Huawei Technologies

COMMUNICATE

05/2015 > ISSUE 75

Beyond Technology

Evaluation model for quality brand MBB networks

Mobile video: The next feast for mobile broadband

Going virtual: Life on the cloud

Value operations

through BEST Networks based on user perception

Scan for mobile reading

ANYTIME, ANYWHERE

With the success of Web 2.0, broadband will be universally available to encourage access to society and the world. Within the coverage area, everyone will be able to obtain information seamlessly at any place and at any time. Learning and working over networks will overtake the conventional geographical concept of schools and offices. Likewise, web-based activities will be the main platform for commercial transactions, surpassing the traditional trading activities. All of the above will become realities with the convergence of the virtual world and the real world over the next decade.

Building A Better Connected World

Enabling business and operations excellence

As MBB, FBB, and data centers (DCs) develop, smart devices proliferate, and data services evolve, user behavior has changed dramatically in the digital era, requiring network experiences that are real-time, on-demand, all-online, DIY, and social (ROADS).

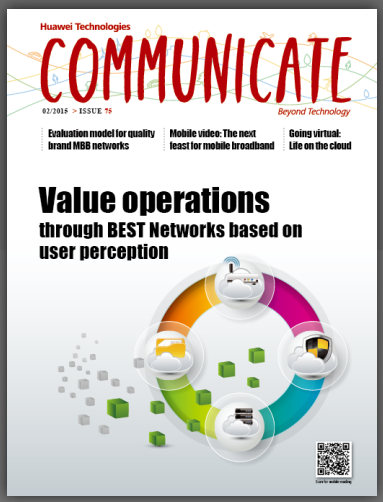
However, ROADS capability requires the transformation of telecom network architecture and operations. Service TTM must be shortened from months to hours. Network connections must increase tenfold. Open APIs must be introduced that integrate various applications used by individuals, families, and enterprises. Real-time big data analytics and decision-making must also be supported, with the OSS and BSS transformed from support roles to enablement.

The integration of four systems is of particular importance – the DC system, network function virtualization (NFV) system, software-defined networking (SDN) system, and telco operations system (Telco OS). The DC system will become the center of the network, built as cloud-based agile IT infrastructure. Operators will rely on experienced primary system E2E integrators, as telco OS-based system integration requires a full understanding of end-user behavior as well as ICT network data. Once the infrastructure enabling system (IES), business enablement system (BES), and big data platform are integrated, user service requirements will be met.

The telco value chain will shift to new value areas, with changes across three domains – from network function to user experience, from voice & bandwidth provision to rich & convergent ICT services, and from user growth to application innovation development. These changes will encourage the telecom industry to embrace open digital operations. All players in the industry chain must collaborate closely to build this ecosystem. Operators, OTT players, equipment vendors, system integrators, content providers, and end users will all be a part of it.

Huawei will proactively build it. We will innovate cooperatively with operators and partners, upstream & downstream. Huawei has continuously invested in business processes, tools & platforms, and professional teams, and has fully collaborated with the TM Forum, Quest Forum, ETSI, etc., to share our best practices. These initiatives will help us continuously integrate into an open and cooperative ecosystem, and add value to a Better Connected World.

Liang Hua
President of the Global Technical Service Department, Huawei



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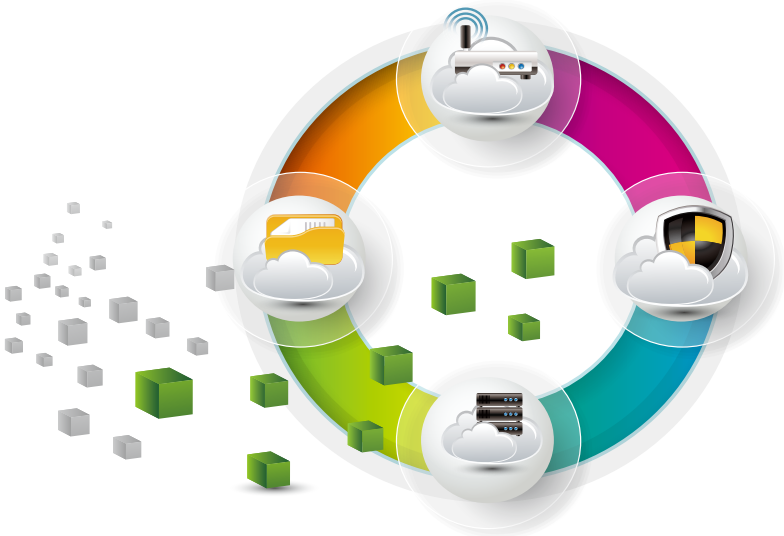

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Let's COMMUNICATE beyond technology and share understandings of the latest industry trends, successful operational cases, leading technologies and more. Based on in-depth analysis of the matters that lie close to your heart, we will help you stay on top of the telecom game.

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SmartPCC

Berlin, Germany, April 15, 2015, Huawei announced that its SmartPCC solution has won the “Best Traffic Management Solution" award at the Policy Control Forum 2015 held in Berlin, Germany. The award represents Huawei’s achievements in the traffic management and Policy and Charging Control (PCC) field. The Huawei traffic management solution offers real-time insights into networks and services. Through Big Data analysis, the solution can adjust and optimize policies, resulting in maximum network efficiency and subscriber experience.

Security

The Hague, April 17, 2015, Huawei was named a founding member of the Global Forum on Cyber Expertise (GFCE). The Forum brings together a range of private companies, intergovernmental organizations and governments for the first time to work towards ensuring a "free, open and secure cyberspace." Huawei supports the GFCE’s mission of collaboration to ensure that all the related parties can work together to find ways to minimize the disruptive threat of cyber-criminality.

450Mbps

<< Statistics

Hong Kong, April 23, 2015, HKT and Huawei have successfully demonstrated the world’s first IP-RAN based LTE-A 450Mbps solution (3-band FDD carrier aggregation). At a press briefing, HKT and Huawei achieved a peak download rate of 440Mbps in a live test of the world’s first demonstration of three component carrier (3CC) inter-site LTE-A carrier aggregation (CA) across three 20MHz spectrum blocks using a solution based on IP Radio Access Network (IP-RAN).

Global Analyst Summit

Shenzhen, China, April 21, 2015, Huawei convened the 12th Global Analyst Summit in Shenzhen, China. The event brought together over 400 analysts & business leaders from the telecom, Internet, and finance industries. At the event, Huawei launched its service strategy for its Carrier business, Enterprise business and Consumer business, also showcasing its technological prowess with products like Digital inCloud and the NetEngine 9000 (NE9000) core router platform. Huawei also released its 2015 Global Connectivity Index (GCI) for countries.

<< Ecosystem

Huawei P8

London, U.K., April 15, 2015, At the legendary Old Billingsgate, London's renowned arts and fashion venue, Huawei Consumer Business Group unveiled the Huawei P8 smartphone, a perfect blend of technology, sleek styling, usability and revolutionary low-light camera features. The Huawei P8 is the culmination of the P series' rich heritage of style and functionality, and is once again redefining the smartphone market with easy-to-use features that amaze and inspire consumers.

Software-defined Network

Shenzhen, China, April 10, 2015, Huawei and China Mobile launched the industry' s first Software-defined Clock Network solution which provides centralized control and automated management of clock synchronization networks. The new solution is a breakthrough in the field of software-defined mobile backhaul innovation, and further promotes the commercialization of Software-defined Networking (SDN) technology.

Fusion Engine

Shenzhen, China, April 16, 2015, Huawei demonstrated its Commercial Off-the-shelf (COTS) server FusionEngine solution at the 2015 Intel Developer Forum. FusionEngine is designed for next-gen carrier-grade COT servers, which use Huawei's advanced IT and CT technology to secure extremely high bandwidth, low latency and high reliability. As a carrier-grade COTS server, FusionEngine provides the best hardware platform for Huawei's CloudEdge solution facilitating the construction of next-gen MBB network architecture.

FireHunter Sandbox

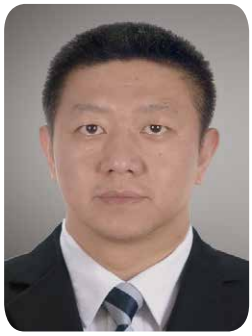
San Francisco, U.S., April 23, 2015, Huawei unveiled its new FireHunter Sandbox at the RSA Conference 2015. Designed to prevent APT attacks, the New FireHunter Sandbox can detect and report up to 99.5% of "grey" traffic in real-time through local and cloud techniques such as reputation scanning, real-time behavior analysis, and Big Data correlation. This controls the spread of unknown threats and minimizes the loss of key and sensitive information of large enterprises.

Carrier-grade 4K

London, U.K., April 30, 2015, Huawei presented its "Carrier-grade 4K" standard in video domain, during the annual video exhibition TV Connect in London. The solution delivers an improved video service to users through sharper colors, increased bandwidth, and excellent operations. Huawei also presented a number of other video solutions and facilitated discussions with industry experts.

<< Cutting Edge Technology

Value operations through BEST Networks based on user perception



Ken Wang
President of Global Marketing and Solution Sales, Huawei

Huawei offers a diverse lineup of solutions to help carriers build "BEST (beneficial, efficient, service-oriented, and transformative) Networks," whether measured by network rankings, consistency, value for money, or pretty much any other criteria.

As the MBB era dawns, a rich variety of mobile services is emerging and user demands for better network quality and superior service experience are rising. End-to-end (E2E) service experience in complex scenarios will be crucial to telco business success, directly impacting revenue. According to a Yankee survey, 64% of European mobile users have network quality as top priority when choosing a carrier, with over 10% willing to pay more for a better service experience. Third-party or crowdsourcing test results from the likes of P3 and Speedtest greatly influence users and put tremendous pressure on carriers by comparing network performance. Thus, telcos are increasingly resorting to building what Huawei dubs "BEST Networks."

Differing goals for BEST Networks

No two telcos are alike, and neither are their needs. Major carriers have all realized the importance of user experience, but telcos build BEST Networks with a variety of goals in their mind. One telco might expect higher Speedtest rankings. Another might be more interested in value for money. This makes the BEST concept not necessarily a matter of best in the world (though it could be), but BEST for you.

Value & user-perception

Huawei sees a quality network as an evolvable network that balances the customer's ROI and customer experience while ensuring profitability – a network that enhances telcos' competitive edge. Huawei has developed the BEST concept (beneficial, efficient, service-oriented, and transformative) for quality network construction, based on the ideas of "value operation" and "network construction oriented around user perception."

Benefits

Facing intense competition with OTTs and with each other, telcos are seeing declines in average revenue per user (ARPU) and sluggish

growth. Huawei suggests that telcos increase revenues and maintain profits through user migration and new service adoption.

Huawei has developed customized user migration solutions for different telcos to help boost both the subscriber base and traffic consumption. Optimization can break the bottleneck at the network side, and help migrate users as efficiently as possible by optimizing network handover parameters, adopting software features, refarming for better spectrum utilization, and optimizing indoor coverage.

User behavior analysis and business consulting based on expert advice and a global benchmark database can also help. Huawei can help telcos create optimized terminal/subsidy tariff packages that cater to local demands, which can stimulate new users to try data services and encourage existing users to consume more. Such consumption encouragement will eventually drive user network migration. For instance, in 2013, Huawei helped a certain carrier optimize its "user camping" strategy. In just three months, the telco's LTE user base increased by a staggering 543%, with LTE traffic consumption surging 741%.

Efficiency

Telcos all face intense competition and high coverage demands in the face of limited capital. How can they guarantee coverage of value areas and value customers? Huawei recommends our SmartCAPEX solution for targeted network construction.

SmartCAPEX uses automated tools to collect detailed network data and conduct multi-dimensional association analysis, and develops network investment and construction schemes based on site value. SmartCAPEX helps telcos identify cells, sites, and network grids with the greatest value, and uncovers potential sites often neglected in traditional network evaluation. The solution maximizes ROI for each new site, making sure money is spent in the right place.

SmartCAPEX helped an African carrier implement precision network construction, increasing the carrier's network traffic by 30% in three months, with traffic at certain new sites twice as high as the average for existing sites.

What's more, Huawei's service operations centers (SOCs) support service quality evaluation, user satisfaction monitoring, service quality monitoring, and fault location, allowing for proactive E2E service quality optimization and management. SOC drives network/market/marketing departments to coordinate effectively and solve problems, guarantee user experience, market more precisely, and make O&M more efficient.

Figure 1 Huawei "BEST Networks" concept

Service experience

Video services are becoming basic telco services, but they require high bandwidth, low latency, and few interruptions; this is very hard to guarantee from end to end. Huawei is dedicated to helping customers to build quality mobile broadband (MBB) networks. As mobile video shifts from 360p to 720p to 1080p, it has become almost compulsory for telcos to keep video buffering time under three seconds, and ensure zero interruptions. High bitrate video services pose an unprecedented challenge to E2E network capability, placing new requirements on the intensive coverage and signal quality of wireless networks and the fiber to the site (FTTS) and architecture of backhaul networks.

Huawei provides a range of mobile video solutions. We can help telcos test the KQIs of OTT video and locate network problems, effectively shortening buffering and reducing freezes. Our evolved multimedia broadcast/multicast service (eMBMS) solution helps telcos integrate current networks with new solutions, activate E2E features, aggregate the industry chain, and design new business models. Our value growth solution (VGS) optimizes user experience by enabling traffic consumption notification, video acceleration, balance query, and new package subscription.

During network optimization, Huawei can perform KPI/KQI monitoring and assessment of the network and its services, and conduct E2E network optimization of key areas, which involves coverage evaluation, network rate/neighboring cell optimization, interference troubleshooting, and transmission layer optimization to guarantee service E2E QoS.

A Huawei survey has found that 1Mbps can guarantee excellent service perception for gaming and web browsing, while 3Mbps can effectively improve service experience for HD video and high-speed transfer. Thus, we proposed the concept of "xMbps anywhere-anytime" to realize on-demand network resource allocation.

In 2013, Carrier Y in Southeast Asia lagged behind its competitors in UMTS network construction, and wanted to deploy UMTS2100. Huawei's "xMbps anywhere-anytime" solution matched their goals perfectly. After complete network performance evaluation and accurate solution planning, a group of solutions covering carrier expansion, six-sector deployment, and new site planning was implemented. In 2014, Carrier Y achieved its goal of 2Mbps anywhere-anytime, making for a clear advantage in market competition.

Some carriers attach great importance to

third-party testing, as websites like Speedtest can have a great influence over end users. Poor performance on Speedtest could compromise a telco's brand. Speedtest utilizes spontaneous crowdsourcing for testing, which can better reflect real service experience than traditional drive-tests. Huawei has developed a crowdsourcing testing optimization solution to help carriers improve their rankings. In 2014, Huawei successfully helped a Middle Eastern carrier raise its Speedtest ranking for its mobile and fixed broadband to the global top-five.

Transformation

BEST Networks must protect investments and support new services, so they must support multi-network coordination and smooth evolution.

Market service coordination: With multi-network coordination, different services can be designed for different user groups to deliver varied service experience. The service experience can also be improved to enhance the loyalty of high-value users.

Hybrid networking & technical coordination: For multi-standard/multi-service coordination, the building of BEST Networks with a superb user experience depends on network standards and services that maximize ROIs.

Network architecture & technology evolution: Solutions must allow for long-term evolution, with regular network upgrade and transformation carried out in line with industry trends.

For example, as a basic communication service for next-gen mobile networking, voice over LTE (VoLTE) will play an increasingly important role in future business models. Thanks to VoLTE, telcos can retain users through voice and data services and continuously enjoy the advantages of their substantial phone-number resources. Therefore, BEST Networks must be capable of evolving to support VoLTE.

Huawei sees a quality network as an evolvable network that balances the customer's ROI and customer experience while ensuring profitability – a network that enhances telcos' competitive edge.

Based on the needs of future network evolution, Huawei leverages its expert resources, professional processes, and tools & platforms to deliver highly-efficient network integration, verification, and implementation through evaluation and indoor/outdoor and multi-standard/multi-band/multi-vendor coordination. Huawei is committed to carrier business success through BEST Networks that support smooth evolution.

BEST Networks empower telcos

Huawei has created a set of BEST Network assessment standards for O&M processes & platforms, equipment health, network capacity, coverage, interference, and service quality. Telcos can measure their networks against them to find network problems and use the O&M center to solve them, realizing quality assurance for key services.

Executing the BEST Network strategy of "value operation and network construction oriented towards user perception," telcos can concentrate their limited funds and resources on value areas and value customers. BEST Networks enable telcos to conduct refined operation, enhance their brands, and stay ahead of the competition in an increasingly homogeneous market.

How should operators go digital?

Leveraging technology is fundamental to digital transformation but understanding customers and serving them exceptionally is at the heart of digital business. The TM Forum lists the following as the strategic pillars of digital business – business agility and rapid innovation, operational agility and effectiveness, IT and data-centricity, and customer-centricity. Keith Willetts, TM Forum Founder and board member, provides a glimpse of his digital vision for telco.

Mohammad Hussain

Keith Willetts,
TM Forum founder

Beginning would be a good start

Communicate: How should operators transform into digital businesses?

Keith Willetts: First they have to start. A lot of operators are still thinking, "We've got time." And the process of transformation, especially when you talk about cultural transformation, about the kind of people you employ, about how you promote and reward them, about how you treat them – these take time. In terms of getting your business more innovative, really figuring out the business you're in, changing from long-term strategic planning to more of an experimentation kind of mindset, these things don't happen overnight. The problem is markets can change overnight.

