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VIP Voices

JT: Building an Enviably 4G Network
in the Channel Islands

VimpelCom: Go for Virtualization

Tech Forum

Immersive Experience: A Prime
Dimension in Video Entertainment

Special
Topic

Big Video

The Road to Big Video Revolution

Graeme Millar, CEO of JT

CONTENTS

ZTE TECHNOLOGIES JUN 2016



VIP Voices

05 JT: Building an Enviably 4G Network in the Channel Islands

Reporter: Ma Xin

09 VimpelCom: Go for Virtualization

Reporter: Zhang Ying

12 Voices from Global Major Operators

Reporters: Zhang Ying, Yue Lihua

Special Topic: Big Video

15 The Road to Big Video Revolution

By Cao Jia, Xu Huoshun, Yin Qin

19 PSVN: The Ultimate Path to Video Transmission Network

By Zhou Xueren

21 Big Video, Best View

By Zuo Luo

23 Promising CDN in the Big Video Era

By He Yanfeng



Tech Forum

26 Immersive Experience: A Prime Dimension in Video Entertainment
By Weijun Lee

29 At ZTE 5G Is Now—Ubiquitous Connectivity and the Internet of Things
By Silvio H. Fernandez

32 Enabling the Future with ZTE Services
By Thierry Langlais

Success Stories

35 JT Celebrates the Delivery of Its 4G Mobile Network
By Ma Xin

37 Big Video Booming Worldwide
By Cao Chengbo

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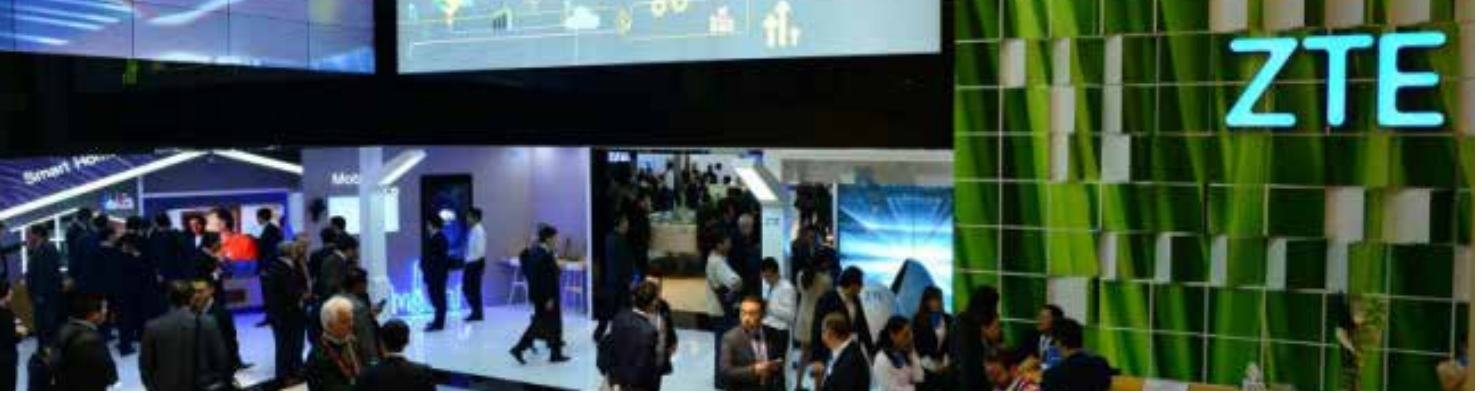
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A technical magazine that keeps up with the latest industry trends, communicates leading technologies and solutions, and shares stories of our customer success



ZTE First-Quarter Profit Reaches RMB 950 Million after Improvements in Operating Cash Flow

28 April 2016, Shenzhen, China — ZTE Corporation (H share stock code: 0763.HK / A share stock code: 000063.SZ), a major international provider of telecommunications, enterprise and consumer technology solutions for the mobile internet, announced its first quarter results for the period ending 31 March 2016.

The Group reported operating revenue of RMB 21.859 billion, representing a 4.09% increase year on year. Net profit attributable to shareholders of the listed company amounted to RMB 950 million, representing a 15.97% increase from the same period last year. Basic earnings per share amounted to RMB 0.23. The Group's net profit after extraordinary items, operating cash flow and net cash and cash

equivalents at the end of the year all made a big progress. R&D ratio hit a historical high 13.96%.

ZTE continues to innovate in line with its M-ICT strategy and set a new record by investing 13.96% of revenue into R&D in Q1. ZTE is among the top three companies for number of PCT patent filed globally and first for the number of invention patents applied for in the mainland. ZTE has filed for more than 22,000 terminal-related patents globally, of which more than 4600 were accepted. More than 500 patent applications were related to the flagship AXON series. This is strategically significant for the internationalization of ZTE's products, especially in Europe and North America.

Looking towards the next quarterly

announcement, "multiple connections and ultra-broadband" will become the new trademarks of the M-ICT era. Network operators will benefit from ZTE's increased value on smart network to support operators' transformation from telecommunications operators to information carriers. For enterprise business, ZTE will continue the focus on key industries and markets, streamlining standard operations and speed-up replication of successful examples to solidify its position in the industry. For terminal business, ZTE will continue to fortify its competitiveness by increasing brand awareness. Concurrently, ZTE will continue to increase internal managerial efficiencies, especially in talent acquisition to advance core R&D to advance its M-ICT strategy journey.

3
JUN 2016
ZTE

ZTE OTN Equipment Rated "Leader" by Current Analysis in Metro Packet-Optical Transport class

11 April 2016, Shenzhen, China — ZTE announced that its new-generation, super-large-capacity packet optical transport network (OTN) equipment, ZXONE 9700, received a positive response from Current Analysis, a leading global telecommunications, software and IT service consulting company. The ZXONE 9700 was rated as a "leader" in the metro packet-optical platform product class. Additionally, according to the latest

global optical networking market share report issued by OVUM, thanks to the excellent performance of the ZXONE 9700 series products, ZTE wavelength-division multiplexing (WDM) products experienced major market share growth in Q4 2015 and ZTE has become the third largest WDM product supplier in the world.

The ZXONE 9700 series products adopt a number of subrack designs

with different sizes and different cross-connect capacities, so they can satisfy the requirements of all application scenarios from the edge aggregation layer to the core backbone layer. The ZXONE 9700 S6 subrack has an industry-leading 72 service slots; each service slot has a backplane bandwidth of up to 400G, which can help to achieve the smooth upgrade from 100G OTN to 400G OTN.



ZTE-Jiangsu Telecom's Big Video Fixed-Mobile Convergence Solution Wins Best Multiscreen TV Service or Solution at TV Connect

28 April 2016, Shenzhen, China — ZTE announced that its big video fixed-mobile convergence solution for Jiangsu Telecom won the Informa “Best Multiscreen TV Service or Solution” category at the TV Connect Awards for the connected entertainment industry held on 27th April in London.

Widely recognized by telecom operators, ZTE's big video fixed-mobile convergence solution is designed to enable the convergence of fixed and mobile networks. It integrates the service platform, content delivery network (CDN) and multi-screen terminals for telecom operators. It features a unified platform, flexible networking, intelligent operation and maintenance (O&M) multi-screen

interaction and ultra-high definition (UHD) to meet diversified customer requirements and deliver a high quality video experience to users. Jiangsu Telecom's internet television/over-the-top (IPTV/OTT) platform deployed by ZTE is extensive, and the fixed-mobile convergence solution has helped Jiangsu Telecom increase the number of its users from 1,000 to 6 million. The ZTE solution accelerates full-service development for Jiangsu Telecom, including video-on-demand (VOD), liveTV, OTT, gaming, public services and internet services. It offers a full-terminal experience for users through interaction between a TV and a mobile phone, tablet and PC, which underlines why this is a successful model in the field of big video.

ZTE Unveils ZSmart Digital CRM at TMF Forum Live

11 May 2016, Shenzhen, China — ZTE announced the debut of its ZSmart Digital customer relationship management (CRM) solution at TMF Forum Live this week. The ZSmart Digital CRM is a cloud-based, digital ecosystem-driven next-generation telecom solution that enables communication service providers (CSPs) to facilitate the digital life of customers by delivering sophisticated services and seamless experiences.



ZTE Awarded the 2015 SSA Frost & Sullivan Award for Customer Value Leadership

10 May 2016, Shenzhen, China — ZTE has been awarded the 2015 Sub-Saharan Africa (SSA) Frost & Sullivan Award for Customer Value Leadership.

During its recent analysis of the green energy solutions market for telecommunications, Frost & Sullivan found that ZTE's integrated multi-energy solutions with its industry-leading telecom technology, makes it both a strategic technology and an energy partner of choice. Frost & Sullivan also identified ZTE's leading ability to meet the evolving needs of the SSA market by providing clean, reliable, modular, and cost-competitive energy solutions.

“ZTE is honored to accept this award,” said Cui Wanheng, General Manager of Energy Product Department. “We are committed to bringing our innovative solutions to the SSA region, addressing the singular needs and constraints of this vibrant regional market.”

“Committed to pioneering improvements in the entire telecom technology value chain, ZTE's global geographical service footprint exceeds 160 countries and 386 telecom operators,” said Danielle de la Mare, Frost & Sullivan Research Analyst. “The transformation of its brand and corporate culture to encompass its values of environmental responsibility, creativity, and collaboration is significant in driving its reputation in the SSA market for the next generation of best-in-class green energy solutions.”

JT: Building an Enviably 4G Network in the Channel Islands

Reporter: Ma Xin



5
JUN 2016
ZTE

Graeme Millar, CEO of JT

Jersey Telecom (JT) has over 120 years' experience in telecommunications and is dedicated to delivering world-class services. JT's history goes back to 1895. It is a full-service global consumer and business enterprise provider, with services covering domestic fixed land line through to leading-edge data hosting for the e-gaming industry. Recently, *ZTE Technologies* interviewed Graeme Millar, CEO of JT. He shared with us the unique characteristics of the Channel Islands; JT's achievements, challenges and opportunities; his thoughts on the MNR project; and plans for 2016. He also talked about his expectations for ZTE and network operation.

What JT's achievements would you like to highlight in the past five years?

I think the greatest achievements have been business growth and preparing the business for further growth. We've done a lot of things over the past five years. In terms of the plan, we've put a lot of focus on systems. As well as focusing on improving the way we train people and looking at improving processes.

