ZTE TECHNOLOGIES
DEC 2012 VOL. 14 NO. 6 ISSUE 143

VIP Voice

TrueMove:
Making Dreams Come True

Special Topic: User Experience

User Experience Always Comes First

Steven Hopcraft, CTO of True Corporation

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ZTE Profile

ZTE is a leading global provider of telecommunications equipment and network solutions. It has the widest and most complete product range in the world—covering virtually every sector of the wireline, wireless, service and terminals markets. The company delivers innovative, custom-made products and services to over 500 operators in more than 140 countries, helping them achieve continued revenue growth and shape the future of the world's communications.

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

TrueMove

Making Dreams Come True

Reporter: Wu Xiaolin

Steven Hopcraft, CTO of True Corporation

TrueMove is a diverse, energetic IT company and the most successful telecom operator in Thailand. Since putting forward its strategic plan "True Together" in 2007, TrueMove has rapidly become the largest integrated operator in Thailand. It operates mobile, broadband, fixed line, and WiFi networks and has more than 30 million subscribers. How has TrueMove expanded in Thailand's highly competitive telecom market? We recently interviewed Steven Hopcraft, CTO of True Corporation.

Q: As the largest 3G mobile operator, what is TrueMove's strategy for developing in the face of fierce competition?

A: Our development strategy is to constantly provide customers with new products and services over the past decade. Persistence has made us the largest internet service provider in Thailand; we have the largest cable TV network and widest WiFi coverage. Last year, we became the largest 3G mobile operator in Thailand. Actually, taking the lead in the telecommunication industry is not our only goal. When constructing our 3G network, we most wanted to allow rural people to enjoy an advanced high-speed data network so that they could view the outside world and share in the benefits brought about by technological development.

Q: What are the main challenges for TrueMove in the wireless data business, and how is TrueMove coping with these challenges?

A: Technically, the biggest challenge is forecasting user requirements that arise from smart phones and predicting the habits of people that use social networking. With many of these new trends, it is hard to know what to expect and our experience in forecasting these trends may be limited. We must be very sensitive to technical trends.

In the market, we are focused not only on maintaining flexible tariffs but also on providing optimum personalized services and products for every customer. We address the specific requirements of each of our customers to keep them satisfied.

Q: How will you develop the market through your existing cable TV, broadband, fixed line, 2G/3G, and WiFi networks?

A: On the one hand, we should continue to consolidate our leading position in broadband access; on the other hand, we will focus on constructing our mobile network. Our group is enthusiastic about mobile network development. When we realize cross-coverage in our broadband and mobile networks, we will provide diverse multinetwork bundles and provide users with additional features and benefits.

Q: What are your concerns about the transition from 2G to 3G? How do you deal with problems that arise in the transition when 3G coverage is not yet 100% across the whole country?

A: This is no longer a problem because we already have 100% 3G network coverage nationally. We have constructed 7850 3G base stations covering the whole country. We are more concerned about driving users to migrate from 2G to 3G networks. Based on the existing OCS system, we may provide a platform

similar to MVNO to phase out the borders between different networks.

Q: Public access to mobile number portability (MNP) may create a fair competition environment for operators. How will TrueMove take advantage of this opportunity to attract customers and develop services?

A: We accept MNP with pleasure. It is always a good thing to let users have choice. For operators, MNP means fiercer competition and greater opportunity. TrueMove is an energetic and innovative company. MNP allows our users to rapidly respond to our new technologies and services. For example, many of our 3G users have given positive feedback about the strong signal coverage of TrueMove's 3G network.

Q: Data service offloading has been brought about by the rapid development of data bandwidth and services. How does TrueMove handle and share mass data traffic through WiFi?

A: The increase in data traffic has been amazing, and we are focused on providing stable, high-quality, cost-effective data services. We encourage the use of WiFi and 3G at the same time. Our 3G users can also use our WiFi network in business districts, cities, and towns.

Q: Enterprise customers are a big revenue source for operators. What is TrueMove's strategy for these customers?

A: Moreso than our competitors, we pay much attention to our enterprise customers. Other operators have advantages in mobile service, but our advantages lie in serving enterprise customers in the fixed line and broadband segment. Recently, the advantages of our 3G network have become more obvious, and we are confident of growing our enterprise customer base.

Q: What do you expect from the convergent charging and service control platform (CCP)?

A: CCP is the single engine in our multinetwork structure. It plays a key role in both prepaid/postpaid convergence and multinetwork convergence. We researched an online charging system and launched it before we began 3G network construction. After the network structure is simplified and user resources are integrated, our goals can come true. That is the real meaning of "True Together". We have completed the first step in convergence: construction of the basic structure. In the future, you will see more innovation from TrueMove. ZTE TECHNOLOGIES

Tu Jiashun, vice president of ZTE core network products

Telco Cloud

Meeting the OTT Challenge

By Tu Jiashun

Why Telco Cloud?

For many years, the telecom industry has been challenged by over-the-top (OTT) providers who have usurped the basic voice and message services of operators. Because FTTX and HSPA+ have been widely deployed and LTE and WiFi networks offer better wireless coverage, multimedia communication using intelligent terminals has developed rapidly. According to industry analysts, iMessage and WhatsApp will replace traditional SMS and MMS services within two years, and VoIP services such as FaceTime and Skype will replace traditional voice services when LTE becomes more popular.

A telecom network is highly reliable, interoperable, and has high QoS. It supports emergency calls and other communication specifications. The standard interfaces and open architecture of a telecom network create a good environment for future expansion. IMS allows unique convergence and seamless handover between fixed and mobile, narrowband and broadband, and voice and multimedia. This cannot be achieved by OTT applications that rely simply on broadband access. Compared with free OTT services, telecom services based on traditional telecom technologies are inefficient and costly. Communication technologies, therefore, have to be reformed, and telco cloud has to be

incorporated into product development and network construction.

Advantages of Telco Cloud

Telco cloud is a cloud platform designed for telecom applications. It has large capacity and is scalable. It is 99.999% reliable, has N+K redundancy, and can be smoothly upgraded. Apps built on the cloud platform meet carrier-class requirements.

Using distributed computing and virtualization, telco cloud makes it easy for apps to be migrated, copied, and regenerated. This increases the reliability of telecom applications on the cloud platform. Telco cloud also optimizes signaling/session control, media resources, and real-time processing. This guarantees quality of service for users.

Telco cloud supports ultra-large user data center, IP and TDM-based service processing, and SLA (such as resource reservation and fault isolation) to ensure normal service and response times and timely system recovery.

Telco cloud has the basic features of a common cloud platform. It supports IT service applications by using virtualization and is a network infrastructure that separates telecom applications, such as CS, IMS, UDC, VAS, NMS and BSS/OSS, from the telecom infrastructure. In this way, operators can dynamically allocate resources to applications as required. This improves infrastructure use and significantly reduces costs.

Tulip Elastic Computing System

ZTE's tulip elastic computing system (TECS) is a carrier-class cloud computing IaaS platform based on virtualization. It divides physical hardware such as CPU, memory and storage into several isolated virtual machines. Different virtual machines can run different operating systems, and multiple service systems share the basic physical platform. This improves resource utilization, simplifies equipment room structure, and protects operator investment. TECS supports

- carrier-class computing and storage devices (ATCA/ETCA) and third-party universal computing and storage devices
- multiple operating systems
- computing, network and storage virtualization as well as related virtual resource management.

zVOA

In 2011, ZTE launched a voice and video over any access solution (zVOA). It is a TESC-based, converged CS/IMS solution that allows a traditional network to seamlessly evolve to VoLTE and full-service operation.

Mobile operators currently use

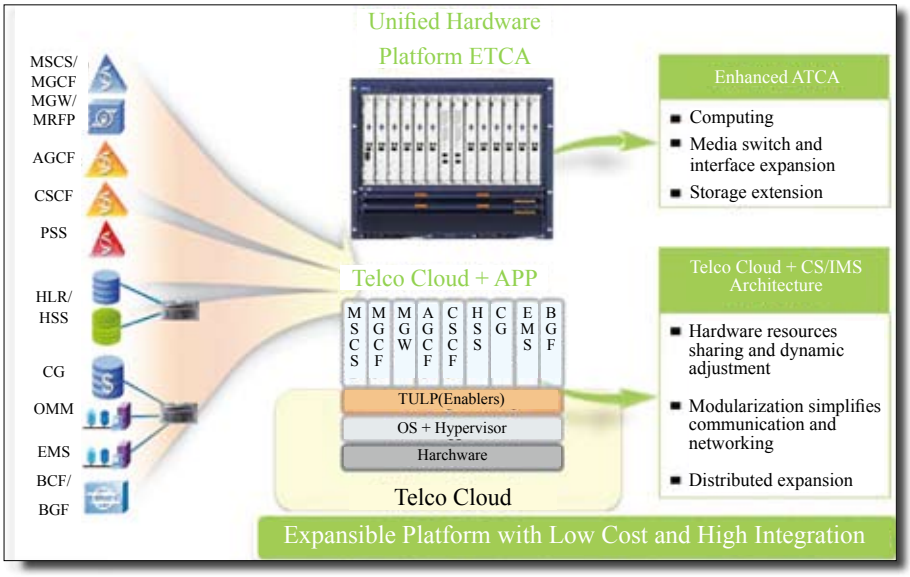


Figure 1. zVOA architecture.

CS+IMS dual-core mode in their core network architecture. They use a mobile softswitch network to provide voice, SMS, and USSD services for 2G/3G terminals and an IMS network to deliver multimedia services to 3.5G, LTE, and WiFi broadband terminals. According to 3GPP standards, CS will evolve to an access network of IMS. Because evolving mobile networks from 2G/3G to 4G is a long process, CS and IMS networks will coexist for a long time, and CS+IMS dual-core mode will certainly result in high operation costs.

zVOA converges CS softswitch and IMS on a telco cloud platform. With standard 3GPP architecture, zVOA enables public hardware and system processing capability to be shared. System processing capability can be shared by both Softswitch and IMS domains. zVOA helps operators simply and quickly deploy VoLTE and VoBB in the initial stage of network construction. When CS users migrate to IMS, system capacity can be upgraded smoothly. zVOA is used to migrate voice traffic from traditional terminals to intelligent terminals. zVOA is designed to provide a low-cost, converged voice and multimedia solution that is easy to maintain and expand. It helps operators smoothly deploy VoLTE, VoBB, and multimedia networks and improve their competitiveness by reducing capex and opex. It also provides excellent user experience through service convergence and multiaccess technologies. This helps operators transform into full-service, multimedia providers and fulfill their goals of sustainable development and profitability.

IMS On Cloud

ZTE rolled out its IMS-on-cloud solution in 2012. The solution provides large-capacity hosting for multinational operators. It can deploy logically independent IMS instances on the unified cloud platform and supports multitenancy deployment. Telco cloud makes centralized deployment, unified management, and remote geographical redundancy possible for multinational operators. This greatly reduces network construction cost and speeds up service deployment. Logically, each branch of the operator corresponds to an independent IMS core. This allows each branch to deploy personalized services and have an independent operation and settlement. Hosting has become a preferred choice for IMS deployment.

Conclusion

The development of carrier-class ATCA architecture, virtualization, and distributed processing technologies has made it possible to design a telco cloud that transforms existing telecom networks into terminal-pipe-cloud networks. Telco cloud facilitates network evolution to converged fixed/mobile networks based on IP. It also facilitates the development of multimedia, streaming media, and converged communication services as well as converged IT/CT applications. This helps operators build an operable, profitable, and evolvable full-service telecom network. ZTE TECHNOLOGIES

Big Data
Brings Opportunities to Telecom Operators

By Li Qiujing

Li Qiujing, integrated solution expert at ZTE Corporation

Cisco has forecasted that between 2011 and 2016 global mobile internet data traffic will increase by a factor of 18 (to 10.8 exabytes per month) and global IP traffic will reach 110.28 exabytes per month by 2016. A greater amount of data requires more data storage, processing, and analysis. Big data technology has thus been introduced to effectively handle data, ensure adequate scalability, and lower deployment costs. It has also been introduced to expand applications of intelligent data analysis. Big data technology allows enterprises to quickly adapt to changes and enhance their competitiveness.

According to Wikipedia, big data includes data sets that cannot be captured, managed, and processed by common software tools within a reasonable timeframe. Big data involves a huge amount and variety of data from different sources that is rapidly fed in and out.

Big data technology is closely connected to cloud computing and is considered an extension of it. The technology ranges from mass data storage and processing to applications. These all involve mass distributed file systems, parallel computing framework, NoSQL database, real-time streaming processing, and intelligent pattern recognition, natural language understanding, and expert knowledge base.