Getting the transformation timeline and the business defense or offense strategies in line are challenges most operators have. Go too fast and you are there before the market and end up spending lot of money. Get there too late and you don't have a business. Most of the CEOs that I talk to are really grappling with, "How do I make change fast enough and how do I not get caught unawares by the likes of WhatsApp taking billions of dollars out of my business every year?"

Communicate: What impact does this have on the telco industry ecosystem and how can the digital services value chain be redefined by operators?

Willetts: The ecosystem has seen significant consolidation (over the last decade) on the supply side of telecom. Where there were hundreds of small companies there are now a few large ones. The same is starting to happen to the operators, where we have a thousand or so licensed operators in the world, typically three or four or five per country. Europe has 98 operators for a population maybe twice the size of the U.S., where they only have four. So, something is not right with the country-level of economies of scale.

But it goes more deeply than that. What do you do best? What do you do uniquely?

And what does somebody else in the ecosystem do faster, cheaper, better than you can? It might be operations, for example. A lot of operators have partnered with Huawei to help run the network, or maybe billing operations. So, there's probably more around the exploitation of the network in the creativity of all the applications that we've seen in the app stores. This is starting to be mirrored in applications for business. Now, the difficulty for most telecom operators is to really understand where the opportunities are moving, fast enough. Now partnering can be opening up APIs, opening up software-defined toolkits, software development toolkits, to allow people to come in and add that creativity. So, partnering in the ecosystem at the formal business-to-business outsource partnering-level or it can be opening up of the infrastructure for people to come in and look at the creative ways of revenue sharing. But, the Internet of things, the mushrooming of those things, and the need of business, all businesses, to digitize it create fantastic opportunities for operators, but you've got to grab it.

Communicate: How will digitization impact operations and what steps can operators take to prepare for this?

Willetts: I will talk a bit about agility. One of the keys to agility is being able to change what my network can do. Traditionally networks have been built and optimized to do a job, but increasingly we are looking at software-defined networking. Increasingly, we are looking at virtualization of the network in the same way we look at virtualization of the data center. I think they bring pretty profound operational implications in that there's no real difference between the device at the end and the data center running the application and the storage pieces running on the network. They're kind of morphing into one connected digital platform. So, we're to say, "We're telecom. We're different. We're going to do things quite differently. We've got to think all across the borders, particularly if those borders are the many players across the ecosystem. So, to deliver a great quality of experience to the customer, I can't just say, "My bit works as well as the other guy's." So, I think the operations infrastructure, in a path-oriented, truly digital and truly soft model, changes pretty profoundly.

I think one of the biggest challenges we haven't faced is how you migrate. Do I build the new world and cut people over to it? Do I slowly evolve my current world? Either way, we end up with some duality for a while, with old and new

The Internet of things, the mushrooming of those things, and the need of business, all businesses, to digitize it create fantastic opportunities for operators, but you've got to grab it.

coexisting. Agility is the key. Simplicity is the key. The simpler you make your business, the simpler will be your operational infrastructure

Who is ahead in the game?

Communicate: Is Huawei well-positioned in services as well?

Willetts: I do think so. In terms of the underlying network technology, you're well established there. More and more you are providing the "as services" of one sort or another. Elsewhere in the value chain, a very interesting evolution might be not just a communications platform but an entire business platform, a go-to-market enterprise business platform. I think Huawei has a huge landscape to play in.

If you look back ten years, operators knew how to run their business. They just wanted technology to do things faster and cheaper. Today, they are much less certain of the business they are in or how to get there. So, the days of vendors saying, "Here is my box. Here is the feature/functionality. Here is the configuration. Mine is cheaper," are on the way out. Wrapping your capabilities with consulting, with help and expertise and all those things are hugely valuable and vital. I see a number of software companies coming in, telecom companies coming in, all wrapping their product with business experience, excellence and support for, "What do I do next?"

Communicate: Can you share some examples from TM Forum members that you think are leading in this transformation to stay competitive in the digital economy?

Willetts: It's difficult naming names of companies who are better than other people. As I said before, it's about timing. Lots of operators are actually quite reticent in talking about what they are doing until they have done it. I tried to get people to republish a case-study handbook and usually they only let you publish it two or three years after it's already working. But, a lot of the most interesting stuff that is going on is experimental; trying things and seeing what works, and not seeing things as a failure if it doesn't work.

For example, I point to Telefónica as the company I think is getting its head around a lot of these issues. They created Telefonica Digital and then a year or so later they folded it in-house and everybody said that was a failure. No, it wasn't. They were just experimenting in trying different things. So, at the new service-level, companies like Telefonica, AT&T, Verizon, China Mobile, South Korea Telecom, are all quite active, for example, depending on which area you are focusing.

In network, Deutsche Telekom is quite advanced in their thinking on software-defined networking and NFV. AT&T is as well. At the business operations level we are seeing creative things from Vodafone and Orange, as well as Telefónica. There have been some successes and some have not done quite so well. In the new enterprise-class operations, Telenor is quite advanced and Etisalat is very advanced. My heart goes out to those people who are prepared to try things and not be afraid of failure. Those guys that think that they can sit there and wait for all to happen and some magic will drop from sky are

going to be very sadly let down.

Communicate: How do you see Huawei adding value to digitization?

Willetts: Well, Huawei has emerged as a critically-important player in enabling capability. I call it capability now, but five years ago I would have called it "enabling technology." Of course the technology is important. Increasingly we have seen Huawei deliver of capability as a service.

Essentially every business in the world is going towards digital business. There are opportunities for telecom operators to help them do that in more than just providing electronics. And there are opportunities for Huawei to provide skills and capabilities sets as a partner to those operators to grab that prize. And they say in the conference today that it's "The worst of times, it's the best of times," but to me the glass is half full.

There has never been a bigger opportunity for anybody who is in the business of providing enabling connected technologies to a digitizing world. And the people who get the formula right for that are going to be pretty wealthy. And, I am sure Huawei is going to be among them.

Where are the opportunities?

Communicate: Where do you see the opportunities for operator growth as companies everywhere digitize their business?

Willetts: There are lots of opportunities, but they are not going to be there forever. If you look at small and medium enterprises, as an example, there are a huge number of these in the world. They don't have chief information officers. They don't have technically-sophisticated people. Take a plumbing firm, for example. They just want to get out there and compete. They are competing generally with companies that have sophisticated sales order processing, telemarketing, etc.

If you can provide a small enterprise, say, for example, by using systems such as Salesforce.com, it allows you take a bite-size chunk of very sophisticated systems, for one person or ten people. Whatever you want. If you put that together along with, "How do I handle my payroll? How do I handle my stock? How do I handle customer billing?" You name it. This plumbing firm needs all of that. They don't want to buy this from 50 different people and glue it all together. They don't have the skill for that.

I think telecom operators generally are a trusted brand. What the telcos have are the technical skills within local reach. I will be very interested to see what BT has done from transforming itself, when it didn't have mobile operations, into a content player, and seemingly becoming very successful at that. I think a lot of people are looking at that to see how that plays out.

I see things like home automation platforms and it's interesting to see that AT&T is licensing that to other operators and various people experimenting there. I know that I have a holiday home and I want to be able to turn the central heating on and off remotely. It all comes as different plug-ins. If the operators provided me with a seamless platform with these things and I can download the app into it, that will be pretty neat. Who is better placed than the operator, because they have physical kit in every home, and if they don't, they have a tower up the street.

I think there are lots of opportunities there. Being in the spot, getting the partners, experimenting, trying, and moving fast, they are the keys.

An emerging CSP vsion

Given the diversity of companies represented, we were struck by the similarities in their themes and solutions to the CSP's role in the ICT industry. A consensus on challenges, strategies, and roles seems to be developing in the telecommunications industry. That consensus acknowledges the difficulties facing the CSP's business position as well as profitable roles at the center of the emerging digital ecosystem.

Huawei sees CSPs as having to evolve their networks and decrease costs while substantially improving their focus on customer experience. Huawei has established specialized centers to assist in this effort, namely a Global Network Evolution & Experience Center (GNEEC) that simulates network evolution models, five Service Operations Centers that work in concert with its GNOCs, and recently, a Customer Experience Transformation Center that focuses on customer journeys, purchase, use, payment, and inquiry. On the managed services side, Huawei has a major CEM module in our IT and network services suite.

Huawei places heavy emphasis on making the quality of the mobile network experience part of a carrier's brand. High availability and high performance, we argue are still important differentiators in mobile markets. As outlined by Dr. Howard Liang, Senior Vice President and President of its Global Technical Services, the CSP focus is moving from an “old value zone” to a “new value zone” – from network functions to

service experiences, from siloed telecom services to an open digital model, and from growth by acquiring new customers to growth by providing innovative services.

Huawei has coined the ROADS acronym to describe the attributes that the CSP world will demand of ICT services, irrespective of whether the CSP sells them to customers directly or supports those services as part of a larger ecosystem. These services will be real-time, on-demand, all-online, do-it-yourself, and social (ROADS). By "do-it-yourself," Huawei refers to self-service paradigms, enabling mashups and collaboration via open digital operations.

The industry consensus

Given the diversity of companies represented, we were struck by the similarities in their themes and solutions to the CSP's role in the emerging ICT industry. A consensus on challenges, strategies, and roles seems to be developing in the telecommunications industry. That consensus acknowledges the difficulties facing the CSP's business position, but is also optimistic that CSPs can develop profitable roles at the center of the emerging digital ecosystem. Major points of agreement include:

CSPs are well placed in the new ICT world

Running a network can still be a good business. The network is the foundation of emerging ICT services; even the "dumb pipe" business model can be profitable as long as the network is simplified and run efficiently.

CSPs occupy a privileged position in the growing digital economy as the entities that connect customers of all types with the services they consume. CSPs have expertise in mobile devices and connectivity, which can influence service design and enable them, for example, to help enterprises change the way that they provide services to employees and customers.

Network quality and a CE focus are essential

A focus on customer experience can increase the top line by aiding competitive differentiation, helping upsales and reducing churn. While key performance indicators (KPIs) will always be used, they should be supplemented by key quality indicators (KQIs) that focus on the customer experience. CSPs should incorporate these customer experience indicators into their partner and vendor relationships so that the entire ecosystem is working toward similar goals. Several CSPs have dedicated departments to translate customer experience goals into specific targets for each department as a way to give every employee a stake in this transformation.

Network quality is still an important differentiator, and that quality must be assessed in terms of actual customer experience. Most CSP presenters at the forum had devoted significant time and funds to improving network quality. One European CSP shared its experiences where they overemphasized LTE. In building out its 4G network, it let its focus on the 2G and 3G experience lapse, which led to customer dissatisfaction and poor ratings in consumer tests. Most of this dissatisfaction related to degradations in the voice network; while the temptation is often to focus primarily on mobile broadband, CSPs should remember that voice is still a vital component of the mobile experience.

CSPs presenting at the forum also hinted at the importance of being able to differentiate around new innovative services – showing more

willingness to test new ideas out even if many would fail. The need to keep ahead is seen as vital by CSPs, especially with markets that are highly competitive and mature.

Service ecosystem acumen is a new core competency

Openness and collaboration are the best ways to grow revenue. CSPs should publish open interfaces that enable third-party developers to incorporate operator capabilities into their own applications. In some cases, this will mean that CSPs are enabling direct competition to their own offerings, but this competition is the cost of the agility and growth that openness enables. One major Asian CSP has an ongoing effort to identify common capabilities across services. Once identified, these services are abstracted and modularized so that they can be reused by both internal developers and external partners.

All but the largest CSPs will need to manage an ecosystem of suppliers and partners to provide the full range of ICT capabilities that the market demands. Selecting and managing these ecosystem players will be a key determinant of efficiency and agility. Ecosystem management must therefore become a core capability of both CSPs and the vendors and consultants that advise them.

Networks must be virtualized, simplified, automated, and smarter

Network function virtualization (NFV) is inevitable, but faces some challenges in the short term. Most notably, testing and deployment of virtualized network functions (VNFs) is running ahead of the standards bodies. ETSI's NFV group estimates that a full set of standards for NFV will be finalized in 2018 and 2019, but many CSPs plan to start using VNFs in 2016. The resulting shortfalls in multivendor interoperability, management and orchestration, and the cost benefits of a common code base will be filled by the open-source software community.

Simplification is crucial to efficient and agile operations. As they transform their systems, CSPs should work towards having only one system for each function. This goal applies especially to hybrid environments of legacy and virtualized elements; network virtualization must not create a new batch of digital silos.

Increasing network capacity holistically and linearly is unsustainable, since network demand in some areas of the network will always outpace CSPs' financial and technical abilities to bring the entire network up to that threshold. Rather, CSPs and their partners must improve their abilities to target upgrades to the most important customers, services, and locations.

Automation will be increasingly essential to the CSP's business. As the number of services, customer types, KQIs, partners, and infrastructure nodes explodes, the scale and complexity of the ICT environment will grow beyond the ability of human beings to manage it in any sort of cost- or time-efficient manner. One large European incumbent advocated complete network autopilot, saying that it wanted to get out of the business of managing the network entirely.

Analytics are essential to this automated operation, as well as to every other aspect of CSP operations. Analytics are often discussed, with budgets justified, in terms of customer experience improvement. Analytics can also help CSPs monetize their data by helping third parties with targeted offers and enhanced services. However, vendors and CSPs still have a long way to go to bring analytics to the necessary levels of maturity, functionality, and pervasiveness required.

Organization, process, and culture are just as important

A CSP's organization must evolve in parallel with its infrastructure to realize maximum efficiency. Similarly, a customer-focused culture must suffuse the entire organization. The organizational and cultural changes may be the hardest tasks to achieve in CSP transformation. The CEO plays an essential role in driving these changes throughout the organization.

Many CSPs are considering moving to a developer operations (DevOps) paradigm to ensure continuous improvement as well as more agile development and more efficient operations. DevOps should automatically increase automation in management and orchestration.

Global services organizations will have to respond to the expansion of NFV, SDN, and ICT transformation by providing assistance with network design, business cases, product design, organizational transformation, and ecosystem management. They will thus have to increase the proportion of their staff devoted to consulting and planning.

Voice of the customer

In the forum's demonstration area, Huawei posed a series of questions for attendees to vote on. IDC felt that the most notable overall outcome was the fairly even distribution of top challenges and priorities in almost every question. While the forum did indeed showcase a common emerging vision, it is clear that the paths to that goal will be as varied as ever.

CSPs are moving beyond mourning for legacy business models and resentment toward OTT providers, and toward a collaborative focus and a conviction that they will play a key role in the coming digital ecosystem.

When asked what the most important capability to build into operations was, 27% responded that it was some form of customer experience management, followed by cloud service enablement with 18%. The digital opportunities that most interested the CSPs attending were cloud services (23%), partnerships with OTT providers (21%), and applications/content/video (19%). The most important network issues facing delegates were coverage (31%), network evolution (22%) and capacity management (18%). Delegates felt that the biggest barriers to innovation within their organization were slowness in introducing new services (29%), followed by a lack of strategic focus and agreement (23%). The main drivers for network optimization were reducing OPEX (33%), followed by addressing user complaints/churn reduction and service assurance (tied at 26%). There was a broad range of experience with NFV, with 25% still studying the issue, while 22% had one or more virtualized network functions in production, and an additional 19% had trials in progress or planned, with 18% saying that they would not invest in NFV in the short term.

IDC guidance

IDC agrees with the priorities laid out at the forum, and is heartened by the constructive attitude that permeated both the presentations and the informal discussions. CSPs are moving beyond mourning for legacy business models and resentment toward OTT providers, and toward a collaborative focus and a conviction that they will play a key role in the coming digital ecosystem. While all recognize the scale of the associated challenges to technology, operations, processes, organization, and business models, there is also a conviction that these hurdles are surmountable with mature and committed leadership as well as healthy collaboration among CSPs, vendors, partners, and customers.

Huawei's Global Services team showed confidence in making the forum less about the mechanics of service relationships and more about how to grow the CSP business. From what we heard at the forum, it seems that Global Services is in alignment with its customers on the tasks ahead.

Catch the right customers

There is value to be found when telcos segment their users, but some segments are more valuable than others. We identify six useful categories for telecoms, assess their priorities, and determine which you may want to focus on.

Jonathan Hopkinson
Senior Consultant of Managed Services, Huawei

Challenging times

Even with modern customer experience management solutions, telecoms find it challenging to design, deliver and assure the optimum experience for each end-user. A "one-size fits all" approach to customer experience delivery is inefficient at best and often harmful. So which users should your business focus on, what do they need and expect from you, and how do you deliver it?

In this article we share some consumer research recently conducted by Huawei's Customer Experience Transformation Center (CETC) which answers these questions for the general case. The answers are quite revealing, with some customer segments much more desirable than others, and each group having distinct priorities.

Key customer segments

Analysis of over 3,000 survey respondents, sampled across mature mobile markets, has revealed six distinct customer groups, differentiated by their main motivation for owning a mobile device.

Business-focused: Device used primarily for business purposes. Seeks reliable network quality, particularly for voice, together with a high level of customer care.

Value-chaser: Driven by price. Spending money begrudgingly, this user seeks first-class service, but at an economy price.

Family-focused: Device mainly used for maintaining contact with family members. Seeks reliable coverage, particularly in the home.

Entertainer: Uses device for watching videos and playing games. Seeks high-speed data, and is an early adopter of new services. Youthful, with limited disposable income.