Perhaps our biggest focus has been on our enterprise managed services, things like cloud, machine to machine, subscriber intelligence products and, of course, ultrafast network connectivity, of which the 4G network that we've done with ZTE has been very important.

What are the unique characteristics of the Channel Islands telecom market?

I think we are a kind of unique bridge between Europe and the rest of the world. Because the island has very few natural resources, we've had to be a nation of traders from the early days, and we've been very innovative. If we go back to the 1700s, we would take French cider, re-label it with a Jersey label, and ship it to England. In fact, at the height of that trade, you would have needed an island 50-fold bigger than Jersey to grow all the apples to make the cider. Then in the 1800s, we were a landing port for the cod fishing fleets in the North Atlantic that would catch cod, salt it,

and bring it to Jersey, where it would be shipped to the UK. So we've been that kind of unique bridge between Europe and the rest of the world for many centuries.

These days, we're a meeting point for a lot of technologies, financial services, intellectual property, and legal firms.

What do local customers demand from a network?

In many respects, it's the same as all other countries that have a sophisticated and developed customer base. About two percent of all the wealth in the world passes through Jersey each year which is about two trillion dollars a year. Because of that, many of the world's largest banks have a presence in Jersey. JT delivers services to 18 of the world's top 20 banks. They demand great connectivity and, very importantly the reliability.

As well as that, we've supported many local small and medium-size businesses, particularly in the digital space. For example, one of our customers is a video production company that does a lot of work for Hollywood right here from Jersey. They have huge files that they need to be able to send, and our fibre network provides the speed and superfast connectivity to allow them to do so seamlessly.

Despite the island's small size, our customers are very demanding. They don't expect to get small service just because we're in a small island.

Could you tell us some details about the MNR project? What is the significance of this project for JT's further development?

The 4G rollout project was really important for us.

When we talk about the 4G rollout, we actually took out the entire 2G and 3G network and did an entire upgrade. The equipment that we had was ten or eleven years old and was getting to the end of its life. There were many service and upgrade issues.

Working with ZTE, we got some of the most advanced equipment, and that helped us do two things: Firstly, it massively improved the reliability of services we provided to our customers; secondly, it had a huge



improvement on the quality of services.

Customers get much better coverage, and we have extra spectrum, including spectrum at 800 MHz, so both the coverage and speed has gotten much better. We have an advanced network. We've seen speeds of up to 200 Mbps, which is more than fourfold faster than the speed customers were experiencing on the old 3G network.

In your view, what are the main issues concerning network evolution?

I think there are several issues. Of course a key challenge for any operator is to continue to satisfy customer demands for data, but also deliver that at an affordable price. I think this is maybe an area where JT, as a small operator, has some unique challenges. Because we have got a relatively small customer base, it can be difficult to get that return before we make further investment.

In addition, we face the same issues as everyone does in relation to delivering great services at a sensible cost for our customers, and we have an extra challenge of paying for the latest piece of technology we've bought, before it gets superceded by something new.

What main challenges do you see for JT?

Our biggest challenge is that telecom is a scale game, and we're relatively small. How do we succeed as a small player in a world where two things are happening: the capability of the equipment in terms of capacity is getting bigger all the time. Vendors keep building boxes that do more and more for more and more people. The rate of change is also increasing exponentially.

I remember analogue deployment—analogue Advanced Mobile Phone System (AMPS) in America, Extended Total Access Communication System (ETACS), and Nordic Mobile Telephone (NMT). I even remember NMT-450. Some of those NMT-450 networks lasted nearly twenty years before they were decommissioned, yet we might these days be changing or decommissioning the 4G network after potentially five or six years. You really see as each generation goes by the increasing speed of change. Because of our size,



that is a great challenge. The secret for us, therefore, is to work with world-class partners such as ZTE, to provide equipment that is upgradable and to help us anticipate and build for the future.

Another challenge is our own business development outside the Channel Islands and finding customers for our services outside our home market to help provide the return on capital investment on our home shores.

What are your ambitions for 2016?

We're coming to the end of a big investment period. We've completely switched out our fixed network infrastructure, and we're almost through rolling out fibre to the home for our customers. These investments will see Jersey ranked in the Top 5 for



In an interview

global connectivity in the air and in the ground. We've also swapped out the mobile infrastructure and alongside this have put in a new billing and customer operation systems.

Therefore for me, 2016 will be a year of consolidation; it's a year of making everything we've put in place over the past three or four years work really well together to improve customer experience, and enable customers to access the capability of the systems we've bought. And we want to use that to continue our global growth.

In six years, we've gone from seven percent of our sales coming from outside the Channel Islands to about two thirds, and I want to see that build further during the year.

How do you view ZTE as a partner of JT? What are your expectations for the future cooperation?

When asked about ZTE, what I've said to other people is that in my six years as CEO of JT, choosing ZTE as our partner for the mobile network was the best vendor-selection decision I've made.

Why? Because we've formed a genuine strategic partnership, we work very closely together; we trust and understand each other; we respect each other's businesses. Both of us are trying to make a positive business case for both parties. Finally, we enjoy working together, we have a bit of fun along the way as well.

With twenty-five years' experience in the telecom industry, could you share some of your insights into the network operation?

Well, the changes have been so great. When I started out, fewer than one in a hundred people in the UK had a mobile phone. We were on analogue technology, and when people asked for your number, you would give your fixed-line number, not your mobile number.

What I've seen change enormously over the last twenty five years is the way that people have used our services. I don't really look at the technological change; I look at what has happened with the way people use things. People have gone from very static voice-only service, where they were used to voices being delivered to a place, to a totally immersive interactive experience which is delivered to you when you want, wherever you are. Within that we've therefore seen a colossal move from voice to data.

We've seen the take-up from almost no customers, I mean from less than one in a hundred people in UK. I still remember that the original business case for Vodafone for the deployment of its analogue network in the UK. We now talk about penetration rate in terms of hundreds of percent and multiple devices, and we've had to build networks over the past twenty-five years that cope not just with voice but with data and increasing amounts of content, such as video.

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VimpelCom: Go for Virtualization

Reporter: Zhang Ying

Yogesh Malik, Group CTO of VimpelCom



VimpelCom is an international communications and technology company headquartered in Amsterdam. It is one of the largest mobile network operators in the world by subscribers, with more than 200 million customers in 14 markets. VimpelCom's brands include "Beeline" (in Russia and CIS), "Kyivstar" (in Ukraine), "Wind" (in Italy), "Djezzy" (in Algeria), "Mobilink" (in Pakistan), "Banglalink" (in Bangladesh), amongst others. Recently, *ZTE Technologies* interviewed Yogesh Malik, Group CTO of VimpelCom. He shared with us VimpelCom's innovation initiatives; his hopes for the virtualization technology; challenges in digital transformation; and priorities for the next few years. He also talked about his expectations for ZTE.

Could you introduce some of VimpelCom's innovation initiatives?

I think VimpelCom is thinking of innovation in a very different manner than the rest of the telecom industry. In my opinion, what we want to do is not to innovate within the current model, but to change the total telecom model. By that, I mean coming closer to the customer, so we are implementing a lot of initiatives on the customer end, and decoupling data out of the current architecture in a way that will allow us to really bring data science into life.

In addition, we are looking at systems, not only from the system point of view, but from the globalization point of view. By doing that, we can become leaner and faster to operate in the telecom market.

These are a couple of innovation initiatives that we have engaged in across the VimpelCom group.

What are your hopes for the virtualization technology? What is the importance of the virtualization-based network?

Well, first of all, I'm very happy that virtualization is

not a myth, but a reality. It is happening here and now.

We have launched our virtual packet core with ZTE in two countries so far, but VimpelCom is planning to launch virtualization in other countries as well, in the future.

My biggest hope is that virtualization can really decouple hardware and software. De-couple hardware and applications in such way that we can become application agnostic, while the redundancy and the performance would still stay at a carrier grade or higher. I think that is my biggest hope.

The future is about virtualization. I believe it will be available in the very near future, so we should start embracing it everywhere. I would say my hope is to go more virtual.

What measures did VimpelCom take to promote the digital transformation?

We have already started the journey of digital transformation. We think of the architecture in a very different manner, and we think customer engagement first, hopefully to the extent where we can implement the internet-like model. We have taken competence, skillset and enhancement measures to promote the digital operating transformation and we are serious about it.

Moreover, we have recruited top notch talent and invited them to use their experience to help us lead the transformation of VimpelCom into a digital technology company.

What are the main challenges faced by VimpelCom in the digital transformation? How do you overcome them?

I think the biggest challenge we are facing is mindset, because when companies operate in a certain way for many years, let's say, for ten, fifteen or twenty years, it is really hard to change it quickly.

The challenge we are facing is not a technology



challenge or a process challenge, but people's mindset challenge. We have people that need to think differently when we move into the digital world. It's thinking beyond network, and about customers' lives and their digital lifestyle. To achieve the transformation, we need to implement this mindset.

Customers are more ready than we think, because in most of our markets, even in emerging markets, they are on Facebook, they are on WhatsApp, and they are banking online, so I can say with confidence that the customers are ready. However, our organization needs to be ready to completely reinvent the current model. It's quite a challenge, but I believe we can tackle it.

What will your priorities be over the next three to five years?


We have three priorities for the next few years. First, we will bring out the next-generation operating structure of VimpelCom as a group. Second, we plan to deliver

digital proximity to customers, and to become a part of the customers' lifestyle. Third, we are going to enhance customer experience with the knowledge we have from transactions, locations and other kinds of data.

What makes ZTE a partner for VimpelCom? What are your expectations for the cooperation between VimpelCom and ZTE in the future?

For me, ZTE has been a fresh thinker. That is why I appreciate ZTE very much.

In the future, we look forward for VimpelCom to collaborate with ZTE in various areas, not only in the radio network access, but also in new areas such as virtualization. Moreover, we might cooperate on solutions that serve enterprise customers, especially the small and medium enterprises.

I think ZTE has a DNA which is close to being a disruptor and a challenger. We appreciate this attitude in our business partners. 

Voices from Global Major Operators

Reporters: Zhang Ying, Yue Lihua

At the Global Mobile Awards 2016, ZTE won the Best Mobile Technology Breakthrough Award and Outstanding Overall Mobile Technology—The CTO’s Choice 2016 for its Pre5G Massive MIMO technology. Mobile World Congress 2016, hosted by the GSM Association (GSMA), is the world’s

most influential gathering in the mobile communications industry, and the GSMA’s Global Mobile Awards represent the highest honor. With operations in 160 countries, ZTE is a leader in technology innovation, delivering superior products and business solutions to more than 500 operators worldwide. Here are voices from global major operators.

