p screen would outshine 4K resolution when it comes to colors that pop out at you for an experience that's more akin to looking out of a window.

"I think for us, the main feature of UHD is high dynamic range content, which is really a qualitative difference rather than quantitative difference," agrees Basse. "Our filmmakers really like [HDR] because they now have a much larger canvass to work with than they used to."

However, he adds that for HDR to have value, "The quality of the client device needs to be there." When it comes to delivering outstanding content, high-end quality requirements are as true for networks and latency as they are for devices. Referring to Huawei's 2017 Ultra-Broadband Forum, Basse states that, "We talked a lot about creating 5G networks, high bandwidth, and cloud technology [and] we're working in parallel with technology development to make sure our content development pipeline matches device capability and network capability," a viewpoint that mirrors Huawei's cloud, pipe, device strategy and also expresses the need for upstream and downstream partnerships.

> How you're going to tell a story in VR or AR isn't really clear yet. It's probably not just a game-playing medium. It's somewhere in-between...We're in the middle of figuring out how that will work.

Basse mentions that 20th Century Fox Film Corporation is teaming up with network, device, and component vendors, "including Huawei and its subsidiary HiSilicon as well as TV manufacturers in China." Clearly, the movie and entertainment ecosystem is expanding quickly and deeply into the digital realm.

VR and AR

The final installment of Fox's critically acclaimed *Planet of the Apes* trilogy, *War for the Planet of the Apes*, scored an impressive 93 percent on Rotten Tomatoes. However, it wasn't just the taut and emotive story that impressed reviewers. Soon after the movie's release, the phenomenal visual effects were being described as "astounding", "bleeding-edge," "jaw-dropping", and "taking CGI to a new level."

The potential mix of virtual reality, HDR capabilities, CGI, and artificial intelligence expands the landscape of the movie and entertainment industry into a potentially astonishing vista. But, at present this vista is difficult to define, says Basse, "How you're going to tell a story in VR or AR isn't really clear yet. It's probably not just a game-playing medium. It's somewhere in-between...a story combined with an element of exploration, an element of role-playing...We're in the middle of figuring out how that will work."

Any exploration and role-playing element will certainly excite the gaming industry, which is worth an estimated US$108 billion. Best-selling titles like *The Last of Us* and *Uncharted 4* already play to a certain extent like interactive movies, with fleshed-out characters and stories, stellar scripts and voice acting, emotional investment, and high-quality graphics.

With the first title in the series released in 2007, Bioware's *Mass Effect* trilogy was groundbreaking in that it merged action and RPG with a gripping, cinematic story whereby a player's decisions – often tough moral ones – had a major impact on a story arc that spanned all three titles. While the game was not without its flaws, its complex decision matrix is still up for discussion years later, with this analysis neatly summing up the trilogy's basic premise: "Ever since the first game, Mass Effect has always been about

> VR and AR have a great future and are going to be a pillar of our business in the future.

shaping the story the way the player wants it...Players could create millions upon millions of iterations of the same universe."

Interactive stories and user-controlled decisions of the type seen in *Mass Effect* are likely to continue to be a huge draw. A decade on and the right ingredients for shaking up traditional linear story-telling are in place: advances in artificial intelligence, graphics processing, VR, AR, and HDR, and enabling technologies like cloud. Add in a gripping cinematic experience, and the home entertainment experience could well be redefined, positioning the user as the architect of his or her own story with an unprecedented level of immersion.

Fox is already involved in producing VR content oriented towards filmmaking. Its research arm, Fox Innovation Lab, teamed up with the startup Felix & Paul Labs to co-create VR content in October 2016. Basse is realistic about the difficulties with VR, citing cost and complexity as two current limiting factors. But, he says, "I think 2019 to 2020 are going to be the time framework [when we will] see a lot more mass adoption of VR content." Over the next few years, says Basse, image quality, graphics processing, and live image capture capabilities will be more conducive to producing high-quality VR content. And he's confident about the years to come, "VR and AR have a great future and are going be a pillar of our business in the future."

Content is still king

Basse – a CTO – nevertheless emphasizes that content is the main market driver rather than the tech-powered content pipe, "Unless it's filled with content, it's meaningless." He specifically means high-quality content that not only uses the available network and device technology, but also effectively pushes it to consumers. Due to the explosion in content in recent years, this has never been more important, "It's becoming more of a problem for consumers to really find content that resonates with them," says Basse. "So we need to figure out how to help them do that." Fox is looking into big data and AI, with data collection and analytics at the heart of ensuring that different consumer segments can access content that reflects their habits and preferences.

It's clear that the movie industry is expanding into a much broader ecosystem that comprises an array of technologies, delivery channels, and new partnerships. The burgeoning ecosystem will enable Fox to fulfill its vision, which according to Basse, involves, "Making sure that the stories we're telling resonate with global audiences."

And the nascent blend of creativity and technology promises a level of resonance we've never seen before.

Know your competencies and control points

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A small number of market leaders in the ICT space sit at the top of the ecosystem chain and pocket most of the profits. Despite helping the ecosystem flourish, the majority receive pitiful low returns. Operators that hope to boost their profits and influence the playing field of collaboration and competition must identify their competencies and control points, or they will continue to spend trillions on building networks and fail to reap meaningful rewards.

By Li Changwei

Li Changwei

Value doesn't equal profit

China's Ministry of Industry and Information Technology Research Institute reported that ICT contributed 22.6 trillion yuan to China's 2016 GDP of 74 trillion yuan. Of that 22.6 trillion, 5.2 trillion yuan derived from ICT infrastructure such as networks, data platforms, and Internet service platforms, and the remainder came from industries supported by ICT infrastructure.