Socializer: Device primarily used to access social networking sites. Seeks reliable data and application performance.

Heavy User: Consumes large volumes of data for video and applications. Seeks high data speeds and large data bundles.

Whom to target?

Your business strategy may already include the targeting of particular customer segments based upon your own unique competitive environment and specific business goals, but are these really the right customers for you? Let's take a look at the most desirable customer segments in general.

The chart in Figure 1 provides some guidance on this. Each of the customer segments are compared by customer lifetime value (CLV)

and their net promoter score (NPS) for network service. In effect it shows their value to you in terms of direct revenue together with their likelihood to recommend your network service to others. The size of the circle represents the relative size of each segment, while the CLV is normalized to U.K. spending levels.

Although NPS is generally low, as is typical in the telecom space, it is clear that some customer segments are more likely to recommend their service provider than others. There is also a significant difference in CLV between customer segments. Using these criteria, the upper right area of the chart is the sweet spot. Socializers for example, offer a high CLV as a result of high ARPU combined with a lower propensity to churn, and they also have a relatively high NPS. In contrast, value-chasers offer a much lower CLV, and are less likely to recommend you to others.

In addition to socializers, another potentially valuable customer segment is the business-focused group who, although demanding, do have considerable CLV. The large group of heavy users is also attractive, being most likely to recommend your network service, and with a relatively high CLV.

Attracting the most value

Building on our example above, the most important factors which would attract the heavy user, socializer and business-focused customer segments to switch to your business are shown in Figure 2.

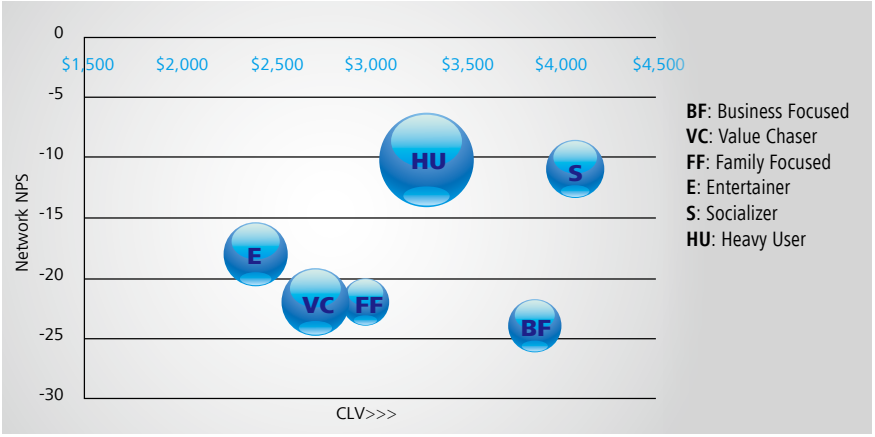


Figure 1 Persona CLV against Network NPS

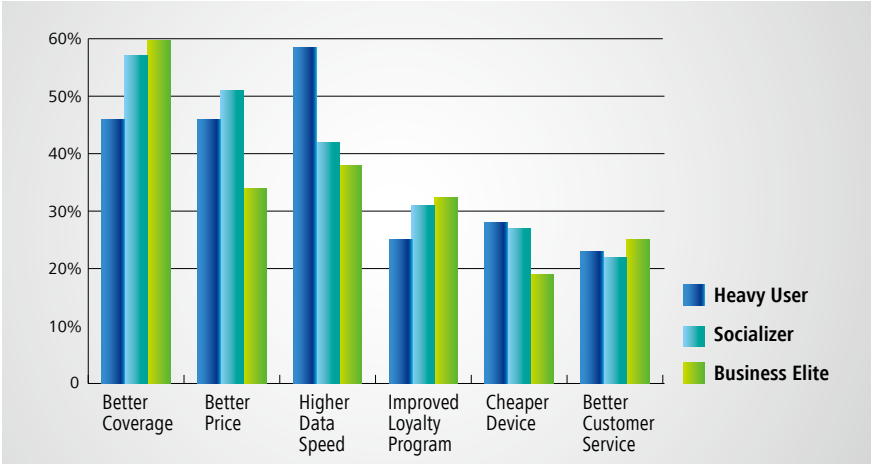


Figure 2 What factor would attract you to change service provider?

Interestingly, none of the most valuable customer segments cite price as the most important factor. The typical heavy user prioritizes higher data speed; you can attract them by offering and promoting high levels of data speed. The Huawei SmartCare CEM solution can support you by monitoring the data speeds being delivered to similar existing users across your network, identifying any faults and areas for improvement, while also generating quantitative data to support associated marketing campaigns.

Typically, the socializer and business-focus customer segments prioritize coverage.

Your case, like every case, is unique

The case listed above is just an example; our experts at CETC can partner with you to apply the same analysis to your own market, identifying those customer segments key to the success of your business. The SmartCare CEM solution can then help you attract and retain these essential customers, delivering real business value.

Going virtual: Life on the cloud

Huawei is well on its way to becoming a leading Prime System Integrator thanks to our mature products and technologies that fully cover the NFV sector, verified integration management capabilities, and an increasingly comprehensive testing and verification environment.

Chen Qiuju
NIS Marketing Operations Manager, Huawei

Telcos have consistently focused on providing better, faster network services for users, and have made considerable progress in this area. In less than ten years, the bearing capacities of OTNs and WANs have grown exponentially, while PON FTTH and 4G fast downstream rates have accelerated access for users more than tenfold.

However, major technological advances and capacity building have failed to translate into greater returns for carriers; instead, they have paved the way for OTT applications that hinder operators' revenue streams. Just a few years ago, for example, SMS messages over Chinese New Year would generate tens of millions of dollars in revenue for China Mobile; however, after WeChat grew to 200 million users, the impact of SNS on voice and SMS services of operators became clear – a sharp decline in revenue from

both sources. Statistics reveal that there are now over 700 million WeChat users; their impact can only grow.

To compete with Internet companies in the application arena, carriers must possess the same rapid operating capabilities as Baidu, Alibaba, Tencent (BAT), Amazon and Google. Unfortunately, they currently lack the ability to develop in this way. In addition to the difficulties faced by operators in adjusting their structures over the short term, ICT vendors that can develop quickly only want to sell specialized equipment – a developmental direction that does not directly translate into a competitive advantage. Many IT vendors are poised to pounce and disrupt the market, seize control from operators, and redefine the industry structure.

But how do operators feel about IT vendors, especially OTTs. What are their strengths and weaknesses?

NFV: The answer for operators?

Operators are tired of their existing network systems for a number of reasons. Network functions and equipment are unified. Planning-based network construction takes too long. Exclusive resource use due to multi-vendor systems and versions complicates interconnections and joint debugging. Vendors are defining new function demands from software to hardware, leaving no room for competition. And, while there may be definite data for resource utilization, operators lack precise feedback in terms of end-to-end (E2E) revenue.

Open IT architecture happens to meet these demands, so operators are cautiously welcoming IT players. They are cautious because IT vendors do not understand the CT business and lack practical experience, which is in fact a situation that benefits ICT solutions vendors. Operators that want to both harness the openness of IT vendors and exploit rich experience in CT require network function virtualization (NFV) to do so.

The best thing about NFV is that it is open and fast. NFV adopts a horizontal network architecture that deploys a unified cloud OS on common hardware. Virtual network functions (VNFs) are then deployed on this system to cloudify existing network equipment and services through VNF orchestration and application. NFV possesses certain clear advantages – decoupled software and hardware, function abstraction, elimination of specialized hardware, and easy resource sharing. This culminates in the rapid development and automated deployment of new, scalable services that are tailored to actual business needs. Moreover, faults can be isolated, with self-healing possible.

NFV can truly address the major issues that operators face; however, as a new trend, are operators willing to roll up their sleeves and give it a go? Are there challenges in store? What other major issues must be dealt with?

First, a new business model is needed. Operators are accustomed to voice and data services but lack experience in operating content and marketing applications. Moreover, once network architecture shifts to IT-based NFV network architecture, operators must balance their investments. This will impact ICT vendors who have to sell integrated solutions instead of equipment, and force buyers and sellers to negotiate new business collaboration models.

Second, network planning and design face even greater demands, and operators must carry out capacity optimization for one or more data centers (DCs). The unified management of virtual hardware resources and the adoption of VxLAN technology will pave the way for data center resource pooling, which will in turn complicate capacity optimization because such large-scale data centers are involved. Also, while NFV will simplify network architecture, it will bring into question whether or not IT architecture can realize carrier-level reliability. As such, NFV networks will have to prove that they are not only simple and efficient, but robust and reliable as well.

System integration is effort-intensive and must support multi-module, cross-level integration. For example, the functions of OSI layers 4-7 must be unified on the application layer, but standardized solutions for this type of integration have yet to be created. The OpenStack intermediate system must be open to numerous third-party applications through open interfaces,

System integration is effort-intensive and must support multi-module, cross-level integration. The OpenStack intermediate system must be open to numerous third-party applications through open interfaces.

which will significantly increase development and maintenance costs. Additionally, most of the original CT architecture-based testing methods and tools are no longer applicable, so new network optimization and testing tools must be developed. The need to integrate existing OSS/BSS and management and orchestration (MANO) is yet another new problem that ICT vendors and operators must face.

PSI: The best choice?

Difficulties and rewards go hand in hand. So how can operators make the right move? Which model can minimize the costs of achieving these objectives? In the current stage, the Prime System Integrator (PSI) model is the most suitable in that it fully assesses multiple ICT vendors as well as their product, management and integration capabilities. PSI also enables the provision of an integrated management system on which other vendors perform module integration and service deployment.

A PSI must build four platforms that realize the following functions – network planning; business modeling, simulation, and verification; integration program implementation; and performance monitoring and operations. A PSI must have the ability to advise, plan and design; integrate multiple vendors; and integrate business processes and IT architectural platforms. The PSI is also responsible for overseeing the integration of four modules – NFV Infrastructure (NFVI), MANO, application platforms, and existing equipment and systems.

Given its rich PSI integration experiences with major operators like Vodafone and vendors such as HP and VMware, Huawei plans to create an open environment by constructing its own NFV Open Lab in Xi'an, China. The laboratory will develop, fulfill, and verify services in the OpenStack and NFV environments; carry out integration testing; and offer comprehensive services, including technical training, certifications, and demos.

Huawei has remained open and positive about NFV. As chair of the European Telecommunications Standards Institute (ETSI) Infrastructure Work Group (WG), 236 of Huawei's proposals have been adopted. It has contributed to all nine cases, and was the main contributor for four. In 2013, Huawei became an OpenStack gold member and participated in key research for the MPLS VPN and Neutron projects. In 2014, Huawei was honored at the IMS World Forum for providing the "Most Innovative Virtualized IMS Solution". At the ONF (Open Network Foundation), Huawei leads nine different projects including wireless, northbound interface (NBI), and optical transmission solutions. It has also been honored as an "Outstanding Technical Contributor" in network security, and has contributed to seven of nine total use cases.

With investments and accumulation throughout the NFV sector, Huawei has evolved its products and technologies, enhanced its verified integration management capabilities, and optimized and expanded its testing and verification environment. As it embarks on the road to becoming a senior Prime System Integrator, Huawei will work together with operators to accelerate the arrival of NFV.

Mobile video: The next boom for mobile broadband

LTE makes optimizing video service quality and customer experience possible. But to enable a golden age of video services, operators must prepare by optimizing their business models, enhancing network capabilities, and improving customer experience.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Video has emerged as a primary revenue source for mobile broadband traffic. In fact, Huawei estimates that video traffic will make up over 70% of all mobile traffic by 2018. In the 3G era, high traffic fees and a poor service experience held back widespread user adoption, but the superior wireless pipes of the LTE era make an optimal customer experience possible. Nevertheless, to enable the golden age of video services, telcos need to tackle the challenges they face by designing suitable business models, strengthening network capabilities, and improving user experience.

Mobile video trends

From the perspective of user behavior, mainstream demand in the 3G era covers browsing social networking sites (SNS) and web pages, whereas LTE users like to watch videos on mobile devices. Huawei's MBB Lab (mLAB) and Sohu Video jointly released the Mobile

Video has emerged as the primary revenue source for mobile broadband traffic. In fact, Huawei estimates that video traffic will make up over 70% of all mobile traffic by 2018.

Video Insight Report for Q3 2014, which lists the main factors that influence online video experience as smoothness, definition and traffic consumption.

LTE is better than 3G for playing online videos, delivering higher success rates and smoothness. Loading times for mobile video on LTE is twice as fast as on a 3G network, with average initial buffering decreasing to 2.4 seconds compared with 4.5 seconds. HD video is rising as a percentage of total mobile video and, notably, a total of 36% LTE users choose HD video, compared with 16% of 3G users.

In the context of the industry chain, smart LTE devices are equipped with larger screens and batteries, yet prices are continuing to drop. According to the report, 43% of all smart devices launched by Q3 2014 have screens larger than five inches, and 35% have batteries over 3,000mAh. Bigger screens, larger batteries and HD combine to make video services even more popular. The price of smart devices also keeps falling, with LTE-enabled handsets for less than CNY1,000 (USD160) available everywhere.

There is an increasing trend of integrating telcos and media companies. Mainstream global telcos have embarked on inter-field operations using advantageous video resources to build future-oriented competitiveness. They employ multiple methods to do so. First, direct investment in content and TV services, such as BT's TV service - BT Sports. Second, acquisition of video or TV companies to launch integrated services, such as AT&T's purchase of DirectTV. Third, cooperation with OTTs, an example of which is the targeted traffic package China Unicom developed for Sohu Video. And fourth, launch of an innovative video service, such as when Jiangsu Unicom launched its LTE Evolved Multimedia Broadcast Multicast Service (eMBMS) for the 2014 Youth Olympic Games, and the BBC partnered with EE to provide LTE eMBMS for the Commonwealth Games.

Chances and challenges

Mobile video gives telcos a chance to cultivate new users, enhance network competitiveness, and increase revenues. First, video services help telcos attract more LTE users; for example, SKT in South Korea plans to attract users through LTE-enabled HD and UHD video services. LTE networks allow users to shoot and upload pictures quickly and easily. Services like WeChat's short video shooting (6-to-8 seconds) tap into users' passion for shooting videos and fuel the explosive growth of user-generated content (UGC) on mobile terminals. Second, LTE can enhance telcos' network competitiveness. Spectral efficiency is higher than on UMTS networks, which indirectly reduces telcos' network construction costs. Since over half of all traffic will be generated by mobile video in the future, reducing network construction costs means enhancing network capabilities. Third, video services will become the main revenue source for telcos in the future. NTT DOCOMO, for example, plans to build a future business operation model centered on video. Huawei also forecasts that, as video traffic increases, mobile

data revenue will grow rapidly from CNY400 billion (USD64 billion) per month in 2013 to CNY1 trillion (USD160 billion) per month in 2018.

As a double-edged sword, video services also create challenges for telcos in terms of increasing ROI, guaranteeing user experience, and enhancing pipeline capabilities. First, how can ROI be increased? Faced with the dilemma of increased traffic and static profits, telcos are seeking new ways to boost ROI. For video services, they can design new business models and reduce the per bit cost of pipelines to increase profits. Second, how can a consistent service experience be ensured for 3G and LTE users, users with different operating services, and different scenarios like unicast and multicast scenarios? New users should be provided with easy-to-use services that are easy to order, provide traffic use notifications, and offer flexible tariff packages.

Finally, how can pipeline capabilities be enhanced, including pipeline capacity and network agility? Pipeline capacity is affected by a growing demand for uplink capacity due to the popularity of sharing selfies and videos, coupled with the fact that users are becoming less tolerant of delay. Reducing E2E delay involves optimizing wireless, bearer, and core networks, as well as content sources.

Tackling mobile video challenges

New business models

For OTT video services, in addition to traditional traffic billing, telcos can design new business models such as targeted OTT traffic packages or ad sales. Huawei lists four scenarios for its broadcast and multicast video service – live sports, mobile TV, file delivery, and M2M. For live sports broadcasts, telcos can cooperate with sponsors to gain content rights. They can then charge users a certain fee each month for the content. Alternatively, they can offer the content for free and profit through reverse charging on multi-screen ads. For mobile TV, telcos can learn from the cooperative model between EE and the BBC where EE broadcasts BBC TV content live on its eMBMS network.

To enable file delivery, telcos can deliver content in batches to users when the network is free and the charge is low. To facilitate M2M, telcos can deliver ads to screens in airports, elevators, and bus stations, cutting labor costs and ensuring rapid content delivery. To guarantee a viable business model, Huawei is willing to share its successful experiences in different projects around the world to discuss the commercial scenarios of LTE video services with telcos.

Improved mobile video experience

Boosting video experience is an E2E task that requires special tools for key quality indicator (KQI) tests. KQI tests mainly cover initial buffering time, download rate, video streaming start success rate, frame freeze frequency, and average freeze time. Areas with poor service experience are then subject to root cause analysis to determine whether insufficient wireless coverage, roundabout bearer networks, or insufficient caching space in content servers are to blame. After the problems are identified, video optimization solutions can be deployed, including wireless network TCP acceleration, QoS assurance for video services on IP networks, and format conversion/bitrate adaptation/intelligent buffering of video on the

To date, Huawei has deployed LTE networks in more than 110 cities around the world and carried out 30+ video optimization projects and six LTE eMBMS joint innovation projects.

PS network side.