Big data technology brings new opportunities to telecom operators faced with increasingly complex networks.

This increased complexity has come as a result of the rapid adoption of smart phones and competition in the internet ecosystem. Operators can use big data technology to improve operational efficiency and network intelligence. In-depth insight into customers and prompt decision-making based on big data can bring value to operators. Operators can also provide results of data analysis to third parties. This creates new market opportunities. Big data applications include business management, such as strategic and competitive analysis; operation analysis, such as user and traffic analysis; network management and maintenance, such as signaling monitoring and network quality analysis; and marketing analysis, such as precision marketing and personalized recommendations. Some typical applications are

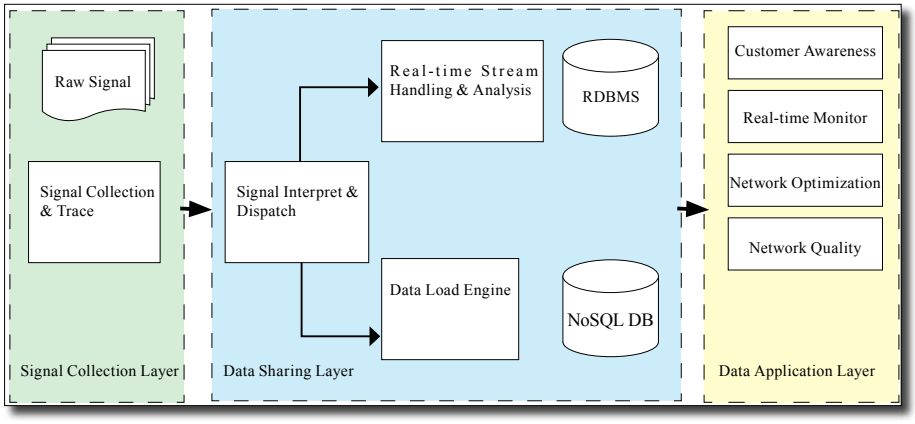


Figure 1. Big data based signal collection and analysis system.

- **Network management, maintenance, and optimization**

As the amount of data traffic grows, revenue from data services accounts for an increasing proportion of total operator revenue. However, data traffic grows much faster than data revenue. This imbalance has become prominent, and operators have arrived at the consensus that smart pipes and optimized operation is the way out. An important basis for optimized pipes is network management, maintenance and optimization.

Traditional signal monitoring, especially data signal monitoring, is affected by a bottleneck. A telecom operator might produce 1TB of raw packet-switched signal data per day and store it in a file format. After processing, 550 GB xDR signal data is generated per day and is saved in a database format. This data is often saved for a few days or a few months. Handling such a large amount of data is quite difficult for the traditional file system and relational database. Big data technology can address problems associated with rapid data growth, scalability, and high cost. A mass distributed file system can store an almost unlimited amount of data and can expand the data as required. An NoSQL database can handle up to a petabyte of data, and a stream handling and analysis platform can handle huge amounts of event data in real time (Fig. 1).

Intelligent analysis based on big data technology is important in network OAM. Real-time network maintenance is greatly enhanced so that a pre-prevention mechanism is set up. For example, historical traffic data and expert knowledge base are combined to generate an early warning model that identifies abnormal traffic and prevents network congestion or viruses.

- **User behavior analysis**

User behavior analysis is important in data traffic operation. By analyzing user profiles, product packages, services, billing, and financial information, operators can obtain precisely control policies. Web pages, messages, pictures and movies, and other traffic delivered through pipes can also be analyzed to better understand user behavior.

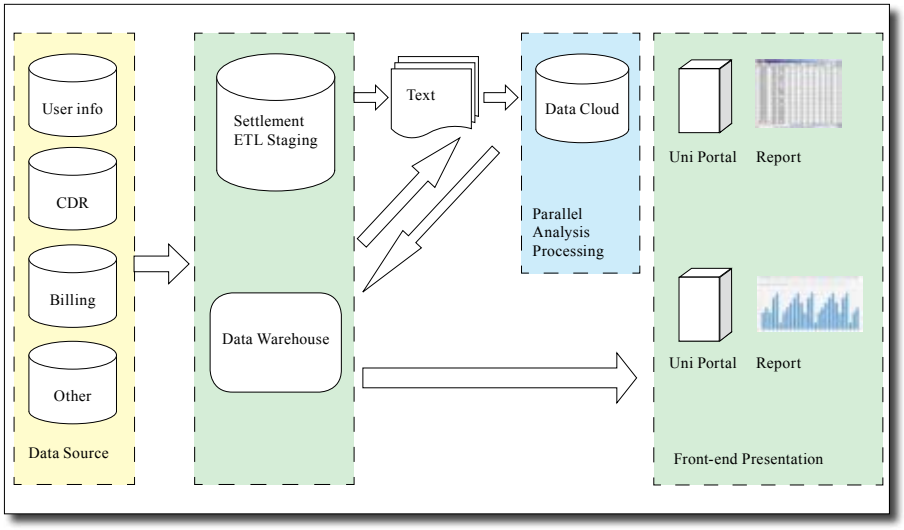


Figure 2. An operator's marketing portal system.

Data collection and processing is a significant bottleneck. Fig. 2 shows an operator marketing portal that is built for marketing staff, managers, and technical support staff at all levels. The portal provides daily and monthly statistical reports on data flow, revenue, subscriber development, warnings, and summary tree structure. The amount of data added each month can reach up to 4 TB. Usually, it takes 26 hours to analyze 4 TB of data using a traditional method that is inefficient and cannot adequately deal with system expansion. However, when parallel distributed processing is used, only two hours are needed for analysis and reporting. These technologies allow good system scalability and availability so that deadlines for statistical reports can be met.

- **Personalized recommendations**

Operators recommend services and applications according to user preferences. In applications such as Appstore and IPTV, large amounts of structured and unstructured data are handled in real time, and big data technology is key to service-recommendation systems. An IPTV program recommendation system involves analyzing not only user logs, comments, and rating but also relevant videos and comments obtained from the internet using a web crawler. Technologies that can be used for personalized recommendations include parallel computing framework; distributed file systems; text classification, clustering, and correlation algorithm; and intelligent analysis algorithms such as text abstract extraction, semantic analysis, and text mining.

- **Data as a service (DaaS)**

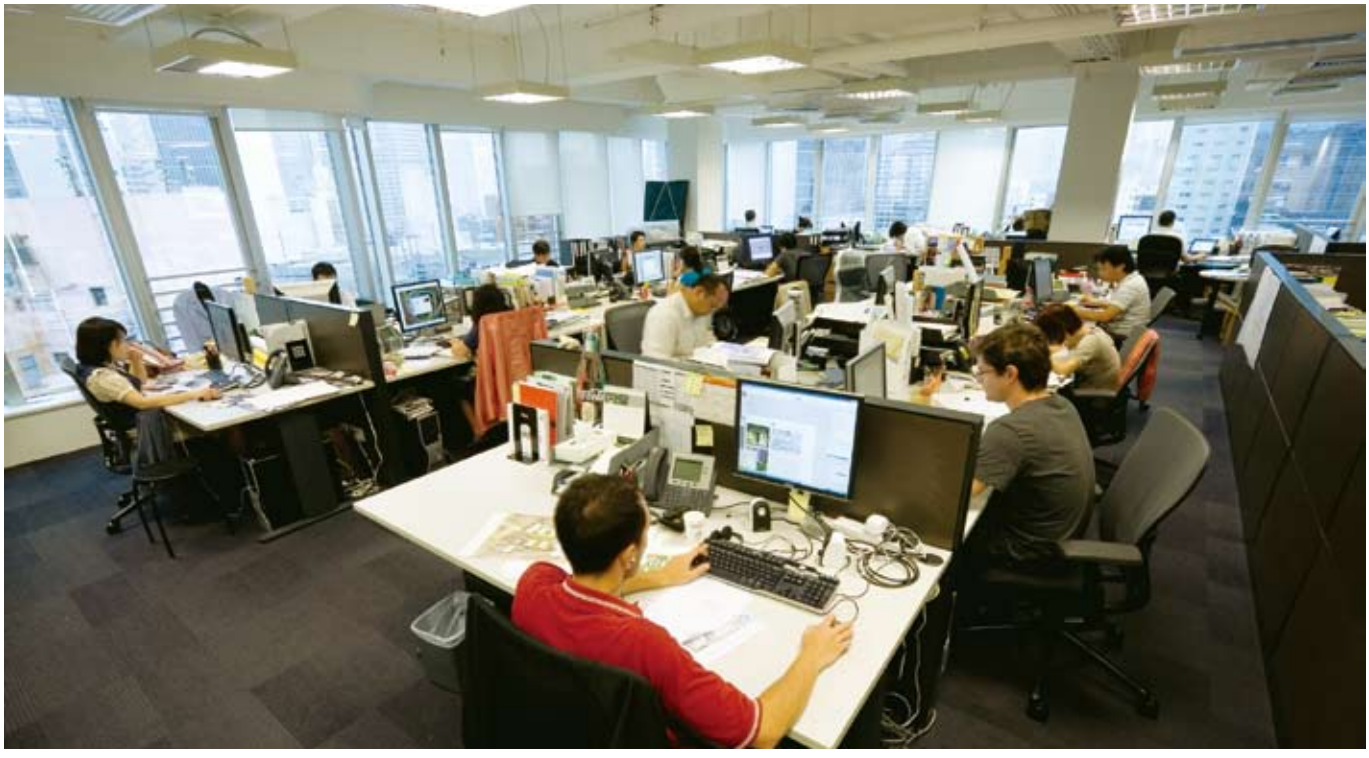
The heaviest traffic in mobile internet sector is video data. With the development of social networks, mobile payment, and internet of things, the real economy and virtual world are much more intermingled, and the value of data continues to rise. Telecom operators can obtain valuable information by analyzing user profile, location, terminal status, call record, and web log. The information belongs exclusively to the operators and can be provided to third parties such as SPs/CPs, research institutions, and enterprises. Operators can offer companies and public sector bodies analytical insights based on real-time, location-based data service. Mapping the movement of crowds can also help with city and transportation planning and can help retailers with promotions and choosing store locations. When providing these data services, user privacy protection and legal permission need to be considered.

There has been a surge of big data, and the industry is optimistic about its future prospects. As mobile internet develops rapidly, big data will certainly bring great opportunities to telecom operators. ZTE TECHNOLOGIES

User Experience

Always Comes First

By Wang Weibin



User Experience Is the Core of Internet Economy

In the 40 years since the emergence of internet, the number of internet users has ballooned to 2.3 billion worldwide. In recent years, this number has been increased by the rapid development of mobile internet.

The success of an internet business model is determined by user scale, user stickiness, and the influence of information. The size of the user base is of vital importance to an internet company. Research by Bain & Co. revealed that a 5% improvement in customer retention rates can yield a 75% increase in profits for companies across a wide range of industries.

It is the consensus in the internet industry that users are the core of the internet economy.

- "Users are the foundation of internet services." —NetEase CEO William Ding
- "The essence of the internet is to promote communication between users for lower costs." —Tencent CEO Ma Huateng
- "The essence of the internet is to share." —Ma Yun, chairman of Alibaba

Users are vital to an internet enterprise. Many successful business models are based on developing free user groups in the infancy. The Internet has given customers a convenient way of exchanging information, abundant entertainment, diverse communication platforms, and more efficient and economical transaction channels that cannot be provided by traditional

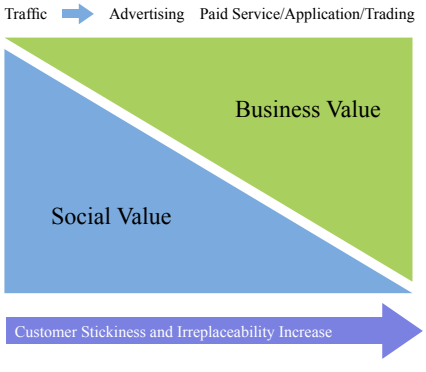


Figure 1. A basic internet business model.

channels. The internet attracts users by providing novel, economical, convenient, and high-quality experiences. Good user experience not only enhances user dependence on products and information but also attracts new users and improves user stickiness.

For enterprises in the internet industry, business value is gained using a traffic model mainly used by telecom operators or an advertisements or services/applications model mainly used by content providers. The former merely relies on traffic and provides the most fundamental service, but the model has higher social value rather than business value and has low user stickiness. Users can choose any traffic service provider and usually regard low price as the most important criterion. That is also the main reason why operators are channelized and why their revenues do not increase along with traffic.