In 2016, operators generated just 1.2 trillion yuan (US$182 billion) in revenue from networks, far short of what they put in. For the first time, Internet companies outperformed operators, generating 1.24 trillion yuan. Operators' revenue grew by 5 to 6 percent, but for the 54 listed Internet companies, it shot up by 41 percent. China Mobile led the operator field with profits of 15 percent, which lagged far behind Tencent's whopping 42 percent.

However, operators are the real value contributors to basic network and Internet platform benchmarks as well as relative platform and industry growth. Without

> Thanks to strengths in connectivity and carrier-grade security, reliability, localization, and E2E services, the horizontal industries in which telcos shine are smart homes, security in smart cities, and IoV.

4G, neither mobile Internet services nor applications would exist. Without broadband, information-based, intelligent industry wouldn't be able to develop. But operators still miss out on high returns.

Globally, the 18 ICT companies listed on the Fortune 500 saw their 2016 revenues rise by 5.1 percent to hit US$1.2124 trillion, but their profits only edged up by a weak 1.8 percent to reach US$80.4 billion. Overall profit in the telecom industry fell from 7.41 percent to 6.45 percent in 2016, and it sits waiting to slide further down to 5.64 percent in 2017.

So, value does not equal profit. But, why?

Core competency for survival, control point for profits

Air is a good example of something with indisputable value that can't really be monetized, except in certain healthcare scenarios and isolated cases of severe pollution.

Air is a core competency in that without any added value, it cannot generate high returns. Oxygen and clean air, on the other hand, have unique, added value. They are value control points, because they can deliver returns.

The biggest change in the ICT industry in the past 10 years has been the emergence and popularization of smartphones. In the smartphone arena, Apple has done phenomenally well for 10 consecutive years, capturing 90 percent of industry profits every single year. And in Q2 2017, its profit share increased to 92 percent. With its hardware (A9/A10 chips) and software (iOS), Apple has become the top dog in customer experience and value thanks to its innovative experience model that blends "technology, humanities, and liberal arts." In 2016, Samsung still grew its profits by 48 percent, despite losing US$5 billion following the Note 7 battery debacle. The key reason was that in the hardware sector, its exclusive chips are a strategic industry control point.

Between 2007 and 2017, Apple and Samsung took home more than 95 percent of profits in the device market. Lacking control points, other manufacturers have been struggling to survive. This shows how strategic industry control points can be established by developing exclusive control of customer-side value. Core competencies are the basis for competing in the ecosystem, but control points decide where business value and high profits lie.

A new model: Core

> It's difficult for telcos to form a profit model from connectivity alone...telcos must monetize platforms and applications.

competencies + control points

The voice era integrated core competencies and control points

Pre-2007, voice and SMS were core operator services. The were basic bearer services that unified competencies and control points. As long as they held network coverage and capacity advantages, operators controlled the market. Terminals and upstream and downstream SMS services were subject to network capacity, so when it came to ecosystem cooperation, the power lay in operators' hands. This was a golden age of high profits for operators.

The Internet era made terminals a control point where the basic competition model became data traffic + smart terminals

With the iPhone's debut in 2007, the focus of user value and experience began to shift from voice to web. Mobile phones had become information service centers, and smart devices were replacing the Internet as the best way to satisfy customer experience and value demands, causing the focus of competition to shift to smart devices. Apple thus dominated the market.

AT&T, the first operator to cooperate with Apple, was able to quickly reverse its fortunes in the market and become the world's top 3G operator by leveraging Apple's smart terminals to drive user migration and increase market share. In the US, AT&T and Verizon, which were positioned at the high-end of the market, cooperated with Apple, while mid-market and low-end operators worked with Samsung and HTC, respectively. Operators needed to offer data plans bundled with specific devices, or they would be unable to either grow users or increase data traffic.

The late Internet era saw video become a control point where data traffic + video became the new keys to success

In 2015, smart terminals started to become ubiquitous in the device-pipe-cloud ecosystem, and their importance in customer experience and value began to decline. Value shifted to upstream high-value content. Video currently accounts for 70 percent of traffic, and high-value video has started to become a new user and market control point. Without high-value video bundles, vicious competition over data prices would become unavoidable, which would lead to a collapse in the value of the data traffic market.

For example, following the end of five-year market penetration growth in the Saudi market, price competition over data traffic led to a double-digit slide in revenue and profits for operators. In developed markets like the US, Japan, and South

Before 2015 "Traffic + Terminal" strategy

Advantage: 4G networks

- Leader in network coverage and speeds: leading technology/superior experience
- Bundling of strategic control points: Leader in the user market landscape

Control point: Smart terminals

Matching users: AT&T/Verizon–iPhone; Sprint/TME–Samsung/HTC

Canceling terminal subsidies as the control power over terminal users wanes

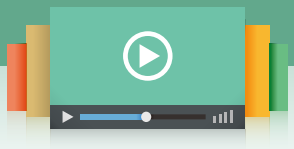
After 2015 "Traffic + Video" strategy

Advantage: FMC/SDN

- Network convergence: 8:2 traffic topology
- Network cloudification: Cost–efficiency

Control point: High–value video

- AT&T acquired Time Warner and DirecTV
- Verizon acquired CBS/Disney/Comcast through merger talks
- TME's partnerships with Netflix and YouTube/Binge–On



Bundling content packages as the control power over video users increases

Korea, average data per user per month (DOU) had increased by 1 GB per year, leading operators to implement data traffic and video bundle strategies. This generated a positive correlation in growth in user traffic and operating value, leading to positive market growth.