Hutchison Austria Group and ZTE started cooperation in 2010. Recently, they signed a MOU to build the first Pre5G trial site in Europe.



Matthias Baldermann, CTO of Hutchison Austria Group

We have established that the Telco is always mobile, and the fixed network does not exist anymore in the perception of the people. The big majority of the people have mobile access.

I think mobile telecommunication will be even more important than it is rated today, and there will be a lot of innovations coming with new functionality provided by the networks.

We started our cooperation with ZTE six years ago in 2010. ZTE gave us the ambition to increase our network capacity. Today, we have expanded that by a factor of 30. Last year, we were awarded the best network in Austria with best voice network in Austria.

We appreciate ZTE as a real partner. For us, ZTE is flexible, supportive and willing to succeed.



MTN Group and ZTE built a M2M platform in Africa in July 2015. They also launched a global M2M SIM card, providing customers with a blanket rate for M2M activity across MTN's African network.

The communication is becoming a utility service. It's the lifeblood of helping people interact; it's a fundamental part of how you live, how you interact with other people, how you educate yourself, how you communicate, how you shop; it's a catalyst for how we change, and that leads to the ICT.

We expect that MTN and ZTE work together to build an eco-system that creates inclusivity for multiple people in all parts of the world. With the eco-system, we can help the country get better. For us, ZTE is committed, convictive and competent.



Kirshna Chetty, General Manager of MTN South Africa



Dr. Liu Guangyi, CTO of Wireless Department, China Mobile Research Institute

ZTE has become one of the first 11 partners in the China Mobile 5G Joint Innovation Lab, which officially launched at the Global TD-LTE Initiative (GTI) Summit, held at the Mobile World Congress 2016.

Usually, everybody lives in their community, so the communication is a part of our daily life. China Mobile's business is trying to enable more and more convenient communication for our customers.

In the M-ICT era, changes mean opportunities. Of course, China Mobile will try our best to build our competitions. We have a long history to collaborate with ZTE in many fields. ZTE have innovative technologies for 5G, which are very essential for us to build the capability to achieve very high data rates and high spectrum efficiency.

For us, ZTE is capable, productive and growing.

ZTE and Telefonica jointly tested ZTE vIMS & vSBC VNFs, part of ZTE's Cloud UniCore portfolio, in Telefonica's NFV Reference Lab in Madrid, Spain in December 2015.

In the market, we are the No.1 and we will maintain this.

We need to change the paradigm. We need to evolve from monolithics through a virtualized environment. We are trying to simplify our network and our legacy, and putting the software defined networking (SDN) and network functions virtualization (NFV) together, which is helping us.

We are looking to offer what customers want, that is, live connection. So we need to be online every time, and we need to warrant that when the customers need to be connected, they will. This is happening today.

ZTE is helping us in the NFV, but we still have a long way to run. ZTE is trying to put all the efforts in helping us build a unique infrastructure. Today, it is not available, but I'm fully convinced that it will be.

All the portfolio we need and try to look for is on ZTE. For us, ZTE is a professional and enthusiastic partner.



Enrique Blanco, Global CTO of Telefonica

Sichuan Telecom and ZTE have commercially deployed Qcell digital indoor coverage solution. They have also launched a wireless network intelligent operating system to optimize network efficiency and reduce operating costs.



Yang Le, Technical Director of Sichuan Branch, China Telecom

Sichuan Telecom has started cooperation with ZTE since June 2012 to build a wireless network intelligent operating system based on big data.

Since the system was launched, our network optimization efficiency has been improved by a factor of 8 to 10, and the customer complaint resolution efficiency has been increased by a factor of 20 to 30, with huge operating cost saved. **ZTE TECHNOLOGIES**

The Road to Big Video Revolution

By Cao Jia, Xu Huoshun, Yin Qin

15
JUN 2016
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Cao Jia

Chief Architect of
Multimedia Service Products, ZTE



Xu Huoshun

Planning Engineer of
Multimedia Service Products, ZTE



Yin Qin

Chief Engineer of
Multimedia Service Products, ZTE

The Advent of Big Video Era

With the evolution of fiber broadband, launch of the 4G network, and popularization of smart terminals, the demand for video services is soaring. People can now download and play videos at anytime and anywhere. Video services have become an important part of our daily life, even a way of life.

Video services will turn into a major business in addition to voice, SMS and data due to its enormous development space and high profitability. As video traffic has increased dramatically, the industry predicts that video services will consume more than 95 percent of data traffic on operator networks in 2020.

The advent of big video era is

featured by big content, big network, big data and big eco-system.

- Big content is the core of big video. Various films and television programs are bringing pleasure to our lives. There are mass video contents, including video on demand, live video, video time-shift, video playback, and karaoke, presented in 4K UHD or 8K UHD under different formats. These contents can be played on multiple terminals.
- A big network is the carrier of big video. To meet the strict QoS and QoE requirement and improve user experience, high bandwidth, low delays, low packet loss rate and low costs are required for the bearer network. Moreover, the fixed-mobile converged CDN, SDN and NFV technologies, and the flexible resource scheduling capability ensure a seamless video experience for users.
- Big data embodies the value of big video. The statistics and analysis of big data enables joint operation of cloud, pipe and terminals, and provides excellent services and precise business discovery for customers. Big data helps operators create new business models and value.
- Big ecosystem is the future of big video. No operator can meet all customer requirements. To provide a one-stop service and excellent big



video experience for customers, an operator must cooperate with partners inside and outside the industry to achieve win-win situations. To establish an ecosystem, open protocols and technical standards, unified video quality evaluation system, industry integration and participation of all parties are necessities.

Video Becoming the Basic Service for Operators

As traditional voice services have declined, Chinese government has supported to build broadband networks

with many favorable policies. Therefore, operators have attached more and more importance to new data services.

In 2015, with the boom of smart terminals and smart homes, IPTV gradually evolved towards IPTV+, in which various OTT media technologies including HLS are integrated. Video services have extended in many directions, including communication, social media, electronic commerce, and home security and service. An open industry chain has been constructed for the IPTV, and video has developed into a basic service to supplement other services of operators. By formulating

Table 1. Comparison of traditional video and big video.

	Traditional video	Big video
Operating mode	<ul style="list-style-type: none"> • Door-to-door provisioning • Fixed service packages • Closed value-added service platform 	<ul style="list-style-type: none"> • Self-service provisioning, and online services • Advertisement, personal center, and precise marketing • Cooperative ecosystem, and app stores
System architecture	<ul style="list-style-type: none"> • Dedicated hardware • Vertical chimney architecture 	<ul style="list-style-type: none"> • General hardware • Extensible and elastic architecture
Requirement mode	<ul style="list-style-type: none"> • Traditional R&D mode • Long time for version release 	<ul style="list-style-type: none"> • Rapid iteration • Gated launch of versions

comprehensive package, operators attracted subscribers rapidly. For example, the “012” strategy of Sichuan serves as a reference in the field of video services.

Internet video providers, such as Netflix and YouTube, have established their footprint globally in recent years. Meanwhile, traditional telecom operators and TV broadcast operators, through frequently mergers and reorganizations, have provided subscribers with integrated TV video services (IPTV, OTT, and DVB), and specific video services for mobile terminals. Currently, the above operators are boosting their video services with self-built systems or leased systems.

Operators' Pain Points

Operators are facing many challenges when they transform traditional video into big video. Table 1 analyzes the differences between traditional video and big video in terms of operating mode, system architecture and demand mode.

How to transfer the closed platform into a big video-oriented platform, how to promote creativity, how to

satisfy customers with competitive services, and how to expand user base have become major pain points faced by operators.

Big Video Revolutions

To push forward the revolutions of big video, operators must make efforts on cloud-enabled video networks, smart video pipes, capability openness platform and user-centered policy (Fig. 1).

Cloud-Enabled Video Networks

The IPTV architecture is tightly coupled to achieve single video services. It not only coupled software with hardware, but also services and data. This architecture is neither in favor of new services deployment, nor conducive to the multi-vendor cooperation in the industry chain.

ZTE considers that the NFV-based cloud architecture is a good choice in the big video era, as it is an open architecture with loose coupling. It separates

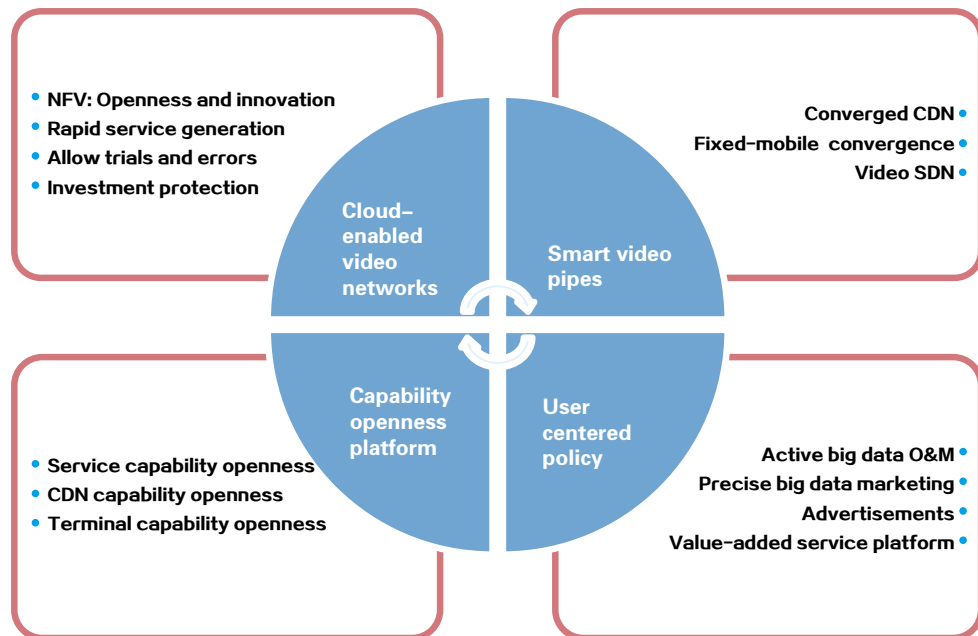


Figure 1. Big video service promotion.



hardware investment from service development, enables multiple vendors to provide diverse services, and helps operators aggregate a range of services.