The second model involves creating value by providing unique, experience-focused services such as online games and electronic trading in addition to traffic service. This business model is more valuable and has more user stickiness than the first model. As the scale of traffic and users expands, the model gains in business value. This effect is especially obvious in advertisement services.

Voice service provided by telecom operators is also a kind of experience service which offers high-quality voice communication to users anytime, anywhere. However, innovation in the telecom industry is KPI-orientated. Telecom operators usually establish a standard architecture first when

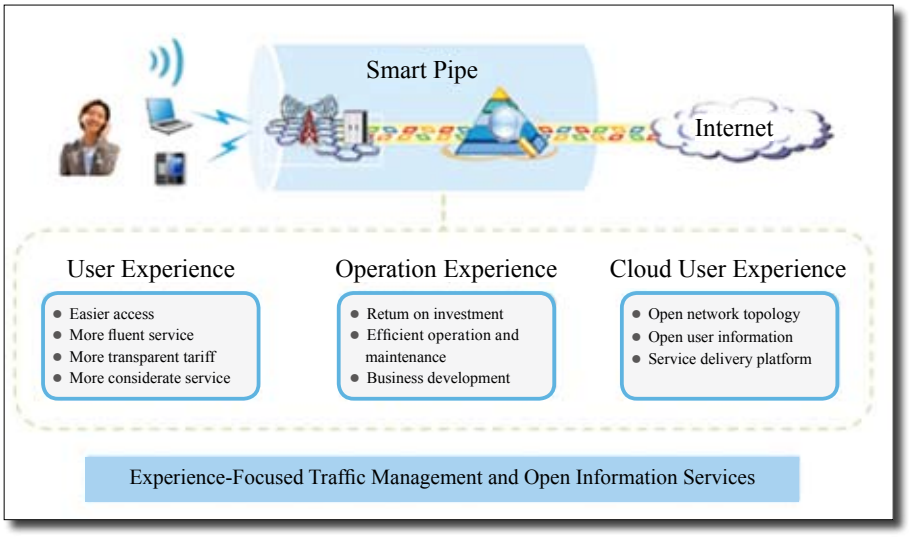


Figure 2. Building a smart pipe focused on experience.

introducing new services. This is always a strict but long process. Once the service is launched it cannot be changed easily. The service experience is not diverse and is inflexible. But internet companies pay more attention to user experience. They flexibly introduce new, innovative products and services to meet the user's need for new experiences. This mode has low costs and has created abundant over-the-top services.

Experience-Focused Smart Pipe Is Key to Operator Transformation

In the mobile internet era, an operator's leading position in the value chain has declined in face of the competition from internet service providers. Building a stronger smart pipe is the best, most feasible way for operators to transform themselves. User experience is the core of the internet economy. Experience determines user loyalty and how long they stay on the network. It also influences an operator's revenue. Therefore, operators must focus on user experience when building a smart pipe.

First, an operator must cease using resource utilization rate as a criterion for capacity expansion. They must also cease being KPI-oriented in network evaluation and construction. Sometimes good KPIs do not mean good user experience. Building a new type of network focused on user experience is key for operators to vie for users. By improving end user experience they can boost network access and traffic revenue and can grow at the same pace as internet companies.

Specific measures include:

- selecting the most suitable and economical access method according to user locations and services when expanding the pipe bandwidth
- managing traffic to accurately know a user's service application and consumption record
- establishing differentiated operation modes, such as application awareness and hierarchical services
- establishing a service-adaption mechanism for distributing effective content and for storing and sharing popular content. This enhances the speed at which users can access an operator's services and mobile internet applications
- setting up a user experience evaluation and management system to collect, analyze, evaluate, and improve user experience and realizing precision user marketing.

Second, operators must learn from internet enterprises and change their current operation principle merely replying on traffic. They must turn network capability and user information into value, provide open platforms for delivering service content, cooperate with internet enterprises, build a new backward business model, and offer more experience-focused services to users.

Internet applications and the market are developing continuously. Mobile internet has brought new development opportunities as well as challenges. The internet market is already witnessing fierce competition long before it has matured. Users will be the ultimate beneficiary in this competition. In the mobile internet era, operators cannot merely depend on their technical advantages to meet the challenges. Only by focusing on innovative products and business model and user experience can they compete. ZTE TECHNOLOGIES

User Experience

Accelerates the Development of Mobile Internet

By Zheng Xingming and Wu Guangwei

Users Drive the Development of Mobile Internet

With the deployment of 3G/LTE networks, smart terminals have gained in popularity. It is predicted that the number of people who use a mobile phone to surf the internet will reach 500 million by 2012, more than half of the 900 million mobile phone users in the world. The mobile internet market has grown aggressively.

In the mobile internet market, user groups determine revenue. Apple, Google, Facebook, and Tencent all have successful business models based on massive user bases. The key to their successful business models is improving user experience based on demand.

However, profits for mobile operators have slowed. Because of the sharp rise in traffic, operators have to spend money to expand their network capacity. Applications from the internet have also hindered the development of operator self-run businesses. Since smartphones started causing traffic jams on AT&T's network several years ago, operators have continually faced the contradiction between improving user experience and reducing network cost.

Improving user experience with limited network resources is one of the urgent problems to be solved by operators.

User Experience is the Focus

User experience includes cost, usability, and quality of service (QoS).

Users will always care about cost and tend to choose cheaper products.

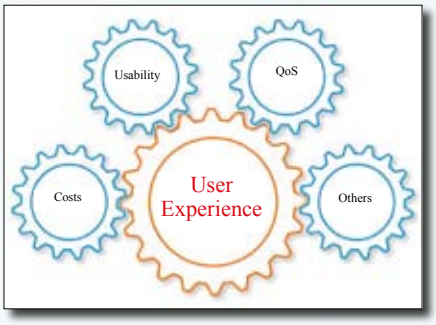


Figure 1. Factors of user experience.

It is very important for operators to provide clear consumption information as well as better value packages. Traffic-based charging is different to time-based charging, and it is sometimes unclear to users how much data they have consumed.

Usability is another concern. Simple and fast operation saves time and relives load. It is a good start to let users intuitively and quickly obtain information that concerns them most. A widget allows people to customize their desktops for better experience.

QoS is crucial to user experience. Every user wants superfast internet surfing, but restricted network resources and increasing users and traffic lead to network jams. Operators have to think about how to rationally allocate resources and let more users freely experience valuable services.

More flexible service subscription can also bring better experience. People can choose suitable service packages to save unnecessary expense. A temporary VIP package provides ordinary users

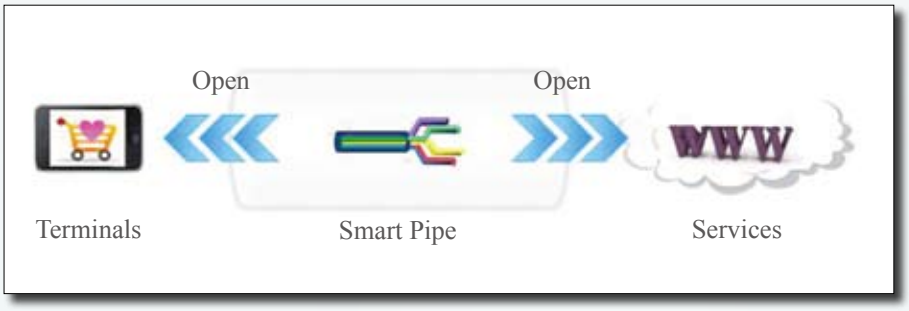


Figure 2. Smart pipe for better experience.

with a faster, more stable network in urgent situations.

User experience can also be enhanced through a wide range of applications and a safe, green network environment.

Smart Pipes for Better User Experience

Smart pipe is the core solution for operators to enhance pipe value. By making pipe information and capabilities open to terminals and services, operators provide transparent consumption information, differentiated services, and high-quality services to users and take full advantage of pipe operation to improve user experience.

Open Network Information and Considerate User Alerts

By displaying information such as consumption data and network status on terminal desktops, operators can offer users a transparent network and clear information that is of most concern to them. Giving the best care through the small details greatly improves user experience. For example, the total traffic consumed in the current month and traffic balance can be intuitively displayed on users' terminal desktops. When monthly or daily traffic exceeds the amount set, an alert is sent to the user. Detailed access information is provided to users so they can quickly troubleshoot if their services fail. An open information feedback platform is provided to collect user advice. This helps operators improve service quality.

Open Pipe Capabilities and Experience Customization

Operators open up pipe capabilities such as QoS, bandwidth, and security through the self-service system and provide users with quick subscription methods and flexible service customization choices. This lets people enjoy differentiated, personalized self-service. For example, a temporary day-pass package and bandwidth on demand (BOD) services are available. People can subscribe to extra packages to meet emerging demand for temporary services and enjoy VIP services. A control service allows parents to control web access and surfing time for their children. An online scanner is provided to VIP users for real-time antivirus scanning.

Cooperation with Internet Services for Value-Added Service Innovation

Operators can combine pipe resources with service content to provide innovative, differentiated services and allocate the most appropriate network resources to these services. By cooperating with third-party internet providers, operators can introduce more favorable services. This can cut down cost for users and integrate pipe value and service value. For example, a smart PUSH service can be provided for a lower tariff. When the network is idle, data services are pushed to users, and when the network is busy, data services are suspended. This helps cut down costs, and idle network resources are used to improve transmission efficiency. When users subscribe to a video service of a third-party, the operator network can reliably transmit this service and ensure smooth streaming. With support for internet of things services, operators can guarantee network transmission for services that need specific bearing.

The future of mobile internet will be focused on user experience—from terminals to applications. Operators must explore new profit opportunities while delivering high-quality services. ZTE TECHNOLOGIES

Customer Experience Management

By Liu Xiaokang and Xue Meiqin

With the coming of the mobile internet era, mobile services and products have become increasingly rich; market competition has become more homogenous; and customers have become more discerning with their service experience. Honing in on customers and their quality of experience (QoE) has become the only way for operators succeed in the market.

To accurately determine and manage QoE, leading mobile operators have developed customer experience management (CEM). According to the TeleManagement Forum, CEM is subordinate to QoE management. In CEM, the emphasis is on measuring user experience directly in real time and defining a user experience index. CEM is used to determine the service experience of certain users or groups in the hope of finding and solving problems before complaints are made. In this way, customer satisfaction can be improved.

A CEM system can compile key user indexes and convert them into information about user experience. This helps an operator recognize and understand user experience, and business departments can optimize existing resources accordingly. The system can provide data for fault analysis so that a fault can be located quickly. It can also observe, assess, and improve in real time the quality of user services and add value to network operation. By analyzing user and service information contained in the data, operators can better understand user behavior and service development. This helps with business planning and expansion. The CEM system mainly consists of QoE assessment system, data source collection and transformation, and mass data computing platform.

QoE Assessment System

QoE can indicate network and service experience in almost a quantitative way, and it can show the gap between the actual and expected quality of service and network. Many standards organizations have researched QoE and proposed their own measurement criteria. The top-down CEI-KQI-KPI modeling approach is widely used in the industry:

- KPI is a key performance indicator for a network or network element.
- KQI is a key quality indicator for different services. It is closely related to user experience and can be divided into service accessibility, retainability, and integrity.
- CEI is a customer experience indicator. It provides an objective measurement of customer experience.

A modeler needs to collect the original data from a network, develop a formula for calculating KPIs, and design models for mapping KQI to KPI and mapping CEI to KQI. Non-technical factors also need to be quantified when building a QoE assessment system. The weight of CEI and KQI in the calculation formula should reflect the degree of customer care, and the ultimate goal of

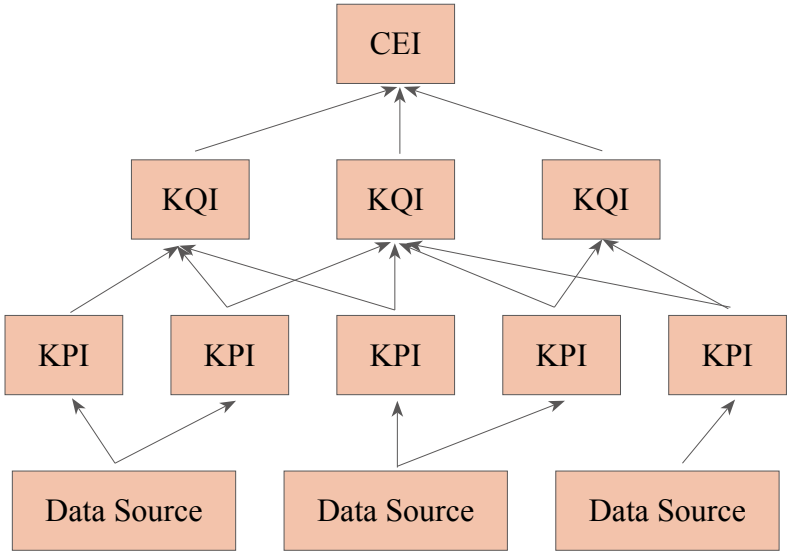


Figure 1. Top-down CEI-KQI-KPI modeling.

the system design is to improve customer satisfaction and value. To build a QoE assessment model that accurately reflects customer experience, the modeler should have a deep understanding of services and be experienced in network optimization.