The smart era approaches: Intelligence in platforms and ecosystems will become the new control point

In 2016, AlphaGo beat world champion Lee Sedol at Go, achieving a milestone in the development of AI. In 2017, AlphaGo 2.0 defeated top-ranked Go player Ke Jie and then achieved quick consecutive wins against 60 masters. At Amazon's annual technology conference, Apple WWDC, and Google I/O 2017, the three leading US over-the-top companies all launched AI products. There's no doubt that we've entered the AI-first era, where intelligence has become the new strategic control point on all platforms.

From data traffic + device to data traffic + video

The US, Japan, and South Korea lead in the development of 4G and 5G. China has overtaken Europe to enter the second tier, while Europe now sits in the third tier. All other countries represent the fourth. As such, market followers such as China are following the strategic development path already set out by the top trio, and are transforming from voice-led markets into data-led ones. In these markets, the strategic control point is shifting from smart terminals to high-value video.

From 2010 to 2015, each of the top four US operators adopted a data traffic + smart terminals approach alongside core competency and control point strategies. In 2015, they shifted to data traffic + video strategies. AT&T's 2015 acquisition of DirecTV for US$48.5 billion and the launch of unlimited LTE, the Roku set-top box, and DirecTV services is a typical example of this strategy. AT&T was acting in response to T-Mobile's continued data price competition with its Un-carrier service. With this move, AT&T was able

> It's difficult for telcos to form a profit model from connectivity alone...telcos must monetize platforms and applications.

to consolidate its market position and protect its data traffic prices and profits.

There is a two-to-three-year gap in LTE development between China and the US. In 2015, AT&T was the first to adopt a video strategy and lead the focus of the market toward video strategies. This means that 2017 may mark a transition towards video strategy in the Chinese market.

Operators should move in the direction of video strategies and, through a process of trial and error, they can make breakthroughs in data traffic + video strategies by reforming their organizational structures and adopting flexible mechanisms.

The current key challenges and difficulties around video strategies are questions of how to acquire high-value content and how to succeed on the business side. There are four models for success in terms of high-value content acquisition: the merger model of US operators AT&T and Verizon; the ecosystem model exemplified by Japanese carrier KDDI's Smart Pass; South Korean operator LG U+'s co-production model; and the buying content rights model favored by European providers such as BT and Telefonica. There are also four high-value content acquisition models that OTT companies use: YouTube's UGC model; Netflix's PUGC model; Tencent's ecosystem collaborative model; and the content rights purchasing model employed LeTV, iQiyi, and others. Different operators in different markets can adopt the most successful high-value content acquisition models from around the world based on their own needs.

When it comes to operating strategies, carriers can learn from Internet companies and leading telcos – they can follow their strategic roadmaps to develop content operations: First, start from content collaboration; for example LG U+ worked with YouTube and local media companies to kick start its video busienss. Second, build up core competencies in fixed-mobile convergent broadband networks, much like Japanese operator KDDI's Smart Pass strategy, which reinforces its experience infrastructure. Third, build a service and data intelligence platforms that develop platform capabilities like video streaming media, CDN, cloud and data analytics, and precision targeting, similar to Netflix's model. And fourth, open powerful platform capabilities to drive ecosystem development and innovation, like the App Store.

With polyphonic caller ring back tone services, Chinese operators have replicable experience at successful content acquisition and operations. Platforms and ecosystems can be built for both music and video. Essentially, they are the same. If operators can learn from past examples and continue to optimize strategies, they can find the right answers.

New profits from new copper in emerging markets

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ADSL broadband is a fixed-line connection technology provided over home telephone lines. Until 2010, ADSL access led to a rapid global growth of Internet users. And today there are still nearly 300 million DSL broadband users and almost 600 million lines of copper cables worldwide, with emerging markets accounting for approximately 70 percent of those lines. How can operators maximize their returns?

By Zhou Jianjun, Vice President of Huawei Carrier Business Group

New copper

Over the past three years, new copper wire technologies like SuperVector and G.fast have revitalized fixed-line copper networks. According to Goldman Sachs, these new technologies will greatly benefit fixed-line operators' growth and "enable them to deliver 200+ Mbps high-speed Internet access to the majority of their users."

The new copper line tech requires between 40 and 75 percent less CAPEX than FTTH. Goldman Sachs predicts that by 2020 revenue growth from home broadband for European fixed-line telcos will have caught up with cable operators' revenues thanks to the benefits of new copper wire technology.

Utilizing existing copper resources to accelerate ultra-fast broadband network transformation has become a widely used method for ramping up broadband speeds among fixed network operators. In addition to offering sufficient bandwidth, new copper acceleration technology has proved popular with operators for two main reasons – no lead-in cabling and lower CAPEX.

Copper acceleration removes need for lead-in cabling, allowing for faster TTM: Because new copper acceleration technology leverages existing lead-in copper cabling, no additional cabling has to be laid and fixed terminals can be posted to end users, slashing on-site installation costs. The project deployment cycle for copper acceleration is up to six months less than FTTH.

Egypt Telecom implemented a Fiber-to-the-Cabinet (FTTC) copper acceleration solution, upgrading 3.5 million households in only three years, increasing 110% of FBB subcribers and optimizing the provisioning of fixed-line broadband services. The project was well-received by Egyptian consumers, leading to a considerable increase in customer satisfaction.