Smart Video Pipes

Smart video pipes are used to deploy networks flexibly by integrating fixed and mobile networks. Through multi-screen convergence, the on-demand video services can cover both fixed and mobile network subscribers.

Smart video pipes can be achieved by deploying converged CDN, which supports IPTV, OTT, and cache services. In addition, the converged CDN supports operators' proprietary services in injected pattern, reduces the cache of inter-network settlement, and improves user experience.

Capability Openness Platform

Big video requires that multiple vendors in the industry chain cooperate in an open capability architecture. Capability openness involves service capability, terminal capability, and CDN capability.

ZTE has developed a cloud-based SOA architecture to build a lightweight big video open service platform. Its flat architecture and rapid iteration mode support the gated launch of version release.

This platform enables a series of service components, including user management, content management, service management, unified authentication, self-registration, payment, messaging, advertisement, bookmarks and favorites, recommendation, and statistics and analysis. By accessing networks, the services invocations are provided to the platform, and unified services are provided on the service discovery layer and service presentation layer.

User-Centered Policy

Good user experience requires that video services should not only be of high quality but also be customized according to customer habits. Therefore, big data technology can be applied to the new generation video network to improve user experience.

With big data technology, the visual O&M system based on equipment operation monitoring and service monitoring can guarantee high quality of video services. The big data operating system, which based on user profile and service analysis to guide service operation, satisfies users' demands for customized video services.

Conclusion

The development of broadband services and terminal capabilities greatly promotes video services, which by virtue of their interaction, openness, and user-centered policy, have ramifications for the operation of traditional IPTV, OTT, and DVB video services.

Innovations and reforms are implemented in the system network architecture, audio and video transmission and presentation, and video operating mode. In the big video era, these innovations and reforms make new video experience possible for users.

PSVN: The Ultimate Path to Video Transmission Network

By Zhou Xueren

After several years of development, OTT has evolved from fuzzy to concrete. It is becoming the dominant bearer for video services. OTT developed rapidly around the world in 2015. Let's take a brief look at what happened in the OTT field in this year.

Driven by the launch of Netflix in more than 130 countries, the development of OTT is in full swing. After purchasing DirecTV, AT&T gradually stopped its IPTV services and handed them over to the more experienced DirecTV who rolled out the services in DVB + OTT mode;

Verizon expanded GO90, an OTT service; Telefónica purchased CANAL+; British Telecom increased their investment in content. The strategies of these top operators again reveal the truth that content is king, and also show that telecom operators are transforming to media operators.

In the transition to media operators, telecom operators are gradually taking video services as their core competitiveness and using the OTT technology as the most effective way of transmitting ubiquitous video or big video. Today, in the United States, all content—including the key content that used to be available or purchased only through private networks—can be obtained via OTT transmission. More and more users are getting what they want via OTT rather than buying a fixed and complete package from network TV operators

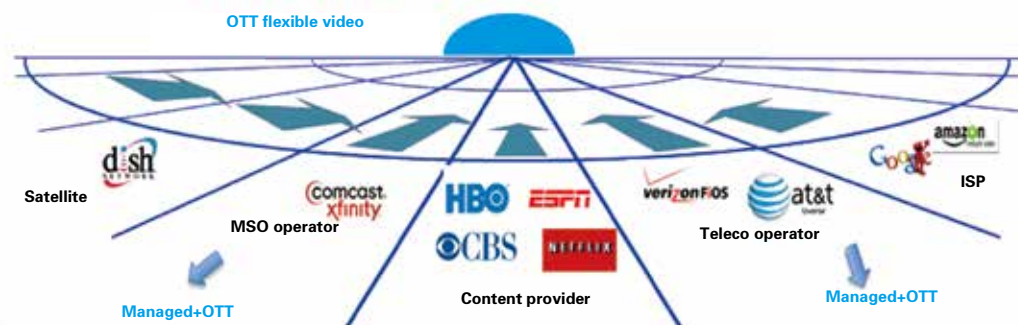


Figure 1. Schematic diagram of ubiquitous OTT video transmission.



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Multimedia International
Director, ZTE

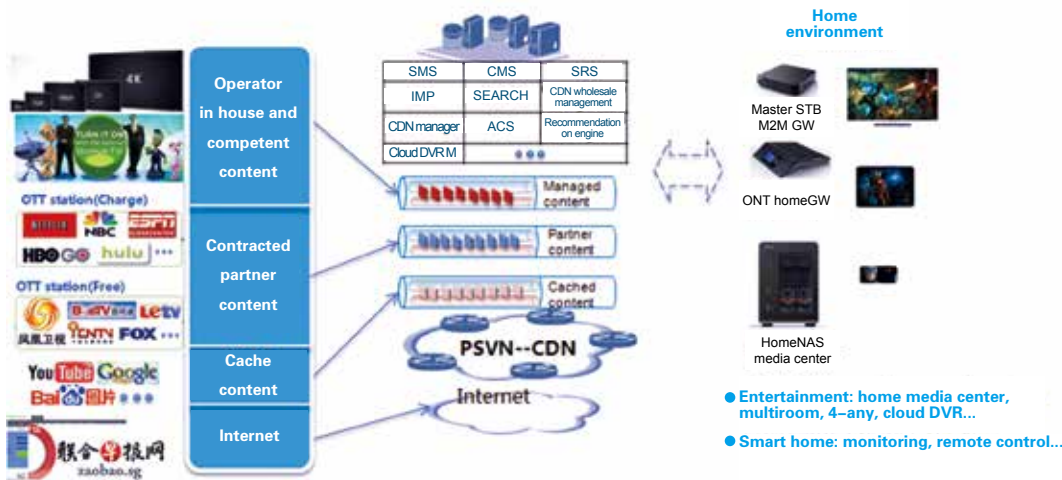


Figure 2. PSVN-CDN architecture.

as in the past. This trend shows that PayTV is evolving to be personalized, that is, transforming from PayTV to MeTV.

On the contrary, telecom operators' traditional wireline and wireless voice continue to fall, and their broadband and broadband-related services will become the only source of revenue growth.

Once a large amount of communication pipelines have been laid, what can be expected to attract users? The answer is content. It is the content that can be the most effective way to attract end users. This is also the reason why telecom operators are inevitably transforming into media operators.

In an IP-based broadband network, how can videos be effectively transmitted? This subject has been discussed a lot. Technically, in the case of ubiquitous broadband connections, only OTT can act as the major bearer for ubiquitous video services. More and more terminals, video formats, and user generated content (UGC) can be transferred conveniently to viewers only through an OTT-based architecture (Fig. 1).

How can operators ensure the quality of video transmission and ensure the content is not tampered? In other words, how can an efficient bridge be built between the growing number of content providers and the increasingly personalized content consumers? For this, a content distribution network (CDN) must be deployed to carry different services and guarantee reliable and

timely delivery of important media content. When CDN becomes a guarantee for public basic services as the telephone or broadband does, an efficient, public-oriented video transmission and switching network will be formed. The network is also known as public service video network (PSVN).

In the PSVN, the most critical part is the CDN-centric video transmission and switching network (Fig. 2). It is a service-aware smart network that can distinguish different video requirements and functions as a bridge for efficient communications between numerous content providers and consumers.

As broadband develops rapidly, there are emerging more and more attractive video services. Virtual reality techniques like AR and VR have been introduced and will place higher requirements on video transmission. It is therefore a pressing need to build a PSVN that is capable of service awareness and differentiation.

However, PSVN cannot be built in one step. First, an OTT-based video transmission network must be built where different operators can be integrated with different access networks via PayTV or package plans. Second, CDN must be gradually built for OTT videos, and at this stage the CDN networks are still driven by services. As numerous CDNs are set up, they can interconnect each other and form a service-aware smart channel. Finally, the smart channel is developed into a PSVN with video transmission and switching as its core and service awareness as its application. **ZTE TECHNOLOGIES**

Big Video Best View

By Zuo Luo



With the development of fixed-line broadband and mobile internet, there are increasing demands for video service. It has been a tendency for people to watch 4K or HD videos through TV or mobile phones. The number of PayTV subscribers is expected to exceed one billion by 2017, including an increase between 80 million to 180 million of IPTV users. Moreover, More than USD 80 billion will be invested in the video industry, among which over USD 15 billion will be spent on TV distribution business by telecom operators.

Video will become the main basic telecom service after voice, SMS and data, because of its huge investment potentials and profitability. However, rapid traffic growth will bring a big challenge to an operator's network. Mobile video traffic will grow by 24 fold in the coming six years and fixed-line video traffic will increase by three to seven fold.

The Essence of Big Video

Big video has four crucial characteristics: big content, big network, big data, and big ecosystem. Big video supports diverse formats such as HD and 4K UHD, and diverse channels such as IPTV, OTT video, and mobile video. It also supports fixed-line and mobile networks, ranging from access, bearer and CDN networks. Big data technologies

are adopted to analyze mass data from video networks, services and user behavior to support end-to-end video maintenance and marketing. Big video is also a win-win ecosystem based on an open platform, aiming to enhance profitability.

The Strategy to Cope with Big Video Challenges

ZTE has a profound understanding of the essence of big video. To offer the best 4K video experience at home and the best HD video experience through mobile phones, ZTE proposes that operators focus on four areas: user experience, network architecture, innovative business, and ecosystem construction.

Best 4K and HD Video Experience

- Build ultra broadband, low latency FBB/MBB network. Access network products adopting FTTH/G.fast technology support several megabits per second or even gigabits per second at home, and 400G BRAS & IT CR platform supports ultra broadband metro network. 4G/Pre5G wireless products can greatly enhance the bandwidth of mobile base stations. The core network supports various video optimization solutions including TCP optimization.
- Build FMC, layered deployment, flexible scheduling CDN network. Integrated CDN provides IPTV/OTT video services in both the wired and mobile networks. It can meet user requirements of multi-screen interaction and provide users with a consistent video experience via TV or mobile phone screens. CDN supports layered deployment. It can be deployed down to the OLT/RAN side, as the increasingly huge amount of 4K video may cause



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congestion at the metro network. CDN nodes in the fixed-line network can be deployed to the OLT side. In the mobile network, the deployment of CDN to the RAN side greatly reduces transmission delay and enhances user mobile video experience.

CDN can control its resources flexibly through vDV rebuilt in SDN/NFV. All CDN nodes make up a big resource pool by vDC interconnection. The CDN resource pool can improve system efficiency remarkably and reduce CDN system download traffic. With the help of SDN/NFV, CDN can distribute network resources for SLA and provide better user experience.