Leveraging its monetization solution lab for mobile broadband traffic and network solution lab for mobile broadband quality, Huawei has established a complete set of benchmark databases and methods for evaluating video experience, alongside a corresponding test platform. Huawei can work with telcos to help them assess video experience and give optimization suggestions accordingly.

Enhanced pipe capabilities

In terms of pipe construction, telcos need to carry out E2E network transformation in service provision capability, network architecture and support for multicast video services. To enhance service capabilities, telcos should transform their current voice- and data-bearing networks into video-bearing networks that offer superior network capacity, architecture, and video coding/decoding. IP-based bearing networks are needed to support multicast, clock synchronization, user authentication, content error correction and compensation, and interworking with third-party platforms.

Network elements (NEs), such as a multi-cell/multicast coordination entity (MCE) and broadcast/multicast service center (BM-SC), are also needed to support evolved multimedia broadcast/multicast service (eMBMS). In terms of traffic models, the current voice- and data-based traffic model will gradually give way to a data-based model that primarily carries video traffic. The traffic oversubscription ratio for access/MAN/backbone networks will shift from 4:3:2 to 1:1:1. Telcos need to fully analyze user data and user behaviors to effectively plan future network capacity. Moreover, flexible resource scheduling should be employed for unicast and multicast scenarios to maximize spectral efficiency. To optimize billing models, telcos should evolve their simple voice- and data-centric billing to flexible billing that supports diverse video services.

To date, Huawei has deployed LTE networks in more than 110 cities around the world and carried out 30+ video optimization projects and six LTE eMBMS joint innovation projects. We have accumulated rich experience in terms of evaluating and planning mobile video networks, and are willing to help telcos offer superior mobile video services.

Industry chain coordination

To achieve business success, industry participants should collaborate and coordinate effectively and take the following actions. They should expand the industry scale and promote smart terminals and chips to jump the barriers to industry development; explore new business models to promote the penetration of video services; optimize service experience from the content source at the network side to guarantee user experience; conduct E2E reconstruction and adaptation of networks to satisfy the future needs of video distribution; and accurately identify high-value areas of video services, and invest modest resources in these areas to optimize ROI.

Anytime-anywhere xMbps
Building quality wireless based on user perception

Access rate is fundamental to the data service experience, with more and more telcos listing it as one of their most important goals for network construction. But during the construction process itself, regional xMbps goals can actually cut costs and strike a balance between network experience and overall investment.

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User experience: The key to telco success

According to Google statistics, a 0.4-second delay in network response will decrease search volume by eight million, with Amazon statistics similar. For online shopping, a one-second delay will reduce online sales by USD160 million per year. A Huawei mLAB survey has found poor service experience, stemming primarily from low data rates, to be a major customer complaint; 80% of users switch networks because of poor experience, while 72% stick with the same network due to the opposite.

Data service experience also holds direct sway over subscriber loyalty, attraction of new subscribers, and ultimately, carrier revenue. This fact is becoming an increasing concern for telcos. At Huawei's 2014 User Conference, 89%

of carriers considered service quality and user experience consistency to be key challenges, with 96% believing improved coverage and access rate essential to resolving customer pain points. Huawei has designed an innovative network planning approach to address this.

Anytime-anywhere xMbps

Roughly 50% of carriers surveyed at Huawei's Wireless User Conference rated network speed as the single most important network construction benchmark. Vodafone announced anywhere-anytime 1Mbps as its network construction goal in 2011. China Unicom has done likewise, and now includes this in the guidelines for its various branches.

When setting target rates, one should note that there is a huge demand for high-rate services in urban areas, and an equally huge demand for low-rate services in rural areas. This makes regional xMbps goals a reasonable compromise that balances cost, experience and resources, through precision investment.

Network planning based on user rate perception involves three phases – business insight, network capability evaluation, and strategic solution design.

- Business insight refers to the analysis of experience requirements for current users and setting regional xMbps goals based on future business development and competitor status. Huawei classifies target areas as important, value, or general, based on traffic and distribution of customers and terminals. Then we identify the mainstream services for a particular area and set specific bitrate goals for it. For areas where web browsing and SD video streaming are mainstream, 1Mbps would be the appropriate goal. For areas HD resolution or beyond is the norm, 5Mbps or even 10Mbps should be considered.
- Network capability evaluation involves both determining bitrates and what ails them in certain areas. Evaluation encompasses coverage, interference, resource utilization, network load, and user number. Currently, xMbps-targeted network planning supports 50m × 50m grid-level granularity, enabling timely root-cause identification and paving the way for effective solution selection.
- Strategic solution design is meant to bridge the gap between customer requirement and actual performance, both now and in the future, and this is a complex, iterative process.

In terms of network coverage, strategic solutions for xMbps at cell edges include site addition, antenna adjustment, lower frequency bands, and new feature activation. Reasonable intersite distances are critical to guaranteeing xMbps integrity. In Huawei's experiences, typical intersite distances for high-frequency bands such as UMTS2100 (5MHz, 1Mbps) and LTE1800 (20MHz, 5Mbps) are similar to those for GSM1800 voice and the distances for low frequency bands such as UMTS900 (5MHz, 1Mbps) and LTE800 (20MHz, 5Mbps) are similar to those for GFSM900 voice.

For network capacity, solutions include carrier addition, multi-sector deployment, capacity supplements (such as small cells), GUL bearing policy adjustment, and new feature activation. For multi-sector, site capacity can be boosted by 50 to 85%, with coverage enhanced by 3dB, all without new sites or spectrum. For supplementation, solutions such as Huawei's

LampSite can be quite efficacious. This solution currently serves Beijing Airport, providing 50Mbps downlink at every point within its walls.

Benefits of xMbps-targeted network planning

Compared with traditional network construction, xMbps-targeted network planning has three advantages:

User experience consistency: User requirement insights, target rate design, and wireless capability evaluation all depend on massive amounts of user perception data. Compared with traditional drive tests or customer complaint analysis, this method takes longer and is more comprehensive, as it involves the real experiences of current users.

Accurate investment: In the mobile Internet era, user requirement differences are no longer confined to urban versus rural; they can also involve different areas of a city, or even different corners of a street. Network planning based on user perception is more accurate and targeted in that it can reflect even the finest nuances of user requirements, target rates, and network capabilities in different areas. This ensures that finite telco resources go only to what is needed most, therefore maximizing ROI.

Higher efficiency: Don't let the laboriousness involved in achieving the previous two advantages scare you off. Huawei xMbps is based on our automated cloud network evaluation platform, which supports one-click data collection, high-speed data processing, and automated site planning. These features greatly reduce the time spent on data collection/analysis and initial planning, enough to actually cut the network planning cycle in half.

Network planning based on user perception of rates is built on Huawei's automatic network evaluation cloud platform and can greatly reduce time on data collection/analysis and initial planning, greatly improving the efficiency of network planning.

Case study: Western Europe

This solution was recently deployed in a certain Western European market in a scenario that involved both UMTS and LTE, having already stood out clearly amongst competing solutions. Through accurate UMTS site addition and carrier expansion, Huawei completed UMTS optimization and performance enhancement in one city, and carried out xMbps-targeted LTE planning through user experience-based simulation and forecast. This work drew praise from the carrier's network planning department, which invited Huawei to carry out further network planning for the remaining 31 areas of the city.

Evaluation model for quality brand MBB networks

Premium networks are best evaluated by comprehensively analyzing the intrinsic links between key performance indicators (KPIs), key quality indicators (KQIs), and quality of experience (QoE). Linking KPIs, KQIs, and QoE enhances the accuracy of network planning and optimization capabilities, and helps carriers build and evaluate high-quality networks.

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The development of mobile broadband, especially in the LTE era, drives the rapid growth of data services. GSMA statistics reveal that LTE users consume twice as much data traffic per month as 3G users. At a time when user experience is of paramount importance, how can carriers tackle the challenges posed by big data traffic and build premium networks? McKinsey suggests that carriers in the big data era can prioritize the following targets: optimize network performance and service quality to improve user experience; analyze network data for more accurate traffic forecasts and network capacity assessments; and utilize new technologies and solutions to enhance operation and maintenance (O&M) efficiency.

How can we make good use of quantitative indicators such as KPIs, KQIs, user experience, capacity, and O&M efficiency to evaluate top-quality networks? Like a physical examination, assessing network quality requires rigorous systems and experience. With advanced methods and extensive experience, carriers can focus on key indicators that genuinely reflect network quality and user experience to arrive at scientific and persuasive conclusions.

Optimal seven-dimension network evaluation model

Based on successful partnerships with various carriers, Huawei has designed an optimal seven-dimension evaluation program that incorporates the following indicators – coverage, capacity, interference, network KPIs, NE health, O&M, and KQIs.

The seven-dimension model incorporates not only technical indicators, but also non-technical O&M indicators. Meanwhile, the focus of O&M has shifted from NE assurance to service assurance. Only key indicators that are closely related to user experience are used as criteria for network quality assessments. Each

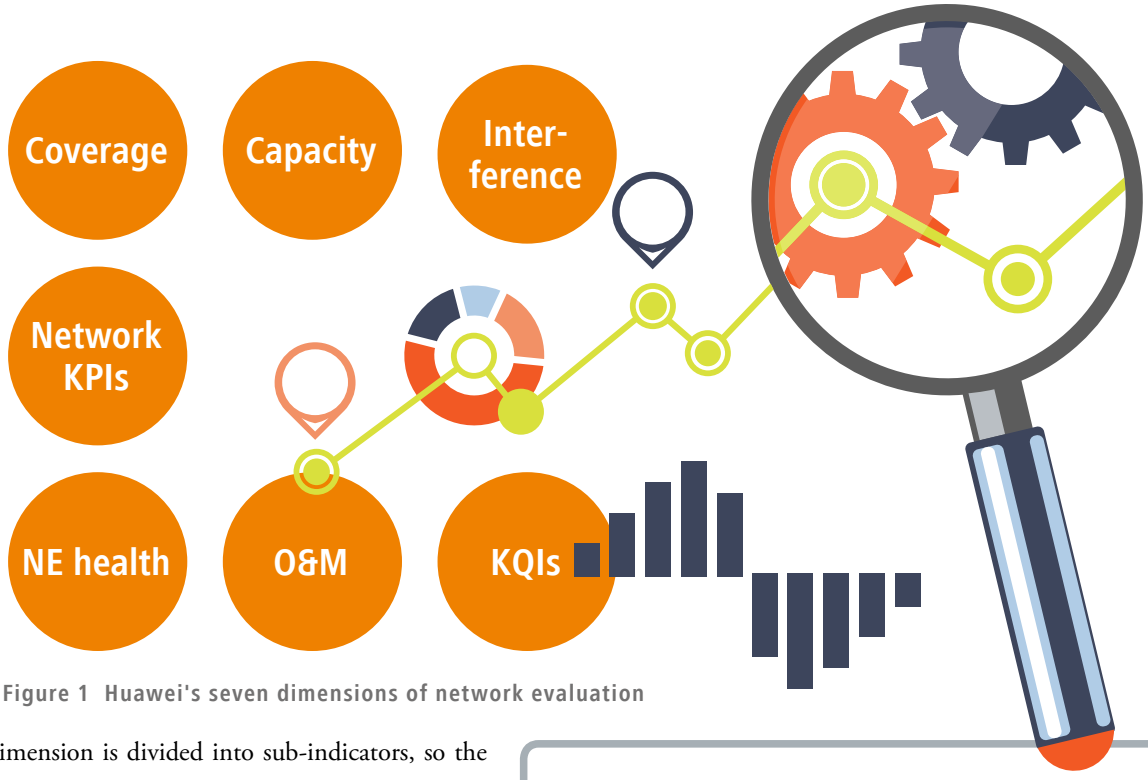

Figure 1 Huawei's seven dimensions of network evaluation

dimension is divided into sub-indicators, so the entire evaluation system covers all the important quantitative indicators that can be used to assess the quality and experience offered by a mobile broadband network. By grading each network indicator as optimal, good, moderate or poor, and giving an overall score, we can identify the gap between a current network and a top-quality network.

Based on its experience in cooperating with various carriers, Huawei has designed a seven-dimension, premium assessment model that incorporates indicators such as coverage, capacity, interference, network KPIs, NE health, O&M, and service KQIs.

Improving network KPIs for a better user experience

The scores of key indicators reflect the health of the network. Network assessments can expose many pain points for telcos such as weak coverage, high loads, high interference, and high failure. The "bucket effect" tells us that the shortest bucket board determines the capacity of a bucket. So, for telcos, it is crucial to reduce network loads, interference and failure rate by repairing the shortest board. Enhancing user experience begins with locating network problems and optimizing key indicators.

Network coverage: Coverage is a key indicator in the seven-dimension network model for quality evaluation; for example, it ensures that users can readily access services. Although telcos in different countries face different network conditions, coverage remains the basic guarantee for service provision. Therefore, many telcos prioritize coverage when seeking to build top-quality networks.

For example, Carrier A from Europe considers coverage, especially key areas, its

By strengthening LTE deployment in key cities coupled with precise network planning and optimization, the carrier significantly improved coverage and markedly reduced the call drop rate.

top priority for modernizing networks and constructing a leading LTE network. By strengthening LTE deployment in key cities coupled with precise network planning and optimization, the carrier significantly improved coverage and markedly reduced the call drop rate. As a result, it receives fewer user complaints due to a greatly improved user experience. Now, Carrier A plans to expand LTE coverage to over 70% nationwide in urban areas and to 80% in hotspots such as airports, CBDs and highways.

In network development, high loads, interference and failure rates greatly compromise user experience and require immediate solutions. An evaluation on a high-quality network project run by an African carrier revealed numerous problems, including low download rates, poor voice quality and high complaint rates. A more thorough analysis found that these problems were caused by poor indoor coverage because the number of HSDPA users in CBD areas was too high, causing high loads and interference between 2G and 3G signals. Based on the assessment result, the project team introduced coverage and capacity enhancement features, and carried out refined network optimization in areas of high interference. As a result, both network performance and user satisfaction improved.

Comprehensive analysis: We select key network indicators that reflect the problems with user experience as the criteria for quality assessments. For example, for coverage evaluation we choose the proportion of weak coverage; for NE assessment we look at the number of faulty NEs; and for network quality we select the proportion of low-rate links and links with low CSFB rates. These network assessment indicators are often correlated and interactive. Therefore, we need to conduct a holistic analysis on key indicators, including KPIs, coverage, NEs, capacity, interference and O&M. We can then evaluate their combined influence on network performance and user experience. In summary, we should focus on delivering accurate network optimization and strengthening weak links to enhance overall network performance.

Service KQI assessment to enhance application performance

Currently, KQIs – such as Europe's P3 and U.K.'s ROOT tests – are the most commonly used indicators to assess network quality. Service KQIs are mainly QoS parameters used to assess the network performance and user experience of different services. Based on industry standards and field experience, Huawei has built its own KQI system that incorporates tests on voice, SMS, web browsing and video. This system conforms to ETSI standards, covers the KQI scenarios of the P3 test, and includes an indicator for improving user experience.

For example, mobile Operator A from Europe came last in a benchmark network quality test conducted by a third party in 2013, falling far behind its competitors. At that time, Operator A's management was experiencing considerable difficulties. Based on its quality criteria system, Huawei analyzed network

requirements and decided to focus on improving user experience and network quality. By analyzing service quality and other indicators, Huawei helped the customer accurately locate network problems. With its advanced KQI system, accurate planning capabilities, experience and tools, Huawei carried out deep service and network optimization for the telco, holistically improving numerous network indicators and greatly enhancing the customer's network and application performance. In later tests, the carrier surpassed its competitors and topped the ranking lists.

Future evolution of network quality evaluation

Due to differences in mobile network complexity, area, and the competitive environment, mobile operators differ in terms of mainstream services, competitiveness, customer requirements and quality standards. Therefore, the indicators of the quality assessment system should be customized (indicator addition/deletion and threshold adjustment) for different networks.

In the big data era, top-quality networks that focus on user experience have become a key point for competitiveness among mobile operators. As the top-quality networks become increasingly centered on user experience, quality evaluation will continue to evolve. For example, the focus on assessments will shift from the quality of service types (video and web) to the service quality offered by certain apps (e.g., YouTube and WeChat). In turn, voice quality assessments will shift from CS-centered voice to voice over IP (VoIP).

As the O&M model of global carriers transforms from network-focused to service-focused, they will gradually take service quality indicators as key indicators for assessing premium networks. With the service operations center (SOC) as the key and the top-quality network quality assessment system as the quantitative standard, carriers will be able to precisely improve network planning and optimization capabilities, guarantee a superior user experience and carry out precision marketing. A premium network that features quality services and enhanced network performance not only delivers excellent user experience and profitability, but also increases ROI for carriers and maintains their competitiveness in the market.

A premium network that features quality services and enhanced network performance not only delivers excellent user experience and profitability, but also increases ROI for carriers and maintains their competitiveness in the market.

Centralized operations: Strategies for today & tomorrow

Operations centralization is core to the transformational journey to digital convergence. Centralization is essential if CSPs are to optimize the management of business and network operations, reduce cost, improve TTM, improve quality assurance and customer experience, and future-proof their operations. SDN/NFV will play a particularly important role, although a phased approach is recommended, making use of a close strategic partner to help guide and implement the process.

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Optimized management of business & network operations

Centralization provides a real opportunity to meet all of an operator's transformation objectives. In fact, according to a global survey conducted by Ovum in May and June 2014 (Figure 1), 53% of operators have already implemented or are implementing a centralized operations strategy of some kind and a further 23% are considering it.