Copper acceleration lowers CAPEX and speeds up payback: According to Deutsche Telekom's publication *Capital Markets Day*, the CAPEX of the carrier's copper acceleration project was 70 percent less than FTTH deployment. Cheaper and able to deliver ultra-broadband to more users, copper acceleration is cost-efficient and, based on Huawei's experience, the payback period is under two years.

Fiber-copper integration

Some operators are employing a fiber-copper integration network construction model, supplementing the main method of copper acceleration, with FTTH. Fiber-copper integration is a creative network construction strategy that integrates a network's "spots and areas". "Spots" are greenfield areas with high user density such as high-rise residential buildings. The conditions of these areas allow FTTH to be used while mitigating the associated issues of high costs and long deployment times. "Areas" refers to the rest of the network where regular copper broadband acceleration methods such as Fiber-to-the-Cabinet (FTTC), Fiber-to-the-Building (FTTB), and Fiber-to-the-Distribution-point (FTTdp) can be easily adopted.

This combined method has significant benefits. FTTH can help to establish a market brand and attract high-end users, while copper acceleration can deliver services for users looking for a more economical product, who often represent the bulk of fixed-line broadband revenues.

Our global market insight shows that whole network upgrades generally take place in home broadband markets every 3 to 5 years and bandwidth upgrades follow a tiered progression from 5 Mbps to 20 Mbps, 50 Mbps, 100 Mbps, and 300 Mbps, and 1 Gbps. These changes are gradual and progress relatively steadily in the context of various factors, including Internet penetration rate, the wealth of video and content, consumer spending power, and information consumption habits in the local market.

For a significant number of operators, fiber-copper integration network construction has proved to be a robust strategy. In Philippine, the carrier PLDT adopted one-stop FTTC SuperVector acceleration solution to upgrade its legacy copper network. The solution satisfied the carrier's requirements to quickly increase speeds and revenue, boost its brand recognition, and attract high-value customers.

The advanced nature of FTTH networks and the ability of copper acceleration to deliver a quick commercial win requires operators to combine market segments

> The advanced nature of FTTH networks and the ability of copper acceleration to deliver a quick commercial win requires operators to combine market segments based on the current demands of the market.

based on the current demands of the market. They can then maintain a technological advantage to beat the competition and ensure the efficiency of commercial investment to obtain ample revenue. As such, fiber-copper integration is an excellent commercial strategy for fixed network operators.

However, for many operators doubts remain around copper wire quality and deployment when it comes to copper acceleration. After all, oxidation and poor contacts in copper cabling buried underground for decades can impact the ability to boost copper line speeds. In response, Huawei developed Line Expert, a copper quality assessment system that lets operators accurately and visually understand the quality of their copper lines and attainable bandwidth following the implementation of the new copper technology.

In one instance, Huawei set up a joint team with an operator, and collected test data and site samples over nearly two months, subsequently producing a copper cabling quality map of the carrier's entire network. Estimates showed that for 90 percent of the copper lines, the new copper technology SuperVector could deliver speeds of 50+ Mbps to end users within 800 meters.

Deployment difficulties associated with outdoor access sites, such as moving sites down to the street, site access, power supply, site integration, and anti-theft measures for batteries, are causes for hesitation for operators deciding on copper acceleration. In answer to these challenges, Huawei launched a one-stop solution that solves these problems, leveraging its experience of having deployed almost 400,000 outdoor access sites globally.

Huawei constantly invests in technological innovations for copper acceleration solutions, particularly in emerging markets where it refines scenario-based solutions to meet local conditions, working closely with operators in everything from front-end business design to back-end network O&M. We believe that basic copper networks still have great potential.

For fixed-line operators with vast copper resources, we recommend leveraging the fiber-copper integration networking strategy to harness the respective advantages of optical fiber and copper networks. With this solution, carriers can achieve the best combination of network advancement and investment efficiency and build future-oriented ultra-high-speed networks that will help them achieve sustainable business success.

Dubai Airports

Huawei partners with Dubai Airports to build a smart airport

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Business transformation drives company growth for telcos and other companies looking to enter the telecoms space. The key to business transformation is developing and promoting new service applications and creating the right business models to maximize service take up and payback.

By Chen Yingying

The giant along the maritime Silk Road

A cargo vessel loaded with commodities manufactured in China departed from Shenzhen for Dubai, a city on the southeast coast of the Arabian Gulf and an important stop on the 21st Century Maritime Silk Road. The commodities were mainly sci-tech products like computers and mobile phones, instead of the silk, chinaware, and tea exported to countries and regions along the ancient Silk Road thousands of years ago. There were also several containers with the Huawei logo loaded on the vessel. They carried Huawei's prefabricated modular data center inside. After a six-week voyage, the vessel arrived at Jebel Ali Port in Dubai, the world's seventh largest container port. Very early the next morning, the cargoes and containers were unloaded and shipped to the final destination — the data center construction site near Dubai International (DXB) Terminal 2. Technicians and engineers from Dubai Airports, Huawei, and Huawei's partner ALEC, had long been expecting the prefabricated modular data center and had been making preparations over the past four months.