- Provide UHD and integrated smart home solution. A 4K STB supports 4K@60P video, HDMI2.0, and standard 4K experience. An integrated home-GW (xPON+STB) can simplify home network and device operation, reduce device cost, and improve service experience.

Smart Big Video Maintenance and Analysis

- Video quality of experience (V-QoE). Based on the measurement of end-to-end video service, ZTE has established a video QoE evaluation system that focuses on customer video experience. The system has a uniform standard to evaluate video experience on different networks and screens.
- Smart video maintenance. By deploying a series of video probes, the big video system can collect network KPI data, and also data from STB, CDN, and video service platform. Using big data technology, the system can evaluate video QoE, monitor customer video experience, locate fault, and give advice on network planning and optimization.
- Smart video analysis. Based on a big data platform, the big video system can look into customer

behaviors and build customer portraits for video content recommendation, precision advertising and data monetization.

Diverse and Innovative Big Video businesses for More Profitability

- Diverse commercial advertisement business. ZTE can help operators construct smart advertising platform to implement multiple advertising patterns such as boot advertising, VOD advertising, channel advertising, and wide angle advertising. Ultra-sound advertising based on multi-screen interaction of cell phone and television can also be provided.
- Visual communication. Based on the IMS+RCS visual communication solution, ZTE enables visual communication between the cell phone and television and also between televisions. The visual communication has better quality and is more effective than OTT visual communication.
- Fixed and mobile convergence. ZTE will expand IPTV business on mobile devices and ensure the same video experience on both a cell phone and a television set. ZTE will also enable multi-screen interaction and flexible operation on the cell phone to develop more creative businesses.

Win-Win Big Video Ecosystem for Better Business Development

ZTE will consolidate individual part of the big video industry chain involving terminal chips, video encoding and decoding equipment, internet equipment, and content provision. A big video ecosystem needs to be created for mutual benefit between ZTE and operators. ZTE is willing to work with operators and cooperative partners to build a promising future for big video. **ZTE TECHNOLOGIES**

Promising CDN in the Big Video Era

By He Yanfeng

23

JUN 2016

ZTE

No products or services can survive without focusing on user requirements. Smartphones and internet services are no exception. They are evolving to continually meet user needs. Although user needs are varied, studies find that implementation of any user need starts with information acquisition, followed by logical analysis and R&D activities. This process then repeats until the expected outcomes are met or no further actions can be made.



He Yanfeng

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According to information theory, the more information you get, the better you will act, to be exact, comprehensive information makes estimation more accurate, actions more efficient, and users more satisfied. At present, information is represented in text, image, and video. Although all of them can provide the

same amount of information, the efficiency users receive them is quite different. Video is the most effective and will become a major way of providing information for users. Video-based services will also gradually replace text- and image-based services to dominate the market.

ZTE has proposed big video—an integrated solution developed to meet user demands for videos in the future. The solution provides video services that feature six “big”—big traffic, big storage, big computing, big network, big data, and big ecosystem.

A content distribution network (CDN) serves as a key part of the big video solution that can guarantee video experience of users. User experience reflects how well and how fast users acquire information and implement actions for self-fulfillment. The CDN plays a vital role in improving user experience in big video services.

Big Traffic

The definition of future video footage will be inevitably close to a real world, especially when virtual reality (VR) services requiring higher definition and fidelity are widely used. Although the compression technology continues to advance, the overall video streams are still growing dramatically. Moreover, as



more services are provided in videos, the number of concurrent HD video streams also increases rapidly. All these present a huge challenge to the bandwidth of underlying networks especially the convergence and core networks. In the big video solution, the CDN devices for content caching are deployed near the user end to reduce the pressure of big traffic on the underlying networks and cut down network capex while guaranteeing user experience. Like in a mobile network, with the rise of the big video data rate, these CDN devices will be further split and deployed close to the user side and may eventually manage the user's home gateway.

Big Storage

In the future, video-based internet services will experience an explosive growth, along with a surge in video content that requires at least EB-scale storage space. To improve storage efficiency and lower storage costs, the existing CDN simple-caching pattern will co-work with distributed cloud storage. Specifically, hot content will still be cached on the CDN while other non-hot content will be stored on the cloud. Of course, content, whether it is hot or not, varies with time, and its storage will be migrated between the CDN and the cloud.

Big Computing

Video-based services are computationally expensive in terms of scene processing. A traditional CDN is an IO-intensive system focusing on service data caching, and does not require a high CPU speed. However, this will no longer be the case in the big video era, where the CDN will gradually evolve to an edge computing system. In addition, to serve different services, the CDN will be deployed on virtualized middleware to act as a real distributed cloud system. This system will carry out scheduling strategies based on services rather than on user requests, and will dynamically allocate computing resources as required by services.

Big Network

In the era of ubiquitous connections, both the existing access (wireline and wireless), convergence, backbone and core networks, and the burgeoning IoT and quantum communications networks will carry video-dominant traffic. Because of its service perception capability, the CDN, an overlay network built on the above networks, will ride on the SDN technology to function as the control layer of underlying networks. The control policies

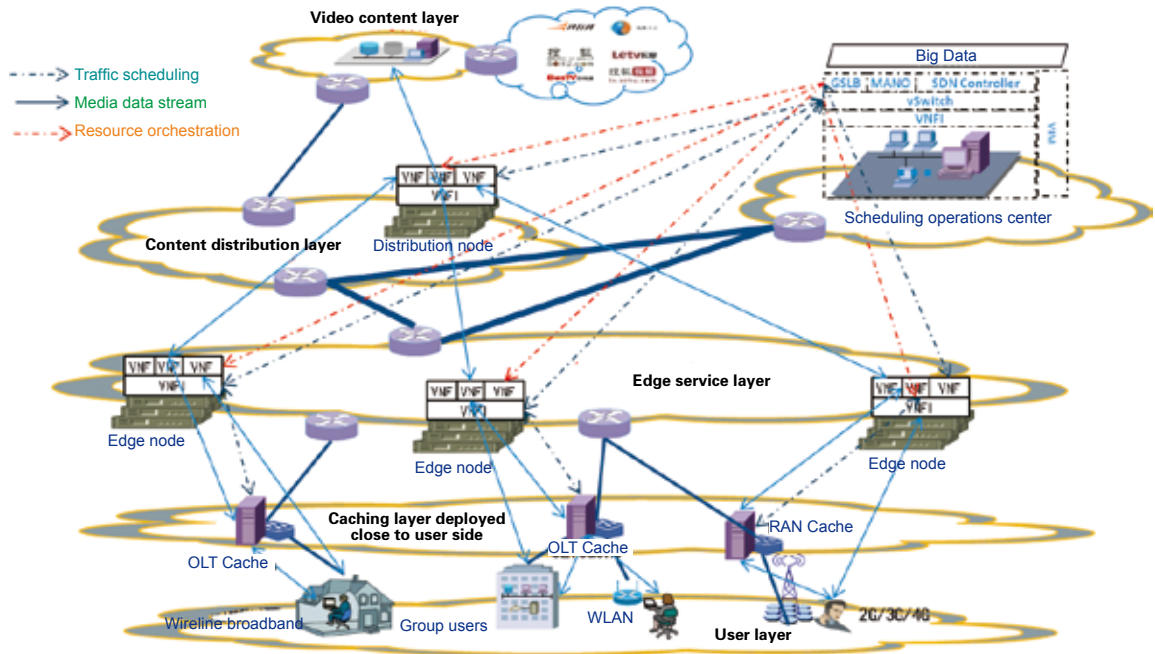


Figure 1. CDN network architecture in the big video era.

must be based on services; otherwise, network control will be of little use. As the CDN acts as the access point to content services, it is sensitive to service changes and can enable the controller to re-arrange the resources of underlying networks accordingly.

Big Data

The CDN relies on big data to make all policies, which involve deploying CDN cache devices close to users, migrating hot and non-hot content between the CDN and cloud, allocating computing resources among services, and controlling network resources for services. Big data is regarded as the nerve center of all policies and makes them as an organic whole to give full play to the CDN.

Big Ecosystem

In the big video era, the CDN will expand its industry

chain, evolving from the underlying network platform to a service platform. Although such expansion is limited and cannot cover all services or applications, the CDN does have its place in advertising—currently a major service on the internet. This works because big video can efficiently provide information, parse and process video scenes, and analyze user behaviors to help advertisers place ads into proper video streams based on user preferences and habits.

To achieve all the promising features discussed above, the CDN requires a powerful network architecture to reach its full potential. Figure 1 illustrates the CDN network architecture in the big video era.

The big video solution is an effective approach to serve users in the future, and its essence is big traffic, big storage, big computing, big network, big data, and big ecosystem. As the key element of the solution, the CDN will play an indispensable role in supporting the six “bigs”. **ZTE TECHNOLOGIES**

Immersive Experience: A Prime Dimension in Video Entertainment

By Weijun Lee

Mankind has a perpetual desire for better entertainment. Immersive experience is a prime dimension in video evolution, with mushrooming new enablers like VR, AR, UHD, and HDR.

—**Weijun Lee**, CTO Group, ZTE Corporation



26
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Physical presence is an entertainment experience that is irreplaceable by any other means for one simple reason: true immersion. For instance, when you travel to an exotic island, you can smell the sea breeze, sunbathe in a beach, taste the local foods, and socialize with the local people. When you attend a live concert or a sport game, you can feel the excitement of the crowd and scream out to cheer up. Such a deep immersive experience is not achievable by other means like reading travel guides, browsing scenery photos, or watching tourism videos.

Whereas physical presence is infeasible in many occasions, immersive

experience can be simulated via advanced technologies such as virtual reality (VR), interactive video, photo sharing, voice interaction, and text messages, in decreasing order of engagement.

Hereby we review the key technologies to simulate immersive experience: VR and augmented reality (AR) enhance human perception with rich information; ultra-high-definition (UHD) improves the resolution (i.e. smoothness) of videos; and high-dynamic range (HDR) expands the brightness/darkness range of existing display devices to approximate the richer color space perceivable by human eyes.

VR and AR

VR needs to cover both eyes of a viewer with a head-mounted device (HMD) and soaks the viewer into a fully virtual environment that is totally isolated from the real surroundings. AR adds, subtracts, or replaces certain objects onto the real-world video captured by cameras and shown on a display

device. AR is more complex than VR and requires more computing power.