Data Source Collection and Transformation

The CEM system needs to support data collection from various heterogeneous data sources in order to accurately reflect the quality of end-to-end services and customer experience. Data sources include:

- customer data. This includes detailed customer information such as name, service subscription, and SLA.
- active probing. This includes drive test and dialing test. A test pack is added to the existing network to obtain end-to-end metric data.
- passive probing. This is used when the network or equipment supplied by a third party does not automatically provide data for service analysis. The data is obtained by monitoring the network in a way that does not involve adding a test pack to the network.
- NMS data. This includes network KPIs and network element KPIs, both of which are obtained through the EMS or NMS northbound interface.
- xDR data. This includes MR, CDR and TDR data, which are delivered through relative interfaces on the equipment.
- network asset management. This provides detailed configuration data for all network elements.

The CEM system also needs to extract and transform these heterogeneous data sources for statistical analysis of different dimensions.

Mass Data Computing Platform

A mass data computing platform is essential for effective customer experience management. The platform has the following main functions:

- mass data collection, extraction, and storage
- real-time aggregation computation and monitoring of QoE indexes
- data mining for user behavior and QoS analysis
- separation of computation and data based on the network type and service product in order to ensure system expandability
- unified interface management system that provides user interfaces for real-time QoE monitoring, specialized analysis reports, fault handling, and SLA management.

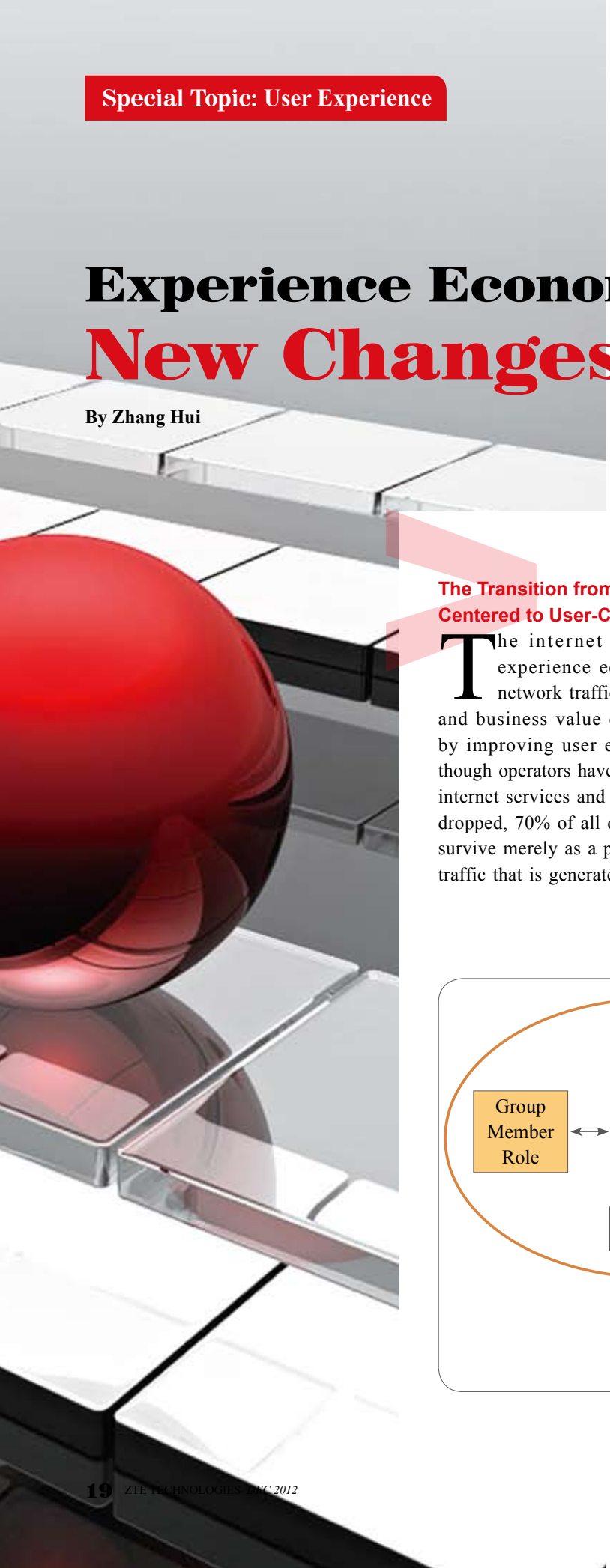
ZTE's self-developed user behavior analysis system, called ZXUN UBAS, can provide all these functions. With embedded scripting ability, it can customize extract, transform, and load (ETL) processes. It can also compute and monitor in real time any index from any data source on any dimension. It stores and analyzes mass data in the data center and supports online report definition and query. A unified web portal provides abundant UI interaction. Depending on the scale of the data, centralized or distributed networking can be implemented. ZXUN UBAS has been applied successfully in many markets worldwide.

Conclusion

CEM is inevitable for operators to advocate and implement QoE. CEM focuses on every contact with customers and integrates enterprise resources to create a positive customer experience. Building a CEM system is a complicated engineering task that requires not only necessary technical skills but also a deep understanding of the network, services, and customers. ZTE TECHNOLOGIES

Experience Economy Brings New Changes to Network OAM

By Zhang Hui



The Transition from Network-Centered to User-Centered OAM

The internet economy is an experience economy; that is, network traffic, user stickiness, and business value can be enhanced by improving user experience. Even though operators have been affected by internet services and their profits have dropped, 70% of all operators can still survive merely as a pipe provider. The traffic that is generated by a large user base is essential for pipe providers. Communication pipes generally have very similar functions, and it is difficult to differentiate. Demand for network neutrality and fair access has also increased, so improving user experience is both a challenge and a top priority for operators to retain users and boost traffic. Marketing factors such as tariffs and service promotions affect quality of experience (QoE). Quality of service (QoS) is a technical indicator (Fig. 1) for

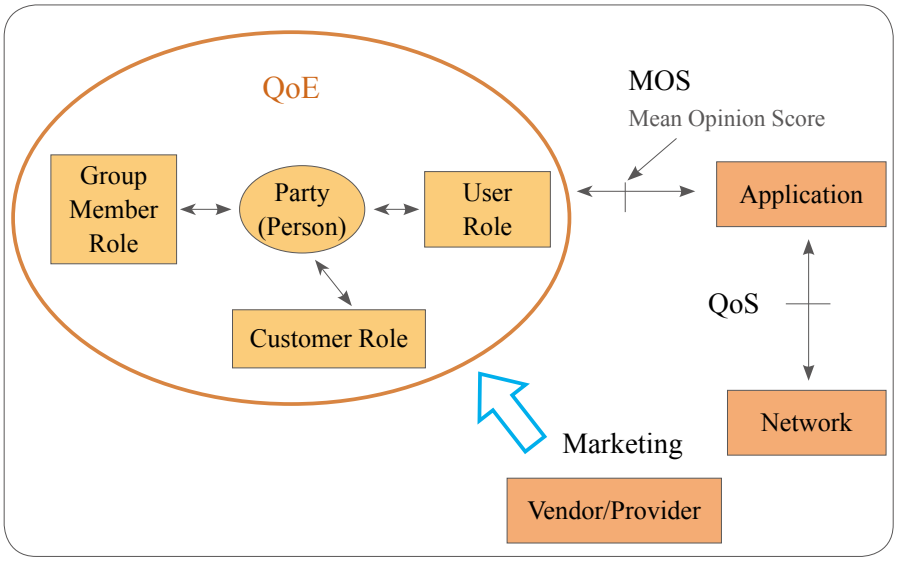


Figure 1. QoE model.

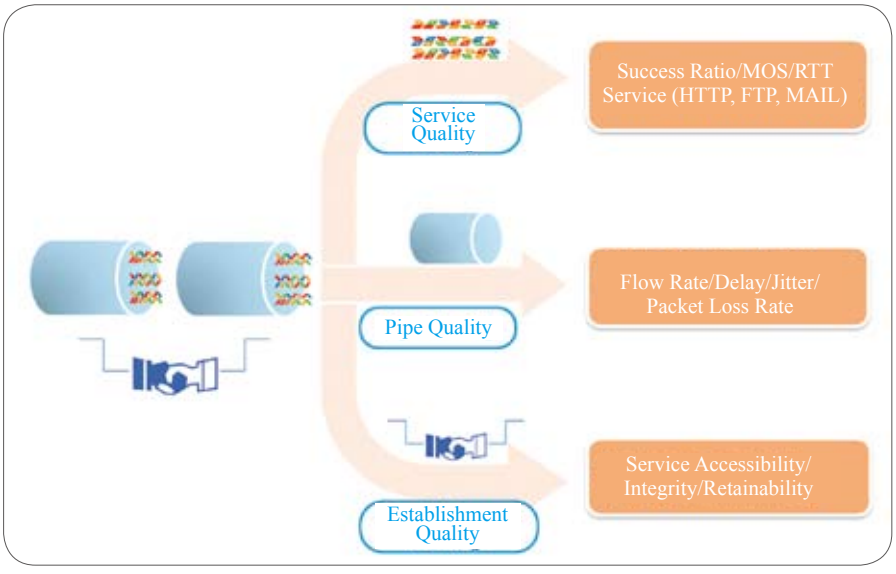


Figure 2. Three layers of QoS.

measuring network performance. What users experience is the quality of an application, which does not necessarily reflect the quality of the network. It is the application itself rather than the network that provides QoE. In the mobile internet era, network-centered OAM is not sufficient, and user-centered OAM mode has become the trend.

Improving Maintenance Using Traffic Analysis

In the voice era, an operator's network and applications were integrated in one physical entity. Operators could manage voice and SMS carried over their networks. However, in the internet era, an operator's network and applications are separate. This makes it difficult for operators to manage their networks. Operators are challenged by how to determine customer experience, how to reflect service usage, and how to guarantee QoS. Factors affecting QoS include operator network equipment and lack of control over a large number of terminals, and non-self-operating internet services. Moreover, operators can no longer detect everything in a traffic model (as they could in the voice era) nor do they have a full plan of where the traffic will flow. New terminals and services result in new features in the traffic model. How to properly plan and deploy network resources is a new challenge for operators.

Traditional KPIs cannot reflect customer experience. In Fig. 2, the radio, bearer, transmission, and network parts are abstracted into a communication pipe. Traditional KPIs focus on accessibility, continuity, and integrity of the pipe and include RRC setup success rate and PDP activation success rate. The quality of the pipe itself is determined by the flow rate, average bandwidth, and delay. However, customers directly experience services. The speed and success of web surfing and video cannot be represented by KPIs. It is therefore necessary to deeply analyze traffic flow from user and service perspectives to assess QoE and QoS. In-depth flow analysis provides a data basis for quality enhancement, customer guarantee, and network architecture optimization.

Services used by customers can be analyzed through deep packet inspection (DPI); however, after such inspection, it is difficult to build a QoS model. In the 2G era, assessing the quality of CS services such as voice and SMS was not a problem. The message network at the CS control plane was perceptible, and KPIs for voice and SMS were abundant and specific. However, PS service assessment involves inspecting service type, managing messages associated with service establishment, and assessing

quality of services. The cost is also relatively high. In practice, mapping QoS by the quality of pipe resources is another way to assess QoS. Although this is a simple way, a fault caused by a remote server or terminal cannot be located immediately. Therefore, building a simple and practical QoS model applicable to different scenarios is a continual process.

Optimizing multinetwork convergence—or 2G, 3G, 4G and WiFi multi-access—to enhance user experience has become a hotspot issue. The solution needs to include ways of choosing the best network without manual intervention and maintaining service continuity. A traffic flow analysis also needs to be done in network deployment and optimization. Such an analysis helps determine the ratio of 2G to 3G traffic flow, whether to deploy WiFi in order to offload cellular networks, and which services to deploy in hot spots. It also helps optimize network architecture, increase resource use, and enhance customer experience.