This was, in fact, a very challenging data center project. In recent years, driven by rapid business growth, the eternal pursuit of a better passenger experience, as well as the increasing social responsibility of green energy conservation solutions, data centers have become an important part of Dubai Airports' digital transformation. Dubai Airports had several data centers, with devices provided by many vendors, complicated management, and limited cooling capacity. A new data center, therefore, needed to be built to further expand airport services and consolidate the services of the legacy data centers. The new data center was designed to have 100 service cabinets, with up to 10 kW/rack in a single cabinet. To ensure high reliability, Dubai Airports expected

> Huawei Fusion Module 1000B adopts a wide range of cutting-edge data center technologies to improve energy efficiency.

to build the world's first Modular Data Center Complex (MDCC) within a year, which will be certified by the Uptime Institute to Tier III for design and construction. The 10 kW/rack power density requirement, plus the extremely high temperatures in Dubai, posed great challenges for heat dissipation; however, an appropriate building to house such a large MDCC wasn't readily available. After considering quick deployment, easy capacity expansion, energy conservation, and other important features, Dubai Airports chose Huawei's prefabricated modular data center solution.

Prefabricated modular data center

Huawei's FusionModule1000B prefabricated modular data center solution was adopted to build the new data center for Dubai Airports. The solution consists of 23 container-sized prefabricated modules, equipped with in-row precision air conditioners and highly efficient modular UPS products. The total power is up to 1 MW. To obtain full Tier III certification from the Uptime Institute for both design and construction, the data center must ensure availability of 99.98 percent and an annual downtime of no more than 1.6 hours. The project was estimated to be completed in 10 months, meeting Dubai Airports' requirement for quick delivery and addressing the problem of lack of space for building a traditional data center. The modular data center solution is half the costs of a traditional facility and can be constructed twice as quickly.

Huawei FusionModule1000B adopts a wide range of cutting-edge data center technologies to improve energy efficiency. The variable-frequency in-row air conditioner, highly efficient modular UPS, and aisle containment can reduce the designed power usage effectiveness (PUE) to less than 1.6, which is 30 percent lower than that of a traditional data center. The design is also more adaptable to the intensely hot weather of the Middle East. In addition, Huawei equipped the new data center with the NetEco intelligent management system to simplify O&M and reduce management costs. The size of the prefabricated modules complies with ISO standards. Therefore, the capacity can be easily expanded by adding required modules.

Compared with traditional data centers, this implements flexible expansion and saves engineering costs and floor area.

DXB plus program

Dubai Airports has made sound plans and preparations to build such a large-scale data center. Since 1960, DXB has grown into the world's number one airport for international passenger traffic and one of the world's largest logistics transfer hubs. However, with Expo Dubai 2020 approaching, the airport faces increasing pressure to perform more efficient and smooth operations. The annual passenger traffic of the airport is estimated to increase from 83.6 million in 2016 to 118 million in 2025. To meet rising customer expectations and accommodate ongoing growth in traffic, Dubai Airports has launched the DXB Plus program which aims to use innovation and technology to increase the hub's capacity.

Peter R Moore, Director of Development (Design) at Dubai Airports commented: "With little room for any further major infrastructure on the airport, Dubai Airports is joining forces with its key stakeholders to design product innovation and operational improvements that will deliver on the sector's ambition and ensure ongoing contributions to Dubai's economy. The focus of DXB Plus is to integrate the sector's efforts to meet airline demand and ensure a world-class customer experience from 'cloud to curb' – vital for delivering unconstrained sector growth."

The MDCC at DXB represents an innovative masterpiece jointly created by Dubai Airports, Huawei, and other players in the ecosystem. The MDCC meets the information infrastructure requirements specified DXB Plus, helping Dubai Airports to achieve stable and efficient operations, as well as digital and cloud-based business over the next ten years.

Customer experience matters most

One of the world's most popular airport provides not only upgraded hardware infrastructure, but also an optimal customer experience. The International Air Transport Association (IATA) conducted a worldwide

survey in 2016 to provide some references and suggestions for airports. The survey results show that 64 percent of the respondents prefer to board aircraft using electronic boarding passes on their mobile phones, 39 percent prefer electronic bag tags, and 61 percent expect to track their baggage throughout their journey, similar to the way courier companies allow them to track parcels. Also, 47 percent of the respondents hope the time for baggage drop-off can be limited to within one to three minutes, and 52 percent said their acceptable queuing time at immigration is between 5 and 10 minutes.

Dubai Airports puts customer experience first. The company attempts to optimize customer experience with a three-pronged approach: products, operations, and airport infrastructure. In terms of products, based on a deep insight into future trends, behaviors, and customer expectations, Dubai Airports integrates products and services to deliver a consistent customer experience, and lead the innovation of future products and services that enhance hospitality and meaningful connections. As for operations, Dubai Airports aims to enhance the predictability of airport operations, ensure the cost effective use of existing assets, provide a reliable, resilient, and streamlined process for each customer touch point, and ensure stress free journies for varied customer types. Last but not the least, Dubai Airports will implement customer-centric design and develop an infrastructure and ecosystem, providing sufficient capacity to accommodate sustained airline and operator growth while maintaining the integrity of existing infrastructure.

Dubai Airports is proactively continuing to optimize customer experience in a wide range of aspects, including customer service and processing, baggage and cargo processing, operations, airspace and runways, stands, and infrastructure. Great efforts have been made to enable free Wi-Fi, Smart Gates, data collection and sharing, airport apps, requirement forecasts, asset management and maintenance, and flight punctuality rate management, among others.