The most common objectives driving transformation are cost optimization, faster time to market (TTM), quality assurance, effective control, better customer experience, and readiness for the future. In terms of centralization, the following elements can help CSPs realize these objectives.

Consolidation

Consolidation of network and IT/OSS platforms offers considerable and immediate operational savings. In a consolidated platform environment, it is easier to automate progressively to reduce service delivery costs. Offshoring labor and functions to a centralized and consolidated platform location is generally more cost-efficient than repetitive local provision, and enables synergy across functions and resources while benefiting from economies of scale. Where CSPs own multiple operating companies (OpCos), consolidation and centralized resources enable visibility across all OpCo operations and implementation of consistent, standardized performance and reporting across the entire group. It is then possible to streamline benchmarking and present achievable targets for the dynamic and continuous improvement of the entire group.

Expert resource pooling for network & IT

As the merger of telecom and IT networks continues, the need for available expert resources with experience in both domains becomes ever more critical. Creating a pool of these resources in a central location that works to standards specific to telco and IT operations such as ITIL and eTOM will enable faster times to market for new applications and services than was previously possible.

Best practices and continuous improvement

Centralized operations centers compliant with TL9000 Quality Management System (QMS) standards provide a managed environment where skills may be continually developed and shared. This is achieved through sharing of best practices to assure the best possible operational performance, and ensure a flexible resource pool and minimization of transformation risk.

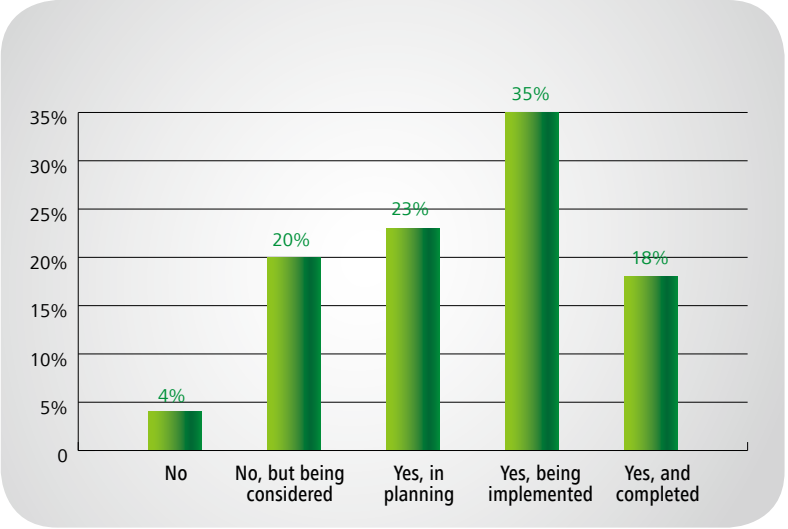

Figure 1 Ovum survey: Centralized operations strategy

In centralized operations centers, the exchange of technical expertise and knowledge is encouraged. Subject matter experts (SMEs), engineers and technicians work closely together, utilizing the best available tools, processes and best practices. Service performance across a number of regions or operating countries may be monitored and measured by specialized teams. To ensure delivery of dynamic, continuous improvement across OpCos, this team applies internal and external benchmarking to establish baseline and desired key performance metrics which can provide early warning of KPI or SQI deviation, while performing offline root cause analysis to prevent future performance degradation.

Operations improvement and business insights

Centralized operations and systems make

it possible to provide a consolidated and consistent view of the customer experience, with a wide variety of service customer behavioral data and operations metrics gathered. This allows near-real-time analysis within a central, dedicated location, enabling both reactive and proactive resolution of customer experience issues and network & service performance degradation.

Readiness for SDN/NFV operations

CSPs are investigating how to transform their networks into leaner, flexible, cost-effective platforms. This requires the adoption of SDN, NFV and associated IT concepts. Both networks and data centers will become increasingly unified around a single network, starting initially with the core. While still in its early days, numerous NFV proofs of concept are already in progress, and momentum is growing.

In future cloud-based operations and virtualization, network & data security and business continuity management will be mission-critical issues. Having these functions delivered in a controlled standards-compliant environment such as a GOC will be essential to delivery of secure and robust network operations.

However, evolution to software-centric network architecture will not be an easy transformation, but strong vendor and MSP partnerships can bring expertise and competencies to the table that help to transform operations. CSPs likely need to tap into MSP expertise with the assistance of professional services, including outsourcing of specific tasks, consulting around NFV architecture issues, network design and systems integration of SDN, NFV and OSS elements and their interworking.

CSPs will require partners who can help implement changes that transform traditional OSS and BSS, make effective use of big data analytics and CEM, and break down functional silos through support of open digital operations and ecosystem management. These changes will require service platform and competence improvements, and assistance with operations centralization and standardization. Therefore, a phased approach to transformation and

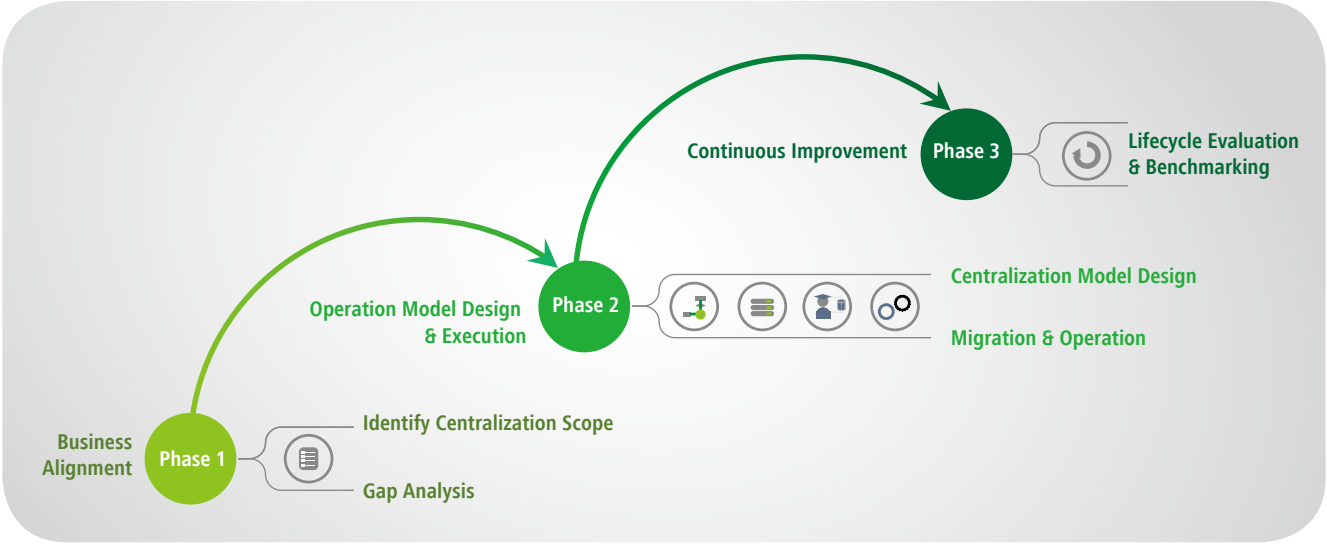

Figure 2 Phased systematic approach to centralization

centralization is recommended, one that makes use of a close strategic partner to help guide and implement the process.

Paths to transformation

Step-by-step approach to minimize risk

To minimize the risks of ambitious transformations, a proven three-phase methodology is recommended, with each phase a series of systematic steps that map the journey for successful migration from a distributed to a centralized operating model (Figure 2).

Phase 1: This is the preparation phase, involving establishment of business objectives for centralization. Preparation involves "as-is" capture; "to-be" objective definition; and gap analysis resulting in a detailed scope of work, agreed phasing, and technology roadmaps with detailed risk analysis and mitigation planning.

Phase 2: This involves high-level solution design and collaborative agreement with the customer on the solution scope and implementation of the agreed plan. During this phase the transition of personnel, tools and processes takes place to the new centralized operation center. A period of stabilization is then implemented during which adjustments and process optimization will occur.

Phase 3: This is the completion of the transformation to steady-state operations, post-stabilization. During this phase, evaluation will take place of the established centralized people, tools and processes against the objectives agreed upon in Phase 1 and necessary corrections made. This phase also involves benchmarking of the centralized performance and establishment of baseline metrics. A continuous improvement process will be implemented from this point onwards.

As the core assets of the GOC, best-in-class resources are gathered together employing global best practices compliant with internationally-recognized standards, ensuring the best possible operational outcomes.

Centralization into Global Operations Centers (GOC)

An effective centralized operation approach will address system, process and organizational alignment, with operational governance and ongoing improvement strategies incrementally supported by high-quality, flexible, secure platforms, within a customer-centric service culture, culminating in a Global Operations Center.

GOC: Resources, future-readiness, global expertise

Personal and organizational excellence is the stable foundation for a GOC. As the core assets of the GOC, best-in-class resources are gathered together employing global best practices compliant with internationally-recognized standards, ensuring the best possible operational outcomes. Continuous recruitment and development training programs based on experience and knowledge-sharing ensure competence, readiness, and resource availability.

GOC enables OSS as a service

One of the key objectives of centralization is consolidation and rationalization of operational support services (OSS). In the GOC model, this can be taken a stage further with centralized OSS services offered to multiple operations

from a single location by provision of a centralized data collection platform and consolidated automated OSS systems that enable customer support; B2B, network and service operations; front and back office functions; and field maintenance. This GOC approach to OSS is of course suitable for multiple vendors, technologies and languages, and allows for the management of multiple SLAs across different operators.

Multi-dimensional capabilities

A systematic program management capability can be imposed centrally to assure consistent service delivery in terms of multi-country transformations, performance management initiatives, etc., and move the organization towards a more service- and experience-focused culture. Some global operators have partially implemented this concept with establishment of centralized but non-OSS-integrated service assurance functions serving many countries. An example of how GOC centralized functions may be extended is illustrated in Figure 3.

Conclusions

CSPs have wrestled for some time with the conflicting challenges of how to introduce new network technologies and services, remove barriers between network services and infrastructure, reduce CAPEX and OPEX, and achieve network elasticity and scalability to meet demand, without service degradation and with significantly improved customer experience.

Centralization is the key for CSP transformation to digital service provision, and preparation for future technology introduction. Choosing the right partner for centralization transformation is crucial. A partner with a track record of delivery excellence in centralization projects is recommended, with a culture of best practice sharing and demonstrated expertise.

As a leading managed services provider, Huawei has achieved global best practice recognition in the delivery of cost-effective, transparent and secure operations for multi-network, multi-vendor and multi-technology centralization projects around the world, for a diverse range of operators. Our GOCs in Romania and India provide good examples, with both working seamlessly with multiple networks, technologies, vendors, and languages, while delivering platform consolidation, technical support, dedication security operations, and other competencies.

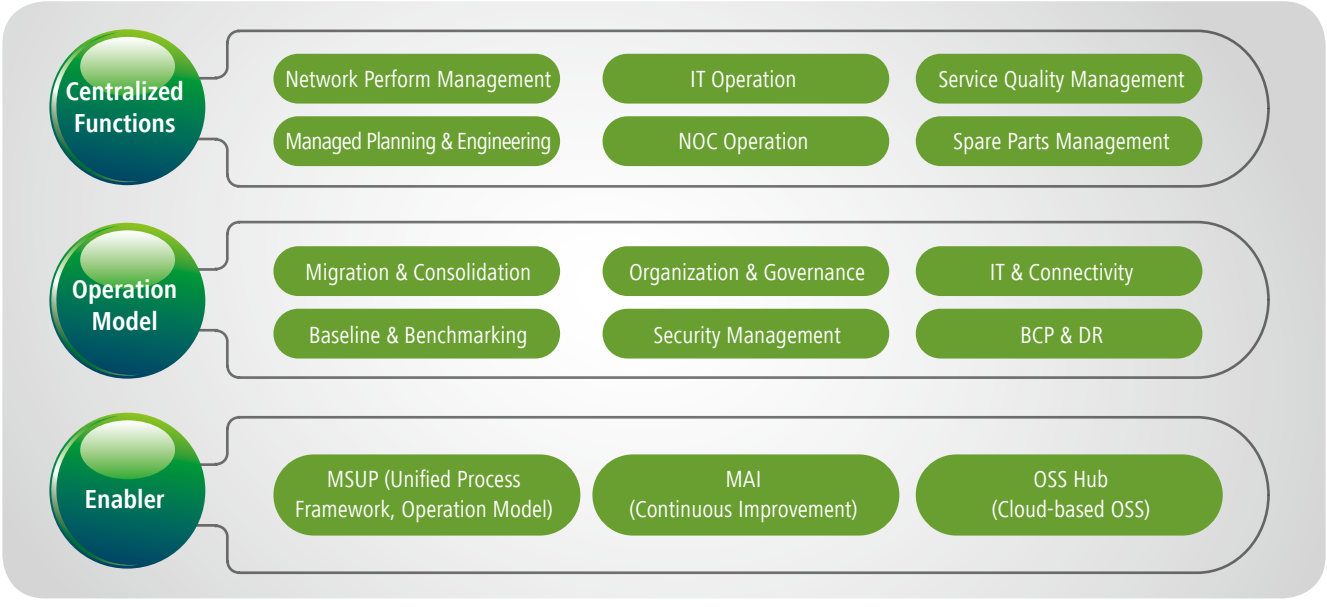

Figure 3 Functional areas of GOC centralized operations

Next-gen OSS: Unleashing network potential

A next-generation operational support system (OSS) must be the core telco network platform for digital services, one that is real-time, automated, intelligent, and open. It will be thus an enabler of business transformation, while providing customers with superior services, and enhanced revenue in the digital economy.



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With the broad application of ICT technologies and the popularization of the Internet, all traditional media have gone digital, with verticals such as transportation, healthcare, automobiles, education, and finance now joining the game. User behavior has changed dramatically in the digital era, as consumers expect everything to be ROADS (real-time, on-demand, all-online, DIY, and social). For example, they want real-time video conferencing, bandwidth on demand, access to all content & services online, customizability for everything, and to be able to share those things via social networking (SNS).

Expectations of next-gen OSS

As user behavior changes, so must business. Telcos must shift their focus from "size" (performance, capacity, and cost) to "speed" (agility in service innovation/provision, response to customers, and network troubleshooting), with this helping drive the move towards software-defined networking (SDN) and network function virtualization (NFV). So how can telcos adapt themselves to the new industry ecosystem? How can they cut costs and improve service agility? How can they do to unleash their network potential? And how can they increase revenue? As an Infrastructure Enabling System (IES), next-gen OSS must have the following capabilities.

Real-time, on-demand, E2E service & resource orchestration

Physical and virtual networks will coexist for a long time. The service orchestrator is the key to rapid service deployment. It controls

the physical and virtual networks from end to end and orchestrates network functions based on service requirements. Thus, it orchestrates E2E network function resources in real time, coordinates DCs and virtual/physical networks in different geographical locations, and supports the planning, design, optimization, automated provision, and configuration of ICT services.

Zero-touch service assurance that enables elastic scale-in & scale-out

A traditional OSS has independent service fulfillment and service assurance systems, with service assurance mostly event-driven. Alarms trigger fault management, for example. But a next-generation IES will be intelligent, with service assurance analysis-driven rather than event-driven. Said analysis will be in real time, and involve SLAs and KPIs/KQIs on a per-service per-user (PSPU) basis. Combined with Big Data analysis offline (network capacity forecasts, index trend analysis, etc.), active service assurance will be enabled. Service assurance and service fulfillment will also be streamlined, with service assurance triggering service fulfillment so that elastic scale in and scale out, flexible scheduling, dynamic service optimization and issue closure are all realized. For example, the service orchestrator can be automatically triggered based on the SLA and performance indicators of enterprise users, scheduling resources (bandwidth, QoS) to satisfy their SLA needs and "self-heal" services dynamically.

Open APIs that boost telco revenue

As the ICT industry becomes increasingly open and carriers shift from competition to cooperation with OTTs, OSS capacity will emerge as a new resource for third-parties. By opening APIs to these parties (OSS-as-a-service), telcos can meet customer needs more flexibly, and thus boost their own utility (and therefore profit). From the perspective of the industry chain, open APIs can bring and hold partners together, and help establish a less linear and more networked ecosystem.

A developer ecosystem (app factory)

Telcos should create IES app factories that leverage their newfound system architecture

Centered on a ROADS user experience, IES will become the front-end service system and a customer-oriented product and solution development platform that builds the industry ecosystem. IES will greatly simplify network O&M by bringing automation and intelligence to the network.

flexibility to provide a graphic development studio pre-installed with templates, views, and tools. Developers can orchestrate visually, and process multi-source APIs and data. The design, development, coding, packaging, and release processes will all be pre-installed, with DevOps supported to accelerate the app creation process. Developers can develop and release apps through an app factory in a quick DIY manner. Such a factory will be scalable and powerful, and will support single-point applications such as capacity planning and management of LTE services that enable on-demand service provision and issue closure management, as well as business model applications. For example, telcos can develop special DC apps for bank customers related to data analysis.

Pioneering IES in Europe

In 2012, Huawei launched its network architecture development strategy for the next decade – SoftCOM. This open telecom network architecture blueprint includes IES, under the Telco OS concept. Centered on a ROADS user experience, IES will become the front-end service system and a customer-oriented product and solution development platform that aggregates carrier resources, including third-party resources. It will also open network capabilities, and build an industry ecosystem. It will also bring automation and intelligence to the network, thus greatly simplifying network O&M.