VR may be more powerful than the reality in some sense. People who are physically located in disparate places across the globe can present in the same virtual space to meet, interact, collaborate, and play together. This transcends the inherent limitations of a real world.

Mainstream VR gears in the market today can be classified into high-end, middle-end, and entry-level categories according to the cost and technologies:

- High-end VR devices such as Oculus Rift Touch and HTC Vive provide crisp resolution, swift orientation, natural interaction, and strong sense of immersion. They require high-end desktop PCs with state-of-art GPUs for complex computing, dedicated HMDs as display, and purpose-designed gloves or controllers for natural interaction.
- Middle-end VR devices such as Samsung Gear VR rely on a smartphone for both computing and display, provide good resolution and space orientation, but lack in crispness, smoothness, and natural interaction.
- Entry-level VR devices like Google Cardboard provide basic sense of virtual reality but may cause dizziness after continuous viewing. Nevertheless, these VR gears give everyday users a chance to taste the novel VR content that are gaining popularity in YouTube 360, Oculus Store, and other content stores.

The key parameters for VR quality include video resolution, display refresh rate, and latency of sensors. A ideal resolution is 1920×1080 or higher for each eye. The current mainstream resolution is 960×1080 for one eye and 1920×1080 for two eyes combined. A ideal refresh rate for VR display is 120 fps or 240 fps. The best VR headset today can reach 90 fps. Some prototype VR devices like PlayStation VR claims to reach 120 fps. A low refresh rate may cause unrealistic feeling and dizziness. The total latency should be less than 20 ms, i.e. from the time when a head turn or hand movement is captured by various sensors, transmitted to the controller, to the time when the appropriate new position is calculated and displayed. Oculus Rift has 25 ms, much better than others in the market, usually at 40 ms. A short latency makes VR feel natural and smooth.

The creative applications of VR and AR are mushrooming. Customers in a VR-enabled car dealership can “see” all the possible models with their desired interior and exterior configurations, far beyond the limited number of display models available in the show floor. An AR-enabled fitting room allows a customer to “see” the effect of each fashion piece in

different angles. In the realm of home entertainment which is traditionally only one-way delivery of video content, VR and AR are revolutionary in enabling an end user to enter into a VR/AR scene, select any angle to watch, use natural gesture or voice to interact, and thus simulate the immersive sense of the real world.

Status and Standards on UHD/4K

Higher resolution is always desirable for better video entertainment. The current generation video standard of full high definition (FHD) at 1920×1080 is defined by ITU-R Recommendations BT.709. The newer generation video standard of UHD at 4K or 8K resolution is defined by ITU-R Recommendation BT.2020 with three key parameters: resolution, refresh rate, and color depth.

- Resolution: UHD includes both 4K resolution at 3840×2160 and 8K resolution at 7680×4320. While support for 8K in TV sets and player devices are still expensive and nascent, UHD/4K has increasingly become economical and popular.
- Refresh rate: UHD standard has deprecated the lower-quality interlaced-scan mode in the FHD and kept only the higher-quality progressive-scan model, including p24, p25/p50, p30/p60, p24/1.001=23.976, p30/1.001=29.97, and p60/1.001=59.94. Higher refresh rates in p100, p120, and p120/1.001=119.88 are added for smoother experience in sport games.
- Color depth: In addition to the 8-bit and 10-bit modes in FHD, UHD adds a 12-bit color mode, i.e. each of the prime colors (red, green, and blue) is represented with a 12-bit

value. A higher color depth enables more colors and closer-to-life display effects.

4K p30/8bits is the entry-level UHD configuration typically used in bandwidth-constrained delivery paths; 4K p60/10bits is a mainstream UHD configuration typically used in high-bandwidth delivery channels or storage media; and 4K p120/12bits is a top-end configuration typically used in production studios or premium movies or sport games.

UHD necessitates more efficient and complex codecs to save bandwidth, e.g. H.265 (HEVC) or VP9. Whereas a FHD 1920×1080 p30/8bits video in H.264 requires 6–8 Mbps, a 4K 3840×2160 p30/8bits video in H.265 requires 12–15 Mbps, namely twice code rates to represent fourfold the pixels. The HEVC Main Profile uses 8 bits, and the Main 10 Profile uses 10-bit color space and requires higher bandwidth.

The advent of UHD not only enables large-screen TV without compromising pixel granularity, but also allows a viewer to sit very close to the TV screen and enjoy an extremely wide view angle, as immersive as in a giant IMAX theater.

HDR—More Powerful than UHD

HDR is critical to improve video quality. It expands the brightness/contrast range beyond the current color space and thus makes a picture/video look more vivid, i.e. both very dark pixels and very bright pixels coexist in the same frame, just like how human eyes adapt to both dark and bright light conditions.

As we have learnt from photography experience, a photo tends to get overexposed under direct sunlight and

lose details about dark shades, or get underexposed in dark and lose details in the brightness levels, so the HDR mode in a camera actually takes three photos consecutively: over-exposure, normal-exposure, and under-exposure, and then mix the dark and bright portions into the same photo so as to keep the details in both ends. The net effect of HDR photography is a more vivid picture than non-HDR mode, although some HDR photos may seem too perfect to be realistic.

HDR for video is more complex than HDR photography because video frames are captured so frequently (e.g. 30/60/120 fps), and each video frame needs to be captured in different exposure modes and then composed into an HDR frame via complex calculation.

It is generally agreed in the industry that HDR is more effective in improving viewer perception of video quality than UHD/4K for at least two reasons. First, whereas UHD/4K aims to present more pixels for more details, HDR makes each pixel more accurate and vivid, and better simulates human perception. Second, whereas human perception of pixel resolution decreases dramatically by distance, human perception of colors and brightness remain relatively constant by distance. The effect of UHD/4K vs. 1080p may become indiscernible at three meters or further, but the effect of HDR vs. non-HDR remains after three meters, i.e. within a typical home media room.

Although HDR has been around for 20 years, the emergence of HDR-capable TV sets is relatively new. Mainstream non-HDR TV sets and display monitors have a limited brightness of 300–500 nits. A typical HDR-capable TV set or computer monitor needs to deliver 700–1000 nits in brightness. A high-end HDR device, e.g. Dolby Vision TV, may reach 4000 nits.

HDR may be applied to both FHD (1080p) video and 4K videos. Various user tests have found that 1080p+HDR uses less bandwidth than 4K+non-HDR but delivers better viewing experience. Of course, 4K+HDR is the ideal combination. HDR mandates a 10-bit or 12-bit color space. Whereas a typical 4Kp30/8-bit video in HEVC requires 15 Mbps, a 4Kp30/10-bit video needs 18 Mbps or higher. For 12-bit color or higher frame rate (e.g. 60 or 120 fps), the required bandwidth has to increase accordingly.

Mankind has a perpetual desire for better entertainment. Immersive experience is a prime dimension in video evolution, with mushrooming new enablers like VR, AR, UHD, and HDR. Together with other evolutionary dimensions such as artificial intelligence (AI), social network sharing (SNS), and big data, immersive experience is approaching and will transcend our real-life experience in the not-so-distant future. **ZTE TECHNOLOGIES**

At ZTE 5G Is Now— Ubiquitous Connectivity and the Internet of Things

By Silvio H. Fernandez



At ZTE 5G is now. ZTE sees 5G as an enabler for new services in multiple industries, and hence also an enabler for new businesses.

—**Silvio H. Fernandez**, Senior Director Global IoT Strategy, ZTE CTO Group

29
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ZTE

The future not only never waits, but arrives a lot sooner than we expect. Not too long ago, telecom operators started making significant investments in fourth and even third generation mobile technologies (4G and 3G). In many cases, their deployments were technologies in search of a business case and, naturally, many are now wondering why they should invest in a yet-underspecified technology like 5G. ZTE sees that, unlike the cases of 3G and 4G, there is now a business demand driven by end-users for the deployment of 5G. A multitude of new connections, fast and slow, are being created. A new digital, socially-connected economy is developing. Consumers worldwide are moving at an accelerated pace; their services created and discarded with unprecedented speed. Users are increasingly mobile and demand new services and applications that can be accessed anytime, anywhere, in a transparent or “natural” way. We are immersed in a new

information revolution. ZTE believes that this demand presents an unprecedented business opportunity. Therefore, ZTE has embraced and committed to the M-ICT strategy, taking the leadership in responding to this massive demand for always-available, relevant information and services.

At ZTE 5G is now. ZTE has successfully demonstrated Pre5G technologies, like Massive MIMO, in a commercial environment. ZTE is actively driving standards and developing novel technologies like ultra dense networks (UDN), multiple user shared access (MUSA), and narrowband internet of

things (NB-IoT) that allow operators to more efficiently utilize scarce and expensive resources like spectrum and mobile site real estate. ZTE sees 5G as an enabler for new services in multiple industries, and hence also an enabler for new businesses.

Ubiquitous connectivity affords new cloud-based intelligence from which we all benefit, allowing us to be more productive, cost effective, resource and environmentally aware. While wireless connectivity was initially used mainly to connect individuals on the move to the internet and to one another, many industries have recently started to understand the benefits of also interconnecting devices or “things” to make them smarter by working in concert. This expanded connectivity was eventually termed the internet of things (IoT).

Today, two demand scenarios are emerging for IoT—a high data rate, ultra-low latency scenario, loosely called broadband IoT, and a low data rate, relaxed latency scenario, or narrowband IoT (NB-IoT). Standards are under development for both scenarios, with technologies such as LTE for machine-type communications (LTE-M) and narrowband LTE (NB-LTE) to meet the requirements of each. While, on one side,

we tighten the existing 4G requirements, on the other side, we relax them. 5G promises to serve both scenarios, by leveraging innovations like moving cells and smooth virtual cells, on-demand high data rates, device to device communications, elastic and ultra-dense networks, evolved big data analytics, low cost/low power devices, and high-security cloud services.