Smart Gates are deployed at DXB to speed up passport control procedures, facilitating smooth and swift entry and exit at the airport. A passenger holding an Emirates ID card or a biometric passport can bypass long queues

> Technology is key to enhancing our ability to grow, innovate, and ultimately enhance the customer experience.

and complete the immigration process within seconds. The Smart Gate service saves passengers' time and helps the airport maintain smoother passenger flow.

New ICT helps build a smart airport

According to the Societe Internationale de Telecommunications Aeronautiques (SITA), cutting-edge technologies are needed to optimize Information and Communications Technology (ICT) systems, thus building a dynamic, efficient, collaborative, and innovative smart airport to accommodate future needs. How can we use new ICT technologies to support smart airport construction? For example, cloud computing and big data make airports more intelligent. Advanced network technologies ensure ubiquitous connections. LTE technologies help provide network coverage over the airports' airspace. The Internet of Things (IoT) supports interconnected and intelligent devices. With these new ICT technologies, all businesses will become digitalized while service levels rise. All the above are inseparable from data storage, transmission, and computing, and none can happen without data centers.

After being officially rolled out, the MDCC constructed by Huawei at DXB will carry services that cover almost every aspect of the airport, including flight information and airport operations, passenger transportation and baggage services, connectivity and Internet services, video surveillance, enterprise business operations, and maintenance. Featuring resilience, quick deployment, reliability, energy-conservation, easy maintenance, and cost effectiveness, the MDCC provides powerful support to carry out highly efficient business operations in Dubai Airports.

The CIO at Dubai Airports said "Technology is key to enhancing our ability to grow, innovate and ultimately enhance customer experience. At the same time we will improve system reliability across both airports and cut operating costs."

Dubai Airports will deliver an optimal customer experience and the highest levels of mobility, sustainability, and opportunities to visitors coming from around the globe to Expo Dubai 2020, and showcase what the world's best smart airport can offer.

SIRO gets serious about Gigabit

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Aiming to take Ireland into the age of next-gen connectivity, SIRO is a joint venture between Vodafone Ireland and the nation's state-owned electricity utility, ESB. The JV is investing €450 million in Ireland's first 100 percent fiber-to-the-building (FTTB) broadband network, offering speeds of 1 Gbps and connecting 500,000 premises in 50 Irish towns.

By Sylvie Su

> SIRO has changed the conversation in Ireland as to what a 'true' fiber network is...We mean 100% FTTB.
>
> – Sean Atkinson, CEO, Siro

Changing the conversation to fiber

Ireland, the emerald isle, has a population of more than 4.7 million, over 2 million households, and a digital economy worth an estimated €12 billion per annum. The Irish government wants to bring high-speed communications to everyone under its National Broadband Plan, with a commitment to delivering at least 30 Mbps to all citizens, including those in rural and remote areas.

However the latest statistics from the nation's regulator, ComReg, shows that copper is still the dominant technology in the fixed broadband market, accounting for nearly 70 percent of total subscriptions. Despite recent investment, Ireland's copper networks are unable to meet the demands of emerging new services, especially bandwidth-hungry applications like cloud computing and video conferencing. According to ComReg, 20 percent of people in Ireland have broadband access with a contracted speed of less than 10 Mbps. The 2016 consumer report by Switcher paints a bleaker picture, particularly outside Dublin, reporting that one-third of Irish connections are less than 5 Mbps.

SIRO was established in May 2015 to improve this situation, and began with rolling out a 100 percent fiber optic network, which has improved services in towns and forced other operators to start implementing fiber as well.

"SIRO has changed the conversation in Ireland as to what a 'true' fiber network is," says SIRO CEO Sean Atkinson. "We mean 100 percent FTTB, so that consumers get proper broadband connectivity that meets their needs for decades to come." As an open network, six operators currently offer services, which according to Atkinson, means that people get more choice and value.

Power networks

Fixed network deployment involves heavy up-front investment and slow ROI, which is an obvious challenge for most operators. When an operator builds a fiber network from scratch without access to an existing infrastructure, it has to dig a trench and lay down the fiber, which is very costly and time-consuming.

> People no longer need to move to major cities for broadband access, with Gigabit connectivity bridging the rural-urban digital divide in Ireland, allowing people to work from home and set up businesses in their hometown.

According to Atkinson, SIRO uses the local electricity network to deliver FTTB, because of course every building in Ireland is connected to an electricity supply. When SIRO builds in a town, it runs fiber optic cables underground in the existing ducts of the electricity company, then up onto the power lines, and finally to people's homes. Both underground and overhead, SIRO has a unique way of deploying fiber optic cables along electricity pathways, which saves time and minimizes cost and gives the JV a competitive advantage.

Plans and partnerships

SIRO's initial business plan is to connect 500,000 premises in 50 towns, which is about 25 percent of the Irish market. "We plan to connect over 100,000 premises by the third quarter of 2017," says Atkinson, commenting on an ambitious plan that needs partners. SIRO works closely with a community of vendors, contractors, suppliers, retailers, and of course its parent companies, ESB and Vodafone.

SIRO teamed up with Huawei when the initial technical trials were conducted in Cavan Town in March 2015. Since then, the relationship has gone from strength to strength, with Huawei now the exclusive provider of active equipment for SIRO for its first phase build and its build partner in Athlone.

True gigabit connectivity

Atkinson believes that it's important to educate the public on the benefits of true gigabit connectivity. SIRO aims to change the way people communicate and do business in regional Irish towns. People no longer need to move to major cities for broadband access, with Gigabit connectivity bridging the rural-urban digital divide in Ireland, allowing people to work from home and set up businesses in their hometown.