In 2014, Huawei collaborated with leading European carriers to participate in their NFV laboratory innovation projects. In addition to NFV testing, Huawei also verified the efficacy of the service orchestrator, through scenarios that included NFV network design and planning, VoLTE (vIMS, vEPC) service provision and orchestration, GiLAN service deployment and orchestration, and the deployment of small and medium enterprise (SME) applications.

In the near future, the next-generation of OSS (IES) will help telcos transform their businesses through its real-time, automated, intelligent, and open capabilities, enabling telcos to provide better services, and boost revenues in the digital economy.

IT convergence drives demand for telecom managed services

Operators are turning to managed services to control operational costs and complexity in their IT and network environments. The IT outsourcing (ITO) managed services market in telecom is expected to exceed USD 12 billion by the end of 2016, driven by operators need for data center functions to be integrated with network operations for increased operational efficiency.

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Michael Sullivan
Trainer, TBR

ITO demand is increasing across all regions, although developing markets in Asia, the Middle East, Africa, and Latin America are at the forefront. Operators in these regions are facing challenges.

Paying-customer saturation: An increasingly saturated customer base of paying subscribers.

Smarter, more demanding subscribers: Customers are becoming more savvy and now expect more service at less cost.

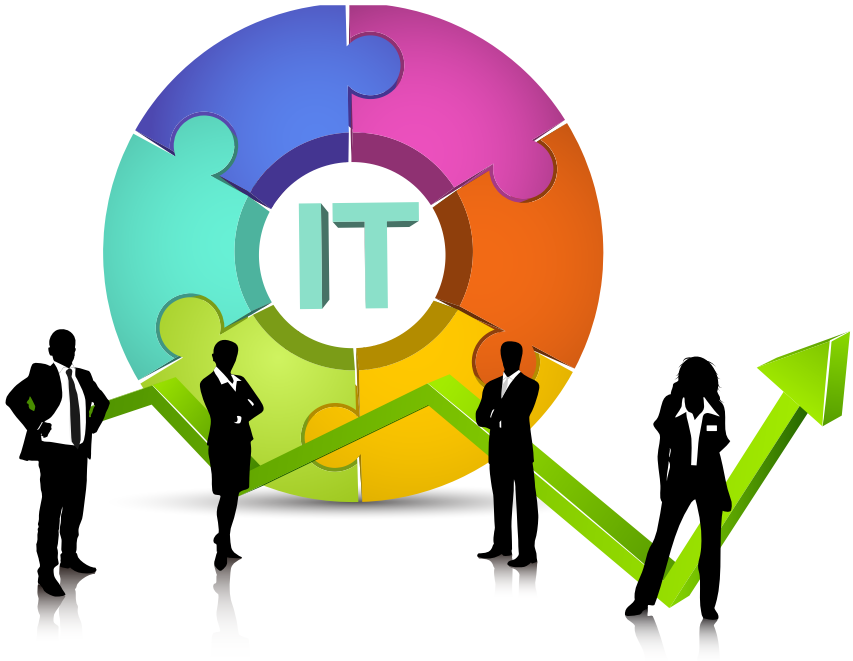
Fast bandwidth but slow innovation: LTE and fixed broadband have boosted bandwidth but slow internal processes cause service innovation to lag behind.

Increased competition: Multinational telecom operators compete against local operators and each other for the limited user base, while Internet, cable and media companies are also entering the market to capture value-added service opportunities.

Adaptation to new architecture: Virtualization is spreading across IT and network environments in the form of cloud services, NFV, and SDN. The increased complexity is challenging the competency of traditional operator IT organizations.

Operators need to innovate faster if they hope to retain customers in this more competitive market. To tap new markets, they also need to expand where possible. They can expand geographically or by deepening the variety of services they offer, particularly through cloud and digital content services. To increase the focus on innovation and efficiency, many of these operators are deciding that operating networks or IT data centers is not their core business. They would rather reassign staff to cater to customers by improving service, innovating products or extending the reach of the business models. These operators gain the competency to implement this strategy by turning over noncore operations to managed services providers.

"Our company is a telecom company; we



are not a software company. That's why we outsource IT," said a Middle East IT director.

When outsourcing, operators enjoy a collection of benefits, including the advantage that managed services suppliers provide the innovation needed to reach new customers, especially in business or enterprise segments.

Key factors driving ITO

To better understand which market trends drive more operators to outsource IT functions, Technology Business Research (TBR) surveyed 30 operators in EMEA, Asia and the Americas. Of operators surveyed, 73% outsource IT and/or network functions, citing a number of benefits. ITO helps them to handle increased complexity of information and communications technology (ICT), improve security, and manage the introduction of technologies such as cloud, NFV and SDN. The increasing complexity of IT environments is at the forefront of operators' decisions to outsource IT functions.

In the TBR survey, 58% of operators said they experienced challenges with compatibility across applications in cloud environments. Additionally, 57% of operators surveyed report that meeting NFV scalability requirements is a challenge, with 50% also reporting performance and reliability challenges.

Of operators surveyed, 56% reported performance and reliability challenges and difficulties meeting scalability requirements. The inherent security risks of deploying cloud environments, SDN and NFV in networks are also driving managed services adoption; 53% of operators surveyed said that transitioning to the cloud posed a data security challenge, while 40% of operators said that working with SDN and NFV technologies posed a data security challenge.

Operators are challenged to keep pace with IT innovation while developing predictable CAPEX and OPEX budgets and when creating value through new services. Managed services suppliers can transform the operations model to achieve both objectives.

Efficiencies enabled by outsourcing give operators added scalability, as about two-thirds of survey respondents indicated they use managed services to extend their geographic reach and focus more on core business processes. Operators also leverage these services to expand their enterprise services offerings to grow revenue.

Capabilities required to transform IT

Managed services suppliers must have sufficient capabilities in outsourced network and IT functions to help operators maximize efficiency. As operators understand and plan for new technology implementation in converged environments, they expect increasing competency from their suppliers. About three-quarters of

surveyed operators indicated it is extremely important for services suppliers to have both integration and migration capabilities that span IT and networking spaces. These capabilities are especially important as NFV and SDN deployments become more prevalent.

In the early stages of this market, network suppliers appear to be the first choice for converged ICT outsourcing. Forty-three percent of operators surveyed indicate they use network suppliers for both IT and network managed services. An additional 13% are likely to call upon their network supplier for IT managed services in the future.

Operators are increasingly accepting suppliers as agents of change. They see outsourcing as the opportunity to transform their network and IT environments. What may be difficult for the operator to accomplish internally due to cultural or organizational challenges, suppliers can address by implementing an objective IT transformation roadmap based on numerous experiences and best practices from other engagements.

Many managed services providers demonstrate a high capability in either the network or IT space, but few can provide a high level of service in both areas. Huawei has a strong reputation in the communications network space, while players like HP and Accenture lean toward the IT space. However, Huawei is quickly growing its presence in IT. The company is gaining traction in operator ITO, as it has invested in broadening its managed services portfolio through acquisition and organic development. These investments also complement Huawei's development of its IT data center, SDN, and NFV portfolios.

Partnering with managed services providers

In cases where operators have benefited from partnering with managed service providers

for either IT and CT services, they are now inviting those providers to handle both IT and CT services. As a result, they gain the ability to reassign staff for other strategic operations such as new service development. They also gain a more efficient network that leverages both the network infrastructure and the data center, while keeping pace with the latest advances in technology, especially NFV/SDN infrastructure. And finally, they can develop and deploy new services more rapidly, as the managed infrastructure features great competence and flexibility.

Huawei's growing leadership in IT and Network managed services

Building on its network operations credibility, Huawei has won more than 360 managed services contracts since it entered the market in 2006. Increasingly these contracts are extending from the network to the data center and some are purely for IT data centers. Operators are viewing Huawei's customer management practices and technical expertise as strong qualifications for turning over their IT functions.

Huawei's Managed IT Transformation Solution is a key asset in addressing ITO requirements. The solution includes an IT environment assessment that leverages Huawei's IT product lineup of server, storage, network and cloud components and managed service offering. Huawei is also equipped to provide managed enterprise cloud services. Huawei's cloud enablement products and services address and extend hosting centers. The company also uses an extensive partner network to address the enterprise cloud.

Operators in the TBR survey named Huawei among the top three managed services providers for network functions, value-added service platforms, business or enterprise cloud services and data center infrastructure. The majority of respondents perceived Huawei's managed services offerings to be among the best and indicated they are likely to use Huawei's managed services in the future.

Huawei's comprehensive range of IT and network managed services solutions includes managed IT transformation, designed to converge operators' siloed IT and CT environments. The need for this service is market-driven, which becomes apparent as operators increase revenue from IT and cloud sources and centralize IT systems in the cloud. Huawei takes an assess-transform-manage approach to IT transformation.

Assessment services: Huawei provides capacity and lifecycle management services as it assesses an operator's needs. The operator and Huawei ensure strategy alignment as they determine market share and subscriber goals, plan IT investment and budget OPEX and CAPEX.

Transformation services: Huawei's comprehensive transformation solution to migrate applications and infrastructure to the cloud begins with a hardware refresh cycle, including computing, storage and networking equipment. Huawei provides virtualization through its SoftCom architecture, transforming IMS and EPC into vIMS and vEPC, powered by Huawei's cloud OS.

Managed operation service: Huawei's ManageOne cloud service management solution enables service orchestration, cloud management, application management and infrastructure management.

Managed Enterprise Cloud: This solution is designed for the changing IT services business model, where cloud computing brings new revenue opportunities. Whatever challenges operators face – small partner ecosystem, lack of a go-to-market system, small early ROI – Huawei can help. Huawei's strong cloud ecosystem includes partners who can offer collaboration, security, CRM, ERP and more. Huawei also reduces risk for its customers by planning, building and operating the enterprise cloud and providing go-to-market assistance including sales support and partner management and collaborating with operators in marketing efforts.

Other managed services solutions, including Managed Planning & Engineering, Managed Network Operations, Managed Service Operations, Managed Business Support, Managed LTE Operations, and Managed Multi-Network Operations round out Huawei's portfolio. Huawei leverages its hosting centers and global

operations centers to provide multi-vendor and multi-technology managed services, improving network quality and making operations more efficient, while also creating more business value for operators.

Operator examples

ITO customers have found that Huawei's IT capability and expertise is on par with its network operations, from onsite outsourcing to the leveraging of internal competency from remote locations including its well-established data centers. Local support in ITO is a critical factor even in offsite deployments. For example, mobile operators in Mexico rely on Huawei's large Mexico-based offices and support centers to deliver ITO services.

Operators interviewed said Huawei frequently wins the bid based on providing the most value while still managing the complexity and cost of ICT convergence.

According to ITO customers, Huawei also brings management experience and adaptability that carries over from its network managed services approach and experience. IT directors see Huawei as fielding managers and staff who are experienced in multivendor operations and are willing to adapt, going beyond service-level agreements (SLAs) and key performance indicators (KPIs) to local service quality metrics such as serviceability and responsiveness to customers. These qualities, learned in the network business, are serving Huawei well in ITO engagements.

For example, Huawei's Managed IT Transformation solution helped an operator in Africa simplify operational complexity and improve cost management. Huawei is servicing a five-year IT managed services contract, including infrastructure and application management. Huawei also built an enterprise private cloud for the operator. The operator experienced CAPEX and OPEX savings and 20% SLA improvement.

An operator in Asia is using Huawei's Managed Enterprise Cloud. The solution provides cloud services to more than 30 large enterprise and government customers while reducing business risk for the operator. Huawei built and operates the cloud, including hosting the computing, storage and network resources.

The main reason we chose Huawei as our managed services provider was the value, as our primary goal when deciding to move to an outsourcing model was reducing operational cost. Huawei has demonstrated remarkable expertise and enabled more efficiency.

– Project Manager, EMEA Service Provider

Conclusion

Operators are increasingly selecting managed services providers that are able to reduce complexity and operational costs in both IT and network environments. Driving operational efficiency and reducing OPEX are of paramount importance to evolving network operators. These outcomes enable operators to expand their services to new geographic markets and focus on core business processes.

Operators see Huawei as one of the leading suppliers of ITO. Its broad portfolio of managed services for IT and network environments delivers IT transformation for operators looking to broaden their enterprise service offerings and incorporate new technologies such as NFV, SDN and cloud into their operations.

Fujian Unicom implements “pre-assessment, post-evaluation” construction model

Through its innovative "pre-assessment, post-evaluation" closed-loop iterative network construction model, China Unicom Fujian (Fujian Unicom) has found the perfect balance between investment, user perception and network quality to effectively support 2G/3G/4G mobile market development.

Liang Chengxu
General Manager of Network Construction, Fujian Unicom

Iterative network construction

Internet companies employ iterative updates to quickly respond to user needs, and use short-cycle, low-density software updates to optimize services and improve user perception. Learning from the concept of iterative development, and based on its experiences from 2012 to 2014, Fujian Unicom established its own "pre-assessment, post-evaluation" iterative network construction model. During the construction of its mobile networks, we established a pre-assessment, post-evaluation model centered on "network returns, user perception and network quality." By verifying iterative updates and continuous effects, Fujian Unicom can now quickly respond to market developments and changes in user perception. The model involves the following steps.

Establish baselines: First, a large network is divided into smaller grids that are analyzed in terms of network return, user perception and network quality so that network characteristics can be summarized and weaknesses identified. Carriers can then establish a baseline archive of network requirements for the entire province and make dynamic adjustments.

Pre-assessment to determine construction order: To determine the order of construction, list management is performed based on the aforementioned baseline archive. The three key network characteristics are then associated with resource utilization to build trust.

Post-evaluation to modify construction order: Three months after network construction, the three characteristics for each grid are updated.

Fujian Unicom completed the first systematic, E2E multi-dimensional analysis of its 3G network, allowing it to summarize and analyze the characteristics of value grids, potential grids and non-value grids.

Changes are assessed and return on investment (ROI) is evaluated to see whether expected goals are met, whether improvements have been made in terms of network quality, and whether user perception and market development objectives have been achieved. The results will serve as the baseline for future investment.

In this iterative, granular, low-density modification process, Fujian Unicom makes adjustments based on constantly evaluating the network and identifying issues with user perception and changes in network quality. Combined with its accountability mechanism, Fujian Unicom ensures accurate and effective investment, and has noticeably improved user perception. With support from Fujian Telecom's management, many provincial branch departments have partnered with Huawei on key pilot and verification projects. Partner departments included network construction, finance, planning, operations and maintenance, customer service and network optimization, and the design institute.

Fujian Unicom completed the first systematic, E2E multi-dimensional analysis of its 3G network, allowing it to summarize and analyze the characteristics of value grids, potential grids and non-value grids from a massive 33TB data pool covering nearly 15,000 base stations. Ultimately, a closed-loop network construction model based on "post-evaluation" and "pre-assessment" was successfully executed.

Diversification: User perception & grid value

Traditional network construction follows an extensive and planned management model

from the 2G era. The model suits the voice-dominated 2G era well, and can assure network quality. However, it can no longer meet demand for 3G, much less 4G. On the one hand, the rapid development of mobile data services means that new demands will continue to emerge and the development cycle for new services will continue to decrease. On the other, network quality alone can no longer reflect the user perception of experience, and user complaints tend to increase even though network quality is improving. This means that network construction, operations and maintenance must change and adapt to changing markets and new services. In turn, resources must be effectively allocated.

As data overtakes voice as the dominant mobile service, Fujian Unicom needs to promote diverse network construction models to replace traditional methods that center solely on network quality. First, Fujian Unicom must improve user perception and network returns to form a three-pronged approach on par with network quality. User perception refers to the network speeds perceived by high-value users when they browse websites or watch online videos. Network returns refer to the comprehensive investment recovery period for single mobile units. Network quality refers to the weighted average of 2G, 3G and 4G coverage, interference, and transmission delays. Second, Fujian Unicom divides its expansive network into smaller grids, and takes its marketing grid as a blueprint for analyzing and mapping out network needs to better control operating responsibilities, costs, investment, and other resources at the grassroots level.

Through quantification, classification and analysis, the overall network becomes a huge province-wide chessboard. The grids within the chessboard are then comprehensively evaluated, filed and sorted. Value grids are prioritized, while potential grids indicate areas with untapped market potential. Even non-value grids are approached in an aggressive manner. In this way, Fujian Unicom can improve investment precision and network effectiveness, promote investment in high-efficiency regions, and improve provincial revenue and the percentage of high-value users while ensuring appropriate 2G/3G/4G coverage.

Perception-based network construction

During the implementation of our “pre-assessment, post-evaluation" model, Fujian Unicom deployed probes to detect the service composition of each grid and quantify data, including service structure, proportion and speed. Following big data analysis from 15,000 2G/3G/4G base stations, Fujian Unicom discovered that 83% of data traffic throughout

Fujian Unicom adopted a "build as needed" strategy in which it balances the service and user demands of each grid based on the expected service rate in its development plan for first-, second- and third-tier cities, respectively.

the province is concentrated around 21% of station sites located in the cities of Fuzhou, Xiamen and Quanzhou. Meanwhile, in terms of hits, traffic and usage time, short video services have continued to grow. This shows that urban users are the main consumer of mobile services, and that 3-to-5 minute short videos will become a basic data service.

With the diversification of mobile Internet services, urban users will continue to demand faster mobile network speeds, which will force operators to figure out how to balance the growing demand for faster network speeds with ROI from urban network construction. Fujian Unicom adopted a "build as needed" strategy in which it balances the service and user demands of each grid based on the expected service rate in its development plan for first-, second- and third-tier cities, respectively. We will then carry out mobile network construction in different cities based on different standards, involving either an increase in 3G capacity or deployment of an LTE network that ensures good user perception while efficiently and effectively allocating network resources.