On the broadband IoT side, end-user applications are being served today mainly by 3G and 4G networks. Several of them will undoubtedly benefit from 5G advances, and more will be created, such as mission-critical applications that leverage the ultra-reliable communications promised by 5G. On the narrowband side, there are a number of technologies vying for the top spot in the race for a standard, with several grouped under the term low power wide area (LPWA). These technologies are characterized by (extremely) narrow spectrum bandwidth and its resulting (very) low data rates. They provide extensive coverage (about a dozen kilometers outdoors) and allow the design of low power (10 or more years of battery life), low cost (less than US\$ 5) devices, all requirements for narrowband IoT. LPWA technologies can be broadly classified into two categories: the ones that use licensed spectrum and the ones that do not. Unlicensed spectrum technologies, like the one specified by the LoRa Alliance®, Sigfox™, or Weightless, are a mix of open and proprietary standards supported by different companies, and are available today in different capacities. Licensed spectrum technologies adhering to these requirements are being finalized by 3GPP and closure is expected around mid 2016. ZTE is an active participant in the 3GPP forum by leading two working groups and having contributed more than 30 papers over the past several months. ZTE is also the leader in patent portfolios, with nearly 300 patents in the IoT space. The technologies being standardized at 3GPP are extended coverage GSM (EC-GSM), LTE-M, and its subset for narrowband communications NB-LTE, which was adopted by 3GPP last September 2015 as the IoT

cellular technology of choice, and renamed NB-IoT.

When it comes to deployment strategies, global telecom operators are divided into two camps—those envisioning NB-IoT as their unique technology and those contemplating a set of complementary technologies, mostly due to legacy or financial constraints. While ZTE is today a driver of NB-IoT, a 3GPP choice, the company foresees that several technologies will coexist and complement one another for a number of years. ZTE understands that there isn't a one-size fits all and strives to support operators in both camps.

At the implementation level, IoT can be broken into three fundamental “CCC layers”—connect, collect, and consume. The connect layer allows IoT devices in the field to talk to an intelligent manager and orchestrator; the collect layer carries out intelligent processing of large amounts of field device data, interpreting every information bit; and the consume layer realizes a variety of applications depending on the requirements of the industries served.

ZTE has a complete solution to implement the CCC layers. At the lowest level, ZTE's IoT devices and custom ASICs support different standards and scenarios ranging from mission critical to low demand. ZTE's devices are available for commercial or personal vehicles, farm equipment, city infrastructure, and smart buildings. At this layer, ZTE's smart IoT operating system enables secure device management with remote testing capabilities in a very small-footprint package. These field devices talk to the network in one of two ways—directly, using technologies like NB-IoT or traditional cellular; or indirectly, via ZTE's smart IoT gateway, using short-range wireless technologies such as Zigbee, Z-Wave, WiFi, Bluetooth, and RF, or wired connectivity for certain industrial applications. The gateway implements routing, communication, and security protocols to collect sensor information or perform field actions, and connects via standard cellular technologies to the network. At the network level, the information is processed by ZTE's smart IoT platform, an elastic, software-defined platform as a service (PaaS) solution with connectivity and application enablement layers. The platform implements device and network management functions, security, big data analytics, and API/SDK management. A highlight of ZTE's IoT platform is its openness, a feature most requested by operators. The platform offers APIs and an SDK to enable operators or third parties to implement any end-user application desired. By leveraging these platform services, many industry applications can be implemented, such as asset tracking,

remote safety and security, connected vehicles (vehicle to cloud, vehicle to infrastructure, vehicle to vehicle), telehealth and wellness monitoring, fleet management, agritech and factory automation, smart resource management (water, waste, energy), smart homes and buildings, and others. ZTE also provides an IoT monetization platform, to allow operators to implement novel business models and capitalize on the growth of these services in a variety of vertical industries. Certainly, these services possible today, plus the ones enabled by a 5G world, are certainly the subject of many more articles like this one.

While IoT is not new, it acquires more relevance now when viewed in the context of smart cities, a topic where ZTE has also demonstrated leadership. In fact, ZTE has IoT deployments in areas like telematics, fleet, water and energy management, smart buildings, and street lighting in 40 countries and 140 cities worldwide, and there are many more to come.

In addition, ZTE believes that multi-industry collaboration in a healthy ecosystem that transcends the boundaries of telecom is essential to advance the development of connected devices in a 5G world. The new information revolution impacts industries and academia alike, and will drive growth in public and private areas like transportation, utilities, healthcare, wellness, retail, financial, security, and learning.

We encourage all ecosystem players to work along with ZTE, each bringing their best, to improve the lifestyles of connected individuals around the world.

ZTE TECHNOLOGIES

Enabling the Future with ZTE Services

By **Thierry Langlais**

In the age of network function virtualization and software defined networks, services will be orchestrated in an agile and dynamic way, and distributed across shared underlying commodity infrastructure.

—**Thierry Langlais**, Senior Service Director, ZTE Corporation



32
JUN 2016
ZTE

Over the last decades, ZTE has built the most comprehensive product portfolio in the telecom industry, covering every vertical sector of wireless, core, access and bearer networks and terminals markets. ZTE is bravely leading the way to the M-ICT digital era.

By 2018, monthly global mobile data traffic will exceed 15 exabytes—tenfold the total network traffic at the end of 2013. This 50%+ annual

growth rate illustrates the challenges a carrier service provider's (CSP) network must face to meet the demand—not only from a technology standpoint, but also and more importantly to stay on top of customer experience and service innovation. It is a daunting task for an organization to plan for, and execute such an expansion and transformation:

- How to differentiate from competition and promote customer loyalty? How to anticipate customer demand with the most efficient use of flexible resources?
- How to evolve the infrastructure from a traditional environment into a scalable, adaptable and cloud-ready platform? How to get ready for 5G?

Partnering with ZTE on managed services, CSPs can focus on their core business and address these challenges, relying on

ZTE experts to assume responsibility for designing, building, operating and managing day-to-day network operations, whilst implementing the transformational building blocks of a successful customer centric organization.

Beyond Cost Reduction—Building the Customer Centric Organization

First generation managed services engagements focused on reducing costs and improving performance through network operations automation. Building on a decade's worth of experience and 150+ customer references, ZTE introduced advanced managed services (MS2.0) models, which align with CSP strategic objective to transform from a network and resources centric, into a customer centric organization.

A common challenge for CSP faced with the surge of mobile broadband data (MBB) services, is how to reconcile the sometimes conflicting views of the network team, proud to exhibit positive trends on network KPIs, and the marketing team, observing customer churn and dissatisfaction on services.

The reason is that operators only measure and monitor network resources elements, and remain blind to the end-to-end service perception, which goes from the device through the network and to the apps providers, compounded by customer expectations vis-à-vis the specific service he/she is using.

Customer experience management (CEM) requires an end-to-end view, combining objective measurements for network's key performance indicators (KPI), services' key quality indicators (KQI), and a robust, adaptive customer experience modeling framework. It also demands a systematic approach throughout the customer lifecycle, to identify, capture and prioritize the opportunities to delight customer, and proactively address problem areas and pain points before they result in a degraded customer experience.

ZTE's VMAX CEM solution differentiates by its unified business insight data analytics solution, which allows grouping all information under a consistent framework, and creating the appropriate responses at customer, service, and network levels. This provides the single view of network quality, service quality and customer experience modeling and measurement. It closes the loop between "operations" and "customer services" teams, and generates the factual data required by marketing for introducing and evolving services in an agile way.

A Pragmatic Path Towards a Customer Centric Organization—NOC-to-SOC Transformation

According to the annual industry survey 2016 by Telecoms.com

Intelligence, 43% of telecom operators plan to invest in Big Data in 2016, 47% consider investing in IoT, and 27% have high B/OSS investment on agenda. How can they ensure successful execution of the corresponding business cases?

Transforming an operator from a network-centric into a customer-centric and digital-era ready organization is not (only) about investment. This requires a thought-through, stepwise approach to ensure that all parts of the organization converge towards the common goal.

ZTE has built a pragmatic roadmap and services capabilities to assist operators on their transformation towards customer-centric companies, and de-risk the overall business case. This approach would typically include the following steps:

1. Network optimization automation, in particular for functions such as coverage/capacity/quality analysis, or value-based capacity planning.
2. Call center automation for MBB services, including proactive care and marketing, churn prevention, enhanced first call resolution of requests, individualized and contextual service promotion.
3. Customer experience assurance with VIP/VAP focus, insight reporting and analytics, incident demarcation, localization and restoral.
4. Agile service product design and orchestration, service usage insight, user behavior insight, and bill analysis.
5. End-to-end operational efficiency and revenue maximization in the digital economy era.

For IT/network operations, the journey from network to service operations center (NOC to SOC) leads to transform from a resource oriented view of services, to a customer-oriented one, with individualized SLA matching customer needs, on-demand user

assurance and proactive value-based optimization of network resources.

Fast-forward Look into the Future Network Operator

10 years ago, it was already predicted that the future would be mobile and video rather than voice. The advent of smartphones and MBB networks made this a reality. Tomorrow, if the much advertised IoT really takes off with billions of connected devices, the pressure on operators for 100% reliability will become immense: would you embark a driverless car with a “four 9s” SLA promise?

In the age of network function virtualization (NFV) and software defined networks (SDN), services will be orchestrated in an agile and dynamic way, and distributed across shared underlying commodity infrastructure. SDN offers programmability, agility and openness that underpins the NFV/NFVI and data centre interconnects. The virtualized infrastructure enables operators to test quickly new service concepts, launch and monetize the successful solutions, or otherwise discard with minimal investment (fail fast). NFV and SDN reduce the cost of network capacity and in turn improve the network service density.

SDN and NFV are transforming traditional networks and steer the convergence of telecoms and IT. In order to be prepared for the resulting changes

in network operations, we have focused on building adequate capabilities in consulting, planning and design, engineering and system integrations.


Accordingly, ZTE has introduced revolution of operation performance (ROP) as the solution which combines the tools, processes, analytics, policies and services to intelligently orchestrate network components and deliver agile, highly reliable and customized services that customers and machines will expect and require. The best way to plan the future is to invent it.

Enhance Network Operation with Big Data Solution—Sichuan Telecom Case Study

Sichuan Telecom and ZTE partnered over the last three years to significantly overhaul the network operations and customer experience for Sichuan Telecom’s 16mn+ mobile subscribers.

ZTE deployed a data analytics platform, delivering:

- Network optimization with automated identification of problem areas, multi-dimensional analysis, intuitive and comprehensive resolution recommendations, and automated verification of the outcomes.
- Effective real time monitoring of key areas, which helped save 3.6 million RMB/year through innovative monitoring of 4,800 km expressways vs traditional, drive-test based method.
- End-to-end customer experience measurement through probing, service modeling, precise RCA localization, data correlation enabling per service/per user view.
- Automated proactive care of VIP/VAP customers.
- Detailed marketing inputs to guide service offerings—such as terminal insight multi-dimensional analysis to measure buying patterns, and user loyalty analysis.