"When we go into a new town, we try to find an initiative to showcase Gigabit connectivity, for example, a digital hub," states Atkinson, mentioning that the people in the town find a building and turn it into a digital hub. "We've partnered with Vodafone as a retailer where we provide free gigabit connectivity for two years, so small businesses can establish themselves in the town. This makes people aware of the new services that SIRO brings and of the benefits of having gigabit connectivity."

Thanks to SIRO, the concept of a Gigabit society is developing in Ireland. With proper connectivity, small businesses and entrepreneurs can establish in regional Ireland and compete globally.

Atkinson concludes that in the next three years, SIRO will add a further 400,000 homes to its existing footprint of 100,000 homes, thus ensuring that 50 of Ireland's regional towns are future-proofed with world-class connectivity.

The race is on: NB-IoT means smart and fast for ofo

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Whether it's shared spaced, books or bikes, the sharing economy is built upon the concept of "use it when you need it." The Chinese government describes the sharing economy as an excellent example of supply side reform that drives wider economic restructuring. With this official seal of approval and strong popular interest, any sharing platform can succeed if it knows the market and has the right amount of technical integration and support.

> The popularization of sharing services has led to rising expectations, and users are no longer satisfied with the basic sharing service. They want a bike exactly when and where they need one.

Pain points behind the figures

As the market expands and industry models continue to develop, the sharing economy has begun to truly mature. By June 2017, for example, more than 100 million people had used China's shared bicycles. The nation's Belt and Road Initiative has further helped the shared bike phenomenon spread through Southeast Asia, Central Asia, and even Europe and the US.

But, the popularization of sharing services has led to rising expectations and users are no longer satisfied with the basic sharing service. They want a bike exactly when and where they need one. And they want to pedal away quickly. As well as frustration at how easily the bikes can be damaged, complaints about slow unlocking and payments are on the rise.

A second issue is unsustainable business models, as companies that go for maximum user numbers soon lose their competitiveness. However, market segmentation based on analytics can focus on and retain high-value users.

For the shared bike scenario, two approaches can revitalize a jaded business model:

- **Implement smart management.**
- **Seek partners for new innovations.**

Tech drivers for ofo

ofo has consistently optimized its operations and marketing to become the world's largest shared bicycle platform with the highest market share. But a range of challenges still remain, including inefficient equipment management, failure to balance communications and power dissipation, and low density of data collection sites.

In response, ofo explored new possibilities of smart management, and decided to work with a number of ecosystem partners to move the sharing economy one step closer to the intelligent era.

Two improvement approaches

One: innovative technologies. The company's top priority was to introduce and popularize smart locks to improve user experience and enable all kinds of value-added services. In the past, although a variety of electronic smart lock technologies had certain strengths, they invariably had at least one glaring defect, for example, network compatibility, battery life, communication costs, or use.

Based on NB-IoT technology, ofo developed an IoT smart lock that lowers power consumption, enables wide coverage and heavy connections, and slashes system resource delays at low cost. Having led the shared bike sector into the NB-IoT era, ofo is already reaping the rewards of an improved user experience, especially for commuters who use the bikes to ride from subway stations to work.

NB-IoT ensures ofo has bikes located at peak locations when commuter demand is highest, while the new lock can be unlocked in less than a second. Both improvements have greatly boosted user satisfaction.

Two: partners. Three key pillars support ofo's tech upgrades: the company's own platform, the commercial network provided by China Telecom, and Huawei's intelligent chip-based NB-IoT solution. When launching its NB-IoT solution earlier this year, ofo founder and CEO Dai Wei commented that the cooperation between ofo, Huawei and China Telecom is a "mutually beneficial joint force of three global leading enterprises."

At the core is Huawei's IoT solution, which includes smart chips, networking, and an IoT platform. The solution provides strong coverage in poor-signal areas and a network capacity that's more than one hundred times stronger than standard terminals. The payment process has dropped from 25 seconds to less than 5, while battery life has extended from 1 or 2 months to more than 2 years, saving costs and reducing the need for frequent maintenance.

> ofo's cooperation with Huawei on NB-IoT smart locks bodes well for improving the industry as a whole.

While Huawei and China Telecom provide the necessary tech support, this is only the beginning of smart management.

Making sharing smart

Key technology platforms for the sharing economy in the mobile area exist in the areas of perception, networking, and application. Perception is the ability of shared equipment to obtain data through sensors. Networking lets equipment process and analyze data. And application is the ability to deliver smart management.

ofo's cooperation with Huawei on NB-IoT smart locks bodes well for improving the industry as whole. Huawei's technology optimizes lifecycle management for locks, while the sensors on the locks collect information such as equipment status, user data, and operating data. They connect the front- and back-end industrial chains to achieve intelligent business management, allow the bikes to be located in hot spots, facilitate rapid maintenance, and boost marketing and VAS capabilities.

This kind of mutually beneficial partnership is emerging as the best guarantee for innovation and progress in not just the sharing economy, but in all industries. In this context, Huawei's Deputy Director of Telecoms Systems Zhang Xiuzheng reported Huawei's plans to collaborate with various partners "in the fields of chips, IoT platforms, big data, and application ecosystems" so as to help industry as a whole become smart.

With the right partnerships and technologies underpinning new business models, the smart sharing economy is destined to improve life for all and, in ofo's case, contribute to a greener and cleaner world.