According to Fujian Province's 2014 Q3 Mobile Brand Development report, 60.3% of customers selected Fujian Unicom for its fast network speeds, and 65.7% of urban users chose Unicom as their mobile service provider.

U900 for wide coverage

The development of users and business in rural areas lags behind urban areas, but the market potential for both is significant. From 2012 to 2014, the voice services of Fujian Province's rural grid increased by 10%. On par with the urban grid, browsing, videos viewing and gaming in rural areas grew by 23%. Mobile networks will inevitably transition from 2G to 3G, so rural network construction is imperative.

The topographic complexities, unbalanced spending power, and diverse range of terminals in rural Fujian all posed challenges to 3G construction. Fujian Unicom chose to effectively use spectrum resources and selected U900 technology for low-cost coverage in rural areas. First, we implemented frequency re-planning for spectrum resources at 900MHz band and built GU900 co-stations to successfully deliver broadband mobile Internet access to rural users. Secondly, we adopted "pre-assessment, post-evaluation" and studied the distribution of rural investment returns, U900 terminal penetration, and market channel distribution across its grids to identify the highest-potential towns and villages. The practical results from 2014 showed just how useful this strategy has been. Through 3-to-4 months of market expansion, both rural users and services increased, with a 300% growth in data traffic.

With mobile Internet construction in full swing, Fujian Telecom forged ahead with a positive spirit, developed the "pre-assessment, post-evaluation" iterative network construction model, and struck balanced development between network returns, user perception and network quality. The constant support from Huawei in the process of project implementation also proved crucial.

Optimizing user experience with openness: Huawei SmartCare CEM

Customer experience management helps improve operation and maintenance (O&M) efficiency to give a better customer experience and create a new revenue source for telcos by monetizing this experience.

Lv Chaodi
Senior Marketing Manager, Huawei

Openness for timely closed-loop CEM

More telco managers are coming to realize that using customer experience to identify, delimit, position and resolve problems cannot be achieved by using customer service or network maintenance departments alone. A meaningful solution requires the cooperation of several departments in the areas of network planning, construction, maintenance, optimization, customer services, marketing, and sales. Customer experience management (CEM) enables telcos to open up internal processes, achieve deep interdepartmental collaboration, ensure an excellent end-to-end (E2E) user experience, and implement fast closed-loop management of user experience problems.

Thanks to Huawei's CEM solution, the telco was able to use Interact, Choose, Use, and Get Help as its key points of contact. It also divided and effectively allocated tasks among different departments, and clearly defined internal collaboration processes. In

Huawei's SmartCare solution is designed to help telcos optimize user experience within an open and collaborative CEM ecosystem, and transform user experience into a potential revenue growth point as a value-added service.

doing so, the telco could ensure E2E user experience, enable fast closed-loop management, and ultimately enhance user satisfaction.

Open CEM monetizes customer experience

Customer experience management (CEM) helps improve operation and maintenance efficiency to give a better customer experience and create new revenue sources for telcos by monetizing this experience.

Telcos have access to vast amounts of user information, which they can use to generate a complete user view to gain insight into user experience and requirements. They can then reduce and prevent user churn, implement precision marketing, and increase revenue. User experience is important for every line of business, whether it involves food, clothing, shelter, transportation, healthcare, education or entertainment. Users are also willing to pay for a high-quality experience. Telcos can open their data to third parties and, by expanding cooperation in the vertical industry, better monetize user experience.

Big data-based CEM enablement platform

As an E2E user experience improvement and assurance tool, Huawei's SmartCare CEM solution is based on a deep understanding of user experience. SmartCare's CEM enablement platform adopts the 3-tier indicator system of CEI-KQI-KPI to

obtain accurate per-service, per-user and per-raster information. Moreover, by analyzing this information alongside users' demographic data, payment records, service use, traffic and packages, telcos can accurately identify user locations, preferences, habits, and social networks, thus enabling a complete user view. This provides strong insights into their requirements, which improves user experience management. APIs for the SmartCare CEM enablement platform, including the real-time location API and user preference API, can be opened for third parties to develop and utilize data. In this way, the catering and entertainment sectors, for example, can target customers with specific ads based on real-time locations. Through big data analysis of app usage habits, telcos can help VC firms perform risk assessments and significantly increase investment success rates.

To better help telcos open their data, Huawei is building open labs for its SmartCare CEM solution, and working with probe, IT and OTT companies to create an open and collaborative market environment. SmartCare CEM will be enabled in the future to integrate telco IT data, data on the NE side, user data, Internet data, and even third-party data.

Open & collaborative ecosystem

Monetizing user experience is best realized through industry cooperation. Individual companies, regardless of how powerful they may be, are no match for an open and collaborative ecosystem. Carriers, vendors, OTTs, system integrators, content providers, and users are all important members of an ecosystem. With SmartCare CEM, Huawei seeks to expand cooperation with its partners to manage user experience and achieve shared business success.

In 2014, Huawei announced the completion of the world's first Customer Experience Transformation Center (CETC). The CETC is designed to build a CEM ecosystem that leads industry development, develops solutions that cater to telcos' business goals, and achieves verifiable CEM business value. As of November 2014, four companies were working with Huawei to conduct feasibility analysis of innovative CEM solutions, which will be verified by the CETC. These companies work in fields as diverse as games, mobile payments, and satisfaction feedback management.

The CETC has also established a cooperative relationship with leading consulting firms such as Gartner, Mason, and Yankee to produce reports on user characteristics and CEM market segmentation, and explore viable business models. In addition, customers from Europe, Latin America, the Middle East, and the Asia-Pacific are getting involved in the CETC to design, develop, and verify solutions. The CETC makes CEM solutions transparent and visible, and enables solutions that center on user experience to be explored.

The key to business success is a strong business model. SmartCare CEM attempts to provide a superb user experience based on the XaaS business model. The enablement platform incubates innovative applications and accommodates partners to enhance service provisioning capabilities, accelerate innovation, and meet the challenges posed by an increasingly personalized, long-tail user experience. At the same time, Huawei sees its partners as the driving force for developing innovative applications, and supports them through funding and hierarchical revenue sharing, both of which aim to engender long-term benefits.

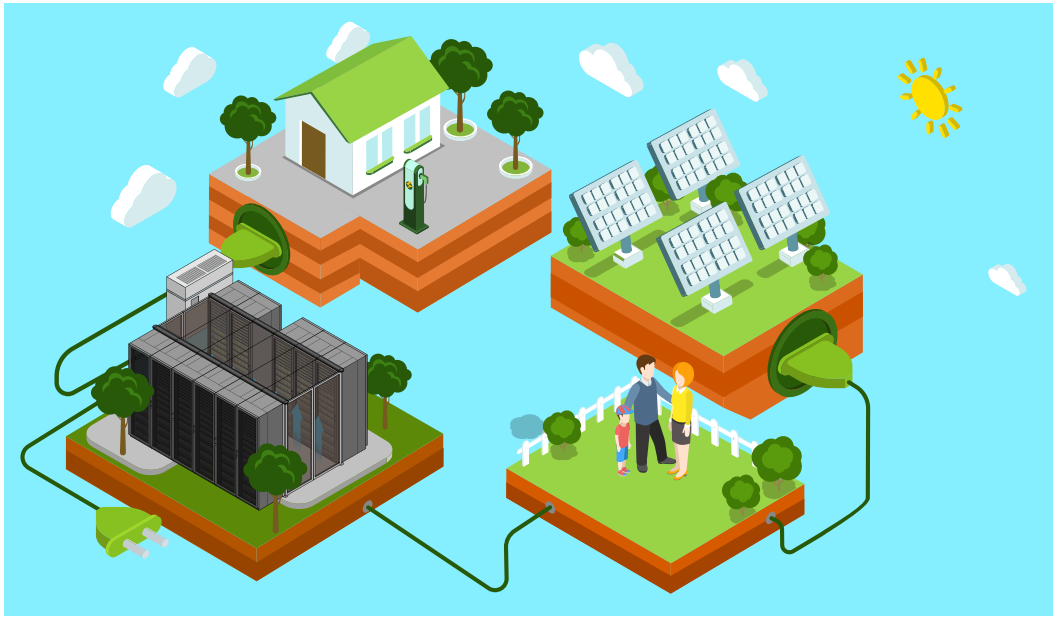
Huawei's SmartCare solution is designed to help telcos optimize user experience within an open and collaborative CEM ecosystem, and transform user experience into a potential revenue growth point as a value-added service.

Green data centers in four steps

Huawei has developed four steps to helping operators plan, construct and manage a new generation of green data centers. Not only will these steps boost operating revenue for enterprises, they will also benefit the planet.

Zhang Fan
Huawei Data Center Senior Advisor

The growth of cloud computing has set off a new wave of data center (DC) construction across the globe. Statistics show that current DC electricity consumption and carbon emissions account for more than 1% of the global total. As such, the construction of green energy-efficient data centers is not just a choice that enterprises themselves must make. It is also a major social responsibility that enterprises and the industry as a whole must assume. As an industry promoter and practitioner of green energy-saving technology, Huawei has years of experience in constructing green data centers and has proposed the "Four Steps" lifecycle of energy savings to help operators build customized green data centers.



Step 1: Effective construction goals

To a large extent, the degree to which a DC is green and energy-efficient is determined in the early planning phase. In DC planning, the builder must determine the construction scale, standards, site selection and phased planning, and specify important indicators such as usability, power density, and power usage effectiveness (PUE). Of these indicators, PUE is the most important for measuring the energy efficiency. In general, a lower PUE indicates higher energy efficiency. The PUE value itself is tied to construction scale, usability, power density, and of course, the natural climate of the local area. However, the greatest determining factor is site selection.

The construction agent should first consider areas that are cold for longer periods over the year or areas that offer rich water resources such as riverbanks and coastal sites. The DC can then tap into natural cooling sources and reduce the system's energy consumption. Site selection must also consider local humidity, cleanliness, acidity, and other such factors to avoid additional energy consumption by filtration and humidification.

For example, when helping China Mobile build its pilot data center in Harbin, Huawei considered various factors including the local climate and air conditions when adopting an indirect heat exchange scheme with rotary air-conditioning. While the DC uses cold outdoor air, it also prevents the indoor/outdoor air exchange for machine rooms, to effectively avoid issues such as winter humidification and acidic gas corrosion. Six months of third-party testing showed that the data center's average PUE was 1.22. For this, the project received the "DCD Greenest Data Center" award for that year.

The construction of green energy-efficient data centers is not only a choice that enterprises themselves must make, it is also a major social responsibility that enterprises and the industry as a whole must assume.

Step 2: Suitable cooling schemes

The use of natural cooling sources is a major development for green, energy-efficient data center construction. To fully utilize air, surface water, groundwater and other free sources of cooling, engineers have designed many new types of cooling systems such as direct ventilation, water source heat pumps, and direct cooling and evaporation from river water or seawater. Several of these have already demonstrated solid application potential. In areas with good air quality and humidity, cool air itself can be used directly as a free cooling source. One great example of this is the large-scale data center that Huawei designed for a customer in Istanbul in which the cooling system uses a combination of direct ventilation and air cooling. Because the data center only uses 215 hours of mechanical cooling all year-round, it can achieve an average annual PUE of 1.28.

To extend the periods of time in which natural cooling sources can be used, the temperature of the air supply for server cabinets needs to be increased, raising higher demands on IT equipment. In the last decade, major ICT vendors have revamped their product design so that IT equipment can operate under air supply temperatures of 35 degrees Celsius or higher.

For the air conditioning terminals, shortened air supply paths and reduced heat exchange losses will be developed in the future. Heat exchange between air conditioning systems and IT equipment will progress from room air conditioning to confined and isolated hot/cold aisles. For operations with relatively high power density, row-level air conditioning is used to shorten the air supply path and reduce losses. There are also cabinet-level schemes such as heat-pipe back panels and cold-water front panels still in the early stages of commercial application, and pilot schemes for server- and even chip-level cooling schemes are currently being run.

The thinking behind such schemes is to bring the heat exchange media as close as possible to the IT equipment

and thus improve heat transfer efficiency. Huawei has already completed lab verification of its liquid server cooling technology. At China Mobile's southern base project, Huawei implemented confined cold aisles, row-level air conditioners and heat pipes alongside other new technologies, which combine to use between 20-to-40% less energy than traditional schemes.

Step 3: Improve electrical efficiency via clean energy

The power supply and distribution gear are actually major power consumers. In recent years, technicians have improved product performance and system architectures to greatly reduce their consumption. Solar, wind and other forms of clean energy are also effective at reducing carbon emissions. Huawei designed a combined cooling, heating and power system (CCHP) using natural gas for Alestra's Mexican data center. The generator is fueled by natural gas, which provides 100% of the data center's power supply. Compared to coal-fired or oil-fired units, the generator's carbon emissions are significantly lower. Meanwhile, high-temperature exhaust gas and wastewater generated by combustion can be recycled for use by absorption-cooling machines, the cooling capacity of which can in turn meet roughly 70% of the data center's required cooling needs.

The major benefit of simplifying the power structure is de-UPS. While uninterruptible power supply (UPS) provides optimal, reliable power for IT equipment, it also consumes approximately 5% of its own electricity. More parties have begun trying out new power technologies to replace UPS schemes, including the use of dynamic flywheel UPS, high-voltage direct current transmission (HVDC) schemes, and battery-based cabinet-level backup power schemes. Of these, HVDC schemes remove two AC-DC conversions, thus greatly improving efficiency. The data center that Huawei helped China Unicom build in Shanghai, for example, adopts a hybrid power supply of 240V HVDC and UPS, and the energy efficiency of the data center's power system is as high as 96%. With technical and engineering improvements, the efficiency of high-voltage DC power supply will also continue to increase.

Step 4: Optimize operations & management

Routine maintenance, operations and management also have a major impact on the actual energy efficiency of data centers. On the one hand, effective routine maintenance will help ensure that equipment continues to operate at its best; on the other, cooling machines, cooling towers, air-conditioning fans, and other energy-consuming equipment exhibit a non-linear efficiency curve that makes it hard to determine control policies and related parameters at the time of design and construction. Therefore, data centers must constantly monitor and adjust these policies and parameters based on actual operations. What's more, the acceptable range for room temperature and humidity that IT equipment and operations can sustain can only be determined after a certain duration of operation.

Once a data center is built and specialists are sent to study, record and adjust operational data, optimal energy consumption can be achieved within 2-to-3 years. For example, after two years of continual adjustments and improvements to its data center in Beijing's Jiuxianqiao, Baidu lowered the data center's PUE from 1.40 during the design phase to 1.33.

Evolution to info-oriented next-gen All-IP

Huawei helps telcos evolve their networks from host-interconnection to information-interconnection orientation through elastic cloud-pipe-device design, agile service provision, and short-term capacity planning. With help from Huawei, telcos can face future business development flexibly, circulate investment effectively, and achieve business success.

Qu Song
Senior Marketing Manager of FBB, Huawei

As the digital economy dawns, people expect seamless one-click access to whatever they want. For this to occur, networks must choose the best source for a clicked HD video, adjust the bandwidth accordingly, and route it as needed as data centers (DCs) migrate or new DCs are built, all automatically. Another must is collaborative office work, with free anytime-anywhere information sharing without network debugging and connection issues, which can take days to resolve. Current telecom networks focus more on connecting hosts, but evolution to an information-oriented architecture is inevitable.

Traffic: Uneven, diversified, bursty

The information volume generated every 18 months on the Internet now equals the total volume of the past information generated in all of human history, but Huawei finds this network traffic to be tremendously uneven. Google, for example, accounts for a quarter of all Internet traffic of the United States, and current telco traffic models, typically involving 1-to-2-year forecasts, simply cannot be reconciled with this. Planning inaccuracies can cost billions, leaving telcos literally staring into the abyss.

Millions of apps are created each year, and in the near future an estimated 51% of all connections will involve things rather than people. As network nodes diversify, service configuration grows more complicated. One carrier had to spend two weeks to coordinate three domains and configure over 5,000 lines of code on the network side to enable just a single new service.

Today, content can go viral in an instant, whether it be an app, video, song, or game, leading to problems in terms of congestion and load. How can telcos adjust their networks in real time so that traffic bursts get through, with a good user experience maintained?

The development of mobile services has made carrier network architecture ever more complex. Network environments are diverse and varied. Pressure from customers on network assurance is increasing, and problems involving coverage, interference, and capacity are becoming more prominent. All pose new challenges for wireless network planning and optimization.

Empowering evolution: Three innovations

Many new technologies have emerged to facilitate information transfer, including software-defined networking (SDN), named data networking (NDN), information center networking (ICN), and content distribution networking (CDN), but it is difficult to evolve current networks to target networks in a single step. Telcos must find ways to integrate the latest technologies into networks that already exist, and evolve in the manner that suits them best.

Huawei offers a complete solution for telco network evolution, one that relies on three innovations.

Cloud-pipe-device planning flexibility

Thanks to real-time perception of information distribution across the entire network, and full consideration of cloud storage and computing resources, network transmission resources, and end users' real-time requirements, Huawei's solution flexibly allocate network resources in response to burst traffic through semantic-based route computing.