Much effort has gone into building cache, CDN, and IDC to speed up internet access and reduce the cost of exit bandwidth. However, duplicate content appears in the cache and IDC; the content of an IDC still goes out to be accessed by another network, and other content in the network cannot be used. These problems cannot be identified with traditional KPIs, but they can be identified using traffic flow analysis according to the destination IP address using DPI. Such problems can be solved by modifying a DNS configuration or introducing a smart DNS.

Optimized Management Based on Traffic Analysis

In the voice era, a business analysis system could help operators with precision marketing by analyzing voice call duration, toll traffic flow, bundling services, tariff, and SMS keywords. However, in the mobile internet era, operators might be operating blind if no in-depth analysis is done on their business.

Increasing effective traffic flow is the main target of the current business analysis. For precision marketing, operators need to determine customer characteristics and subdivide services. Their customers may be business users, migrant workers, news junkies, or music lovers. Services may be online shopping, video entertainment, or making friends. Different types of services are pushed to different customers. A video clip of *Voice of China* can be pushed to those who like downloading songs from the internet, those who have installed a karaoke/singing app, or those who often send MMS to friends at the concert. 360buy.com pushed its client software to those who often visited Taobao and SuNingyi purchase sites. To build a flexible QoS model, an integrated business analysis system is needed that can integrate all information from service analysis systems, CRM systems, and accounting systems in the network. Services also need to be pushed promptly through the service systems. The integrated business analysis system must be smart and operate on a real-time basis.

Differentiated business management is essential when network resources are limited. Differentiation is based on service awareness in the traffic flow. The biggest difference between mobile and fixed broadband networks is that a cellular network is constructed at high cost and is impossible expanded without limitation to meet growing bandwidth needs. To meet the needs of as many users as possible while working with resource constraints, operators have to choose between low-services, high-bandwidth services, low-priority users, and highly congested areas. They must make a portfolio strategy. They can satisfy most users at the expense of a small number of users.

Conclusion

Fierce internet competition has compelled operators to change their conventional network-centered OAM and gradually develop OAM that is focused on customer service. In-depth analysis of traffic flow allows continuous improvement in network maintenance, resource optimization, precision marketing, and the guarantee of customers. ZTE TECHNOLOGIES

H3G
Occupies the High Ground in Mobile Broadband

By Li Na and Thomas Schweeger

Hutchison 3G Austria has successfully swapped and upgraded its legacy network to improve network performance and smoothly evolve its network. This will help it be the leader in mobile broadband in Austria.

The Most Energetic Mobile Market in Europe

Austria is at the heart of Europe and is at the leading edge of European mobile communication. Its mobile market is highly developed and very competitive. By Q1 2012, SIM card penetration in Austria was 156% and growing.

The mobile voice market in Austria is becoming saturated, and mobile broadband is showing vitality. In Austria, there is strong demand for mobile data service. Early in 2009, Austria became the first country in Europe to deploy HSPA+. Austria is the battleground for several leading European commercial 3G network operators. All operators in Austria need to continuously improve the coverage and network capability of their 3G networks. Establishing a 4G network layer is imperative for them to improve and compete.

Fashionable and Vigorous Newcomer

Hutchison 3G is a leader in global wireless technology and is one of the

"In Austria, the demand for broadband services is growing very fast, and the most efficient way to satisfy customer needs is to build a national mobile broadband network. Hutchison 3G Austria is the first operator in Austria to build a nationwide LTE/DC-HSPA+ network, and this will guarantee that customers can enjoy mobile multimedia services anywhere, anytime," said Jan Trionow, CEO of H3G Austria.

most important transnational operators. It provides 3G services in nine countries and regions and had more than 31.6 million subscribers in Q1 2012.

H3G is wholly owned by Hutchison Whampoa Hong Kong and was born with a spirit of breaking free of conventional constraints. With these values, H3G is extending its territory and growing its business in Europe and Asia.

In 2003, H3G started its business in Austria and positioned itself as the most innovative mobile operator there. It is focused on the Austrian consumer market and continually pioneers new technologies and services. It is developing fiercely and promisingly, and this is demonstrated by its rapidly growing subscriber base and traffic.

Ambitious Blueprint

Because the Austrian mobile voice market is saturated, H3G Austria has turned its focus towards mobile data. H3G Austria seeks to build the best mobile data network in Austria, to provide users with high-quality 3G services at a low price, and to seize the high ground of mobile broadband.

Therefore, H3G Austria has been working towards ambitious strategic goals:

- provide lowest cost per megabyte in the market
- provide 94% network coverage with HSPA+ network
- provide a download rate up to 42 Mbit/s in September 2011
- cover high-traffic areas with LTE and data rates up to 100 Mbit/s in 2012.

Developing Step by Step

H3G's legacy network lacked high throughput and had limited capacity. H3G comprehensively evaluated their network for upgrade and began the process of selecting a new vendor.

In June 2010, H3G Austria chose ZTE as its exclusive supplier of radio access, core network equipment, and transmission network equipment. ZTE would also provide managed services for long-term, stable, high-performance network operation.

ZTE built a nationwide DC-HSPA+ network with a large LTE footprint. The network was completed in October 2011 and now helps H3G Austria provide up to 42 Mbit/s for its customers. This is seven times faster than the legacy network. The transmission network was also modernized with new microwave links, and LTE was deployed in high-traffic areas.

ZTE also swapped over the legacy core network and boosted capacity. This was done at the same time as the radio swapover and included

- ZTE circuit core network. This includes MSCS, MGWs, MNP, and LIG to meet standards-based requirements and to allow for easy and fast integration with H3G's existing IN and HLR components. H3G's new circuit core has a large portfolio of standard features. ZTE can quickly and flexibly develop new features for innovative services and allow non-standard legacy features to operate smoothly.
- ZTE packet core. This includes GGSN, SGSN, and CG. A highlight is the new GGSN-named converged multiaccess packet gateway, ZXUN xGW. It is based on ZTE's proven T8000 high-end router platform and supports multiple logic NEs (GGSN, SGW/PGW, PDG, PDSN, HA, BRAS, and SR) on the same physical hardware. These innovations required very close collaboration between H3G and ZTE. They proved the flexibility and professionalism of both parties in managing first-off deployments. The resulting packet core architecture has massively increased capacity to handle H3G's growing throughput.

For each of the circuit and packet core components, ZTE tool chain contains state-of-the art element managers with embedded tracing capability and ample configuration choices. This allows for easy and powerful operation. Together, new ZTE network elements and tool-chain can strengthen H3G Austria's ability to deliver high-quality services and bandwidth using a leading cost structure.

Symphony of Success

In March 2011, H3G Austria finished deploying new SGSN, GGSN, MSCs and MGW elements in the UMTS network. The new core network was connected to legacy RNCs and to new RNCs in parallel.

In November 2011, H3G Austria launched its commercial LTE network in Austria. It is the first LTE network in the

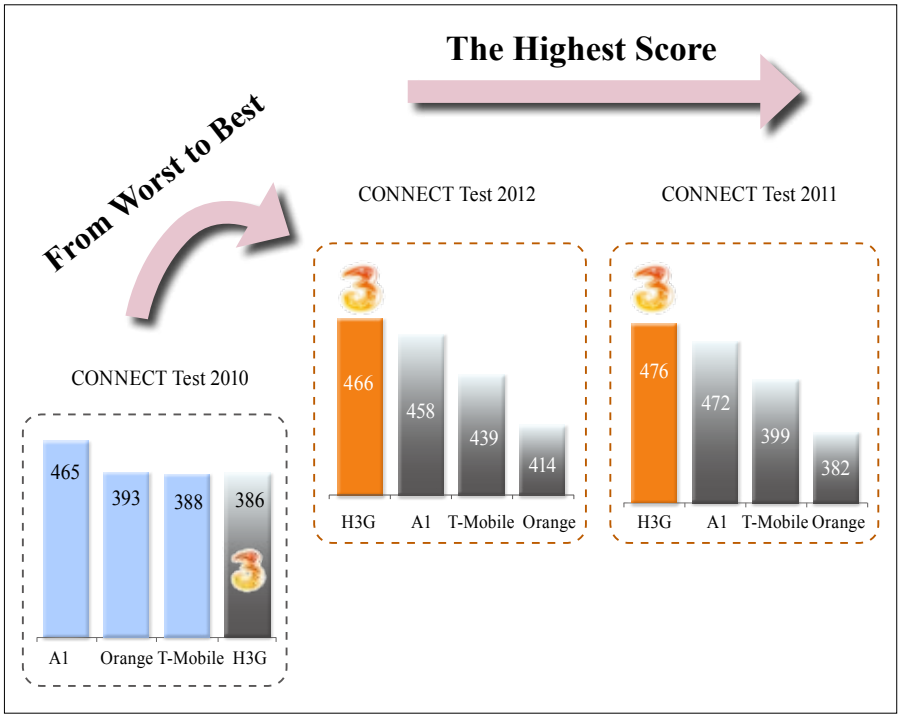


Figure 1. Comprehensive KPI tests by *CONNECT* magazine.

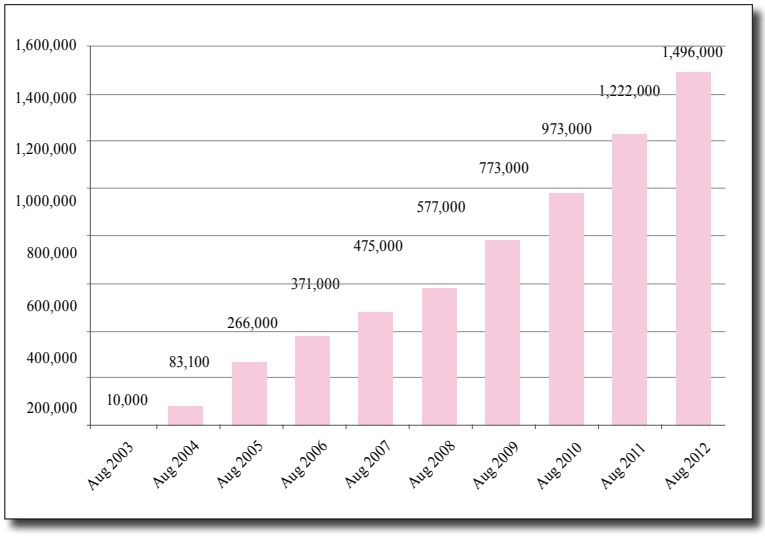


Figure 2. Development of customer figures (H3G Austria).

H3G Group.

In December 2011, independent tests conducted by the European telecommunications publication *CONNECT* proved that H3G Austria's mobile network was the fastest in Austria, Germany, and Switzerland.

In October 2012, H3G Austria again achieved the highest score in the annual CONNECT tests. Testing was done on intelligent handset voice, data, and mobile broadband. H3G Austria was able to meet network KPIs even though their subscriber base had increased 40% and data traffic had doubled year-on-year. H3G Austria provides an average download speed of 11.7 Mbps and average upload speed that is 50% faster than its second-place rival.

With its brand-new mobile network, H3G Austria is well on the way to achieving customer growth, increased traffic, and profit.

Customer Benefits

ZTE's Uni-Core solution offers ample capacity and a rich feature set that complies with industry standards. Because it is based on modern, all-IP architecture, it can accommodate legacy features. This approach allows for smooth network evolution and differentiated end-user experience that is a source of profit.

ZTE's after-sales service team collaborated closely with H3G's engineers to smoothly migrate the legacy network. The agreed KPIs were met, and network quality and performance were improved. The new network was certified as the best network in Austria by *CONNECT* magazine in both 2011 and 2012 after thorough and independent testing.

Optimized managed services from ZTE, and close collaboration between H3G and ZTE ensured flexibility and quality at competitive cost-levels. ZTE TECHNOLOGIES

Intelligent Bearer Network
Brilliant Win-Win Future

ZTE Helps T-Mobile Austria Build a WDM/OTN Intelligent Backbone Network

By Li Bin

T-Mobile Austria is a wholly owned subsidiary of Deutsche Telekom. With more than four million users, it is the second largest operator in Austria. Since April 2011, the company has been operated by DT and has achieved great success.

Rapid expansion of new services has meant that T-Mobile Austria's existing WDM/OTN network was starting to weaken in its capacity and reliability. The operator wanted to upgrade the WDM/OTN backbone to cater for increased business.

T-Mobile sought to build a mesh network that was capable of fast service deployment, wavelength/subwavelength flexible scheduling, better reliability, and that required lower capex.

Like many other operators worldwide, the company needed to prepare itself for a voracious need for extra bandwidth. It decided to design a 100 Gbit/s backbone to coincide with this year's implementation of the IEEE 802.3ba standard, which defines Ethernet networks operating at more than 10 Gbit/s.