The system has been in production for three years, leading to more than 20% improvement on network KPI, 50% reduction in customer complaints, more than 3% points improvement in customer satisfaction (Net Promoter Score—NPS), 50 million RMB/year opex saving for optimization and operations, and 40% headcount reduction of O&M engineers. 



JT CELEBRATES THE DELIVERY OF ITS 4G MOBILE NETWORK

35

JUN 2016

ZTE

By Ma Xin

The Channel Islands lie approximately 100 miles from the south of English coast and 20 miles from the French coast with a total population of 163,857. The Channel Islands are English speaking, self-governing, British Crown dependency outside of the EU.

Jersey is the largest island in the Channel Islands, measuring 118.2 square kilometers. Jersey has grown into a world-class financial services hub, managing an astonishing two percent of the world's wealth and boasting the sixth highest GDP per capita in the world. Jersey Telecom (JT) is the largest telecommunications service provider in Jersey tracing its roots back to the first telephone exchange in 1895. JT is now dedicated to delivering fixed-line, mobile and data hosting services to customers in

**Ma Xin**

Sales Director, ZTE (UK) Ltd

the Channel Islands as well as provide ICT service globally.

JT launched its first 3G mobile network in Jersey in 2006, and upgraded the network with Super 3G technology in 2009 to enable customers to access the internet at speeds of up to 3.6 Mbps. JT planned a mobile network replacement program to meet growing user needs for mobile bandwidth. JT's entire 3G network would be taken out and be upgraded to 4G. Since 2013 JT has started strategic cooperation with ZTE. In August 2014, ZTE was chosen by JT as an exclusive strategic partner for its 4G rollout project. JT's 4G network was launched in Jersey in February 2015 and Guernsey in June 2015. In Guernsey this involved building from scratch and in Jersey replacing all existing mobile equipment.

With smartphone penetration



across the Channel Islands at a higher level than most digitally advanced countries, it's no surprise that JT's 4G network that offers a tenfold faster connection has seen increased traffic in response to the vast appetite for data amongst islanders. To put this in perspective, the 4G network arrived just in time for some major events in Jersey and supported 11,000 different devices during the XVI Natwest Island Games in July 2015 to download 2.1 Terrabytes (equivalent to 1,024,000 photo uploads or 17,000 hours of music). It was also the 4G network that enabled the live results of the Pepsi ICC Europe Division 1, hosted in Jersey in May 2015, to be broadcast live around the world to thousands of fans and for Jersey Live party-goers to keep connected over the two-day event. Overall the benefits of the new network have already been experienced across the islands. As new

technology emerges and smartphone penetration heads closer to one hundred percent, JT has a network that can be upgraded to support future mobile technologies.

The delivery of JT's 4G mobile network reached conclusion in February 2016 with the official handover of the system to JT by ZTE. Senior representatives from ZTE joined JT in Jersey at a formal ceremony to declare the installation and rigorous 10-month testing phase completed, with the network management being passed in its entirety to JT's mobility team.

"I'm pleased to announce that our hard work alongside partner ZTE over the last two years to deliver this ambitious and future-proof 4G network has reached this final milestone. The new 4G mobile network they helped us to deliver here in the Channel Islands is now completely under our management. I'd like to thank the team at ZTE for their professionalism throughout ensuring that JT delivers an enviable network ahead of the market, on schedule and on budget. Our long-term partnership with ZTE has brought valuable returns for our customers. By offering a high performance 4G mobile network, we believe JT will benefit Jersey long into the future," said Graeme Millar, JT's CEO.

ZTE's Kenneth Cao said: "It's a

pleasure to be in Jersey to witness the conclusion of this very important 4G network project with JT. Under ZTE's M-ICT strategy, ZTE is committed to its mission to drive innovations in telecommunications, enterprise computing and consumer devices to help our customers adapt and thrive in the era of intelligent, always-on connectivity. The Channel Islands are a unique location, and we are glad to partner with JT to deliver a high quality network and provide the leading technology to the local community. With mutual respect, I am glad to see the 'One Team' spirit is deeply rooted in both ZTE and JT team. It enables us to overcome the challenges and find the best practical solutions together."

The performance of the new 4G network has been independently tested for quality and speed across the Channel Islands, with excellent results proving its superiority in the market. ZTE's expertise and guidance every step of the way instilled confidence in JT's team to carry out a seamless installation. JT now has the in-house skills and knowledge for long-term management of the network. JT is committed to investing in technology to provide islanders with the most advanced networks and infrastructure and to deliver the very best in seamless connectivity available anywhere in the world.

ZTE TECHNOLOGIES

BIG VIDEO BOOMING WORLDWIDE

By Cao Chengbo

37
JUN 2016
ZTE

massive videos and TV series played on multiple terminals create a new way of life. According to industry estimates, video services will consume more than 95 percent of data traffic on operator networks in 2020.

On the global market, major operators are working extremely hard to provide various video services to customers. In the future, big video will shape up to be operators' major service, which will create huge value and benefits.

Jiangsu Branch of China Telecom (Jiangsu Telecom): the First Operator to Broadcast Live 4K IPTV Sports Events



Cao Chengbo

Operator Solution Manager,
ZTE Corporation

Jiangsu Telecom took the lead in exploring the IPTV field in 2005. It cooperated with Shanghai Media Group and Jiangsu TV Station, established an official IPTV office, and allocated large-scale IPTV accounts in 2008.

By the end of 2014, with more than 5.5 million IPTV subscribers, Jiangsu Telecom ranked No.1 in the China Telecom Group, and its IPTV office has developed as the largest commercial IPTV office in the world.

On the commercial platform, Jiangsu Telecom has provided abundant value-added services, including intelligent search, TV message system (TVMS), smart community, Good Morning Jiangsu, and early childhood education. On the innovation platform, it has launched more than ten value-added services, such as big-data-based deep analysis, multi-screen interaction, social TV, personalized EPG, somatic games, Android app stores, and multi-screen photo album. They will be gradually migrated to the commercial platform.

In 2015, the commercialization of converged CDN made Jiangsu Telecom the first operator to broadcast live 4K IPTV sports events. In addition, it made its worldwide debut of the mobile TV service. Jiangsu Telecom's innovative initiatives in the video service field

have piled up profits.

Sichuan Branch of China Mobile (Sichuan Mobile): China's Largest OTT Commercial Office to Provide Digital Services

Sichuan Mobile started developing OTT TV services in 2014. Now, with a capacity of 2.7 million subscribers and 1.3 million online subscribers, Sichuan Telecom is China's largest commercial OTT office.

By holding the copyright to live broadcast UK's Premier League events, building an authorized HD show library encompasses movies, TV series and documentaries, and offering 1080P HD programs with surround Dolby sound, Sichuan Mobile's OTT TV services brought amazing audio-visual experience to customers.

In 2015, Sichuan Mobile reformed its CDN architecture to ensure busy-hour service quality, introduced OTT multicast technologies to reduce backbone network traffic, and planned to launch visual communication and 4K services in addition to Mi-Cu Music and games in 2016. The OTT TV services have transformed Sichuan Mobile from traffic operation to digital services.

Telkom: Indonesia's First Commercial IPTV Office with More Than One Million Active Users

With 9 million fixed network subscribers and 3 million broadband subscribers, Telkom is the largest full-service operator in Indonesia.

In 2010, Telkom started deploying TV services. At the initial stage, it planned to provide services for 30 thousand IPTV subscribers and 9 thousand OTT subscribers by using ZTE's IPTV/OTT architecture. In January 2015, Telkom made the

IndiHome plan, and ZTE customized an IPTV/OTT end-to-end solution with a capacity of 3 million subscribers.

At MWC 2015, Telkom and ZTE jointly announced that they would establish a united IPTV/OTT innovation center in Indonesia. In June 2015, Telkom tried 4K services and signed the first 1-million-STB contract with ZTE. Currently, Telkom's IPTV/OTT subscribers are increasing 80 thousand per month, leaving its rivals far behind.

Maxcom: Converged TV Services Create New Visual Experience for Mexico

Maxcom introduced Microsoft IPTV in 2009. However, its expensive TCO and outdated services led to a very high churn rate.

Maxcom adopted ZTE OTT system at the end of 2014 and launched the OTT TV services three months later, receiving favorable comments from the market. Therefore, Maxcom resolutely migrate the Microsoft MR IPTV subscribers to ZTE OTT platform due to its excellent functions. In the following 20 days, ZTE successfully deployed and tested the converged TV system, which was put into commercial operation in October 2015.

Good user experience of video services has increased broadband user stickiness. Moreover, diversified contents and multi-screen interaction boost the consumption of video services. Maxcom consequently made a significant breakthrough in profits.

South Africa MTN: Converged CDN Gets Close to Users

With more than 200 million subscribers in total, MTN is the largest multinational mobile operator in the Middle East and Africa.

At the end of 2014, MTN invited

global equipment providers to participate in converged CDN short-list competitive bidding. In the CDN PoC test, ZTE outperformed all its rivals for advanced converged CDN technologies and differentiated content distribution capability.

By introducing converged CDN technologies, MTN achieved fast video distribution, webpage acceleration and file acceleration. Moreover, optimal operation based on big data, hit movies recommendation and high-accuracy content enable MTN to get close to users.

PTCL: Building a New Multi-screen Ecosystem

Till now, PTCL has developed nearly 100 thousands subscribers since it established IPTV service brand—Smart TV in 2007.

However, it is in a dilemma of user stagnation due to its ageing equipment and monotonous services. In 2014, PTCL cooperated with ZTE to develop future-proof multi-screen video services.

With ZTE's IPTV/OTT converged multi-screen solution, PTCL successfully extended its Smart TV brand to the mobile broadband field, bringing users a new experience by beautiful UI design, swift channel switching, and precise content recommendation. On February 15th, 2015, Cricket World Cup 2015, which is Pakistan's most popular game, was inaugurated. ZTE immediately launched a special program for this game to offer multi-screen live services, which earned wide acclaim.

PTCL's Smart TV services integrated advertising platform, third-party leasehold, internet cache, and 4K services. The expansion of operation modes secured PTCL's leading position in Pakistan's telecom market.

ZTE TECHNOLOGIES

The background is a blurred office interior. It features a large, bright window on the right side, a wooden desk in the foreground, and a chair. The ceiling has a circular light fixture. The overall scene is out of focus, emphasizing the text in the center.

ZTE

Tomorrow never waits