About ofo

Launched in June 2015 and headquartered in Beijing, ofo (www.ofo.so) leads the market with downloads, users, user growth, bicycles, daily orders, average daily bike usage, and other indexes. As the creator and leader of the shared-bicycle industry, ofo's trademark yellow bikes represent the world's largest and most valuable bike-sharing platform. ofo connects more than 6.5 million bicycles worldwide, and has provided over 2 billion rides to more than 100 million subscribers in over 150 cities. With footprints in the US, Britain, Singapore, Kazakhstan and Thailand, it's also China's first global online company.

Andreani

Going beyond logistics with cloud and data

Scan for mobile reading

The impact of China's Internet+ strategy has been felt around the world. Products relating to the strategy are on enterprises' wish lists, and data is increasingly recognized as a vital resource – "the new oil" according to some. It's clear that cloud and big data are the keys to digital transformation.

> Andreani's original IT architecture wasn't flexible enough for large-scale concurrent operations, placing growing pressure on its business.

Data strategy

In the information age, the logistics industry is becoming interconnected with ecommerce, retail, and a range of other services that's leading to new partnerships. In China, for example, the courier service SF Express has entered the retail business, while Cainiao Logistics is working with the ecommerce giant Taobao. As a result, the data created from these types of businesses is set to grow exponentially as logistics companies evolve into big data companies and data becomes a core business strategy.

Today, the global logistics industry is worth more than US$8.5 trillion, and is growing at nearly 7 percent annually. While multi-type, multi-structured, and multi-industry data has strategic value, it also presents a challenge for global logistics enterprises when it comes to digital transformation.

Founded in the 1940s, Andreani, Argentina's largest logistics company, is an example of good practice.

Big business needs big data

Andreani provides logistics services for a range of industries, and its operations extend to South America's other major market, Brazil.

Andreani has built on more than 70 years of experience in logistics to expand its reach into ecommerce, becoming the first commercial platform to offer end-to-end solutions in Argentina. Its services include product warehousing and storage, packaging, supplier management, and door-to-door delivery. Its thousands of customers include many big names, including Santander Bank and Hewlett-Packard.

An increasing volume of business meant that Andreani's data has kept growing. The company also faced a classic IT upgrade problem: Its original IT architecture wasn't flexible enough for large-scale concurrent operations, placing growing pressure on its business. Digital transformation was the answer.

Data-first pain points

As data was the source of Andreani's problems, data integration, storage, and cloud computing were the keys to the solution. As the company started on its digital transformation

journey, four issues emerged:

One, its data center was served by four suppliers, which complicated operations and management due to a lack of coordination and unified platform.

Two, after expanding into ecommerce, data traffic increased but the background system architecture wasn't scalable and had low data concurrency. As a result, the user interface was often slow and no disaster recovery plan was in place.

Three, the real-time requirements for data processing required a large and stable private network. But, its cloud service provider was using a SAP ERP system that had no local nodes, delaying application system networks and delivering a poor user experience.

Four, Andreani's core warehousing system used VMware tech and a Veeam remote disaster recovery solution, so disaster recovery sites were expensive to build and at least some downtime was inevitable.

As an industry leader, Andreani's problems were representative of the entire logistics industry in its early transformation period. It needed new solutions through working together with upstream and downstream businesses, as well as forging new links with cross-industry ecosystem partners.

Open Cloud is the answer

In October 2016, Huawei and Telefonica Business Solutions jointly launched Open Cloud and Cloud Server services in Chile, Brazil, and Mexico in a partnership designed to help traditional IT go to the cloud. Huawei provided innovative hardware and software solutions, including servers, storage, networking, and cloud operating systems. It also provided technical support for both Open Cloud and Cloud Server services.

Open Cloud allowed Andreani to achieve cloud transformation and benefit from service support covering strategy, corrective measures, and O&M:

Open Cloud delivers a complete solution for data migration, improves O&M, and helped to migrate Andreani's existing application systems

> Integrated packages that combine mobile products and partners' products have broadened the digital services available to customers and created new revenue streams.

to TOC cloud. The company can gradually unify its decentralized data centers and meet the operating demands of governing multiple data centers on one O&M platform.

At the infrastructure level, Open Cloud provides cloud servers and scalable services to help the IT infrastructure of Andreani's ecommerce platform go to cloud; enable the platform to achieve flexible, scalable and resource-agile expansion; and deliver a targeted disaster recovery solution.

With its inherent advantages in network resources and geography, Open Cloud uses local nodes to reduce the network latency of business applications, such as Andreani SAP DEV&QAS, and enhance the cloud application experience. It's helped Andreani build a cost-effective, stable, and robust disaster recovery system by providing a highly reliable and PAYU-based disaster recovery solution for its core warehousing system.

The DR (disaster recovery) solution provided by Open Cloud is a key solution that, in any industry and especially logistics, is worth millions of dollars. Even a minor problem with a data center may cause the entire logistics chain to collapse.

Open Cloud DR is one of the solution's most successful business application models, providing support for future market expansion in various fields.

Three-step program to cloud

Today, Telefonica and Huawei are preparing to launch Open Cloud public cloud services with a customized three-step process specifically for Andreani. Ecommerce and core warehousing system disaster recovery will go to cloud, and SAP network delays will be reduced. This project will provide Andreani with a complete set of efficient and high-performance disaster recovery solutions, plus the comprehensive and unified management of different cloud platforms. It will enhance O&M efficiency, lower overall disaster recovery TCO, and provide a solid foundation for integrated data storage, allowing Andreani to develop innovative new services including IoT, robotics, and process optimization, helping the company enter the smart logistics era.

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