To ensure the backbone network was reliable, T-Mobile required dynamic service re-routing as well as traditional protection mechanisms for secondary faults.

Three-Step Network Upgrade

In 2010, a network construction plan was devised that comprised three steps and was based on the company's existing network infrastructure.

In the first step, part of the sites on one link was built to bear end-to-end services. Device installation and service cutover were carried out on November 16, 2010.

The second phase involved an entire network upgrade, including an upgrade of those elements built in the first stage. A dynamic control plane was uploaded, and a mesh intelligent network was established. Commissioning of the network and service cutover were completed on December 18, 2011.

In the third phase, the 100 Gbit/s system was finished to meet the expanded service demands.

ZTE built an opto-electrical hybrid cross-connection solution based on reconfigurable optical add-drop multiplexer (ROADM) and optical data unit k (ODUk). The solution covered all sites in Austria and included a mesh network with ZTE's ZXUCP A200 unified control plane supporting the WDM automatic switched optical network (WASON) control plane.

ZXUCP A200 provided protection and dynamic rerouting, which enables protection switchover when the fiber breaks down. There was a service-level agreement between ZTE and T-Mobile Austria to provide carrier-class service reliability at a reasonable cost.

The control plane has advanced

automatic features, including topology discovery, and routing and creation of the service connection. End-to-end configuration is fast. An intelligent service wavelength scheduling solution makes more network resource available for use and reduces the operator's capex.

Brilliant Win-Win Future

ZTE set up a professional handover team to benefit the customer by delivering a successful project as quickly as possible. ZTE and T-Mobile cooperated closely throughout the project. This helped ZTE figure out the customer's demands quickly and arrange necessary lab tests and project handover.

Lab tests were successful, and the cutover was perfect. Phases one and two were completed ahead of time, demonstrating the power of ZTE's handover capability and reinforcing its brand.

In addition, successful completion of the first two phases laid a solid foundation for the development of the step three.

Smooth Evolution Reduces Capex

The low-cost solution enabled a smooth evolution from 10G to 100G and made maximum use of existing network investments. It also made future capacity expansion possible. Most importantly, the customer's capex was reduced.

ZTE and TMA employees work together

ZTE has provided T-Mobile Austria with an intelligent way of reducing opex and capex. Roman Tiediens, project manager of the T-Mobile Austria transport project, described the ZTE DWDM backbone in this way: "ZTE tailored the services for us. It provided an industry-leading optical transport solution to save our investment."

High reliability attracts more users. Features for avoiding fiber breakdown and a dual-host dual-gateway network management solution make the T-Mobile Austria network more reliable.

The intelligent control plane passed the user verification test. The first service cutover was completed, and existing Alcatel-Lucent devices were replaced. The services in phase two ran perfectly until the end of 2011, when the whole cutover was completed.

Rudiger Koster, T-Mobile Austria CTO wrote to ZTE to show his appreciation: "Network reliability has been 99.99% since the WASON was deployed. So far, all the devices in the network are running perfectly."

ZTE's principles are: "Precise service, focus on the customer" and "Create a brilliant win-win future." Guided by these principles, ZTE has provided T-Mobile with the best services to help it be a more powerful force in the future.

ZTE and T-Mobile Austria recently won a fixed-network infrastructure innovation award from Global Telecoms Business for the WASON solution. ZTE's WASON intelligent WDM/OTN network is the first of its kind to be deployed in Europe.

This was the second time ZTE had been honoured with a major prize in the commercial OTN. Last year, ZTE won the Infovision award at Broadband World Forum for the iOTN solution. ZTE's OTN technology is highly recognised in the industry because it is innovative and performs extremely well. ZTE TECHNOLOGIES

SoftBank Group's WCP Builds the World's Largest AXGP Network

By Wang Xing

Intense Competition in the 4G era

The Japanese telecommunication market is characterized by high population density, high mobile penetration, high ARPU, and high quality. The mobile penetration rate is estimated to be more than 97%, and ARPU is $54 per month (more than 60% from data) in 2012. Wireless data is the main contributor to ARPU because there are abundant data services that depend on broadband.

Now, competition in mobile telecommunications is fierce. NTT DoCoMo launched its LTE network in December 2010. KDDI launched its commercial LTE service on 21 Sep, 2012, and plan to have 98% population coverage by Mar, 2013. SoftBank is one of the leading Japanese mobile operators and has a nationwide W-CDMA network, and is the only operator to have the 4G AXGP and FD-LTE technologies simultaneously. Its market share is 23.79%, and it aims to be the No. 1 mobile and fixed broadband internet company in Asia. SoftBank must therefore adopt more advanced 4G technologies to face these challengers.

AXGP: A Better Alternative Choice for SoftBank

As AXGP (Advanced eXtended Global Platform, fully compatible with TD-LTE) matures, SoftBank has applied it to their next-generation mobile broadband services. This began in 2010 when SoftBank acquired Willcom, which owned a 30 MHz TDD spectrum license and more than 160,000 PHS sites across Japan. A new company called Wireless City Planning (WCP) was founded

"We have chosen ZTE, the world's leading telecommunications equipment provider, as our partner to build the world's largest TDD network. We hope that ZTE can maintain its leading innovation capability in mobile communications technologies to help us build the best next generation mobile data network in Japan and even the world," said Mr. Yoshioki Chika, WCP CTO, SoftBank Group

Figure 1. Typical AXGP site configuration (Photo from Fukuoka).

specifically for the AXGP project.

WCP selected ZTE as its strategic partner for the AXGP project. The communication and cooperation with WCP was good, and ZTE built an excellent AXGP network for WCP in several cities. ZTE's reliable products, strong R&D capability, and fast delivery were greatly appreciated by WCP and laid a solid foundation for future projects.

Co-Siting PHS for Lower Cost and Faster Deployment

WCP owns 160,000 PHS (2G TDD) sites. AXGP eNodeB shares site resources with PHS base stations. An AXGP eNodeB and PHS base station can share the antenna, optical transmission, power supply, and other resources. The antenna is a dual-band Omni Spear antenna at 1.9 GHz for PHS and 2.5 GHz for AXGP.

Co-siting reduces network investment and the time needed for deployment because there is no need to acquire new sites with high rents.

Centralized Baseband for Convenient Management and Space Saving in an Equipment Room

ZTE provided large-capacity baseband units (BBUs) for centralized baseband. Every general control room includes several BBU cabinets. A BBU cabinet houses multiple BBUs, and each BBU supports 18 cells. A remote fiber method is used for GPS because a room cannot be drilled for feeder cable.

Distinctive Services in Japan

The Japanese telecom market is well known for its unique services. The development of AXGP and other wireless broadband technologies enables operators to provide better experiences for subscribers.

In Japan, operators invest in their own platforms. The increasing popularity of smart devices has caused an information explosion. Customers tend to seek opinions and advice on web pages or on social media before making purchasing decisions. In an effort to support such services in this market, operators have established online to offline (O2O) platforms for shopping anytime and anywhere. They have also explored the mobile payment market with high profits.

WCP commercialized its 4G AXGP network on 1st November 2011, and attracted 261,400 subscribers till August 2012 (data source: Telecommunication Carriers Association, http://www.tca.or.jp/english/database/2012/08/index.html). It's a new era of MBB for SoftBank.

Milestones

- October 2010. WCP was founded.
- February 2011. ZTE got the PO for AXGP.
- April–August 2011. Lab and field tests on RAN were conducted.
- November 2011. AXGP network was put in service.
- February 2012. As a MVNO, SoftBank released its 4G service with WCP AXGP network.

BeamHop

A New Member of LTE Base Station Family

By Guo Jing

At Mobile Asia Expo 2012, ZTE launched its LTE BeamHop solution and demonstrated the LTE A8808 active antenna system (AAS) based on BeamHop. The product is a major breakthrough for high-end wireless markets. It allows operators to quickly and easily benefit from LTE by leveraging their existing 2G and 3G base stations.

Telecom operators are seeking to build new LTE networks while maintaining their existing 2G and 3G networks. As a result, more wireless systems operating at different frequency bands have appeared, and sites where antennas are installed have become more complicated. It is difficult and expensive for operators in developed countries and regions to rent sites for antennas. Base stations of different systems are often co-sited in central cities and in hotspot areas so that 2G/3G can evolve to LTE. Because the available antenna sites are scarce, operators have a pressing need to simplify their existing antenna sites.

Operators also need to smoothly introduce LTE into their existing 2G/3G networks. They seek a simple LTE overlay network for evolution to LTE at low TCO. This, in turn, has caused base stations to become smaller, multiband multimode radio cellular devices that consume less power and perform better. AAS is cost-efficient and can help operators benefit from LTE by leveraging their existing 2G and 3G base stations.

AAS is a new trend in base station architecture (Fig. 1). Current BBU+RRU architecture includes an RF transceiver unit that is close to the antenna. This reduces RF signal insertion loss and improves efficiency. In the new AAS architecture, the BBU also transmits baseband signals to the active antenna unit as in the BBU+RRU architecture. The difference is that an AAS divides transceiver channels using an antenna oscillator with a smaller granularity. The active antenna oscillator is reconfigurable for flexible beam control, dynamic resource allocation and sharing, and MIMO functioning. AAS has a distinct advantage over distributed base stations. It saves antenna site space, improves

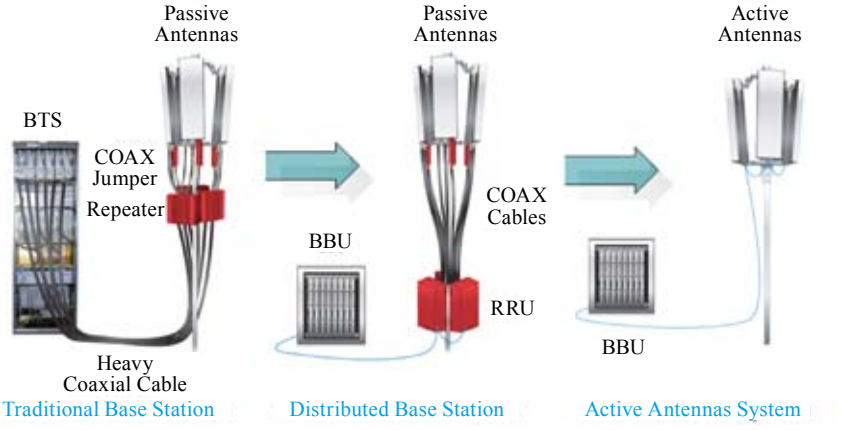


Figure 1. Development of base station architecture.

system reliability, and has no loss.

ZTE's LTE BeamHop AAS integrates the LTE radio unit into the antenna. By coordinating the multichannel RF and antenna oscillator, AAS implements beamforming and RF signal receiving/transmitting.

ZTE's LTE BeamHop AAS is the leading commercial solution for active antennas. It supports integration of active and passive antennas, reduces feeder connections, and increases transmission power of the base station and sensitivity of the receivers. This significantly boosts network capacity and coverage. The BeamHop solution also supports MIMO, beamforming, and flexible configuration to suit different coverage scenarios. A new LTE network can be deployed without the need for additional antenna site space. The solution facilitates network construction engineering and is extremely competitive in the developed European and American market where site rent is expensive.

How can an operator deploy an LTE overlay network using the BeamHop solution? ZTE's LTE A8808 AAS consists of both active and passive antennas. The passive part supports existing GSM and UMTS networks (1800–2100 MHz), and the active part is used for the newly added LTE network (2.6 GHz). When an LTE overlay is deployed on the 2G/3G base station site, the passive part of the AAS can replace the original 2G/3G antenna. The AAS is installed in the same way as the original antenna. 2G/3G RRU is connected to the passive antenna interface, and the connection of antenna feeder remains unchanged. A new LTE overlay network is deployed using the active part of the AAS, and the common public radio interface (CPRI) of the AAS is connected to the BBU's LTE CPRI. The DC power input interface of the AAS is connected to the power cabinet through the power cable (Fig. 2).