One carrier employed Huawei's network perception solution to realize real-time second-level network traffic analysis and accurate forecast. Based on its SDN/NFV architecture, this solution builds models and designs policies for services, networks, the IT system, and user devices so that resources are allocated flexibly in response to burst traffic. A virtual machine (VM) can be created to offload server traffic, or a backup link can be scheduled to divert traffic, or users can be offered the choice to accelerate access speeds on their terminals. All these adjustments employ cloud-pipe-device collaboration; when traffic burst occurs, none proves a bottleneck.

Fast & accurate capacity designing

Huawei can help telcos design a cloud-oriented traffic model and make certain that capacity planning for each node can meet the uneven traffic requirements of the future by shortening the capacity planning cycle, forecast & modification rolling, and multi-dimensional identification of investment priorities. This way, network investments will build on themselves.

For a certain carrier, Huawei leveraged its traffic collection and analysis capability to aid the reconstruction of its user-centered vertical traffic model into a DC-centered vertical and horizontal traffic model, better suited to uneven DC traffic. Huawei also aided the six-month capacity forecasts and performed rolling traffic forecasts and model modifications every half-month, culminating in 30% gains in planning accuracy and 20% gains in turnover rate for goods.

Agile service provision

Network agility requires standardization. Huawei classifies different services based on their network capability requirements and

transforms them accordingly into apps. When a service is needed, programmable network architecture can invoke the corresponding app and orchestrate & deliver it automatically. Thus, service provisioning is restructured, eliminating barriers between departments, improving provisioning efficiency, and enabling an agile business model.

Huawei classified a certain carrier's services into eight categories based on provisioning time, bandwidth requirements, and latency, and aggregated IT systems and network resources accordingly. The next step involved Huawei making over 20 network configuration templates for those eight service categories to align with different scenarios. If a service requires provisioning, simple operations can trigger huge amounts of configuration automatically. This process transformation aligns the marketing, network planning, and supply chain departments, thus balancing the management of physical resources to eliminate bottlenecks, and therefore halving service provision time.

Empowering evolution to All-IP

Huawei's fixed network integration service provides a complete set of solutions from network consulting, planning, and design to network testing, deployment, migration, and optimization so as to support network evolution to next-gen IP-based networking.

Huawei's fixed network integration service provides a complete set of solutions, from network consulting, planning, and design to network testing, deployment, migration, and optimization, with all in support of evolution to All-IP architecture. Huawei facilitates a gradual transition from host-interconnected networks to information-interconnected networks by leveraging our global expert resources, best practices, standardized processes, IT tools, and global support platforms. Huawei has three technical support centers that work 24/7, a powerful professional tool platform, and a Global Network Evolution & Experience Center (GNEEC), all built to ensure efficient delivery of the entire process, and thus facilitate network evolution.

Three-indicator model creates a "compass" for investment value

Huawei's "Three-indicator model" effectively links network returns, network quality and user perceptions to better illustrate a network's features, enabling more targeted investment strategies through a sort of "compass" for investment value.


Zhao Jun
Senior Engineer of
Carrier Solutions, Huawei


Wang Kunlun
Senior Engineer of
Carrier Solutions, Huawei

After completing a large-scale network deployment, a telco's investment policies inevitably return to balancing investment against reasonable returns. The key considerations become, "How can we effectively increase return on investment (ROI), improve equipment utilization, and enhance customer experience using a certain amount of investment?"

Huawei's Three-indicator model addresses telco needs by helping identify a network's relevant features and formulating reasonable, customized investment strategies by associating network returns, network quality, and user perceptions, allowing each carrier to build their own "compass" for investment value.

There are three stages involved in Three-indicator implementation – network segmentation, three-dimensional quantification, and grid classification and policy creation.

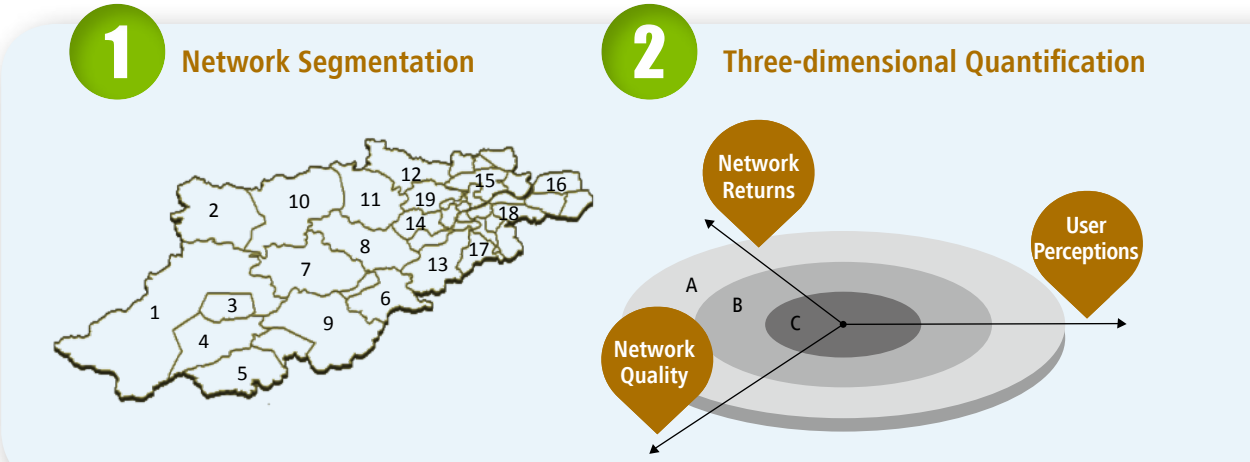
The Three Indicator Model

Network segmentation by region

First, telco networks are divided into sub-networks and grids by scenario (residential areas, shopping malls, commercial districts, etc.), administrative area, and site distribution.

3D analysis

This step entails efficient linking of wireless



data, PS core network data, operational DPI data and multi-vendor data to quantify a network's performance in three dimensions – network returns (CS voice traffic, data traffic, etc.), network quality (Ec/Io, RSCP, etc.), and user experience (speed, latency, etc.). A network's "high-performance features" are marked in red, and are known as level A (Figure 3); its "medium-performance features" are marked in blue, and are known as level B; while its "low-performance features" are marked in green, and are known as level C. Mapping that leverages this can clearly illustrate a telco's network.

Grid classification and policy creation

This last step involves placing the 3D (network returns, network quality, and user perception) results onto a coordinate axis, which is divided into nine quadrants classified by color as shown in Figure 3. In Quadrant I, network returns are high and network quality is good, so most attention should be paid to user experience. In Quadrant II, benefits are high but network quality is only average, so sustained network quality improvement is required. In Quadrant III, benefits are average, network quality is fairly good, and there is still spare network capacity, so regional potential hasn't been fully exploited. Finally, in Quadrant IV, benefits and network quality are both only average, and regional characteristics must be considered when formulating an investment strategy. Investment strategies for each of the four network types are displayed in Table 1.

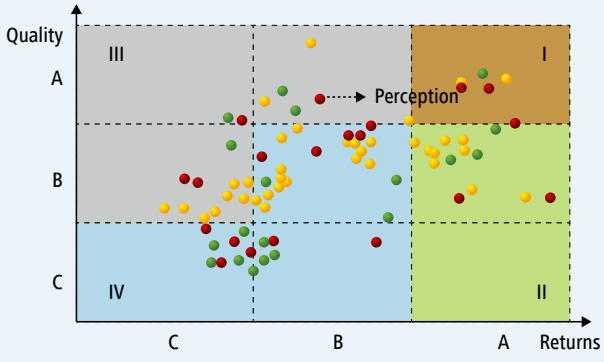
Quadrant	Network Type	Features	Policy
I	Quality network	High network returns and good network quality	User experience guaranteed
II		High network returns and average network quality	Sustained network quality improvement
III	Potential network	Average network returns and high network quality	Exploiting market potential
IV	Average network	Average network returns and average network quality	Regional characteristics must be considered

Table 1 Quadrant classification and poling

The Three-indicator model can be used during both network planning and operations. During planning, this model helps telcos build value investment-oriented strategic maps. During operations, the use of color-coded quadrants for both pre-operational assessment and post-operational evaluation allows for effective network development measurement and timely adjustment of investment strategies.

Huawei's Three-indicator model has already been successfully put to use by telcos in many countries. This includes extensive use in more than ten medium-sized and large cities by China Unicom, where it has aided the rapid development of the operator's 3G business and the establishment of its LTE investment strategy. Huawei's Three-indicator model is an invaluable tool for telcos in the joint, customized establishment of a "compass" for investment value and refined operations, and for obtaining optimum profitability from their networks.

3 Grid Classification



4 Policy Creation

Quadrant	Network Type	Policy
I	Quality networ	Perception first
II	Quality network	Sustained investment
III	Potential network	Market development first
IV	Average network	Quality improvement

Improving carrier ROI through geolocalized network data analysis

Comprehensive assessment and optimization analysis using Huawei's pioneering 6D business model and geolocalized network/service data can help carriers accurately identify hotspots, guarantee coverage quality, and maximize ROI.

Yang Li
Senior Marketing Manager, Network Engineer Service, Huawei

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According to a Visual Networking Index (VNI) report, mobile data traffic has a CAGR of 61% and will continue growing at this rate until at least 2018, reaching 15.9EB per month by that time, 96% of which will come from smart devices. The growth of mobile services presents an enormous challenge for carrier networks. HetNets are becoming mainstream, and the large-scale application of small-cell base stations has made network architecture even more complex. With the diverse and varying number of factors, such as macro- and micro-coordination and multi-standard co-antennas, in the network environment, coverage, interference, and capacity problems are becoming increasingly prominent, and pressure from customers for network assurance is increasing. Wireless network planning and optimization face a variety of new challenges.

Challenges to wireless planning & optimization

The distribution of data service traffic is much less balanced compared with traditional voice. Statistics show that 20% of sites carry 80% of network traffic. Data traffic at a few of the hottest sites can reach several dozen times that of an average site, and in some traffic-heavy areas, such as CBDs, schools, and malls, weak coverage, high interference and network anomalies still occur, and densely populated urban areas are often additionally marked by a scarcity of sites and spectrum resources. So, how can sites be correctly positioned? How can these heavy-traffic areas be effectively discovered and identified? How can macro/micro site interference be reduced? How can the potential of a network be exploited and ROI maximized, while still meeting the goals and needs of different areas and services? These are all key challenges facing carriers in their network planning.

Secondly, although LTE proliferation, increased site clustering, multi-network coordination, and multi-standard co-antennas represent the future for HetNets, this will also create great challenges for network optimization. Traditionally, network optimization primarily relied on standard measures such as drive tests and statistical analysis based on network and

service data (such as traffic statistics, call records, probe statistics, etc.). Among these, drive tests are not only expensive and complicated, but they're marginally effective and limited in the amount of data they can test and analyze on a sustained basis. In addition, analytical granularity (for dimensions/factors including region, RNC/BSC, site, cell/carrier frequency, service, users, etc.) in the statistical analysis of network and service data greatly affects problem resolution due to a lack of site-related information relating to localized problems (overlapping coverage, pilot pollution, connection failures, dropped calls, etc.). Indeed, when problems do occur, such as network failures or major complaints, frequent drive-tests are needed to simulate these anomalies. Lowering the dependency on drive tests, for example, through simulated drive testing or geolocation to accurately locate network faults to a certain grid, and then analyze the faults with network and service data, will be key to improving carriers' network optimization capabilities.

At present, carriers such as DT, Vodafone, Telefonica, and Telenor are beginning to call loudly for the use of geo-location, and are prioritizing geolocalized analysis in their daily O&M work.

6D modeling: Accurate site planning, effective investment

Huawei was the first in the industry to propose the use of a 6D evaluation model. This involves using the Assisted Global Positioning System (AGPS) to accurately display network traffic location so that geolocalized analysis of data may be conducted using six dimensions – traffic (including data and voice), users, terminal devices, revenue, complaints, and coverage. After, joint analysis of tool platform data and customized value weighting systems are used to design network planning schemes for carriers' different network planning needs, creating custom geolocalized "hotspots" for each carrier, and allowing carriers to prioritize their site investments. Compared with traditional coverage and capacity-based planning, this solution is not only better able to accurately identify hotspots, guarantee network coverage,and satisfy service requirements, it also maximizes ROI.

Accurate network optimization through geolocation

Huawei uses an enormous volume of test reports, site topographical locations, and terminal AGPS information to carry out geolocation and precise tracing. Huawei then compiles and charts this information to enable timely, accurate assessment of network performance at every site. Geo-location allows for the clear display of network coverage, voice data traffic, anomalies, users, and KQI distribution, to enable comprehensive analysis of network health and refined network optimization.

Geolocation of network coverage enables problems such as weak coverage, coverage hole, and coverage overlapping in different bands/frequencies/cells and their root causes to be quickly discovered, and guides engineers in their radio frequency optimization work. Geolocation of network coverage also allows for periodic network coverage assessments to be made. For example, coverage can be compared both before and after optimization, so that changes in coverage may be identified in a timely manner to avoid incorrect/invalid optimization. Geolocation of traffic can accurately identify hotspots, and regions with low or average speeds, making customer satisfaction that much easier to achieve.

Geolocation of anomalies involves identifying the location when an incident occurs, and then combining this information with cell information, the anomalous signal stream, and measurement reports to quickly locate faults. User geolocation, such as geolocalized mapping of changes in a user's mobile location during calls, can be used to collect information about signal quality and anomalies during the process, after which simulated drive tests may be used to promptly resolve user complaints and other problems. Geo-location of service quality refers to geolocalized charting of different service KQIs, such as call delay, number of buffers, etc., to identify locations where problems in service quality occur. This can then be combined with

methods such as geolocalized coverage, geolocalized anomaly processing, etc., to aid further mapping analysis.

ACP optimizes efficiency & lowers OPEX

Huawei's Automatic Cell Planning (ACP) is based on geolocalized information and uses intelligent search algorithms to adjust and optimize a cell's RF parameters such as its directional angle, down tilt, as well as its power, station height, and antenna signal, according to data from sources such as cell engineering parameters, traffic, load, test reports, base station information, and drive-tests. Following these initial adjustments, ACP uses information from highly-accurate virtual maps, ray tracing and propagation modeling, and iterative forecast optimizing technology, as well as the weighting of objects and traffic on geographic grid maps, to produce traffic maps of coverage, capacity, and interference. This enables automatic determination of optimal parameters to resolve problems concerning network coverage, capacity, quality, etc. Compared with traditional RF planning and optimization, ACP lowers reliance on engineer experience, and can better conduct quantitative analysis of changes in coverage, capacity and interference in all layers of a network when RF parameters are adjusted. This ensures that the RF parameter adjustment plan produced is appropriate and accurate, while greatly reducing OPEX.

The future of geolocalized network data mining

Network optimization depends on geo-location; if analysis requires location, then accurate position is extremely important. Improving positional accuracy is essential, especially for hotspots and other dense areas, and in indoor settings. Three-dimensional positioning capabilities that identify the specific location of a user or site (perhaps at the granularity of a certain floor of a building) will be required for complicated HetNet environments. Furthermore, due to the fact that a large number of services are delivered indoors, determining how to first conduct geomodeling of actual buildings and construct multi-dimensional geographical data about building interiors and exteriors, and then conduct indoor/outdoor coordination simulations and highly accurate positioning/mapping based upon these, is vital to the expansion and evolution of subsequent services.

In this age of fast mobile internet growth, it's estimated that 67% of mobile apps designed for everyday use are location-based in some way, and the big IT players have each acquired geo-data companies qualified to conduct testing and Internet mapping services. This is significant because by combining their own services with the provision of apps with geolocation capabilities, these IT companies can leverage enormous amounts of low-level user resources to obtain information on users' locations, activities, services used, etc. These companies are therefore in possession of the resources necessary to carry out commercial data mining and analysis, and a few IT companies are already providing similar commercial marketing and inquiry services.

Therefore, as pipeline managers and innovators of transformative services, carriers need to seize this opportunity and use positioning services based on big data from test reports, networks, users, and OTT services to launch programs that guarantee service quality and user experience. This may include determining user location through positional analysis, and then using this information to provide relevant content. Partnering with IT companies to provide special service-quality guarantees to users, such as QoS control policies on network channels, guaranteed use of special services, and other innovative services, will be key to successfully telco transformation into service innovators.

Huawei currently has over 500 experts in the mobile broadband domain worldwide who are committed to better-meeting customer needs, allocating resources, and offering more effective network design plans. Huawei has over 50 patents in the geo-location field, and is providing network planning and design services for over 500 carriers worldwide, helping them plan and optimize their network, achieve smooth network evolution, improve ROI, and accelerate business success.

SMART AT SCALE

Business challenges in areas from finance to energy to healthcare now exist on a worldwide scale, and contain huge opportunities for businesses that strive to meet them. For example, 80% of Tanzanians will go their entire life without seeing a healthcare professional. One solution that has been proposed to help solve this is the development of "telemedicine". Such an endeavor would require the ability to connect individuals, businesses, and institutions in an efficient web of information sharing. Being smarter at scale means connecting individuals to systems in a way that optimizes what every party can accomplish, separately and together.

Building A Better Connected World

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POSSIBLE

Designed to inspire. Inspired to design.

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- **See more in the dark**
  Superb low light performance with 13MP rear camera with OIS, RGBW sensor and ISP
- **Paint with light**
  Light painting made easy with instant preview
- **Designed to inspire**
  Sleek and bold metallic body with 5.2" FHD screen

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Please refer to the real product for color, shape and material.
Demonstration is created by visual effect.