The BeamHop solution is effective for ZTE to tap into high-end European and American wireless markets. ZTE has been committed to developing innovative active antenna products that support wider bandwidth spectrum and more bands. In the era of data services, the BeamHop solution simplifies multinetwork structure and helps operators smoothly evolve their networks for low engineering and construction costs. It is a cost-efficient solution for operators to evolve to 4G. ZTE TECHNOLOGIES

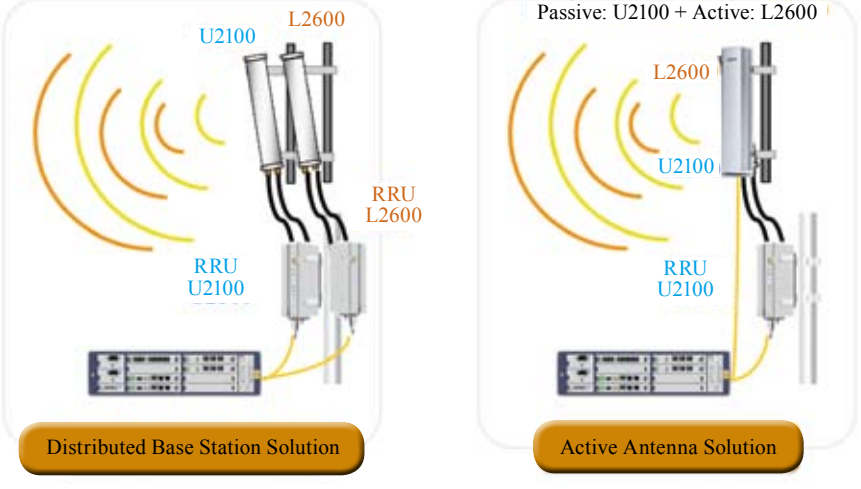


Figure 2. LTE overlay network on UMTS.

Go with WiFi
for Better Mobile Experience

By Zhao Youchun

As the amount of mobile data traffic grows, the task of expanding and evolving cellular spectrum has become a challenge for mobile operators. The fast uptake of mobile data services means that operators' network can no longer meet pressing customer demand for traffic. The spectrum available for mobile applications is limited.

WiFi is the hope of the future. WLAN allows mobile traffic to be offloaded from the limited cellular spectrum and is a way of balancing investment with revenue. WLAN offloading has the advantages of simple and widespread deployment, cost efficiency, and publicly available spectrum.

There are some WLAN offloading solutions that enable better user experience.

Automatic WLAN Discovery

WLAN is widely deployed by operators, but most smartphone users still use the 2G/3G mobile data services instead of WLAN because it is difficult to find the correct WLAN network. Users have to make several attempts to access a WLAN.

Automatic WLAN discovery allows users to access a WLAN easily without manually connecting. They no longer need to turn on WiFi all the time, find hotspots, and select the WLAN SSID. The smartphone automatically detects the best WLAN.

The access network discovery and selection function (ANDSF) provides accurate WLAN discovery information to the smartphone. It assists the smartphone to automatically find the nearest WLAN hotspot based on the user's location. If the WLAN is available, the ANDSF prompts the smartphone.

Even with roaming WLAN, mobile users can get specific WLAN access information from roaming partners via the ANDSF in the home mobile network.

SIM-based WLAN Authentication

Common WLAN authentication methods include web portal, 802.1x EAP-TLS/TTLS, and protected extensible authentication protocol (PEAP). Each of these methods requires the user name and password. However, with ANDSF, the user need only touch the smartphone screen once to access 2G/3G service. Therefore, most users prefer accessing data service via cellular

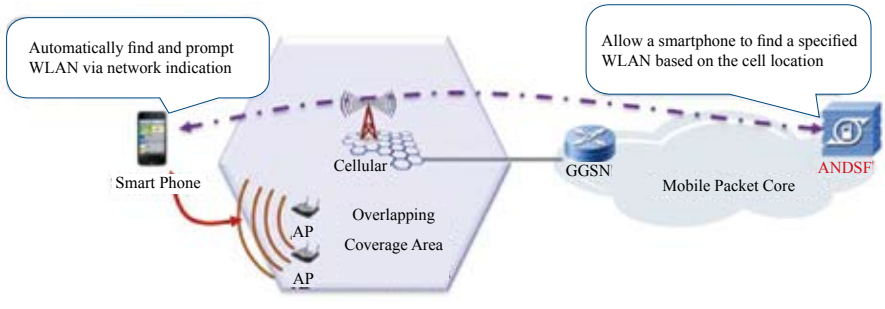


Figure 1. ANDSF provides accurate WLAN information.

access, even when they are in a shopping mall, airport, or café with WLAN coverage.

Most smartphones have begun to support SIM card WLAN authentication. SIM-based WLAN authentication automatically gives the smartphone complete access authentication at the link layer before any web prompt. The ANDSF client is used to find and access the WLAN automatically. This enables a seamless authentication experience, both in WLAN and 2G/3G.

Unified Mobile Data Service

Many applications on a network are walled-garden services. The operator determines which applications are available on a device's home portal.

WLAN cannot provide walled-garden services; it is still a solution for local breakout of low-value data services. It provides bad quality service; the user's mobile identity is lost; there are limited data services; an extra WLAN data plan is required; and it is incompatible with 2G/3G data plans.

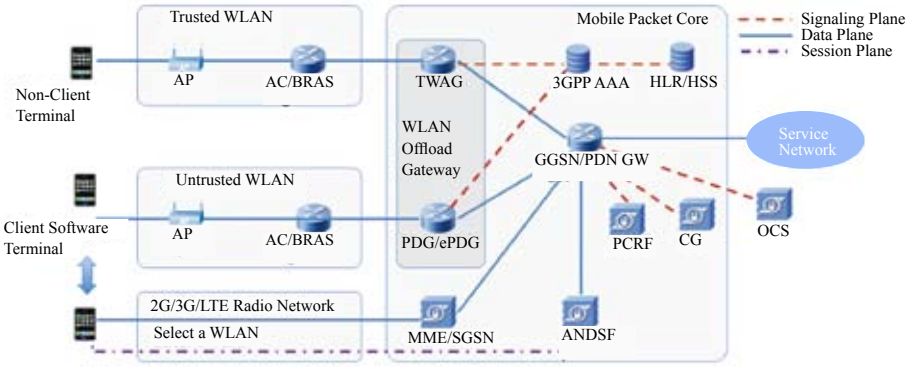


Figure 2. Unified mobile data service for WLAN and cellular networks.

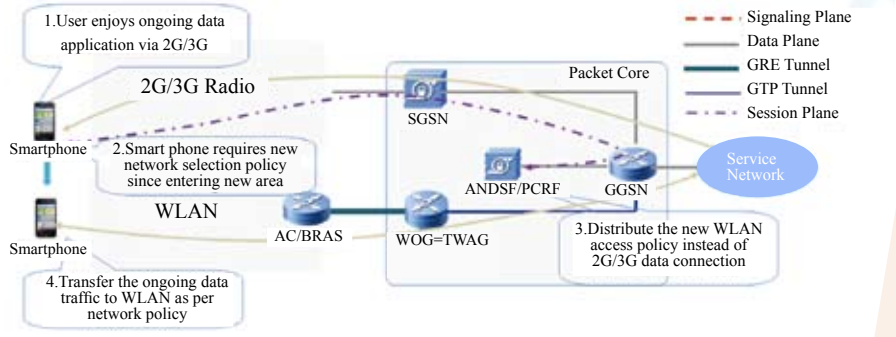


Figure 3. Intelligent traffic steering on WLAN.

A unified data service for both WLAN and 2G/3G networks allows mobile users to enjoy walled-garden services from a WLAN.

With unified access, users of all kinds of smartphones can get unified data service in WLAN and cellular network. The unified data service allows users to select trusted or untrusted WLAN access mode and enjoy all applications from the internet or walled garden. Mobile users can have a data plan for WLAN and cellular, and they will use WLAN more often for more traffic. Users can also enjoy the same traffic policy and service levels—for example, the same QoS assignment, bandwidth management and user profile—in both WLAN and cellular.

Intelligent Traffic Steering

With the intelligent traffic steering solution, when a smartphone detects a WLAN hotspot and, at the same time, the user has an ongoing data session via a cellular connection, the smartphone can initiate WLAN access based on information provided by the ANDSF. The ongoing data traffic can then be automatically transferred to the WLAN without the user even being aware of it. When the device leaves the WLAN hotspot, it automatically switches back to the 2G/3G network.

This solution helps an operator flexibly steer traffic to properly manage the load on the cellular and WLAN networks.

Conclusion

These solutions help wireless operators improve user experience on a WLAN. Better user experience is win-win for operators and users. ZTE TECHNOLOGIES

ZTE IMS Virtualization

By Chen Dan and Wang Meng

Background

Internet applications and IT technology have severely eroded the high profit margins of telecom carriers. Instead of trying to block internet applications such as Skype and Viber, more and more carriers are seeking to cooperate with or learn from them. With the success of Amazon cloud services, carriers have been focusing on how to adopt cloud computing in telecommunications. Some have already built their own cloud data centers and are thinking how best to profit from those technologies. The key technology is virtualization.

IMS is the standardized all-IP architecture for services such as VoLTE, RCS-e, and HD video conferencing. It supports both fixed and mobile access for all terminal types. The elements of IMS are logically independent, and IMS can run on a virtualization platform. Some tier-1 telecom carriers have already started researching how to introduce virtualization into IMS and how to optimize cost, performance, and deployment of telecom equipment.

The marriage of IMS and virtualization benefits carriers in the following ways:

- Virtualization decouples software from hardware. It allows an IMS element to be organized in horizontal layers, such as hardware layer, virtual machine layer, and application layer. You can purchase hardware from manufacturer A, virtual machines from manufacturer B, and upper-layer IMS applications from manufacturer C. This breaks the traditional binding procurement of hardware and software, which provides greater flexibility and lowers cost.
- Virtualization machines (VMs) allow carriers to move applications that are scattered in multiple, rarely-used physical servers into one physical server, regardless of the operating system. This makes resource utilization more efficient. With an elastic virtualization platform, carriers can easily deploy a new element or increase the capacity of an existing element.
- Virtualization is applicable in scenarios such as IMS hosting and IMS-in-a-box where establishment

costs and difficulty are high. A carrier can have many VMs for its operating companies (OpCos) or resellers, and earns revenue from both OpCos/resellers and end users. This is especially useful for a carrier with an unbalanced number of users across multiple OpCos. An OpCo with a smaller number of users can be hosted by the OpCo with a larger number of users, and the former need only manage the VM, to save investment on equipment.

- A VM offers different categories of cloud computing services based on the layers of an IMS cloud. For example, carriers can offer infrastructure-as-a-service (IaaS) for OpCos and resellers to rent. OpCos and resellers can offer platform-as-a-service (PaaS) for government and enterprise, and software-as-a-service (SaaS) for end users.

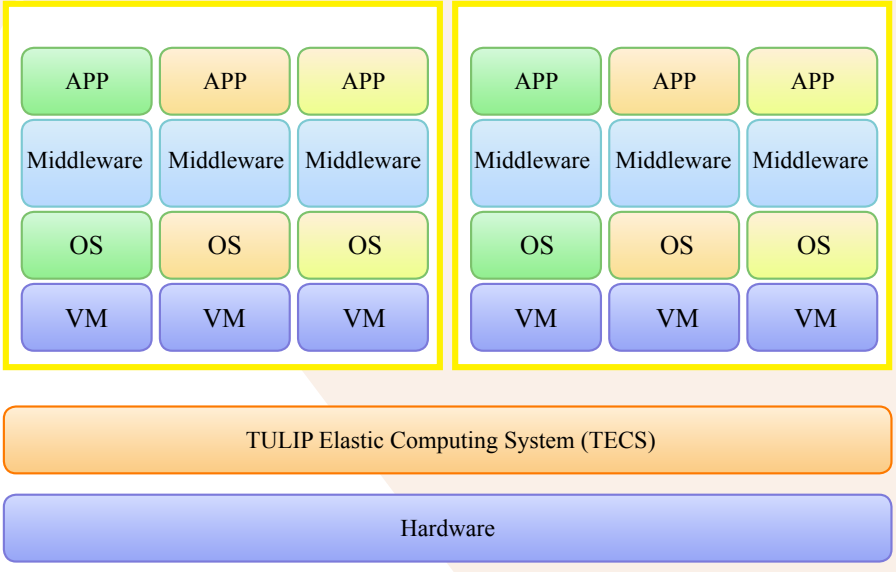


Figure 1. IMS Services on VMs.

ZTE IMS Virtualization Scenarios

ZTE is fully aware of the impact of virtualization on the telecom industry and has developed a virtual management platform called TULIP elastic computing system (TECS). TECS supports hypervisors such as Citrix Xen and VMware vSphere. The use of VMs in TECS makes IMS/CS product deployment more flexible. In addition to ATCA and general-purpose server platforms, VMs can also be deployed in other hardware platforms. However, the ATCA platform is preferable for carrier-grade applications, and a general-purpose server platform is preferable for enterprise-level applications.

Fig. 1 shows the use of VMs in IMS. The TECS divides the operating system of IMS hardware platform into multiple VMs for multiple service systems to run on. The virtualization of CPU, memory, and storage allows multiple service systems to share the hardware platform in order to improve resource utilization, reduce costs, and protect investment.

The TECS has following features:

- multiplatform, multi-OS capabilities
- support for computing, network virtualization, and related virtualization resource management
- support for scalability and independent upgrade of IMS elements and applications.

With a TECS, applications that run on different middleware/operating

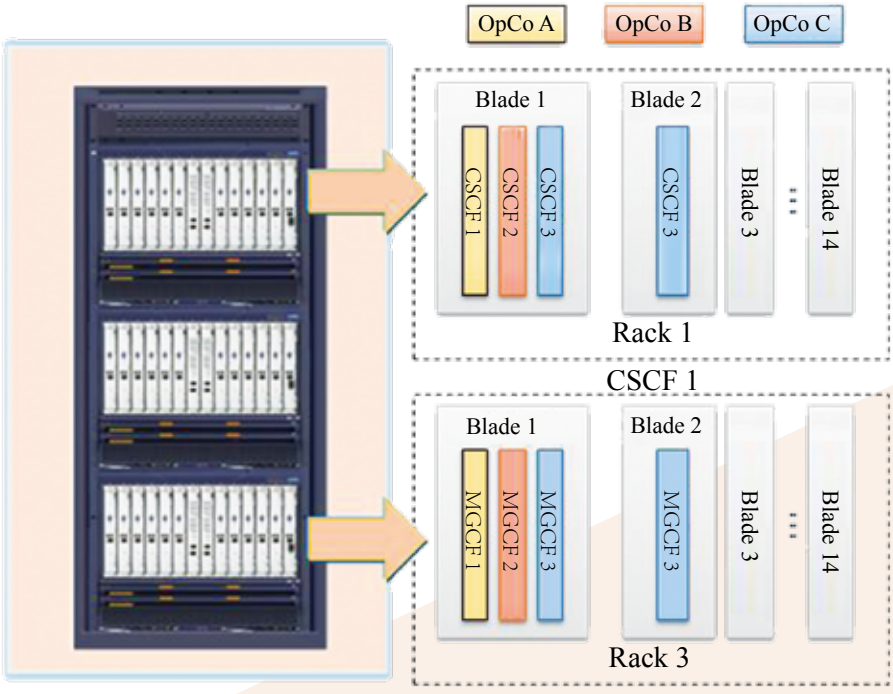


Figure 2. IMS hosting scenario.

systems can share the same hardware in different deployment scenarios. The following scenarios show how virtualization in TECS brings flexibility and scalability to meet the requirements of IMS deployment.

IMS Hosting

Virtualization allows multiple IMS instances to run on the same hardware (a blade or server). A multinational carrier can deploy an IMS system at their headquarters. Multiple instances of the same IMS element, for example, CSCF, run on the IMS hardware to serve multiple OpCos. Each OpCo manages its own instance. IMS hosting is suitable for a multinational carrier with an unbalanced number of users across OpCos and with a need of deploying IMS rapidly for each OpCo. It is also suitable for resellers of wholesale IMS services.

IMS-in-a-Box

Virtualization allows IMS elements and TECS to run on an ATCA blade or commercial server instead of on multiple shelves. This improves the integration of IMS elements. IMS-in-a-box is suitable for a carrier or a medium-to-large sized enterprise to deploy a small-capacity IMS without the need for scalability.

Smooth Migration from CS to IMS

Virtualization allows IMS and CS elements such as MSCS, MGCF, and CSCF to run on an ATCA blade or a commercial server. If there is a reduction in the number of CS users, the carrier can move the VM resources from MSCS to CSCF to avoid resource waste and smoothly migrate from CS to IMS.

Impact of IMS Virtualization

Virtualization is a metaphor for "the IT world," and IMS is an evolved architecture based on telecommunication networks. Virtualization in IMS has following characteristics:

- With optimization technology such as VT-x, the most recent data shows that the performance of a VM-based IMS system is comparable with that of non-VM-based IMS system.
- It is still difficult to move some traditional network elements, such as an E1 card of MGW, to IP-based VMs.
- The software and hardware of a telecommunication network are managed by NMS in a unified manner. However, virtualization technology eliminates the dependencies between software and hardware, which can be managed by different entities. This is a change to the vendor's network management system.

Future Development

It may take a long time to standardize cloud computing, if indeed it ever is standardized. The existing methods for interoperation between clouds rely on testing and certification.

Migrating IMS services to cloud makes network development more flexible for carriers and introduces a variety of services, such as video conferencing, to enterprise customers, end users, and resellers. Also, voice and video services become a kind of cloud computing service provided by the carrier and can be accessed anytime and anywhere through terminals. ZTE TECHNOLOGIES

ZTE Named World's 4th Biggest Smartphone Manufacturer

30 October 2012, Shenzhen — ZTE announced that it climbed one position to become the 4th biggest smartphone manufacturer in the world during the third quarter of 2012, according to IDC, a leading provider of global ICT market research and advisory services.

The IDC report, Worldwide Quarterly Mobile Phone Tracker, details that ZTE shipped 7.5 million smartphones in the third quarter of 2012, closely following RIM with only 0.1 percentage points between them. Number 5 in Q2, ZTE overcame HTC in the last quarter to rank in the global top four smartphone providers for the first time.

The IDC data showed that ZTE's increased market share is due to continued international diversification efforts in Q3. Traditionally dependent on sales in China, ZTE has now achieved significant uptake in developed countries with 35 percent of its overall smartphone shipments being sold in leading international markets, especially North America.

ZTE Helps CERNET Build World's Largest Coherent 100G OTN

8 November 2012, Shenzhen — ZTE announced it has won a network expansion project for phase 3 of the China Education and Research Network (CERNET).

As part of the project, ZTE will provide its industry leading coherent 100G solution and ZXONE 8000 series OTN products to build the backbone bearer network. The 100G solution is capable of hybrid transmission of 100G and 10G services and supports a seamless upgrade from 10G to 100G. The phase 3 expansion will begin in 2012 and aims to expand the coverage and transmission capacity of the network and to improve its speed and security. The network will cover Beijing, Chongqing, Dalian, Guangzhou, Hangzhou, Shanghai, Shenyang, Shenzhen, Wuhan and Xi'an. Its total transmission distance will exceed 10,000 km.

ZTE Wins Big Share of China Unicom BRAS Centralized Purchase

1 November 2012, Shenzhen — ZTE won a tender by China Unicom for broadband remote access server (BRAS) data communications equipment used in metropolitan area networks. The purchase of ZTE's ZXR10 M6000 equipment accounted for 45% of China Unicom's tender for new network construction, and covers 15 provinces, including Liaoning, Shandong, Hebei, Tianjin, Shanxi, Henan, Guangdong and Zhejiang. The latest contract win followed a similar BRAS network tender by China Unicom in 2011, when ZTE won a 17% share. ZTE's ZXR10 M6000 equipment is now deployed in 17 provinces, and is the mainstream product for China Unicom's BRAS and SR networks.

The ZXR10 M6000's simultaneous support for both BRAS and SR platforms, and the reliable user connectivity offered by the hot standby technology are the most significant reasons for the deployment by China Unicom. The ability to support IPv6 and other evolving technologies also enables China Unicom to make a smooth transition to next-generation internet technology and resolve issues such as the shortage of internet addresses. With excellent price-performance characteristics, the ZXR10 M6000 helps maximize China Unicom's return on investment.

ZTE Wins Best Broadband Partnership at Broadband InfoVision Awards

18 October 2012, Amsterdam — ZTE along with its partner Wexnet wins Best Broadband Partnership at the Broadband InfoVision awards held at Broadband World Forum 2012 (BBWF) in Amsterdam.

Since August 2011 ZTE has worked closely with Wexnet, a Swedish broadband operator to build a network that allows end users to select their own service providers and content providers for internet access, IP telephony, and IPTV services using 'ICP Store' a truly innovative service. For the first time users will be able to 'self-organize' their network and choose the service providers that best suit their individual needs, but at the same time have the services delivered over a single network.

'ICP Store' enables Wexnet to provide a better service to customers. Wexnet can now offer a range of choices to customers in ISP Services, IPTV Services and VoIP Services. According to Wexnet Technical Director Lars Wihlborg, "The ICP Store model is something we tell all of our customers about. It gives customers more choices when they connect to the equipment and we believe that this is the best way to build a metropolitan area network."

The 'ICP Store' project not only saw the cooperation between ZTE and Wexnet, but also saw the cooperation between one operator and many ISP/ICPs, with many more continuing to get involved.

ZTE Launches the Industry's First PC-based CPT for LTE Networks

22 October 2012, Shenzhen — ZTE announced it has launched the industry's first personal computer-based capacity planning tool (CPT) for LTE networks, utilizing an innovative concept to overcome long-standing limitations in capacity planning technology, providing operators with a professional and systematic aid for building the highest-performance networks.

Leveraging ZTE's deep experience in network planning, the 3GPP protocol-based CPT is tailored for LTE networks, and incorporates four technology patents. With a powerful set of system-modeling and simulation features developed in reference to data from real networks, the CPT provides operators with a competitive tool for commercial LTE network deployments. Compared with traditional solutions, ZTE's CPT offers a more than 20% improvement in accuracy and an efficiency advantage of more than 80%.

"ZTE's newly released CPT is based on an innovative concept, and provides a one-stop and flexible capacity planning capability, greatly reducing the difficulty of LTE network planning and improving our customers' operating efficiency," said Wang Shouchen, vice president of ZTE. "The tool's planning accuracy has vastly improved compared with traditional solutions. In the near future, ZTE will also launch other versions based on different network scenarios to meet the customer's needs."

H3G Austria's Mobile Network Constructed by ZTE Ranked No.1 for a Consecutive Second Year in 2012

29 October 2012, Vienna, Austria — ZTE announced that its customer Hutchison 3G (H3G) Austria network has come in first place in comprehensive KPI tests that were recently conducted with all the operator networks in Austria by the European telecommunications publication *CONNECT*. The H3G Austria network, which was modernized with RAN and core network equipment by ZTE, was placed in the top position, based on the excellent performance of the network.

H3G Austria has seen a year-on-year user increase of 24% in the last 12 months. In addition, as mobile internet applications grow in popularity, especially applications that rely on social networking services, there has been an increasing demand for throughput capacity, upstream rates and response capabilities of the network.

To meet this demand, ZTE introduced the latest interference cancellation technology, significantly improving the uplink data transfer rate and capacity. Network test results showed that ZTE's technology enabled H3G Austria to offer an average rate of more than 50% faster upload speeds to customers compared with the second-place network. H3G Austria's network also offers average download speeds of up to 11.7 Mbps with ZTE's technology.

The H3G Austria network was also praised in this test for its intelligent handset user experience, offering the highest successful network browse rate and the fastest webpage opening speed.

H3G Austria network has attributed its second consecutive win to the implementation of ZTE Uni-RAN and ZTE Uni-Core solutions. ZTE Uni-RAN solution helps operators accomplish 2G/3G convergence, unified management and maintenance, resource sharing for different systems, and consequently cutting down TCO. ZTE Uni-Core solution supports the seamless evolution from 2G/3G packet core to evolved packet core, and assists operators in supporting unified 2G, 3G and 4G access. ZTE helps operators build a smart pipe that supports service differentiation and traffic distribution.

While H3G Austria users have grown rapidly in the last year, the uplink and downlink data flow of packet data users has doubled, with the help of ZTE Uni-RAN solution and the core network. ZTE Uni-RAN solution enhanced capacity and performance of the network, by applying ZTE's leading interference cancellation technology when ZTE and H3G Austria upgraded the whole network to DC HSPA+. The application of interference cancellation technology eliminates interference between different users and as much as possible between different channels of the same user. By increasing signal noise ratio, the uplink system capacity is increased, making the transmission data performance close to the industry maximum. In the case of certain high traffic sites, the increase in uplink can be up to 40% using this technology, making the network response faster.

"Recognizing our customer needs, ZTE continues to introduce leading-edge technology to enhance network capacity and enable operators to provide high-quality networks. Last year we refreshed ZTE's HSUPA speeds, at present the application of interference cancellation technology can effectively improve network uplink capacity and enhance user experience without changing the network terminal. The third-party evaluation of the Austrian H3G network has ranked number one for the second consecutive year, which confirms that ZTE has a strong technical capability to build world-class networks," said Xu Ziyang, vice president, ZTE.

Building value together

New solutions and opportunities are results of teamwork and commitment.
Our customers know, since we have collaborated with them to create win-win solutions since our foundation in 1985.
Today, ZTE is a global leader in telecom solutions, and now we want to service you.
Visit **www.zte.com.cn** to find out more and to contact us for new opportunities.

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